Maximizing the use of mitigation measures to prevent losses and reduce risk from natural hazards!

City of McFarland Local Hazard Mitigation Plan

Local Hazard Mitigation Plan

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SECTION 1.0 INTRODUCTION

Natural disasters can cause death and injuries, as well as significant damage to our communities, businesses, public infrastructure, and environment. After disasters, repairs and reconstruction are often completed in such a way as to simply restore to pre-disaster conditions. Such efforts expedite a return to normalcy; however, the replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. As the costs of damage from natural disasters continue to increase, communities realize the importance of identifying effective ways to reduce vulnerability to disasters. While natural disasters cannot be prevented from occurring, the effects of natural disasters and hazards can be reduced or eliminated through a well-organized public education and awareness effort, preparedness activities, and mitigation actions. Hazard mitigation planning is the process through which hazards are identified, likely impacts from those hazards are determined, mitigation goals are identified, and appropriate mitigation strategies are determined, prioritized, and implemented. For those hazards which cannot be fully mitigated, the community must be prepared to provide efficient and effective response and recovery.

Local Hazard Mitigation Plans (LHMP) assist communities in reducing risk from natural disasters by identifying resources, information, and strategies for risk reduction, while guiding and coordinating mitigation activities throughout the City. The City of McFarland developed this LHMP in an effort to reduce future loss of life and property resulting from natural disasters and to provide increased resiliency for the City, allowing McFarland to return to “the norm” sooner with fewer impacts to people and infrastructure.

For those hazards that can be mitigated, McFarland must be prepared to implement efficient and effective short- and long-term actions where needed. The purpose of the McFarland LHMP is to provide the City with a blueprint for hazard mitigation action planning. The plan identifies resources, information, and strategies for risk reduction, and provides a tool to measure the success of mitigation implementation on a continual basis. The strategies identified in the LHMP are developed with the following intentions:

- Risk reduction from natural hazards through a set of defined mitigation actions;
- Establishment of a basis for coordination and collaboration among resource agencies and the public; and
- Assisting in meeting the requirements of federal assistance programs.[1]

The LHMP does not supersede current City plans and strategies, but rather enhances the City’s ability to communicate and mitigate natural hazard risk. Information in this plan will be used to help guide and coordinate mitigation activities and decisions for City staff and citizens. Proactive mitigation planning will help reduce the cost of disaster response and recovery to McFarland and its residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions from natural hazards.

[1] The HMP is developed to ensure eligibility for federal and state disaster assistance, including Federal Emergency Management Agency’s (FEMA) Pre-Disaster Mitigation (PDM), Hazard Mitigation Grant Programs (HMGP), Flood Mitigation Assistance Program (FMA), and other hazard mitigation program dollars from across a wide range of state and federal funding opportunities.

1.1 BACKGROUND AND PURPOSE

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more, as well as destroy or severely damage existing buildings, structures, infrastructure, and other facilities. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Many disasters cause extreme burden to city governments and small communities throughout California.

Subject to congressional (federal) funds allocations, the State DRI Program (DRI Program) provides grants to eligible counties and cities to assist with the physical and economic recovery from federally declared disasters (i.e., wildfire, earthquake, flooding). The City of McFarland was awarded a grant through the 2008 DRI Program in order to create this LHMP, as well as update the McFarland General Plan Safety Element.

1.2 AUTHORITY

This LHMP was prepared pursuant to the requirements of the Disaster Mitigation Act (DMA) 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.

While the DMA emphasizes the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations establish the requirements local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). As described in this plan, McFarland is susceptible to many kinds of hazards; thus, access to these federal disaster assistance and hazard mitigation funding is vital to ensure a more resilient community.

1.3 PLAN ORGANIZATION

The LHMP is organized into seven sections to reflect the logical procession of activities undertaken to develop the plan, and includes all relevant documentation required to meet the necessary criteria for FEMA approval. Each section is briefly described below.

- **Section 1.0 - Introduction** describes the background and purpose of the plan, as well as the authority for development of the plan.
- **Section 2.0 - Community Profile** describes McFarland's history, geography, topography, climate, population, economy, housing, and land use and development trends.
- **Section 3.0 - What's New** provides background information to the development of the first LHMP and the first Master Plan of Storm Drainage and details the purpose, and planning process for these safety plans.
- **Section 4.0 - The Planning Process** describes the 10-Step LHMP Planning Process, as well as the meetings and outreach activities undertaken to engage City officials, staff, and the public.

- **Section 5.0 - Natural Hazard Risk Assessment** identifies and profiles natural hazards affecting McFarland, and assesses the City's vulnerability from the identified hazards.

- **Section 6.0 - Mitigation Strategy** identifies mitigation goals, assesses the City's capabilities to implement mitigation actions, reviews the status of previously identified mitigation actions, and identifies and prioritizes new mitigation actions.

- **Section 7.0 - Plan Implementation and Maintenance** discusses plan adoption and implementation, as well as the process to monitor, evaluate, update, and maintain the LHMP. This section also includes a discussion on continued public involvement.

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SECTION 2.0 COMMUNITY PROFILE

The Community Profile summarizes the City's history and existing environmental and socioeconomic conditions. Environmental and socioeconomic factors include geography, topography, climate, population, economic, housing, and land use and development trends.

2.1 CITY OF MCFARLAND HISTORY

The City of McFarland is an agriculture-based City surrounded by farmland in Kern County; refer to Figure 2-1, *McFarland Regional Map*. Kern County is located within California's Central Valley, which includes approximately 22,500 square miles and is home to some of California's most productive agricultural areas. Nearby cities include Delano to the North, Wasco to the Southwest, and Shafter and Bakersfield to the South. The town was originally founded in 1909 by James Boyd McFarland and later became incorporated in 1957.[2] The population in McFarland grew tremendously during the Great Depression of the 1930s, and then population growth gradually discontinued during World War II. The population in McFarland has steadily increased since the 1970s, with average annual growth rates above four percent. The City's population again grew rapidly from 1980 to 2000, with a 40.4 percent increase in population (2,832 persons) occurring between 1990 and 2000. From 2000 to 2010, McFarland experienced a population increase of 29 percent (2,870 persons), resulting in a 2010 population of 12,707 people. As of 2014, McFarland's population is 13,745 persons.[3] Agriculture continues to be the predominant industry. Cotton, sugar beets, potatoes, and roses are some of the leading crops. A citrus processing plant, almond hulling facility, and a winery are also located within the City.

2.2 GEOGRAPHY, TOPOGRAPHY, AND CLIMATE

The prime agricultural lands within and surrounding the City of McFarland are very rich farmland. Geography, topography, and climate factors combine to produce a highly intensive, yet well balanced type of farming land, which is an essential and integral part of the City's resources.

2.2.1 GEOGRAPHY

According to the United States Census Bureau (U.S. Census), McFarland has a total area of 2.6 square miles. The City is approximately 20 miles north of Bakersfield and 3.0 miles south of Delano in the San Joaquin Valley, within Kern County. To the east of McFarland are the Sierra Nevada foothills, and to the west is the Temblor Mountain Range. These distant mountains and hills are frequently hidden by seasonal weather conditions, including summer haze and winter fog.

State Route 99 (SR-99) is a north-south State highway that runs through the City with access to McFarland at Perkins Avenue, Sherwood Avenue, and Elmo Highway. Although a major transportation corridor through the Central Valley, SR-99 serves as a barrier to the local flow pattern within McFarland and separates the eastern and western portions of the City; refer to Figure 2-2, *McFarland Planning Area*.

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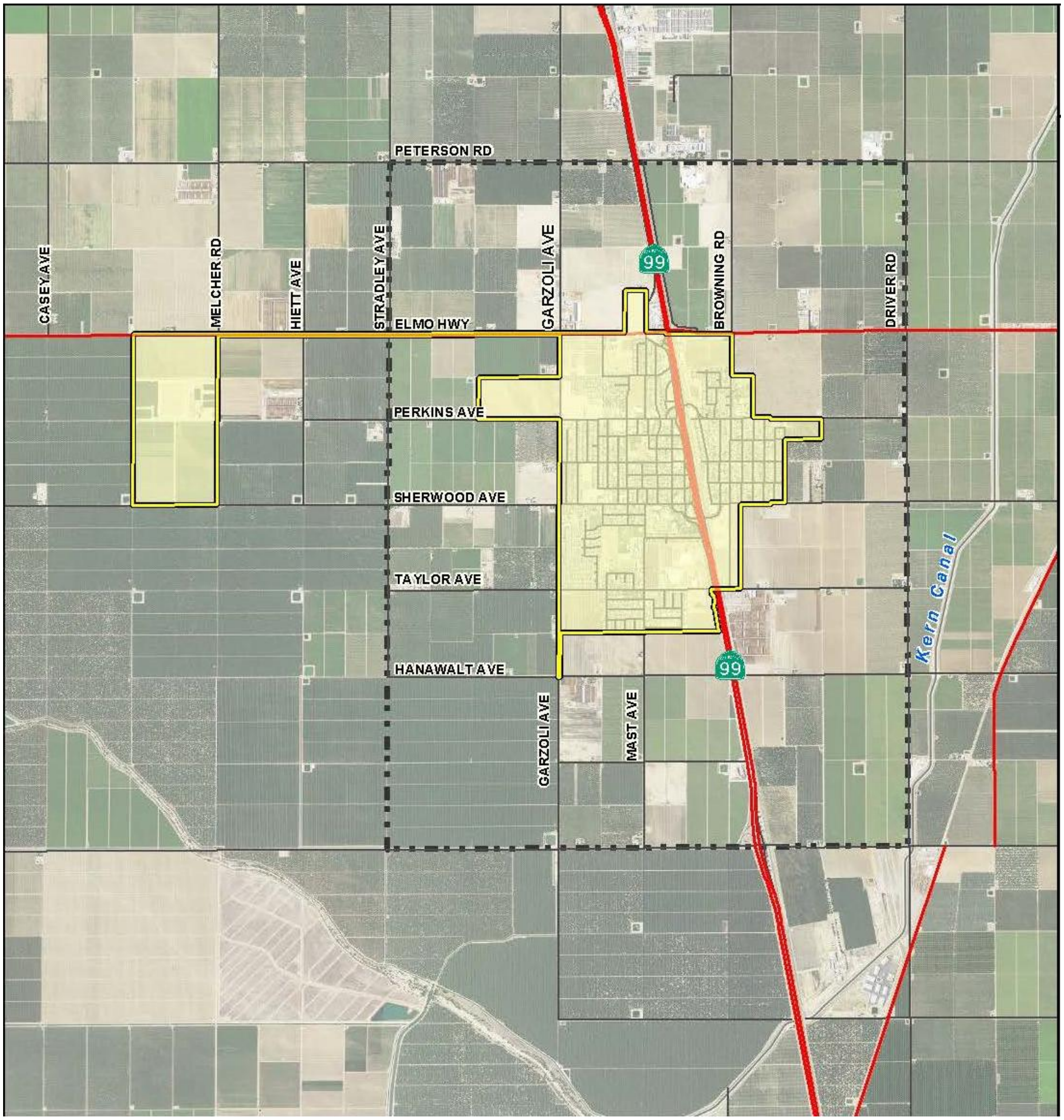
[2] City of McFarland, *History of City,* http://www.mcfarlandcity.org/157/History-of-City, accessed December 11, 2014.
[3] State of California, Department of Finance, *E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2013 and 2014.* Sacramento, California, May 2014.

Figure 2-1: McFarland Regional Map

Figure 2-2: McFarland Planning Area



2.2.2 TOPOGRAPHY

The topography in McFarland is typical of the southern San Joaquin Valley. The City lies in a very flat portion of the Tulare-Buena Vista Basin, with a gradual south to north grade, decreasing in elevation toward the northwest. Elevations within the City range from approximately 360 feet above sea level at the southeast corner to approximately 340 feet at the northwest corner.

2.2.3 CLIMATE

The City of McFarland receives approximately seven inches of rain per year while the U.S. average is 37 inches. The average snowfall in the City is 0.1 inches. The number of days with any measurable precipitation is approximately 35 days a year, and on average there are 272 sunny days per year in McFarland. The average high temperature in July is 99 degrees and the average low temperature in January is 36 degrees. Dense, low lying fog occurs primarily during the months of November through February in the night and early morning hours. Usually fog conditions develop between the passages of storm systems when stagnant air conditions prevail. The McFarland comfort index, which is based on humidity during the hot months, is 50 out of 100, where higher is considered more comfortable. The average comfort index for the U.S. is 44.[4] Refer to Table 2-1, *Climate Summary Table*, for a complete summary of average climate information for McFarland, as compared to the United States.

Table 2-1: Climate Summary Table

Climate Measurements	McFarland, CA	United States
Average Rainfall (inches)	7.2	36.5
Average Snowfall (inches)	0.1	25
Average Precipitation Days	35	100
Average Sunny Days	272	205
Average July High	99	86.5
Average January Low	35.8	20.5
Comfort Index (higher=better)	50	44
UV Index	5.6	4.3
Average Elevation (feet)	347	1,443

Source: Sperling's Best Places, *Climate in McFarland (zip 93250), California,* http://www.bestplaces.net/climate/zip-code/california/mc_farland/93250, accessed December 11, 2014.

[4] This comfort index provides a general idea for how comfortable your time outdoors will be. The index is calculated on a number of weather factors, including temperature, probability of precipitation, humidity, wind speed, and cloud cover. The higher the comfort index, the more comfortable the climate is perceived by general populations across the U.S. One would expect to see a higher index with short-sleeve temperatures, minimal chances of rainfall, relatively low humidity, light winds, and fair skies. On the contrary, the lower the index values one would see cool, damp, and windy conditions.

2.3 SOCIOECONOMIC FACTORS

Population, economic, and housing factors, as well as the land use and future development areas of the City of McFarland are described in this section. Understanding these socioeconomic factors is imperative to determining the potential impacts a natural hazard event can have on the City's population and economy.

2.3.1 POPULATION

Based on the 2010 U.S. Census, McFarland's total population is 12,707 residents. McFarland has 4,762.7 people per square mile, which is close to 20 times the State average of 239.1 people per square mile; refer to Figure 2-3, *Population Density*. The City experienced a population increase of 29 percent (2,870 persons) between 2000 and 2010. The majority of the City's population resides on the west side of SR-99. It should also be noted that the Golden State Modified Community Correctional Facility (GSMCCF) is located within the City of McFarland and accounts for a portion of the City's population.

The age of McFarland's population tends to be younger, with close to 40 percent of the population below the age of 20 and 80 percent of the population below the age of 44. Approximately 4.7 percent of the population is above the age of 65. The City's median age is 25.7 years, compared to the State median age of 35.2 years.

The largest ethnic group in McFarland remains the Hispanic/Latino population, which accounts for 91.5 percent of the total population. The racial makeup of McFarland consists of White at 42.7 percent, Black or African American at 1.8 percent, Native Americans at 1.3 percent, and Asians at 0.6 percent of the City's population. "Some other race" accounts for 49.8 percent of the population, while two or more races make up 3.6 percent of McFarland's population.

2.3.2 EMPLOYMENT

According to the 2009-2013 American Community Survey, U.S. Census Data, there are 8,455 people over 16 years of age, of which 4,931 are in the labor force. Out of the 4,931 people in the labor force, 3,907 (46.2 percent) are employed and 1,024 (12.1 percent) are unemployed. Of the employed population, the agriculture industry employs the largest portion (56.3 percent), followed by education (11.8 percent), transportation (7.3 percent), and retail trade (6.5 percent). The remaining population (15.2 percent) is employed in the construction, manufacturing, wholesale, information, finance and insurance, professional, or public industries. The median household income in McFarland is $35,433, with 1,299 total households having incomes below $35,000 (49.2 percent). The major employers in the City include McFarland Unified School District, GEO Group Correctional Facilities, and Marko Zaninovich Inc., a fruits and vegetables merchant wholesaler. Other fruits and vegetables growers and shippers and farms such as Paramount Farms, Sun Pacific, Grimmway Farms and Wm Bolthouse Farms Inc., are major employers in Kern County. Additional industries popular in the County include federal government, national security, and military bases, as the Edwards Air Force Base, and U.S. Naval Air Weapons Station, and Naval Air Warfare Center are notable contributors to the region.[5]

[5] State of California Employment Development Department, *Major Employers in Kern County*, http://www.labormarketinfo.edd.ca.gov/majorer/countymajorer.asp?CountyCode=000029, accessed December 11, 2014.

2.3.3 HOUSING

Based on the 2009-2013 American Community Survey, U.S. Census Data, there are 2,725 housing units in McFarland. Of the total housing units, 2,641 are occupied and 84 are vacant. The majority of homes in McFarland are single-unit detached homes (79.5 percent). The second largest type is multi-unit (3 or 4 units) homes, which make up 8.5 percent of the total housing stock. Of the 2,641 occupied housing units, relatively half are owner-occupied (50.7 percent), with the remaining 49.3 percent categorized as renter-occupied units. On average, the majority of housing units (78.8 percent) have one occupant or less per room. Of the housing stock, the majority of owner-occupied units are valued at $100,000 - $149,999 (35.7 percent), followed by $50,000 - $99,999 (29.1 percent), and above $150,000 (28.7 percent). The remaining housing units have values below $50,000 (6.6 percent).

In recent years, the City received grant funded projects to ensure that all types of housing are available and that existing housing is safe, decent, and affordable for everyone including the First Time Home Buyer (FTHB) and Owner Occupied Rehabilitation Programs.[6] The Villa del Caribe housing development provides FTHB opportunities, in which qualified low-income first time home buyers will be assisted with gap financing to help obtain an affordable mortgage payment. The project will offer several options for primary financing, such as U.S. Department of Agriculture (USDA) and Federal Housing Administration (FHA) loan programs, and the deferred loan will be carried as a "silent" second mortgage, with no payment required on it for 30 years.[7] The Owner Occupied Rehabilitation funds are used to correct code deficiencies, such as plumbing, electrical, structural, or even as simple as replacement of old windows or heating, ventilating, and air conditions systems.

2.4 LAND USE AND FUTURE DEVELOPMENT AREAS

The City is located at the southern end of the San Joaquin Valley, and is surrounded by the Sierra Nevada foothills to the east and the Temblor Mountain Range to the west. SR-99 and the Union Pacific Railway divide the City into two geographically separate communities, which are connected through overpasses and interchanges.

The General Plan was provided by the City of McFarland, and is used as the basis for land use determination. The General Plan's Land Use Element determines the allowable use of existing and future parcels of land and ensures that adjacent land uses are compatible. It helps to provide general guidance to the City on where development can occur, the allowable size of new development, and how development can be used depending upon its location. The Land Use Element focuses upon land within the City's planning area, consisting of a total of 7,220 acres. Of this land, there are 1,680 acres of incorporated lands and 5,540 acres of land in the City's sphere of influence; refer to Figure 2-2. Incorporated land is land that is within the City limits, and which the City is responsible for controlling the designation and distribution of land uses. Land within the City's sphere of influence is area which the City does not directly have land use control over, but which the City could potentially annex into City limits with approval of the Kern County Local Agency Formation Commission (LAFCO). Although Kern County has jurisdiction over McFarland's sphere of influence, the City can provide comments to Kern County regarding proposed projects within the City's sphere of influence. The sphere of influence area outside the City limits is almost entirely devoted to agricultural uses.

[6] City of McFarland, *Grants*, http://www.mcfarlandcity.org/241/Grants, accessed December 16, 2014.
[7] City of McFarland, *McFarland News Volume 1, Issue 2,* September 2014.

According to the General Plan's Land Use Element (September 2013), most of the land within City limits is designated for residential purposes. Commercially designated lands are located within the northern portion of City and adjacent to SR-99 and Perkins Avenue. The downtown commercial area is not distinctly separated from surrounding homes, but is integrated with older residential neighborhoods, forming a residential commercial transition area. Industrial land uses are located east of SR-99 and adjacent to the railroad tracks. These land uses serve as a buffer separating the surrounding residential areas from the highway. Land designated for agricultural use primarily occurs along the furthest extent of the City boundaries, in the eastern and southern portions of the City. Institutional (wastewater treatment plant, sumps, City Hall, and water tanks), open space (parks), school, and church uses are distributed throughout the City. Vacant lands are also distributed throughout the City, with larger areas of vacant land located in the northwestern and southeastern portions of the City.

There is the potential for future development to occur on currently vacant land within the City or through redevelopment of land by removing existing structures. Existing and future development have the potential to be exposed to natural disasters, such as earthquakes, flooding, and drought. The City adopts and enforces updated building and zoning codes, which would provide for improved protection from earthquakes, as new development or redevelopment occurs within the City. The City currently regulates development within the floodplain through compliance with its Municipal Code. Consideration should be given to conducting additional analysis of the regional flooding that occurs as a result of overflow of Poso Creek and runoff from the mountains east of the City. This would require a regional approach and coordination of several entities. The City is currently in the process of preparing a Master Plan of Storm Drainage that will identify localized storm drainage issues of concerns and proposed improvements that would be implemented as new development occurs within the City. In addition, as water supplies are strained due to drought conditions occurring throughout the State, there is the potential that water supplies may not be available to serve future development. Through compliance with the California Environmental Quality Act (CEQA), SB 601, and SB 221, individual development projects would be required to demonstrate adequate water supplies would be available to serve the development being proposed. Projects to protect water sources and reduce water consumption would need to be considered.

It should be noted that the City is currently in the process of amending its General Plan Land Use Map, primarily within its sphere of influence. The City, in coordination with the Kern Council of Governments (Kern COG), is proposing to amend its General Plan Land Use Map to assign land use designations to portions of the City's sphere of influence that are located in unincorporated Kern County. The proposed land use designations anticipate increased growth and development within the sphere of influence would occur over the long-term based on future development and market conditions. Potential annexation of additional land within the City would potentially expose additional people and structures to natural disasters that could affect the area.

2.4.1 RESIDENTIAL CONSTRUCTION BUILDING PERMITS

Construction permits can often provide a valuable snapshot into the health of the housing market of a community; refer to Table 2-2, *Kern County Residential Building Permits*, for a summary of residential building permits within Kern County between 2001 and 2013.

Table 2-2: Kern County Residential Building Permits

Year	All Permits	Single Family	2-Unit Multi-Family	3 & 4-Unit Multi-Family	5+ Unit Multi-Family
2001	3,365	3,279	6	0	80
2002	3,850	3,839	4	7	0
2003	5,627	5,362	86	64	115
2004	6,641	6,023	100	213	305
2005	8,287	7,110	122	418	637
2006	6,326	5,118	160	742	306
2007	3,616	2,947	314	202	153
2008	2,425	1,526	188	214	497
2009	1,737	1,545	14	7	171
2010	1,617	1,172	26	32	387
2011	802	669	20	0	113
2012	1,842	1,367	22	28	425
2013	317	248	8	0	61

Source: Homefacts, *McFarland, CA Building Permits (Data represents total for Kern County, CA)*, http://www.homefacts.com/buildingpermits/California/Kern-County/Mcfarland.html, accessed December 16, 2014.

In Kern County, there was an average of 3,573 building permits issued per year during 2001 to 2013. Within that time, the highest number was 8,287 building permits in 2005, and the lowest number was 317 building permits in 2013.

Table 2-3, *City of McFarland Residential Building Permits*, provides a summary of residential building permits within the City between 2008 and 2014. There was an average of 154 building permits issued per year from 2008 to 2014 with the lowest occurring in 2008 (93 permits) and the highest in 2014 (191 permits). As indicated in Table 2-3, the majority of building permits issued have been for single family residences.

Table 2-3: City of McFarland Residential Building Permits

Year	All Permits	Single Family	2-Unit Multi-Family	3 Unit Multi-Family
2008	93	89	4	0
2009	181	181	0	0
2010	170	152	16	2
2011	130	126	4	0
2012	151	150	1	0
2013	161	158	1	2
2014	191	189	2	0

Source: City of McFarland Community Development Department, Dennis McNamara, Planning Director, May 2015.

SECTION 3.0 WHAT'S NEW

This section of the plan includes background information on the Local Hazard Mitigation Plan (LHMP) and the City of McFarland Master Plan of Storm Drainage (MPD). The City has not previously prepared a LHMP or MPD. The sections below describe the background, purpose, and planning process for these safety plans.

3.1 LOCAL HAZARD MITIGATION PLAN

The City of McFarland has been awarded a grant through the State of California Disaster Recovery Initiative (DRI) Program to develop and update its safety plans. As a part of its safety plans, the City of McFarland is to prepare its first LHMP, which will serve as a blueprint for reducing property damage and saving lives from the effects of potential natural disasters in the City. The intent of the LHMP is to provide the City with a framework for hazard mitigation action planning. Hazard mitigation planning is the planning process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. The plan provides a tool to measure the success of mitigation implementation on a continual basis.

The City is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Floods, fires, drought, extreme heat, severe weather, and earthquake hazards are among the hazards that can have a significant impact on a City. While natural disasters cannot be prevented from occurring, the effects of natural disasters can be reduced or eliminated through a well-organized public education and awareness effort, preparedness activities, and mitigation actions.

3.2 MASTER PLAN OF STORM DRAINAGE

As part of the grant received through the DRI Program, the City is developing its first MPD. The City has a well-documented history of flooding at both regional and local levels. As such, the purpose of the MPD is to provide comprehensive long-range planning for the implementation and development of drainage facility improvements in the area.

The City of McFarland lies in a very flat portion of the Tulare-Buena Vista Basin with a gradual south to north grade. The Kern County Flood Insurance Study (effective September 26, 2008) identified two sources of regional flooding into the City. Major flood problems on the eastern side of the City result from the overflow of Poso Creek and runoff from the mountains east of McFarland. Runoff from the mountains moves along the Friant-Kern Canal south to SR-99. The runoff then combines with overflows from Poso Creek and moves north across the canal siphon into the City. The City of McFarland is also subject to 1-percent annual chance runoff from the east resulting from flow overtopping the Friant-Kern Canal levee.

As the amount of water that floods the City of McFarland from these sources is unknown, it is not practical to size the City's storm drain infrastructure for a regional 100-year storm event, which includes the overflow from sources outside the City. However, the storm drains can be designed to capture the runoff that results within the City boundaries from a 10- and 100-year storm event. Although it would be preferable to model the runoff through the City from the local and regional areas combined, this is not possible due to the lack of data available from previous local and regional studies. In order to analyze a scenario in which City storm drain systems could convey both local and regional runoff, a more comprehensive study should be conducted.

The MPD provides background of the City's location, topography, and land uses, which pose unique drainage situations for local runoff. The City was divided into two areas of study, the West Watershed and East Watershed in order to analyze the local hydrology and hydraulics of the area. The MPD provides the technical criteria for the hydrology analysis, as defined by the *Kern County Hydrology Manual*. In addition, the MPD consists of modelling storm water conveyance via street flow and storm drain pipes for the hydraulics analysis placed under 10- and 100- year existing and proposed conditions associated with each major watershed area.

The MPD identifies three main factors that contribute to the local flood problems in the City: undersized sump basins, undersized storm drain systems, and the absence of storm drain systems in areas where there are large volumes of runoff. The MPD identifies proposed improvements that have been designed to work in conjunction with each other to ensure that the City's storm drain system is sized so that each section of pipe has sufficient capacity to handle the flows coming from the upstream end of the system.

SECTION 4.0 THE PLANNING PROCESS

This section describes each stage of the planning process used to develop the LHMP. The LHMP planning process provides a framework for document development, and based on the FEMA recommended steps. The LHMP follows a prescribed series of planning steps which includes organizing resources, assessing risk, developing the mitigation plan, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan for approval. Each step is described in this section.

4.1 PLANNING PROCESS

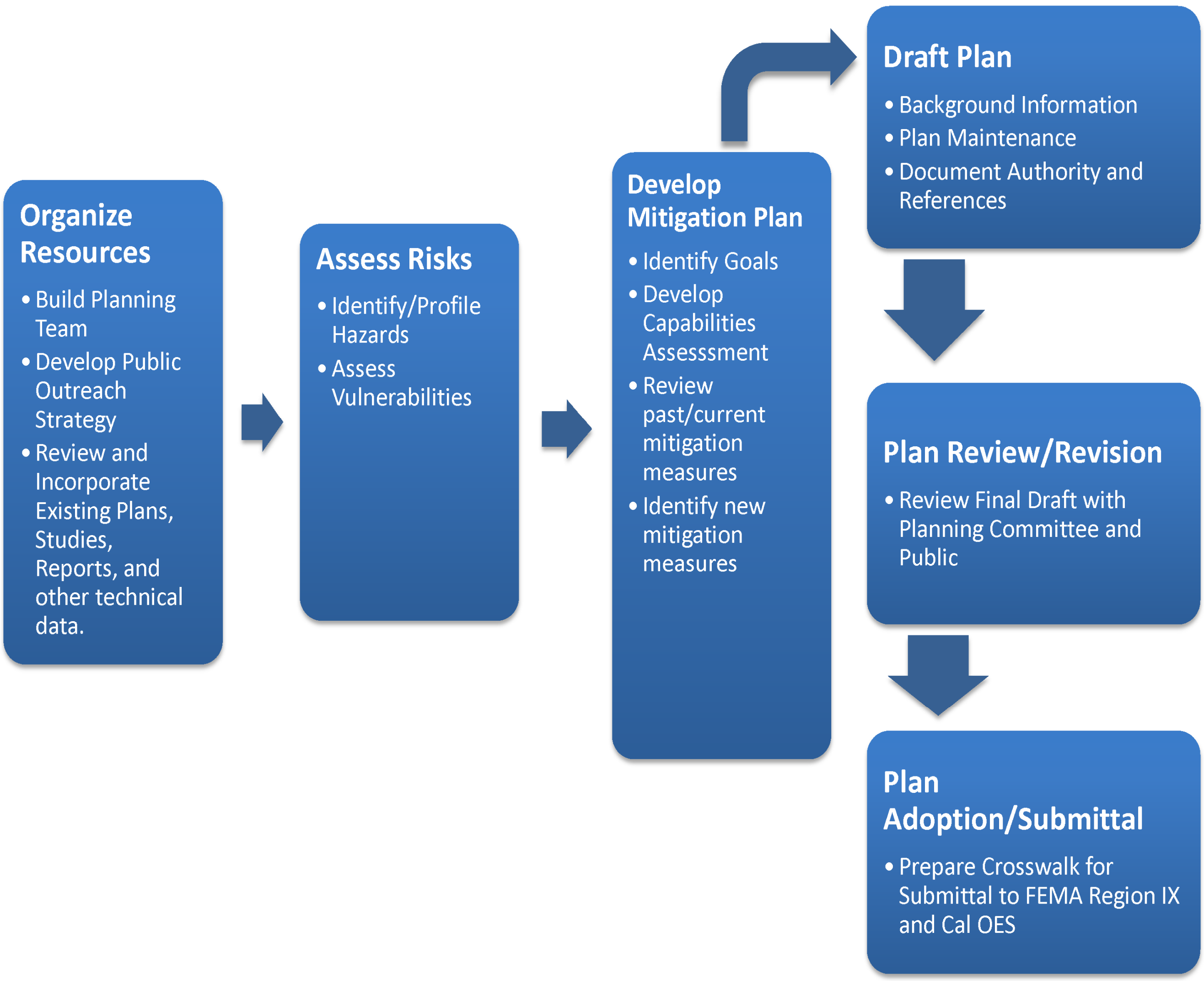
Hazard mitigation planning in the United States is guided by the statutory regulations described in the DMA 2000, and implemented through 44 Code of Federal Regulations (CFR) Part 201 and 206. FEMA's HMP guidelines outline a four-step planning process for the development and approval of HMPs. Table 4-1, *DMA 2000 CFR Crosswalk*, lists the specific CFR excerpts that identify the requirements for approval.

Table 4-1: DMA 2000 CFR Crosswalk

DMA 2000 (44 CFR 201.6)	2014 HMP Plan Section
(1) Organize Resources	Section 4
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	Section 5
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	Section 6
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	Section 7
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

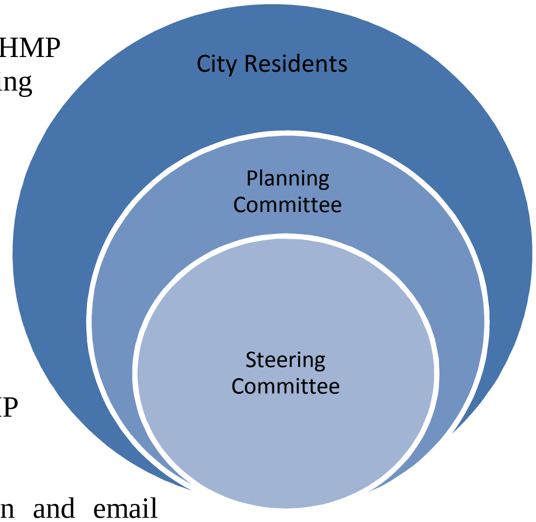
For the development of the McFarland LHMP, a planning process was customized to address the City's unique population and demographic. All basic federal guidance documents and regulations are met through the customized process. As shown in Figure 4-1, *McFarland LHMP Planning Process*, and documented in the corresponding sections, the LHMP planning process included organizing resources, assessing risks, developing the mitigation action strategy, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan.

Figure 4-1: McFarland LHMP Planning Process



4.2 ORGANIZING RESOURCES

This section describes the first step of the McFarland LHMP planning process. Organizing the resources consists of developing the planning team and document review.



4.2.1 BUILDING THE PLANNING TEAM

The Planning Team serves as the foundation of the planning process and was critical for the development of the McFarland LHMP. The Planning Team consisted of a Steering Committee, Planning Committee, engaged City Residents, and a LHMP consultant used for plan development and facilitation.[8]

In addition to key City of McFarland staff, an invitation and email correspondence was sent to neighboring jurisdictions, the County, and other agencies advising them of the City's efforts to prepare a LHMP and requesting their involvement and attendance at the Hazard Mitigation Planning Team Meetings.

4.2.1.1 STEERING COMMITTEE

At the core of the McFarland LHMP planning process is the LHMP Steering Committee, which worked together to ensure the success of the planning process, implementation, and future maintenance. The LHMP Steering Committee consisted of City Staff, with the Planning Director serving as the primary contact, and the LHMP consultant management team. Members of the LHMP Steering Committee were also a part of the LHMP Planning Committee, discussed below.

4.2.1.2 PLANNING COMMITTEE

The LHMP Planning Committee consisted of key decision makers in specific government functions representing City, County and other agencies and organizations. A list of stakeholders invited to participate in the LHMP planning process is included in Appendix B. The committee included stakeholders who actively participated in the planning process. Planning processes included:

- A series of structured coordination meetings
- Collection of valuable local information and other requested data
- Decision on plan process and content
- Development of mitigation actions for the LHMP
- Review and comment on plan drafts
- Coordination of the public input process

The preparation of the LHMP required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and

[8] The City developed a professional services agreement with Michael Baker International to provide direction for the development of the LHMP.

workshops prompted continuous input and feedback from local officials throughout the update process. Table 4-2, *LHMP Planning Committee*, provides a list of the Planning Committee members.

Table 4-2: LHMP Planning Committee

Name	Title	Organization	Planning Committee Role
David Diaz	Chairman	McFarland Parks & Recreation District	Hazard identification, mitigation actions, capabilities assessment, plan review
Dennis McNamara	Planning Director	City of McFarland	Project Manager – Hazard identification, mitigation actions, plan review, organization of planning team and meetings, participation in community outreach
Jean Roberts	Supervisor, Emergency Preparedness	Kern County Public Health Services Department	Hazard identification, mitigation actions, capabilities assessment, plan review
Jerry Helt	City Engineer	HEI	Hazard identification, mitigation actions, capabilities assessment, plan review
Joana Martinez	Administrative Assistant	McFarland Parks & Recreation District	Hazard identification, mitigation actions, capabilities assessment, plan review
Mario Gonzales	Public Works Director	City of McFarland	Hazard identification, mitigation actions, capabilities assessment, plan review
Mark Evans	Maintenance Engineer	Kern County Roads Department	Hazard identification, mitigation actions, capabilities assessment, plan review
Scott Kimble	Chief of Police	City of McFarland	Hazard identification, mitigation actions, capabilities assessment, plan review

4.2.1.3 LHMP CONSULTANT TEAM

To provide assistance with the LHMP process and the LHMP Planning Committee, the City enlisted Michael Baker International, due to its expertise in assisting public sector entities with developing hazard mitigation plans and strategies for hazard prone areas. Michael Baker International supported the City through facilitation of the planning process, data collection, meeting materials, and document development. The LHMP Consultant Team, as shown in Table 4-3, *LHMP Consultant Team*, consists of a variety of hazard mitigation/planning professionals.

Table 4-3: LHMP Consultant Team

LHMP Project Team	LHMP Project Team Role
Glenn Lajoie, AICP	Principal in Charge
Starla Barker, AICP	Project Manager
Ethan Mobley, AICP	LHMP Task Manager
Carver Struve	Senior Technical Advisor
Jason Farrel, CFM	Hazard Mitigation Planner
Renee Gleason	Planner
Alesia Hsiao	Planner
Jason Isherwood, GISP	GIS Specialist/Spatial Analyst
Jim McPherson, GISP	GIS Specialist/Spatial Analyst

4.2.1.4 PLANNING COMMITTEE MEETINGS

The LHMP Planning Committee met throughout the development of the LHMP document. Table 4-4, *Meeting Summary*, provides a summary of the meetings conducted throughout the planning process, including meeting date, type, and topics discussed, as well as public outreach efforts. Meeting documentation, including PowerPoint presentations, sign-in sheets, notes, and other relevant handouts, are provided in Appendix B.

HMP Team Meeting #1

Table 4-4: Meeting Summary

Date	Meeting Type	Topics
November 2012	Kick-off	▪ Introductions ▪ Overview of LHMP and Safety Element Update ▪ Planning Department Input ▪ Public Works/Engineering Input ▪ Police Department Input ▪ City Tour
June 2014	City Council/Planning Commission Study Session	▪ Welcome and Introductions ▪ Project Overview ▪ LHMP Update Process and Components ▪ Project Timeline ▪ Next Steps ▪ Questions
June 2014	Planning Team Meeting #1	Part 1: ▪ Welcome and Introductions ▪ Project Overview ▪ LHMP Process and Components ▪ Project Timeline ▪ Questions and Answer Session Part 2: ▪ Resources ▪ Public Outreach Strategy ▪ Next Steps ▪ Wrap Up
August 2014	Planning Team Meeting #2	Part 1 : ▪ Risk Assessment Methodology ▪ Question and Answer Session ▪ Community Asset Inventory Review ▪ Group Analysis, Risk Factor Development Part 2: ▪ Identify Draft Problem Statements ▪ Open House Review ▪ Next Steps and Wrap Up

Table 4-4: Meeting Summary [continued]

Date	Meeting Type	Topics
August 2014	Community Open House	▪ Where do you live/work/or own property – Participants placed a sticker on an aerial indicating the location of their residence, property, or work ▪ Identify challenges/issues pertaining to safety ▪ Provide recommendations on how to make your community safer ▪ Share your stories and photos with a hazard mitigation specialist ▪ Learn about natural disaster property protection methods
November 2014	Planning Team Meeting #3	Part 1: ▪ Meeting #2 Recap ▪ Review of LHMP Section 5 Part 2: ▪ Issue Identification ▪ Goals and Objectives Development ▪ Mitigation Review and Refinement ▪ Mitigation Priorities and Capabilities ▪ Mitigation Action Implementation Strategies
May 2014	Planning Team Review of Administrative Draft LHMP	▪ The Administrative Draft LHMP was made available to the Planning Team for review and comment. The LHMP was revised to incorporate and comments and revisions prior to public review.
June 2015	Public Review and Comment	▪ The Draft LHMP was made available to the public and interested parties for a 30-day review and comment period prior to submittal to Cal OES and FEMA.
November 2015	City Council Hearing	▪ City Council Hearing to approve Final LHMP document

4.2.2 PUBLIC OUTREACH

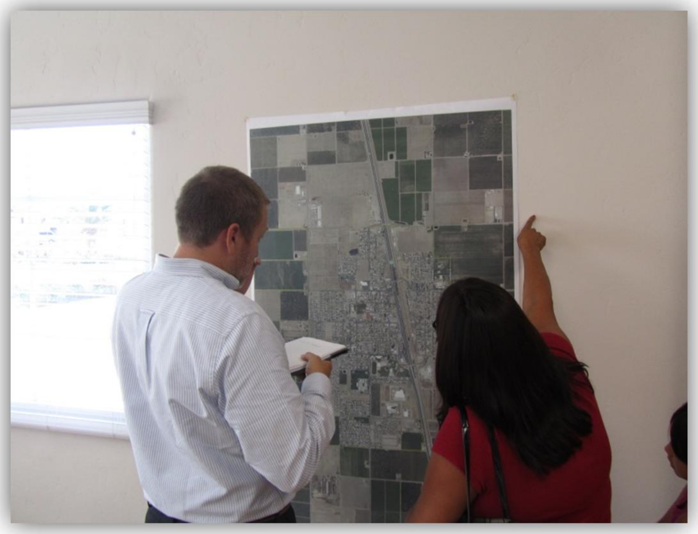
Public outreach is a required component of the LHMP. The McFarland LHMP Public Outreach Strategy was developed in order to maximize public involvement in the LHMP planning process. The LHMP public outreach strategy utilized the City's website, email distribution, local media, and flyers to engage the public throughout the LHMP planning process. This section provides information on the outreach process used during the LHMP development.

4.2.2.1 HAZARD MITIGATION PLAN/ SAFETY ELEMENT OPEN HOUSE WORKSHOP

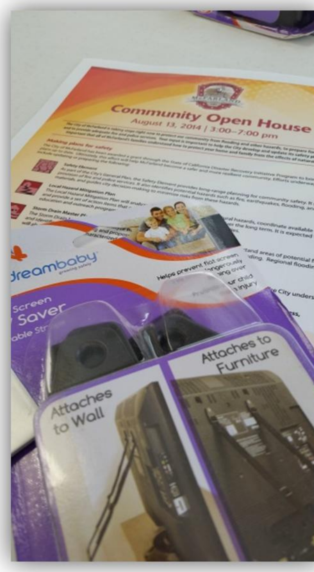
A Community Open House was held on August 14, 2014 at the McFarland Veterans Community Center in order to understand the community's perspective and personal experience with natural and man-made hazards that affect McFarland. Residents communicated safety issues of concern and recommendations on how the community could be made safer. Hazard mitigation planners interacted with residents to gain an understanding of how natural disasters have personally affected them and to educate community members on natural

Community Open House

disaster property protection methods. Photos were obtained from residents, illustrating their direct experience with flooding in the City.



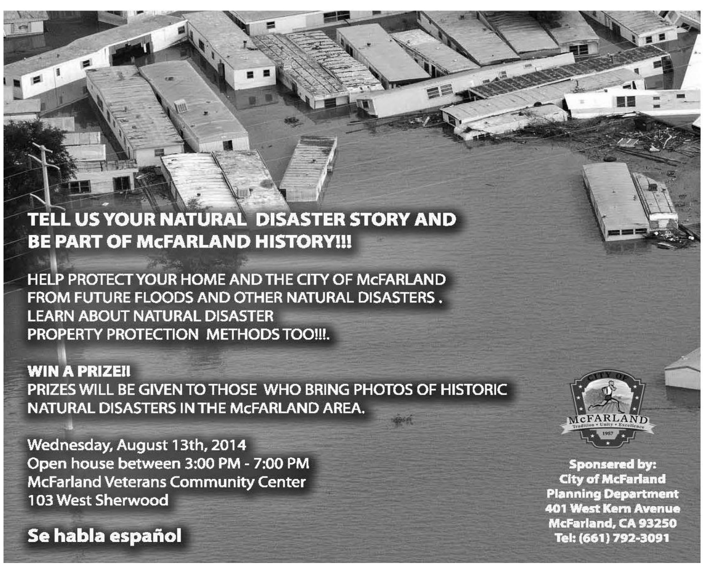
Community Open House



Community Open House Materials and Giveaways

4.2.2.2 PUBLICIZING THE PLAN

The LHMP Planning Team created public notices in the form of postcards that were made available at City Hall and community facilities. An advertisement was also placed in The Delano Record and The Market Shopper, which serves the cities of Delano and McFarland and the surrounding agricultural area with a combined circulation of 15,913 and an estimated 53,000 population market.



Community Open House Advertisement

Community Open House Postcard

Along with the public input received during the Community Open House events, draft copies of the LHMP document were posted on the City of McFarland website for general public review and comment for a period of 30 days. The LHMP was also made available for review at the City of McFarland Planning and Community Development Department. These efforts provided citizens with several opportunities to review the content of the LHMP, ask questions and suggest possible final revisions.

4.2.3 REVIEW AND INCORPORATE EXISTING INFORMATION

The LHMP Planning Committee reviewed and assessed existing plans, studies, and data available from local, state, and federal sources. Documents reviewed and incorporated as part of the LHMP planning process are shown in Table 4-5, *Existing Plans, Studies, Reports, and Other Technical Data/Information*. A complete list of references is included in Section 8.0, Works Cited.

4.2.4 ASSESS RISKS

In accordance with FEMA requirements, the LHMP Planning Committee identified and prioritized the natural hazards affecting McFarland and assessed the community's associated vulnerability from them. Results from this phase of the LHMP planning process aided subsequent identification of appropriate mitigation actions to reduce risk from these hazards. This phase of the LHMP planning process is detailed in Section 5.0.

4.2.4.1 IDENTIFY/PROFILE HAZARDS

Based on a review of past hazards, as well as a review of the existing plans, reports, and other technical studies/data/information, the 2014 LHMP Planning Committee determined if the existing hazards were still valid, and identified new hazards that could affect the City. Updated content for each hazard profile is provided in Section 5.0.

4.2.4.2 ASSESS VULNERABILITIES

Hazard profiling exposes the unique characteristics of individual hazards and begins the process of determining which areas within McFarland are vulnerable to specific hazard events. The vulnerability assessment included field visits and a GIS overlaying method for hazard risk assessments. Using these methodologies, vulnerable populations and infrastructure impacted by natural hazards, as well as potential loss estimates were determined. Detailed information on the vulnerability assessments for each hazard is provided in Section 5.0.

4.2.5 DEVELOP MITIGATION PLAN

The LHMP was prepared in accordance with DMA 2000 and FEMA's HMP guidance documents. This document provides an explicit strategy and blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and McFarland's ability to expand on and improve these existing tools. Developing the mitigation plan involved identifying goals, assessing existing capabilities, and identifying mitigation actions. This step of the LHMP planning process is detailed in Section 6.0, and summarized below.

Table 4-5: Existing Plans, Studies, Reports, and Other Technical Data/Information

Existing Plans, Studies, Reports, and Other Technical Data/Information	Planning Process / Area of Document Inclusion
United States Geological Survey	Hazard Profiles
State of California Multi-Hazard Mitigation Plan (2013)	Hazard Profiles
California Drought Contingency Plan	Drought Hazard Profile and Drought Mitigation Plan Development
California Drought Report 2010	Drought Hazard Profile and Drought Mitigation Plan Development
The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2)	Earthquake Hazard Profile Development
California Geological Survey	Earthquake Hazard Profile Development
Southern California Earthquake Data Center	Earthquake and Geologic Hazard Profile Development
FEMA Hazard Mitigation How-to Guides	2012 Hazard Mitigation Plan Development, Start to Finish
City of McFarland Digital Flood Insurance Rate Map (DFIRM) Panels	Flood Hazard Profile and Development of FEMA special flood hazard area depth grids
Existing Zoning and Floodplain Management Ordinances	Flood Hazard Regulatory Environment and Mitigation Strategy
NFIP flood insurance policies and claims records	Flood Hazard Regulatory Environment and Mitigation Strategy
FEMA E-74 Reducing the Risks of Nonstructural Earthquake Damage – A Practical Guide	Earthquake Mitigation Strategy
FEMA Local Mitigation Planning Handbook	Local Plan Integration Methods
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013	Mitigation Strategy Development
NOAA Record Storm Events	Death and Injuries Report for past disaster declarations
City of McFarland General Plan (1991) City of McFarland General Plan Land Use Element (2013)	Local Plan Integration Existing/Planned Land Uses
Kern Multi Jurisdiction Hazard Mitigation Plan Comprehensive Update (2012)	Hazard Profiles
Kern County Integrated Regional Water Management Plan	Drought Hazard Profile
Department of Water Resources	Drought Hazard Profile
National Integrated Drought Information System (NIDIS)	Drought Hazard Profile
Cal-Adapt	Drought and Extreme Heat Hazard Profile
Kern County Hydrology Manual	Flood Hazard Mitigation Strategy

4.2.5.1 IDENTIFY GOALS

The LHMP Planning Committee reviewed the hazards profiles and vulnerability assessments, and developed goals and objectives for the LHMP based on current information. The Goals and Objectives are presented in Section 5.0.

4.2.5.2 DEVELOP CAPABILITIES ASSESSMENT

A capabilities assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to the City to implement the mitigation actions that are prescribed in the LHMP. The LHMP Consultant Team and LHMP Planning Committee identified the technical, financial, and administrative capabilities to implement mitigation actions, as detailed in Section 5.0.

4.2.5.3 IDENTIFY MITIGATION ACTIONS

As part of the LHMP planning process, the LHMP Consultant Team and LHMP Planning Committee worked together to identify and develop new mitigation actions with implementation elements. A detailed discussion of the identification and prioritization of mitigation actions, and the creation of the implementation strategy are provided in Section 6.0.

4.2.5.4 PLAN REVIEW AND REVISION

Once the "Administrative Draft" LHMP was completed, the document was provided to the LHMP Planning Committee for review. Comments and suggested revisions were received and addressed prior to release to the general public for review and comment and submittal to FEMA and Cal OES.

4.2.5.5 PUBLIC REVIEW DRAFT

On June 10, 2015, the Public Review Draft LHMP document was completed and released to the general public for review and comment. The document was made available at the City of McFarland Community Development Department and on the City's website for a period of 30 days prior to being submitted to Cal OES and FEMA.

4.2.5.6 PLAN ADOPTION AND SUBMITTAL

NOTE TO CITY: *The following is a placeholder. This section will be completed after approval by Cal OES and FEMA.*
This plan has been submitted and approved by FEMA and adopted by the City as the official statement of McFarland hazards. A copy of the resolution is provided in Appendix A.

4.2.5.7 PLAN MAINTENANCE

Plan maintenance procedures, found in Section 7.0, include the measures McFarland and participating agencies will take to ensure the LHMP's continuous long-term implementation. The procedures also include the manner in which the LHMP will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document.

SECTION 5.0 NATURAL HAZARD RISK ASSESSMENT

Natural hazard risk assessment is the process of measuring the potential impact to life, property, and economic impacts resulting from natural hazards. The intent of the risk assessment is to identify, as much as practicable given existing and available data, the qualitative and quantitative vulnerabilities of a community. The results of the risk assessment provide a framework for a better understanding of potential impacts to the community and a foundation on which to develop and prioritize mitigation actions (see Section 6.0). Mitigation actions can reduce damage from natural disasters and an implementation strategy can direct scarce resources to areas of greatest vulnerability described in this section.

This risk assessment follows the methodology described in FEMA publication, *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which outlines a four-step process:

1) Identify Hazards
2) Profile Hazard Events
3) Inventory Assets
4) Estimate Losses

Information gathered during the McFarland planning process related to the above four steps are incorporated into the following sections of this chapter.

Section 5.1 - Hazard Identification identifies and prioritizes the natural hazards that threaten the City. The reasoning for omitting some hazards from further consideration is also provided in this section.

Section 5.2 through Section 5.7 - Hazard Profiles describe each of the natural hazards that pose a threat to the City. Information includes the location, extent/magnitude/severity, previous occurrences, and the likelihood of future occurrences.

Section 5.8 - Vulnerability Assessment presents the City's exposure to natural hazards, identifying at-risk populations and assets, including City-owned facilities and other critical facilities. Where the information was available, potential dollar loss estimates for facilities are provided to show a partial representation of the financial cost of a disaster to a community.

5.1 IDENTIFYING THE HAZARDS

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The McFarland LHMP Planning Committee reviewed previously prepared hazard mitigation plans and other relevant documents to determine the extent of natural hazards with potential to affect the City. Table 5-1, *Development Review Crosswalk*, provides a crosswalk of hazards identified in the McFarland 1991 General Plan Safety and Seismic Safety Element, Kern County 2012 Multi-Jurisdiction Hazard Mitigation Plan (MJHMP), and approved 2013 California State Hazard Mitigation Plan (SHMP).

The document review crosswalk is a tool to develop a preliminary list of hazards for further review. Major and relevant natural and manmade hazards are identified based on a thorough document evaluation. The review crosswalk aids planners in discussing hazards for additional consideration. For example, there was no mention of slope failure/erosion in the 1991 McFarland General Plan Safety and Seismic Safety Element or 2012 Kern County MJHMP, while the 2013 SHMP recognizes slope failure as a prevalent hazard in certain parts of the State.

Table 5-1: Document Review Crosswalk

Hazards	1991 McFarland General Plan Safety and Seismic Safety Element	2012 Kern Multi-Jurisdiction Hazard Mitigation Plan (MJHMP)	2013 State of California Multi-Hazard Mitigation Plan (SHMP)
Natural Hazards			
Geologic and Seismic Hazards			
- *Earthquake/Seismic Shaking*	■	■	■
- *Slope Failure/Erosion*			■
- *Volcano*		■	■
Dam Failure		■	■
Drought		■	■[1]
Flooding	■	■	■
Wildfire		■	■
Severe / Extreme Weather		■	■[2]
- *Extreme Heat/High Temp*		■	■
- *Severe Storm*		■	■
Man Made Hazards			
Hazardous Material Releases/Spills			■
CBRNE (Chemical, Biological, Radiological, Nuclear, & Explosive)			■[3]
Pandemic/Epidemic/ Vector Borne Disease Hazards		■	■
MCI – Multi Casualty Incidents			

Notes:
[1] Listed under Climate Related Hazards.
[2] Listed under Climate Related Hazards.
[3] Listed under Radiological Accidents and Terrorism.

After the document review process, previous hazard occurrences were used to validate existing hazards and identify new hazard risks. Previous hazard occurrences provide a historical view of hazard risk, and a window into potential hazards that can affect the City in the future. Information about Federal and State disaster declarations in Kern County was compiled from FEMA and Cal OES's databases, as shown in Table 5-2, *Federal and State Declared Disasters*.[1]

Though not a complete listing of hazard incidences in the City (since not all hazard events are federally or State declared), Table 5-2 provided the City's LHMP Planning Committee with substantiated accounts of disasters affecting areas around the City dating back to 1967. As shown in Table 5-2, large regional incidents have affected Kern County and entire portions of the State. Severe wildfires were declared across the State during the 2008 fire season causing extensive damage in the County and across California. Though

[1] FEMA does not maintain disaster records at the local level for cities, special districts or other municipal organizations.

none of the fire footprints were located within City boundaries, residents of McFarland experienced secondary effects of wildfire including air quality degradation.

Table 5-2: Federal and State Declared Disasters

Date	Disaster Type	Disaster Name	Disaster#
1/2/1967	Flood	Severe Storms & Flooding	DR-223
1/26/1969	Flood	Severe Storms & Flooding	DR-253
9/29/1970	Fire	Forest and Brush Fires	DR-295
1/20/1977	Drought	Drought	EM-3023
2/15/1978	Flood	Coastal Storms, Mudslides & Flooding	DR-547
2/9/1983	Coastal Storm	Coastal Storms, Floods, Slides & Tornadoes	DR-677
2/11/1991	Freezing	Severe Freeze	DR-894
2/25/1992	Flood	Rain/Snow/Windstorms, Flooding, Mudslides	DR-935
1/10/1995	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044
3/12/1995	Severe Storm(s)	Severe Winter Storms, Flooding Landslides, Mud Flow	DR-1046
2/9/1998	Severe Storm(s)	Severe Winter Storms and Flooding	DR-1203
2/9/1999	Freezing	CA-Citrus Crop Damage 2/2/99	DR-1267
7/22/2002	Fire	Deer Fire	FS-2450
6/28/2003	Fire	CA-Sawmill Fire - 06-27-2003	FM-2473
6/29/2003	Fire	CA-Tejon Fire - 06-30-2003	FM-2474
2/4/2005	Severe Storms(s)	Severe Storms, Flooding, Debris Flows and Mudslides	DR-1577
4/14/2005	Severe Storm(s)	Severe Storms, Flooding, Landslides and Mud and Debris Flow	DR-1585
9/13/2005	Hurricane	Hurricane Katrina Evacuation	EM-3248
3/13/2007	Freezing	Severe Freeze	DR-1689
6/28/2008	Fire	Wildfires	EM-3287
7/27/2010	Fire	Bull Fire	FM-2849
7/28/2010	Fire	West Fire	FM-2850
8/24/2010	Fire	Post Fire	FM-2852
9/15/2010	Fire	Canyon Fire	FM-2858
1/26/2011	Flood	Severe Winter Storms, Flooding and Debris and Mudflows	DR-1952
9/5/2011	Fire	Canyon Fire	FM-2961
9/11/2011	Fire	Keene Fire Complex	FM-2970
9/11/2011	Fire	Comanche Fire Complex	FM-2971

Source: FEMA: Kern County Disaster History; CAL OES Emergency & Disaster Proclamations and Executive Orders by Date (November 2003-Current).

Based on the review of hazards identified in similar and relevant documents, previous incidents, historical knowledge of localized events, and natural hazard trends, the LHMP Planning Team developed a preliminary list of five natural hazards with significant potential to occur in the City: Flooding, Geologic Hazards (Earthquake), Severe Weather, Drought, and Extreme Heat. Due to limited resources to implement mitigation actions, a streamlined list of identified hazards ensures that appropriate efforts are allocated to mitigate the hazards determined to have the largest potential impacts on McFarland.

5.2 HAZARD PROFILES

Natural hazards are profiled individually in this section in order of priority. The profiles in this section provide a baseline definition and description in relation to the City of McFarland. Hazard profiles are used to develop a vulnerability assessment, where natural hazard vulnerability to the community is quantified in terms of population and assets affected for each hazard deemed significant by the LHMP Planning Team.

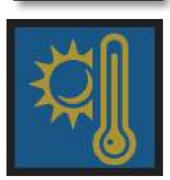
***Important to Note*: For reference, each hazard symbol, as shown below, is placed at the beginning of the applicable hazard profile and vulnerability analysis located throughout Section 5.0.**


- Flooding


- Geologic Hazards


- Severe Weather


- Drought


- Extreme Heat

5.3 FLOOD HAZARD PROFILE

Flood reduction, prevention, and mitigation are major challenges to McFarland residents and its floodplain managers. Large areas of McFarland are at risk to flooding, especially properties on the eastern side of the City. Flood prone areas within McFarland can be organized by watershed, thus examining the impact of water as it travels along a particular tributary, channel, or waterway. Localized flooding associated with creek or stream overflow occurs in McFarland when rainfall runoff volumes exceed the design capacity of drainage facilities or when flood control structures fail. Heavy seasonal rainfall, which typically occurs from late October through April, can result in stream overflows in the McFarland area.

5.3.1 REGULATORY ENVIRONMENT

The regulatory environment for flood control at the local, State, and Federal level is complex, difficult to navigate, and varies based upon flood control structure, location of water bodies, and local participation in State and Federal programs. This section discusses the regulatory framework that McFarland uses to regulate development within the floodplain. This section also highlights some of the requirements from the State of California as well as the National Flood Insurance Program (NFIP).

5.3.1.1 LOCAL BUILDING CODES

The City of McFarland has a number of building codes and development regulations in place to reduce flood risk for new construction, substantial improvements, or other man-made changes. According to McFarland Municipal Code Section 15.12.140, the City Manager is the floodplain administrator for the City. The floodplain administrator determines if new construction must meet certain flood zone construction criteria.

In accordance with McFarland Municipal Code Section 15.12.140, the City Manager has authority to perform Flood Zone Determinations. Upon application for a development permit, the application and plans are reviewed to determine if the proposed structure is within any Special Flood Hazard Area (SFHA) designated by FEMA on regulatory Flood Insurance Rate Maps (FIRMs). Additional information on FEMA flood hazard areas is provided within this section.

NATIONAL FLOOD INSURANCE PROGRAM

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners, in participating communities. As a participating member of the NFIP, McFarland NFIP administrators are dedicated to protecting homes with 151 NFIP policies currently in force. FEMA has prepared a detailed Flood Insurance Study (FIS) for areas of McFarland; the study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood (100-year flood, base flood) and the 0.2-percent annual chance flood (500-year flood). Base flood elevations and the boundaries of the 0.1% and 0.2% Annual Chance flood zones are shown on FIRMs. More information on location and geographic extent is provided in Section 5.3.3.

McFarland entered the NFIP on June 28, 1974, and the City's initial FIRM became effective on September 29, 1986. As a participant in the NFIP, the City is dedicated to regulating development in the FEMA floodplain areas in accordance with NFIP criteria. Structures permitted or built in the City before the NFIP regulatory requirements were incorporated into the City ordinances (before the effective date of the County's FIRM) and are called "pre-FIRM" structures.

For a complete explanation on base flood and flood zone information and California Regulation and the NFIP, please see California's Department of Water Resources NFIP Quick Guide: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/CAQG-screen.pdf.

5.3.1.2 CENTRAL VALLEY FLOOD PROTECTION PLAN

In 2007, legislation spearheaded by the California Department of Water Resources (DWR) to provide protection to people and property in areas especially prone to flooding in California's Central Valley was enacted. State legislative requirements provide Kern County and the City of McFarland local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions).

Some of the requirements of the 2007 flood risk management legislation apply Statewide, while other legislation is additive and provides provisions applicable to lands within the Sacramento-San Joaquin Valley (SSJV), and further to lands also within the Sacramento-San Joaquin Drainage District (SSJDD). Refer to Appendix C for more information on implementing California Flood Legislation into local planning. California Government Codes 65302 and 8685.9 are of particular importance to hazard mitigation planning. Figure 5-1, *Sacramento-San Joaquin Valley (SSJV,)* provides an overview of the area.

GOVERNMENT CODE 65302

Government Code 65302 authorizes, but does not require, cities and counties to adopt a LHMP specified in the Federal Disaster Mitigation Act of 2000 in conjunction with the Safety Element of the General Plan.

GOVERNMENT CODE 8685.9

Government Code 8685.9 prohibits the State share for any eligible project under the California Disaster Assistance Act from exceeding 75 percent of total State eligible costs, unless the local agency is located within a city, county, or city and county that has adopted a LHMP in accordance with the Federal DMA 2000 as part of the Safety Element of its General Plan. In other words, the Legislature may provide for a State share of local costs that exceeds 75% of total State eligible costs if the local jurisdiction/agency has an adopted LHMP.

Government Code Section 8685.9 provides a financial incentive for implementation of Government Code Section 65302.6, which allows local jurisdictions to adopt a LHMP as part of the safety element. The financial incentive is realized when local jurisdictions incur State-eligible, post-disaster costs under California Disaster Assistance Act (CDAA).[2]

[2] California Disaster Assistance Act (CDAA) provides state financial assistance for recovery efforts to counties, cities, special districts, and certain eligible private non-profit agencies after a Governor's Proclamation or a Director's Concurrence by Cal OES. CDAA may be implemented as a "stand alone" funding source following a state disaster.

Figure 5-1: Sacramento-San Joaquin Valley (SSJV)

Most importantly, the General Plan Safety Element will be required to reference information about floodplain management and flood hazards within the City of McFarland. For further information, the crosswalks in Appendix C provide a checklist of the regulatory environment for the California Central Valley Flood Protection and SSJV.

5.3.2 PAST OCCURRENCES

Kern County has been a part of five Federal Disaster Declarations that included flooding. The City of McFarland has experienced damages associated with flood events of this magnitude and has received localized urban flooding, impacting residents and their property. The presence of zero Repetitive Loss (RL) properties in the City indicates flood impacts to private properties insured by the NFIP may be minimal.[3]

A RL property is a FEMA designation defined as an insured property that has made two or more claims of more than $1,000 in any rolling 10-year period since 1978. The term "rolling 10-year period" means that a claim of $1,000 can be made in 1991 and another claim for $2,500 in 2000; or one claim in 2001 and another in 2007, as long as both qualifying claims happen within ten years of each other. Claims must be at least ten days apart but within ten years of each other. RL properties may be classified as a Severe Repetitive Loss (SRL) property under certain conditions. A SRL property has had four or more claims of at least $5,000, or at least two claims that cumulatively exceed the building's reported value. A property that sustains repetitive flooding may or may not be on the City's RL property list for a number of reasons:

- Not everyone is required to carry flood insurance. Structures carrying federally-backed mortgages that are in a SFHA are required to carry flood insurance in McFarland;
- Owners who have completed the terms of the mortgage or who purchased their property outright may not choose to carry flood insurance and instead bear the costs of recovery on their own;
- The owner of a flooded property that does carry flood insurance may choose not to file a claim;
- Even insured properties that are flooded regularly and have filed claims, may not meet the $1,000 minimum threshold to be recognized as an RL property; or
- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat and the RL list (in accordance with FEMA's mitigation reporting requirements).

Extensive FEMA NFIP databases are used to track claims for every participating community. FEMA databases maintain all NFIP claims which allow for the examination of single-loss (SL) properties and RL properties. McFarland has 23 properties that have filed single-loss NFIP claims. The total dollar amount of claims paid to date by the NFIP is $574,298 (SL claims data does not differentiate between building and contents).

NFIP COMMUNITY OVERVIEW

- Policies in force: 151
- Insurance in force: $22,610,100
- Written Premium In-Force: $135,696
- Paid Losses: 23
- Total paid losses: $574,298.07

[3] Correspondence e-mail from FEMA to City of McFarland dated August 11, 2014, indicated that the FEMA loss database contained no RL records to date.

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.

5.3.3 LOCATION/GEOGRAPHIC EXTENT

The area adjacent to a channel is the floodplain. A floodplain is the area that is inundated during a flood event. It is often physically discernible as a broad, flat area created by prior floods. In most cases, the larger the floodplain, the greater the flood risk. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100 year flood is the national minimum standard to which communities regulate development in the floodplains through the NFIP.

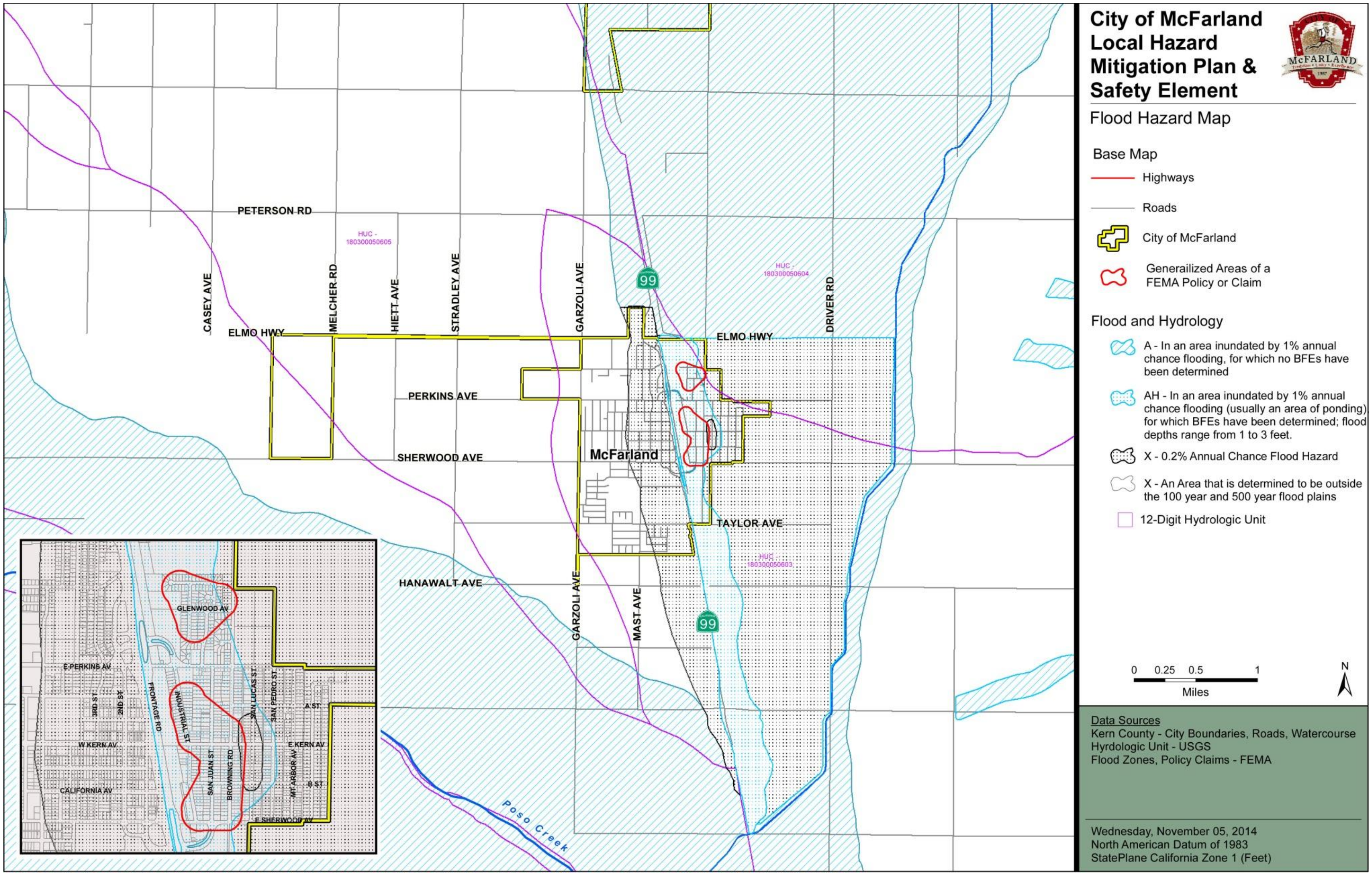
Regional flooding on the eastern side of the City of McFarland is a result from the overflow of Poso Creek and runoff from the mountains east of McFarland. The runoff ponds behind the Friant-Kern Canal and then flows southerly along the east canal bank. Both the overflow from Poso Creek and runoff from the canal flow northerly toward McFarland through the canal siphon at SR-99. East of SR- 99, there are overland flows with an average depth of less than one foot. Previous flooding on the east side of the City, as recently as 1978, was caused by these two sources. Although the effective Flood Insurance Study (FIS) identifies the source of flooding, there is no current overflow analysis for how much flow is coming from Poso Creek, the depth of the water, and the extents of the flooding.

Watersheds are delineated by USGS using a nationwide system based on surface hydrologic features and are divided into numeric codes or Hydrologic Unit Codes (HUCs). This system divides the country into 21 regions (2-digit), 222 sub-regions (4-digit), 352 accounting units (6-digit), and 2,262 cataloguing units (8-digit) and so on. A hierarchical hydrologic unit code (HUC) consisting of 2 digits for each level in the hydrologic unit system is used to identify any hydrologic area. The City of McFarland lies within four HUCs. Table 5-3, *McFarland Local Watersheds*, provides details on the City's watersheds by HUC name. Refer to Figure 5-2, *Flood Hazard Map*, for location and extent of each drainage area.

Table 5-3: McFarland Local Watersheds

Watershed (or HUC Name)	Total Watershed Area (acres)	Watershed within McFarland (acres)
180300050605 (Unnamed)	3,202	198
Lake Woollomes	3,220	32
Old Channel Poso Creek	2,635	183
City of McFarland	2,539	1,281
Total Acreage with Flood Hazard	**11,596**	**1,694**

Figure 5-2: Flood Hazard Map



Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it. Carefully engineered drainage improvements can help minimize these risks. Table 5-4, *Flood Hazard Area*, provides the total area for both the FEMA identified 1% Annual Chance (100-year) and the 0.2% Annual Chance (500-year) flood.

Table 5-4: Flood Hazard Area

Flood Hazard Type	Flood Zone	Acres
AH - In an area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet.	100-YR	239.7
X Shaded - 0.2 percent annual chance flood hazard	500-YR	540.4
X – Area of minimal flood hazard	N/A	927.6
Total Acreage with Flood Hazard		**780.1**

As stated in the FIS, at the City of McFarland, protection from major flood events less than the 1-percent annual chance event is provided by the Friant-Kern Canal and its built-up bank. Runoff from the mountains, located east of McFarland, ponds against the east bank of the canal. Flap gates allow water to enter the canal and be carried away. Under major events, the canal cannot carry away enough flow to keep the water from flowing south to the opening at SR-99 and north toward the City.

5.3.4 MAGNITUDE/SEVERITY

Magnitude and severity of flooding generally results from prolonged heavy rainfall and are characterized by high intensity, short duration runoff events. Floods usually occur during the season of highest precipitation or during heavy rainfalls after long dry spells. Widespread storms over the region can occur anytime from September through April. Flooding is more severe when the ground is frozen and infiltration is minimal due to saturated ground conditions, or when rain-on-snow in the higher elevations adds snowmelt to rainfall runoff, resulting in intensified flood conditions.

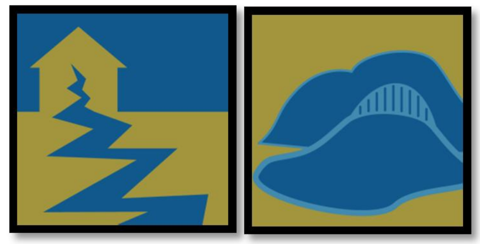
Reports of minor flooding to homes, garages and outbuildings and flooded streets have occurred in the City. Trash and other debris can also be found obstructing culvert and pipe openings during even moderate flows in smaller channels, which can lead to clogging, obstruction, and eventual flooding of nearby properties.

Due to the variable climate and the variability of rainfall, stream flows throughout the City are highly variable and directly impacted from rainfall or flow from regional flood control infrastructure. Many streams in the City are dry during the summer months. Watercourses can experience a high amount of sedimentation during wet years and high amounts of vegetative growth during dry and moderate years. Many tributaries in Kern County only flow during winter months or rain events. There are numerous culverts and or infrastructure crossings that require maintenance throughout the City (and neighboring county) that cause flooding problems within the City.

5.3.4.1 FLOOD WARNING AND NOTIFICATION

The magnitude and severity of flood damage can be reduced with longer periods of warning time and proper notification before flood waters arrive. Warning times of 12 hours or more have proven adequate for preparing communities for flooding and reducing flood damages. More than 12 hours advance warning of a flood can reduce a community's flood damage by approximately 40% in comparison with unprepared communities (Read Sturgess and Associates 2000). In addition, seasonal notification for flooding can enhance awareness for residents at risk, and when communicated effectively advance notification can reach target audiences on a large scale. McFarland coordinates with National Weather Service in Sacramento, California and the California Department of Water Resources for flood forecasting in localized areas.

5.4 GEOLOGIC HAZARDS



Geologic hazards pose a substantial danger to residents and City property. Geologic hazards exist in McFarland due to naturally occurring geologic events and geologic hazards accelerated by human development. Common geologic hazards present throughout the City include seismic shaking or "earthquake", fissures, and subsidence. Each hazard is profiled in detail below.

5.4.1 EARTHQUAKES, FAULTS AND FISSURES

The term "earthquake" refers to the vibration of the earth's surface caused by movement along a fault, by a volcanic eruption, or even by manmade explosions. The vibration can be violent and cause widespread damage and injury, or may be barely felt. Most destructive earthquakes are caused by movements along faults. An earthquake is both the sudden slip on an active earth fault and the resulting shaking and radiated seismic energy caused by the slip. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Section 5.5.7.1 for more information on earthquake magnitude and potential ground shake maps). Seismic shaking is typically the greatest cause of loss to structures during earthquakes.

Fissures are narrow openings or cracks of considerable length and depth usually associated with a nearby fault or earthquake activity. Most fissures occur on unconsolidated ground (as opposed to bedrock) and they can develop from shaking, settling, and lurching of the ground during an earthquake.

5.4.2 SUBSIDENCE

Subsidence is the ground settlement that results over time from the extraction of oil or groundwater. This process usually extends over a large area and occurs on a gradual basis so the settlement effects on a single site, relative to its immediate neighbors, may be negligible as the neighboring properties are also subsiding. This type of ground failure can be aggravated by ground shaking. Subsidence accelerates maintenance problems on roads, lined and unlined canals, and underground utilities. All new installations in areas suspected of subsidence should be engineered to withstand such subsidence. The usual remedial action is that of raising the water table by injecting water or by reducing groundwater pumping. This increases the fluid pressure in the aquifer and, in most instances, subsidence decreases or stops after a period of time.

5.4.3 REGULATORY ENVIRONMENT

Numerous building and zoning codes exist at the state and local levels to decrease the impact of geologic hazard events on residents and infrastructure. Policies and implementation measures applicable to seismic hazards are provided in the Kern County General Plan Safety Element, Sections 4.3, *Seismically Induced Surface Rupture, Ground Shaking, and Ground Failure*, and 4.5, *Landslides, Subsidence, Seiche, and Liquefaction*. The Kern County Multi Hazard Mitigation Plan (MHMP), approved by FEMA in 2006 and updated in July 2012, provides a risk assessment profile for seismic hazards in Sections 4.2.10, *Earthquakes*, including specific locations of risk, history of events, vulnerability assessments, and the mitigation capabilities of the County during such events. A Mitigation Action Plan was developed and is shown in Section 5.4 of the MHMP, which identifies actions, and assigns responsibility to agencies for those actions, to minimize loss to both existing and future development that could result from seismic hazard events.

Building and zoning codes include the 2010 California Standards Building Code (CSBC) and McFarland Municipal Code (adopted entirely from Kern County). To protect lives and infrastructure in the City, the Building Division is responsible for code enforcement and ensures residents follow building and zoning codes that mitigate geologic hazards.

The 2010 CSBC is based on the International Building Codes (IBC), which is widely used throughout the United States. CSBC was modified for California's conditions to include more detailed and stringent building requirements. The McFarland Building Department utilizes the Kern County/2010 CSBC to regulate the infrastructure and development within the City.

Some provisions within the IBC are intended to ensure that structures can adequately resist seismic forces during earthquakes. These seismic provisions represent the best available guidance on how structures should be designed and constructed to limit seismic risk.

Changes or additions to the seismic provisions come from many different sources, including new research results and documentation of performance in past earthquakes. A primary resource is the National Earthquake Hazard Reduction Program (NEHRU) Recommended Seismic Provisions for New Buildings and Other Structures.[4] FEMA's companion document, Earthquake Resistant Design Concepts provides a nontechnical background explanation.[5]

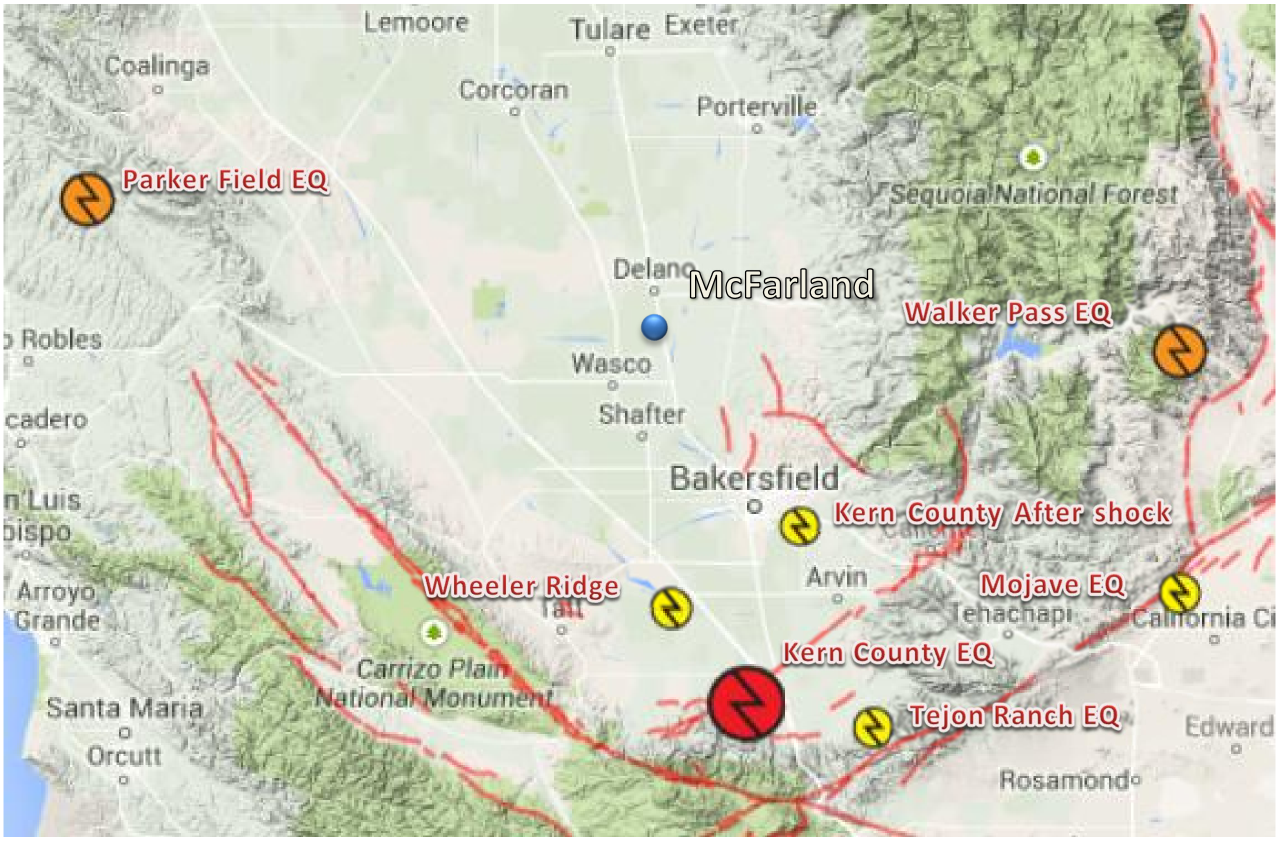
5.4.4 PAST OCCURRENCES

5.4.4.1 EARTHQUAKE

Historical earthquake activity for the McFarland area is significantly below the California state average for earthquakes; however, earthquake activity in the area is 321% greater than the overall U.S. average. Table 5-5, *Major Historic Earthquakes in the McFarland Area Greater Than Magnitude 5.0*, and Figure 5-3, *USGS Earthquake Locations Map*, identify major historical earthquakes that occurred in the region of McFarland and their locations. Refer to Section 5.5.7.1 for information on Magnitude and Intensity ratings.

[4] Federal Emergency Management Agency, http://www.fema.gov/media-library/assets/documents/18152.
[5] Federal Emergency Management Agency, http://www.fema.gov/media-library/assets/documents/21866.

Figure 5-3: USGS Earthquake Location Map



Kern County Earthquake Aftershock Damage

Table 5-5: Major Historic Earthquakes in the McFarland Area Greater Than Magnitude 5.0

Year	Magnitude (Richter)	Depth (Miles)	Intensity (Modified Mercalli)	Distance from McFarland (Miles)
3/15/1946	6.0	21 km	Walker Pass EQ	65.5
7/21/1952	7.5	N.D.	Kern County EQ	47.9
8/22/1952	5.8	N.D.	Kern County EQ (aftershocks)	29.53
6/27/1966	6.0	8.6 km	Parkfield EQ	74.7
6/10/1988	5.4	6.8 km	Tejon Ranch EQ	56.1
7/11/1992	5.7	10.7 km	Mojave EQ	73.4
5/27/1993	5.2	21.4 km	Wheeler Ridge EQ	35.3

Source: California Institute of Technology, Southern California Earthquake Data Center, *Significant Earthquakes and Faults*, June 2015.

On July 21, 1952, the City of McFarland experienced an earthquake that was a magnitude 7.5 at its epicenter. The earthquake claimed 12 lives, caused 18 injuries, and resulted in $50 million in property damage. The source of the earthquake was the White Wolf Fault and it was felt over 200 kilometers (124 miles) away. The Kern County earthquake came as something of a surprise to geologists and seismologists. Not only was the White Wolf fault not previously considered a major threat, but the size of the earthquake seemed disproportionate to the length of the fault which ruptured. The White Wolf fault is traceable for only about 48 km (34 miles), much less than the fault length typically thought necessary to produce such a major earthquake (compare this to the nearly 400 km (250 miles) of the San Andreas fault.[6]

A series of aftershocks from the Kern County/White Wolf Fault Earthquake caused significant damage to property in the area. Although only about the fifth strongest of the aftershocks of the July 21 Kern County earthquake, the aftershock earthquake of August 22 caused a significant amount of damage for three reasons. First, of the sizable aftershocks of the July 21 earthquake, it was the closest to Bakersfield, the largest city in the area. Second, it occurred after at least 18 other aftershocks of magnitude 5.0 or greater had shaken the area, weakening structures over the course of a month. Third, the quake shook with a high frequency, which impacted short, rigid buildings. Refer to the images below of historical damage in Bakersfield.

In all, two people were killed and 35 injuries were reported in the wake of this aftershock, which caused an additional $10 million worth of property damage. Most of the damage was confined to brick structures in a 64-block area of downtown Bakersfield.

Two additional earthquakes in the McFarland region are worth mentioning. The Parkfield Earthquake struck with a magnitude 6.0 on June 27, 1966, and though it caused little damage, the originating fault became well known for the first official earthquake prediction, as the geologist recognized a 22-year pattern. The Wheeler Ridge Earthquake caused minor damage which occurred at Pumpkin Center near the epicenter where ground shaking was the strongest, but otherwise this earthquake caused little damage, though it was noticed over a wide area of southern and central California.

[6] California Institute of Technology, Southern California Earthquake Data Center, *Significant Earthquakes and Faults*, http://scedc.caltech.edu/significant/, accessed June 5, 2015.

5.4.4.2 SUBSIDENCE

Land subsidence in the San Joaquin Valley was first noted in 1935 near the City of Delano, located approximately seven miles north of McFarland. Accelerated ground water pumping of the deep aquifer system during the 1950s and 1960s caused about 75 percent of the total volume of land subsidence. The southern end of the San Joaquin Valley has seen the most subsidence, up to 4 to 8 feet in some areas. Some of the direct damages associated with subsidence have included decreased aquifer storage, partial or complete submergence of canals and associated bridges and pipe crossings, collapse of well casings, and disruption of collector drains and irrigation ditches. According to the Kern County 2012 MJHMP, costs associated with these damages to the San Joaquin Valley (including areas outside Kern County) have been estimated at $25,000,000.[7]

5.4.5 LOCATION/GEOGRAPHIC EXTENT

5.4.5.1 EARTHQUAKE

The risk of seismic hazards to residents of McFarland is based on the approximate location of earthquake faults within and outside the region. According to the California Department of Conservation's Earthquake Fault Zone Maps, McFarland is near one active fault zone, the Pond Fault Zone. In 1983 the Pond Fault Zone was considered sufficiently active and zoned by the State Geologist. During the investigation of a potential site for a nuclear power plant, evidence of historic fault rupture (creep) was evident near the community of Pond (Los Angeles Department of Water and Power [LADWP], 1974). The surface evidence consisted of down-dropped roadways, ground cracks and sags, and repeated pipeline ruptures. The possibility exists that the Pond Fault movement might be the result of subsidence due to groundwater withdrawal and not tectonic forces.

Prior to the completion of the Friant-Kern Canal, the groundwater table had fallen substantially in the area around the agricultural towns resulting in greater subsidence near residential communities. The Friant-Kern Canal brought water to these communities, resulting in less water being pumped from the subsurface in the areas near the canal.

The White Wolf Fault Zone has been identified as the closest active, and possibly hazardous, fault to McFarland residents and property. The White Wolf Fault is considered potentially dangerous today because it ruptured violently in 1952, as previously discussed. The White Wolf Fault Zone is a system of faults that starts approximately 55 miles south of McFarland near where I-5 and US-99 merge and extending easterly about 45 miles between the northeastern end of San Emigdio Mountains to the Tehachapi Mountains ending near Tehachapi Pass. White Wolf Fault was the source of the July 21, 1952, Kern County earthquake (M=7.3), the second largest earthquake in California during the 20th century.

There are closer faults, like the Premier and New Hope Faults, the Kern Front Fault, the Mt. Poso Fault, the Kern Gorge Fault, and the Poso Creek Fault. However, they are not identified as active or a severe threat to McFarland.

5.4.5.2 SUBSIDENCE

Land subsidence is occurring within the San Joaquin Valley, particularly the southwest end of the valley in the vicinity of the Buena Vista Lake Bed. Edwards Air Force Base in the desert region has also experienced subsidence problems in the vicinity of the Rogers Dry Lake Bed. Seismic settlement (ground failure) can

[7] County of Kern, *Kern Multi-Jurisdiction Hazard Mitigation Plan*, September 2012, p. 4.155.

be accelerated by ground shaking in areas where subsidence already occurs. Since this condition currently exists in McFarland, this presents an additional ground failure hazard caused by seismic ground shaking.

5.4.6 MAGNITUDE/SEVERITY

5.4.6.1 EARTHQUAKE

The most common method for measuring earthquakes is magnitude, which measures the strength of earthquakes. Although the Richter Scale is known as the measurement for magnitude, the majority of scientists currently use either the M_w Scale or Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 5-6, *Earthquake Magnitude Scale*, there are seven earthquake magnitude classes, ranging from great to micro. A great class of magnitude can cause tremendous damage to infrastructure in McFarland, compared to a micro class, which results in minor damage to infrastructure.

Table 5-6: Earthquake Magnitude Scale

Earthquake Magnitude Classes		
Magnitude Class	**Magnitude Range (M = Magnitude)**	**Probable Damage Description**
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage.
Micro	M < 3	Minor damage

The MMI Scale measures earthquake intensity as shown in Table 5-7, *Modified Mercalli Scale*. The MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake.

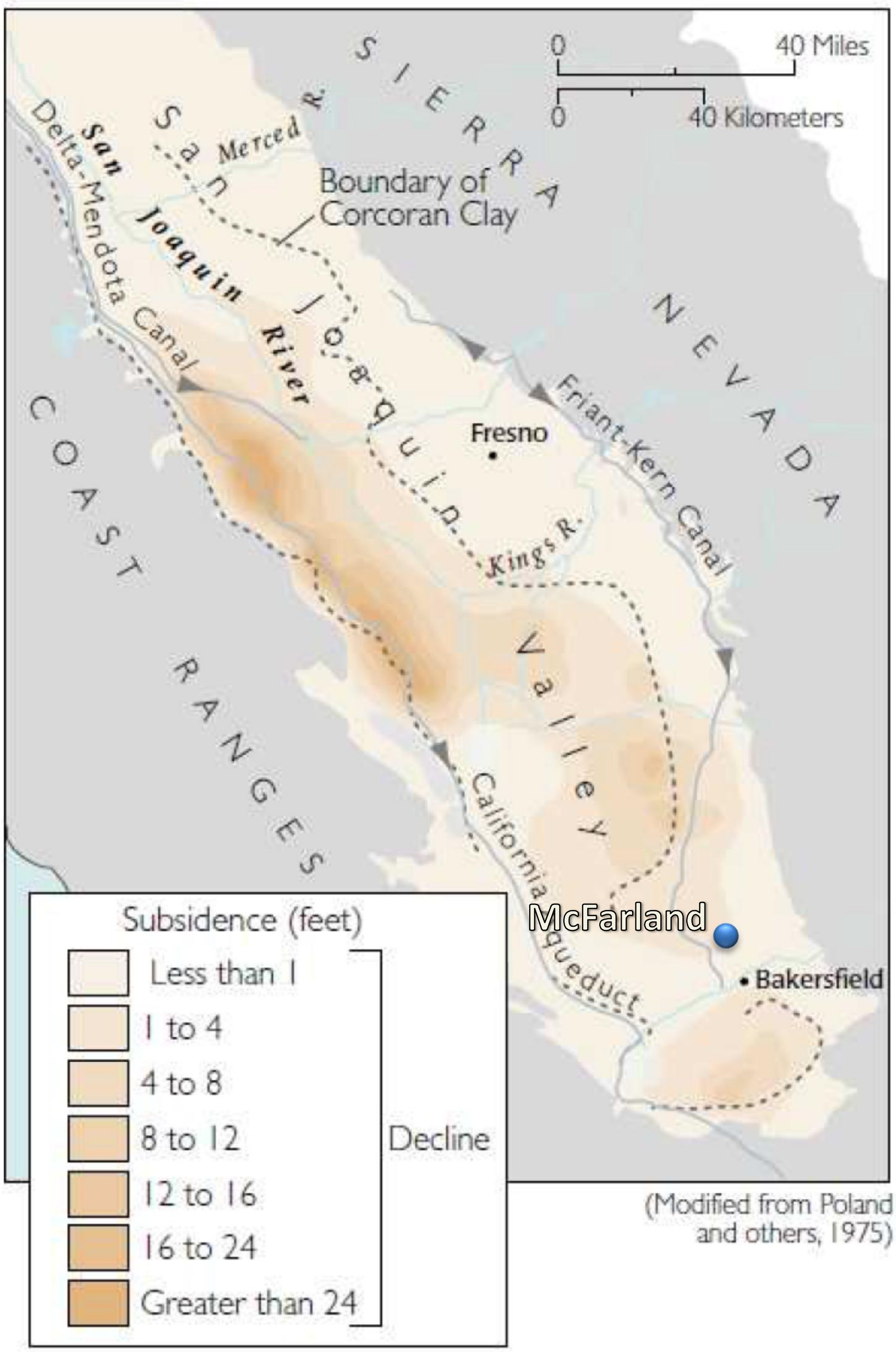
Table 5-7: Modified Mercalli Scale

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows, and doors rattle.
		V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys.
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc., may topple.
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.
7.0 and Higher	VIII and Higher	X. Some well-built wooden structures destroyed. Most masonry structures destroyed. Ground badly cracked. Landslides on steep slopes.
		XI. Few, if any, masonry structures remain standing. Railroad rails bent; bridges destroyed. Broad fissure in ground.
		XII. Virtually total destruction. Waves seen on ground. Objects thrown into the air.

5.4.6.2 SUBSIDENCE

The Kern 2012 MJHMP provides a subsidence map of the San Joaquin Valley, indicating the areas affected by subsidence and the corresponding measurements of decline, ranging from less than one foot to greater than 24 feet; refer to Figure 5-4, *Central Valley Subsidence Map (USGS Circular 1182)*. According to this map, the approximate severity of decline in the McFarland area is 1 to 4 feet.

Figure 5-4: Central Valley Subsidence Map (USGS Circular 1182)



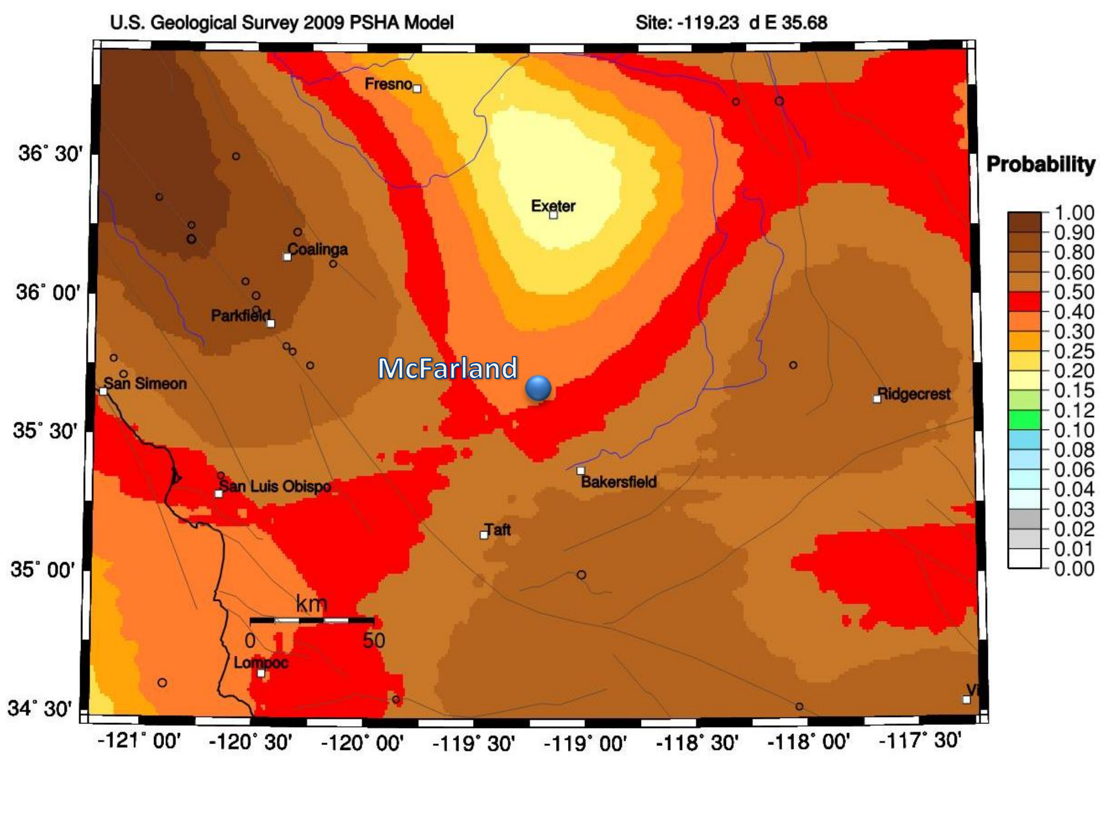
5.4.7 FREQUENCY/PROBABILITY OF FUTURE OCCURRENCES

5.4.7.1 EARTHQUAKE

The variable colored maps in Figure 5-5, *Earthquake Magnitude > 5.0 within 20 Years & 50 km*, and Figure 5-6, *Earthquake Magnitude > 5.0 within 30 Years & 50 km*, are the Probabilistic Seismic Hazards Map (PSHM) for Magnitude 5.0 earthquakes or greater within the next 20 and 30 years in the McFarland region (U.S. Geological Survey 2009).[8] The lower the probability of an earthquake, the further the area is away from known active faults. Areas identified in grey, blue, and green probability on the probability scale are predicted to experience lower levels of shaking less frequently.

Figures 5-5 and 5-6 show a 25 to 30 percent chance of an earthquake greater than Magnitude 5.0 occurring within the next 20 years, and a 50 to 60 percent chance of an earthquake greater than Magnitude 5.0 occurring within the next 30 years.

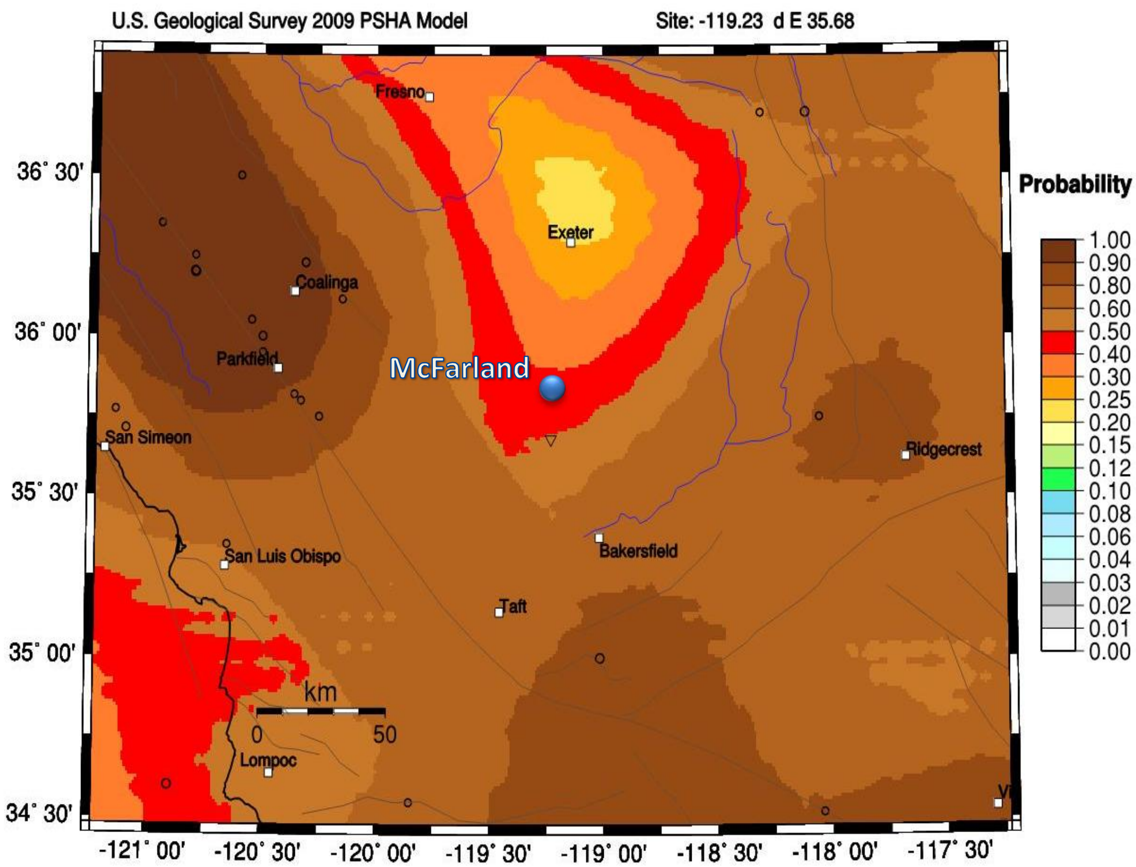
Figure 5-5: Earthquake Magnitude > 5.0 within 20 Years & 50 km[9]



[8] The 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update maps show the expected relative intensity of ground shaking and damage in California from anticipated future earthquakes. The shaking potential is calculated as the level of ground motion that has a 2% chance of being exceeded in 50 years, which is the same as the level of ground-shaking with about a 2500 year average repeat time. Although the greatest hazard is in areas of highest intensity as shown on the map, no region is immune from potential earthquake damage.

[9] EQ probabilities from USGS PSHA 50 km maximum horizontal distance from site of interest. Fault races are brown. Epicenter M > 6.0 are small circles.

Figure 5-6: Earthquake Magnitude > 5.0 within 30 Years & 50 km[10]



***Important to Note*: Earthquakes occur less frequently than other primary natural hazard events, but they have accounted for the greatest combined losses (deaths, injuries, and damage costs) in disasters since 1950 in California and have the greatest catastrophic disaster potential (Cal EMA 2010).**

5.4.7.2 SUBSIDENCE

Land subsidence is occurring within the San Joaquin Valley, particularly within the southwestern end of the valley. Therefore, the probability of future subsidence events occurring in McFarland is likely. Now that the hazard is recognized and understood, subsidence from ground water withdrawal has generally slowed since the 1970s in the San Joaquin Valley due to reductions in ground water pumping. Long-term subsidence is expected to continue, but at slower rates than before. Studies indicate that subsidence in the Edwards AFB area will be between 0.5-1.7 feet in the next 25 years, depending on groundwater levels. Even though water levels have stabilized in the past 20 years, subsidence continues due to past stresses on the aquifer system. Continued population growth, water demands, and uncertain water supplies will likely continue the trend of groundwater withdrawal and continued subsidence.

[10] Ibid.

5.5 SEVERE WEATHER

Severe weather can be defined as any destructive weather event with the potential to damage property or cause loss of life. In regards to the City, severe weather usually occurs as localized storms such as thunderstorms, winter storms, and strong wind and hail events. Severe weather occurs in many forms and varies significantly in size, strength, intensity, duration, and impact. Severe weather may include:

- Dust Storms
- Extreme temperatures (See Section 5.7 for Extreme Heat)
- Severe thunderstorms
- Lightning
- Tornadoes
- Windstorm
- Fog
- Winter Storms

For purposes of this document this severe weather profile will include information on incidences that have occurred in or near the McFarland City boundaries.

SEVERE THUNDERSTORMS

Meteorologists define a severe thunderstorm as having one or more of these characteristics: a tornado; wind gusts equal to or greater than 58 mph; or hail that is 0.75 of an inch or larger. Severe thunderstorms in the planning area may include heavy rains that can lead to flash flooding. Thunderstorms can produce a strong rush of wind known as a downburst, or straight-line winds which may exceed 120 mph. They usually occur when cool, moist air moves in to break a prolonged hot spell. The storms are usually short-lived and infrequent. Over the interior mountain areas storms are more intense, and they may become unusually severe on occasion at intermediate and high elevations of the Sierra Nevada.

FOG

Fog is a collection of water droplets or ice crystals suspended in the air at or near the Earth's surface. Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. Fog can form in a number of ways, depending on how the cooling that caused the condensation occurred. The most common types of fog that occur near the City of McFarland are radiation and advection fog.

One of the most dangerous types of radiation fog is tule fog. It forms on clear nights when the ground is moist and the wind is near calm. On nights like this, the ground cools rapidly. In turn, the moist air above it cools and causes water vapor to condense. Once it has formed, the air must be heated enough to either evaporate the fog or lift it above the surface so that visibilities improve.

WINDSTORMS

Wind is the movement of air from areas of high pressure to areas of low pressure. The greater the difference in atmospheric pressure, the stronger the wind can be. Windstorms in Kern County and McFarland are often straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., not tornadic). Southern California's "Santa Anas" are dry, north-easterly winds that tend to flow out of the Great Basin into the Central Valley, the Southeastern Desert Basin, and the South Coast. These winds usually occur in late fall and winter when a high pressure system forms in the Great Basin between the Sierra Nevada's and the Rocky Mountains. The winds are strong, gusty, and sometimes exceed 100 mph (Kern Couny 2012).

5.5.1 REGULATORY ENVIRONMENT

There are negligible formal regulations that pertain to generalized severe weather events.

5.5.2 PAST OCCURRENCES

Since 1964, fourteen federally or state declared severe winter weather events have occurred in Kern County; refer to Table 5-8, *Severe Weather Federal Declarations*.

Table 5-8: Severe Weather Federal Declarations

Disaster Number	Declaration Date	Disaster Type	Incident Type	Explanation	Cost*
223	1/2/1967	DR	Flood	Severe Storms & Flooding	Unknown
253	1/26/1969	DR	Flood	Severe Storms & Flooding	Unknown
547	2/15/1978	DR	Flood	Coastal Storms, Mudslides & Tornadoes	Unknown
677	2/9/1983	DR	Coastal Storm	Coastal Storms, Floods, Slides & Tornadoes	Unknown
894	2/11/1991	DR	Freezing	Severe Freeze	Unknown
935	2/25/1992	DR	Flood	Rain/Snow/Wind Storms, Flooding, Mudslides	Unknown
1044	1/10/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, Mud Flows	Unknown
1046	3/12/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, Mud Flow	Unknown
1203	2/9/1998	DR	Severe Storm(s)	Severe Winter Storms, and Flooding	Unknown
1267	2/9/1999	DR	Freezing	CA-Citrus Crop Damage 2/2/99	Unknown
1577	2/4/2005	DR	Severe Storm(s)	Severe Storms, Flooding, Debris Flows, and Mudslides	IA - $21,484,255.07 PA - $194,341,592.02
1585	4/14/2005	DR	Severe Storm(s)	Severe Storms, Flooding, Landslides, and Mud and Debris Flows	PA - $77,179,068.07
3248	9/13/2005	EM[11]	Hurricane	Hurricane Katrina Evacuation	PA - $988,951.24
1689	3/13/2007	DR	Freezing	Severe Freeze	Unknown
1952	1/26/2011	DR	Flood	Severe Winter Storms, Flooding, and Debris and Mud Flows	PA - $74,612,146.23

*Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may not be specific to Kern County.
DR- Disaster Recovery.

[11] National Disaster shared by all States and Counties.

According to FEMA Declarations and Cal OES Emergency and Disaster Proclamations (November 1964 to present), these events include: severe storms, freezing events and a coastal storm.

5.5.3 LOCATION/GEOGRAPHIC EXTENT

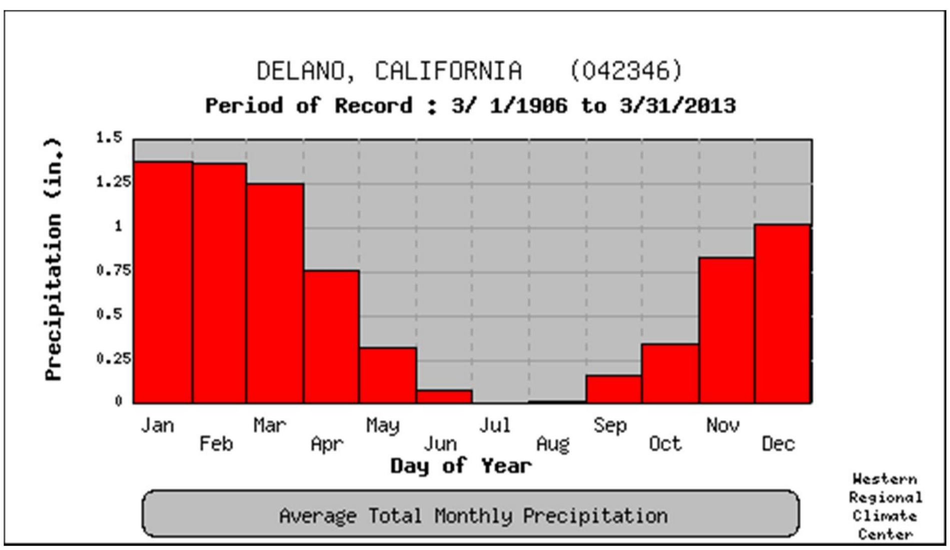
According to the U.S. Environmental Protection Agency (EPA) McFarland is located within the Central California Valley eco-region. This eco-region occurs in the central part of California, and differs from adjacent ecoregions that are hilly or mountainous, forest or shrub-covered, and generally nonagricultural. The ecoregion has a mild, mid-latitude, Mediterranean climate, bordering on a mid-latitude desert climate in the south. The northern Central Valley has a hot Mediterranean climate. The more southerly parts in rain shadow zones are dry enough to be Mediterranean steppe or even low-latitude desert (as in areas around Bakersfield). It is hot and dry during the summer and cool and damp in winter, when frequent ground fog known regionally as "tule fog" can obscure vision. Due to McFarland's location in the rain shadow of the Sierra Nevada range, the area receives as little as 3.5 to 4.5 inches of precipitation on average each year. The entire region around McFarland is susceptible to severe storms, wind, and fog.

5.5.4 MAGNITUDE/SEVERITY

Mid-autumn to mid-spring comprises the rainy season — although during the late summer, southeasterly winds aloft can bring thunderstorms of tropical origin, mainly in the southern half of the San Joaquin Valley but occasionally to the Sacramento Valley.

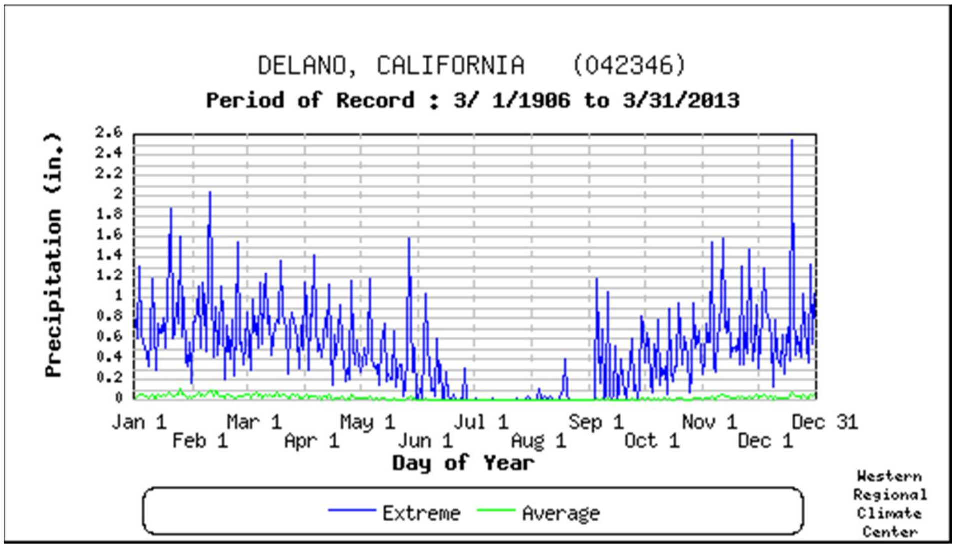
The northern half of the Central Valley receives greater precipitation than the semi-desert southern half. The nearest weather gauge with historic information is located within the City of Delano. Figure 5-7, *Delano Average Monthly Precipitation*, Figure 5-8, *Delano Average and Extreme Monthly Precipitation*, and Figure 5-9, *Delano Average and Extreme Snow Depth*, provide precipitation and snowfall information for the Delano area.

Figure 5-7: Delano Average Monthly Precipitation



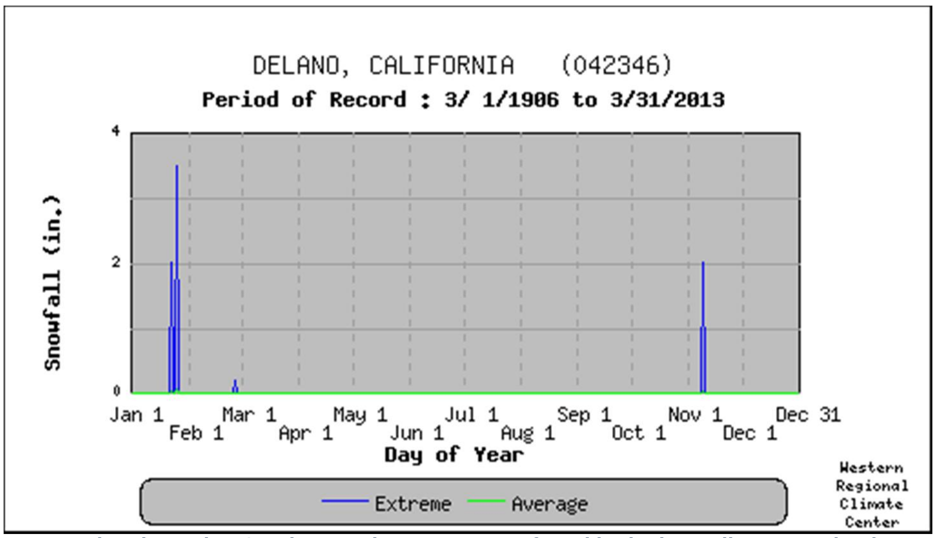
Note: National Weather Service weather gauges not found in the immediate McFarland area. Nearest available gauge data located near Delano, California.

Figure 5-8: Delano Average and Extreme Monthly Precipitation



Note: National Weather Service weather gauges not found in the immediate McFarland area. Nearest available gauge data located near Delano, California.

Figure 5-9: Delano Average and Extreme Snow Depth



Note: National Weather Service weather gauges not found in the immediate McFarland area. Nearest available gauge data located near Delano, California.

Heavy rain and hail storms are some of the most common extreme weather events that occur in McFarland. Some winter storms are possible, as evidenced by the freeze declarations found in Table 5-8. There have been few snow events that have occurred near McFarland. As seen in Figure 5-9, the highest snowfall since 1906 has been just over three inches, towards the end of January. Only three events have been recorded from 1986 to 2013, and two of them have occurred in January. The other occurred in November. In general, the average snow depth in the area is 0 inches.

The agricultural dominated Valley region of the county is likely to experience the greatest impacts from large or unseasonable temperature variations; however, McFarland proper is mostly urbanized. Table 5-9, *Plant Hardiness and Frost*, provides frost zone temperatures and frost yearly averages. Frost occurs at times in the fall months, but snow will occur occasionally.

Table 5-9: Plant Hardiness and Frost

Ecoregion Plant Hardiness and Frost	Average Temp and Frost Dates
2012 Hardiness Zone	Zone 9b: 25 to 30 degrees Fahrenheit
Average First Frost	November 21 - 31
Average Last Frost	February 11 - 20

5.5.4.1 NATIONAL STORM DATA REVIEW

Data from both the Spatial Hazard Events and Losses Database for the United States (SHELDUS) and the National Climatic Data Center (NCDC) Storm Events Database can be used to analyze the trends in severe weather patterns. The National Oceanic and Atmospheric Administration's (NOAA) NCDC has been tracking severe weather in McFarland from 2006 through 2012. NCDC's Storm Events Database contains detailed data on three severe weather events for McFarland. The information below summarizes the magnitude and severity of these events.

EVENT ONE: HEAVY RAIN – FEBRUARY 1, 1998

In February of 1998, a powerful storm system entered Central California. Agricultural losses occurred in Kern County due to flooding and erosion of fields that were planted, and almond trees blown down by high wind. Other losses were attributed to livestock injury, buildings and equipment damage, and employees unable to work. Areas most severely impacted are Arvin-Lamont and McFarland, although flooding occurred in the Lebec-Frazier Park-Cuddy Valley and Kern River Valley areas. Late January and the month of February saw record amounts of precipitation due to the influence of El Nino. The Sacramento 8-station index for the 1998 water year increased 4.6 million acre-feet (MAF) from 13.7 MAF to 18.3 MAF. January and February precipitation were 214% and 265% of average, respectively. For the 8 reference stations, average precipitation is 7.9 inches but in February 1998 precipitation was 20.9 inches. The statewide snowpack water content by the end of February was running at 160% of normal.

EVENT TWO: HIGH WINDS – JANUARY 7, 2005

Strong southeast pre-frontal winds buffeted Central California on January 7, 2005. A truck-trailer was overturned from the high wind with areas of zero visibility, and numerous power poles were downed near Arvin in the South San Joaquin Valley. Wind speeds were commonly up to 45 MPH throughout the Central and South San Joaquin Valley with higher wind gusts in the far South and Southwest areas of the Valley. Even in the foothill areas of the Southern Sierra Nevada and Tulare County Mountains, wind gusts up to 56 MPH were observed. Trees were downed, taking power lines with them, from Merced and Mariposa Counties south through Kern County. Property damage was high due to large trees falling in the Merced, Fresno-Clovis, and Visalia areas. Agriculture suffered losses through numerous deciduous trees being uprooted.

FOG EVENTS

Table 5-10, *NCDC Fog and Dense Fog Events in Kern County (1993 – April 30, 2011)*, shows seven severe fog incidents have occurred within the County during this time period. In these events there has been one death, 55 injuries, and $1,030,000 in property damage county-wide. Primarily, these incidents have been multi-vehicle collisions on Highway 58 approximately 14-20 miles east-southeast of Bakersfield. This highway was affected in 1986 and in 2002 with four separate accidents related to fog and black ice closed this road between Bakersfield and Tehachapi for up to five hours.

Table 5-10: NCDC Fog and Dense Fog Events in Kern County (1993 – April 30, 2011)

Property Location	Date	Time	Type	Deaths	Injuries	Damage
Entire County	1/21/2000	8:00 AM	Fog			
Entire County	1/3/2002	9:13 AM	Fog	1	15	$830,000
Entire County	2/8/2002	10:30 AM	Fog		40	$200,000
Entire County	1/28/2003	6:40 AM	Dense Fog			
Entire County	11/5/2006	12:00 AM	Dense Fog			
Entire County	12/22/2006	3:00 AM	Dense Fog			
Entire County	2/25/2009	12:00 AM	Dense Fog			
Total						**$1,030,000**

5.5.5 FREQUENCY/PROBABILITY OF FUTURE OCCURRENCES

Severe weather will continue to occur annually in McFarland. The probability of future occurrences is highly likely. Due to previous weather patterns and climate change, increases in the probability of future occurrences of severe weather events in the county are anticipated.

5.6 DROUGHT

In the approved 2013 California State Hazard Mitigation Plan (SHMP), climate change is treated as a condition that will occur and potentially exacerbate the impact of hazardous extreme heat and drought. Unlike other hazards profiled in this document, drought is a gradual phenomenon. This section provides definitions and profiles for the hazard of drought.

Drought is a normal, recurrent, feature of climate and originates from a deficiency of precipitation over an extended period, usually one or more seasons. Drought can result in a water shortage for some activity, group, or environmental sector. Drought is a complex natural hazard, which is reflected in the following four definitions commonly used to describe it:

- Agricultural – Drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Hydrological – Drought is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.

- Meteorological – Drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.

- Socio-economic – Drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. It may also be called a water management drought.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of a particular region. Since regions are interconnected by natural systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable stream flow and a higher incidence of hydrologic drought downstream. Land use change is one way human actions alter the frequency of water shortage even when no change in precipitation has been observed (National Drought Mitigation Center 2014).

5.6.1 REGULATORY ENVIRONMENT

Localized regulation or plans for drought are mentioned briefly in local municipal codes. McFarland Municipal Code Chapter 15.30 addresses drought in the landscaping requirements. The landscape design plan requirements outlined in Section 15.30.040 encourage the designation of hydrozones for water conservation, and the use of plants appropriately based upon their adaptability to the climatic, geologic and topographical conditions. Protection and preservation of native plants is strongly encouraged.

On a statewide basis, a number of regulatory requirements and documents address planning for drought in California, most notably the 2010 California Drought Contingency Plan.

5.6.1.1 URBAN WATER MANAGEMENT PLAN

Urban Water Management Plans (UWMP) are prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 or more connections is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple dry years.

Water is supplied to the residents of McFarland by the City's Public Works Department Water Division; and the underlying groundwater basin is the sole source of municipal water. Per information received from the City, McFarland's water consumption is below the annual 3,000 acre-foot threshold that requires preparation of UWMPs.[12] Therefore, no further discussion of UWMPs is included in this section.

KERN COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

McFarland is located in the Tulare Lake Basin hydrologic region within the Kern County Region, which is separated into nine subregions that acknowledge the variation in geographic and water management strategies within the greater region. In November 2011, Kern County released its Integrated Regional Water

[12] Email correspondence received from Dennis McNamara, Planning Director for the City of McFarland, July 7, 2014.

Management Plan (IRWMP) which includes increased use of recycled water for irrigated agriculture and landscape irrigation as a water supply objective, to provide an additional water source during drought or periods of regulatory restrictions when imported potable water quantities are reduced.[13] According to the IRWMP, McFarland's urban water demand in 2010 was 1,765 acre-feet, with future water demand projections of 2,109 acre-feet by 2020, and 2,521 acre-feet by 2030.[14]

McFarland is a project sponsor or co-sponsor for several projects included in the IRWMP's proposed project list, which includes several planned water resources projects throughout the region that are intended to accomplish one or more of the following goals:

- Reduce water demand;
- Increase water supply;
- Improve water quality;
- Improve operational efficiency and transfers; and
- Practice resource stewardship.

Specifically, McFarland is the project sponsor for two local projects including the proposed McFarland Wastewater Treatment Plant Upgrade/Replacement Project and the proposed Browning Road Water Well and Storage Tank Project. McFarland is also a joint sponsor in three joint projects with other jurisdictions, including the proposed McFarland/Delano Trunk Sewer Project (Cities of McFarland and Delano); the proposed Delano/Alpaugh Treated Wastewater Outfall Project (Cities of McFarland and Delano); and the proposed Regional Groundwater Management and Solar Generation Program (Cities of Delano, McFarland, Shafter and Wasco). Refer to Table 11-2 in the IRWMP for the complete list of projects.

5.6.1.2 CALIFORNIA DROUGHT CONTINGENCY PLAN

The California Drought Contingency Plan was prepared in conjunction with the 2009 California Water Plan and will be updated every five years. The purpose of the plan is to minimize drought impacts by improving agency coordination, enhancing monitoring and early warning capabilities, conducting water shortage impact assessments, and implementing preparedness, response, and recovery programs.

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.

5.6.2 PAST OCCURRENCES

Historically, California has experienced severe drought conditions. The approved 2013 State Hazard Mitigation Plan (SHMP) states that from 1972 to 2009, there have been eight-drought State Emergency Proclamations in California. Through 2012, Cal EMA's administered costs due to drought total $2,686,858,480. According to Kern County's MJHMP, a review of both state and federal disaster declarations shows that Kern County has been included in 16 drought events between the years 1950 and

[13] Kern County Water Agency, *Final Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan,* November 2011, p. 2-28.

[14] Kern County Water Agency, *Final Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan*, November 2011, Table 2-19, page 2-38.

2011. Most recently, drought events have been declared every year from 2006 through 2009 by the U.S. Department of Agriculture (USDA).[15]

McFarland is located in the Tulare Lake hydrologic region, which comprises the extreme southern portion of the Central Valley. It is defined by the Sierra Nevada Mountains divide between the San Joaquin and Kings rivers, the Coast Range, and the Tehachapi Mountains. The Kaweah, Tule, Kern, and Kings Rivers all historically drained into the Tulare lake bed. Through the late 1800s, Tulare Lake was of substantial size during wet periods, although its level fluctuated. A number of small reclamation districts were established in the area in the early 1900s. Over the years, these districts built levees and reclaimed the more than 200,000-acre lakebed for agriculture. Though now predominantly agricultural, this region contains the urban centers of Fresno and Bakersfield. It is subject to flooding from winter storms and snow runoff.

Water years 2012 and 2013 were dry statewide, and the 2013 record-low precipitation has worsened California's conditions for the 2014 water year (started October of 2013). Statewide reservoir storage is down significantly and impacts of two (possibly three) dry years in a row may cause significant water delivery issues in California.

Allocations for contractors of DWR's State Water Project (SWP) and the U.S. Bureau of Reclamation's (USBR's) Central Valley Project (CVP) are dependent upon snowpack accumulation in the Cascades and Sierra Nevada. In November of 2013, DWR announced an initial allocation of just five percent of SWP contractors' requested amounts. For more information on current drought conditions in California visit:

http://www.water.ca.gov/waterconditions/drought/

5.6.3 LOCATION/GEOGRAPHIC EXTENT

Droughts are generally widespread events that could easily affect the entire Kern County and surrounding counties as well. The geographic extent of drought conditions will extend to every resident that receives City water supplies.

5.6.4 MAGNITUDE/SEVERITY

Drought severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity. The magnitude of drought is usually measured in time and the severity of the hydrologic deficit.

Drought is one of the few hazards that has the potential to directly or indirectly impact each and every person within Kern County, as well as adversely affect the local economy. The impacts would be water restrictions associated with domestic supplies, agricultural losses and economic impacts associated with those losses, economic impacts to tourism and recreation industries, hydroelectric power reductions, increased wildland firefighting costs, and increased costs for water. History has shown that droughts in Southern California have resulted in disastrous losses to the livestock industry. The magnitude of the drought's impact will be directly related to the severity and length of the drought. Secondary effects include increased susceptibility to wildfires and pine beetle infestations. Increased groundwater pumping during times of drought can contribute to land subsidence problems.[16]

[15] County of Kern, *Kern Multi-Jurisdiction Hazard Mitigation Plan*, September 2012, Table 4.2, p. 4.10.
[16] County of Kern, *Kern Multi-Jurisdiction Hazard Mitigation Plan*, September 2012, p. 4.133.

Several resources are available to evaluate drought status and estimate future expected conditions. The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning. The NIDIS maintains the U.S. Drought Portal (www.drought.gov), a web-based access point to several drought related resources. Resources include the U.S. Drought Monitor (USDM); refer to Figure 5-10, *California Drought Monitor Map*, and the U.S. Seasonal Drought Outlook (USSDO); refer to Figure 5-11, *USSDO Drought Tendency Map*.

A number of indices measure how much precipitation for a given period has deviated from historically established norms. The primary indicator for the USDM and USSDO for the western United States is the Palmer Drought Severity Index (PDSI).

PDSI is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values, and estimates soil moisture. While USDA uses the PDSI to determine when to grant emergency drought assistance, it is not considered consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) nor is it well suited to the dry, mountainous areas in the western U.S.

For western states with mountainous terrain and complex regional microclimates, it is useful to supplement the PDSI values with other indices such as Surface Water Supply Index and Standardized Precipitation Index (SPI). The Surface Water Supply Index takes snowpack and other unique conditions into account. The National Drought Mitigation Center (NDMC) uses the SPI to identify emerging drought months sooner than the PDSI. It is computed on various time scales to monitor moisture supply conditions. The SPI is the number of standard deviations that precipitation value would deviate from the long-term mean. As shown in Figure 5-12, *72-Month SPI Through the end of September 2013*, the 72-month SPI through the end of September 2013 for McFarland is moderately dry.

The Vegetation Drought Response Index, or VegDRI, is a bi-weekly depiction of vegetation stress across the contiguous United States. VegDRI is a fine resolution (1-km^2) index based on remote sensing data, and incorporates climate and biophysical data to determine the cause of vegetation stress. Development of the VegDRI map and associated products is a joint effort by the NDMC, the USGS National Center for Earth Resources Observation and Science (EROS), and the High Plains Regional Climate Center (HPRCC). Figure 5-13, *VegDRI Results for California*, illustrates the VegDRI results for "Quad 4", which is approximately the lower one-fourth of the State of California including Kern County for June 16, 2014.

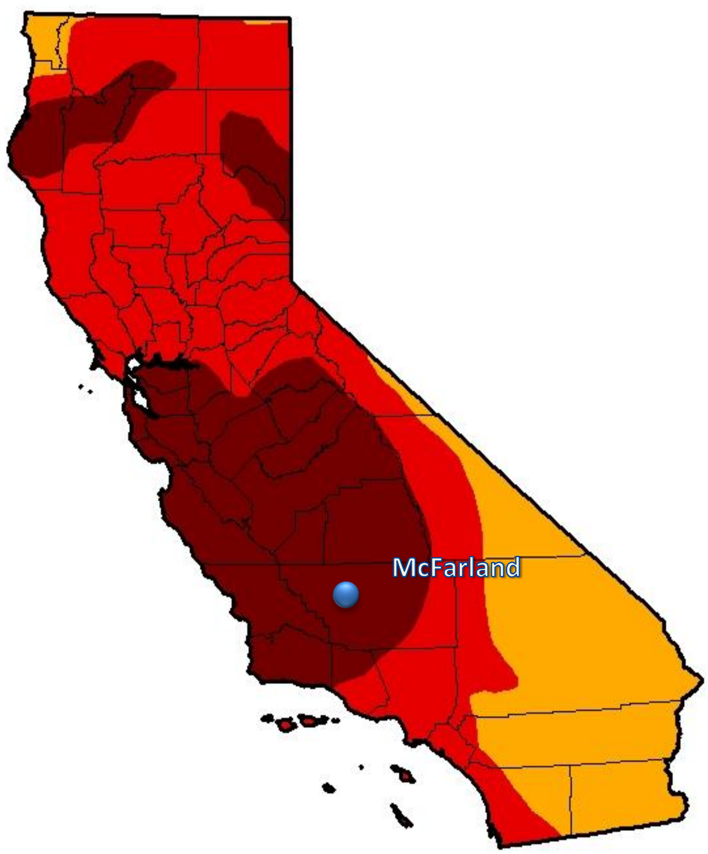
Figure 5-10: California Drought Monitor Map

U.S. Drought Monitor

California

June 24, 2014

(Released Thursday, Jun. 26, 2014)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	76.69	32.98
Last Week 6/17/2014	0.00	100.00	100.00	100.00	76.69	32.98
3 Months Ago 3/25/2014	0.00	100.00	99.80	95.21	71.78	23.42
Start of Calendar Year 12/31/2013	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10/1/2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 6/25/2013	0.00	100.00	98.21	92.61	0.00	0.00

Intensity:

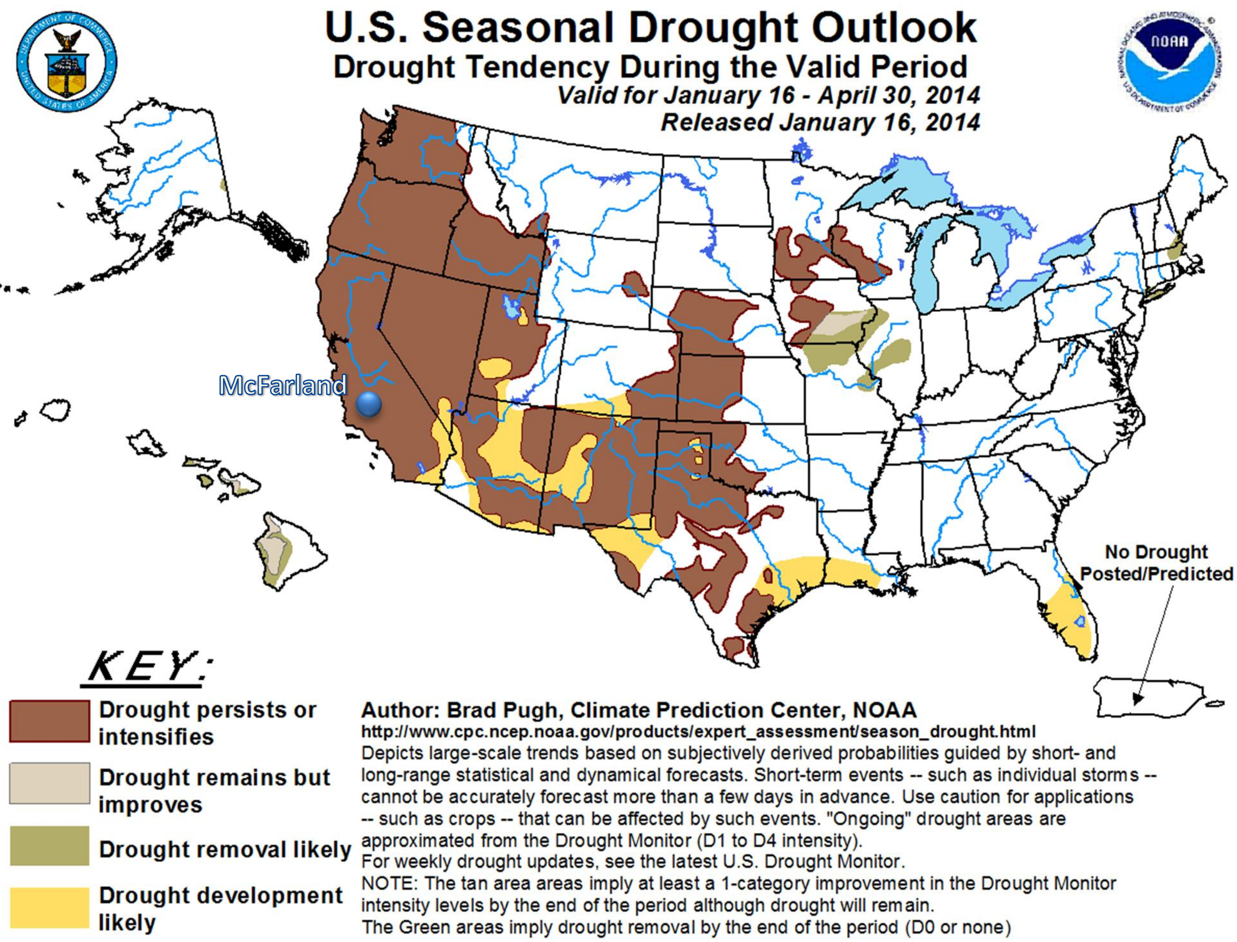
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Eric Luebehusen
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/

Figure 5-11: USSDO Drought Tendency Map



Source: http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_archive/

Figure 5-12: 72-Month SPI through the end of September 2013

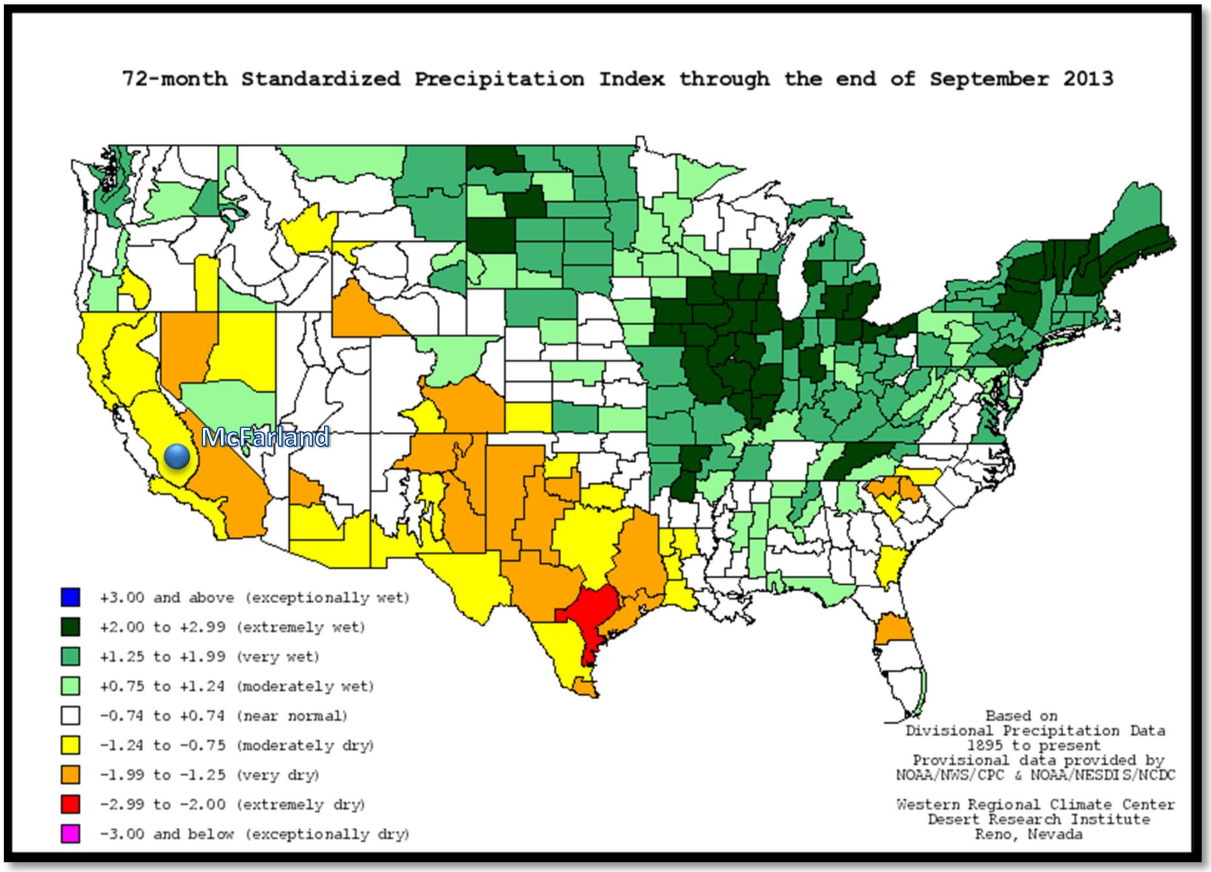
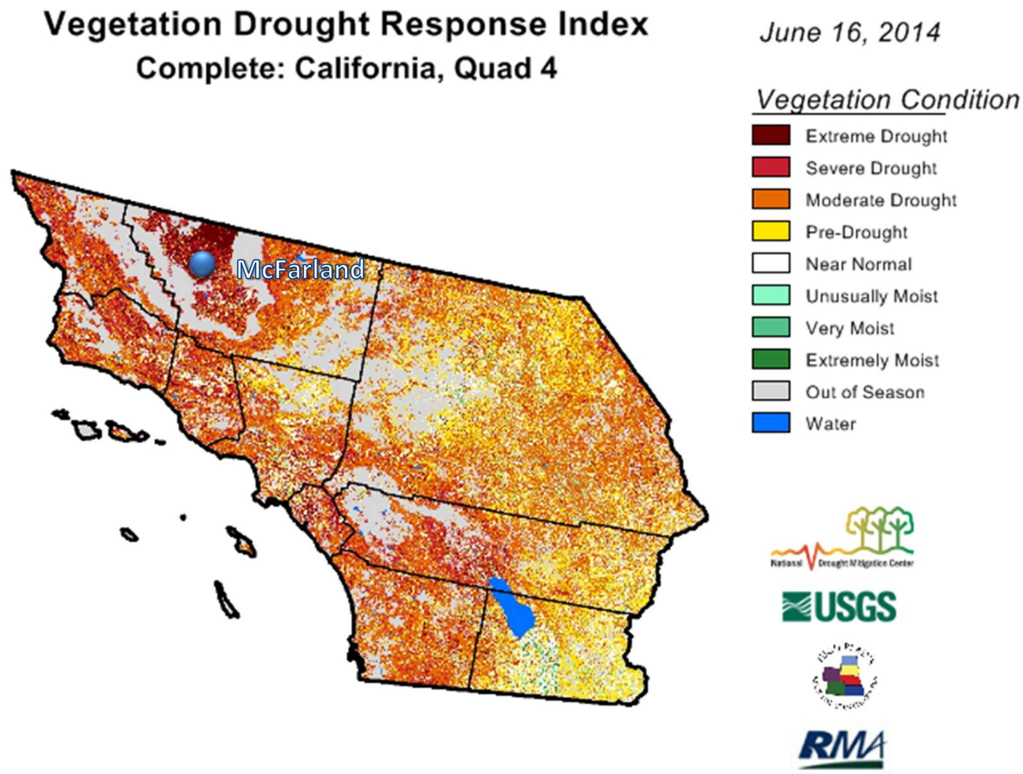


Figure 5-13: VegDRI Results for California



5.6.5 FREQUENCY/PROBABILITY OF FUTURE OCCURRENCES

The probability of future drought events in McFarland, and Kern County overall, is likely. Based on the historical record, 27 droughts have occurred in Kern County and California since 1827 (187 years). Based on this record, California experiences drought on average every seven years, or an approximately 14.6% chance, of a drought in any given year.[17]

According to the approved 2013 SHMP, climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. The experiences water supply agencies faced during 2013, highlighted above, underscore the need to examine the City's water storage, distribution, management, conservation, and use policies more closely. Drought related to climate change will increase pressure on California's water resources. Decreasing snowmelt and spring stream flows coupled with increasing populations, anticipated hotter climate, and demand for water in southern portions of California may lead to water shortages for City residents. By the end of the century, if temperatures rise to the medium warming range and precipitation decreases, late spring stream flow could decline by up to 30 percent (Cal-Adapt 2011). For more information on climate change and water supply and California please see:

http://cal-adapt.org/blog/2011/apr/12/securing-adequate-water-supply/

[17] County of Kern, *Kern Multi-Jurisdiction Hazard Mitigation Plan*, September 2012, p. 4.133.

5.7 EXTREME HEAT

According to the California SHMP, extreme heat and heat waves are existing hazards that will be exacerbated by climate change. Heat is one of the leading weather-related killers in the United States, resulting in hundreds of fatalities each year (National Weather Service 2012). This section provides definitions and profiles for the hazard of extreme heat.

Temperatures that remain at 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. The National Weather Service (NWS) issues an Excessive Heat Warning/Advisory when an extreme heat event (a "heat wave") is expected within 36 hours. The NWS issues these warnings based on a "Heat Index" - a combination of heat and humidity - that is predicted to be 105 degrees or greater for two or more consecutive days. In California, local weather forecast offices may use different criteria for Excessive Heat Warning/Advisories based on maximum temperatures, nighttime temperatures, and other methods (California Climate Action Team 2012).

5.7.1 REGULATORY ENVIRONMENT

On a statewide basis, the 2012 Cool Pavements Bill ("AB 296") was passed by California legislatures. This bill will require the California Environmental Protection Agency (Cal EPA) to develop a definition for the term Urban Heat Island Effect (UHIE) and index. Upon completion of an UHIE index, the bill will provide resources for Cal EPA to develop a standard specification for sustainable or cool pavements. This bill would require the California Department of Transportation to develop the Cool Pavements Handbook and include additional strategies for the Heat Island Effect. As a result of this bill, "Hardscape Alternatives" may be included in the California Green Building Standards Code.[18]

5.7.2 PAST OCCURRENCES

There have been many occurrences of extreme heat hazards throughout California. According to the California SHMP, the worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths. The July 2006 heat wave in California caused approximately 140 people deaths over a 13-day period.

According to the National Climatic Data Center (NCDC), Kern County experienced eight extreme heat events between the years of 1993 and 2011. The extreme heat event in July 2006 caused severe damage in the County and the surrounding areas, including approximately $492 million in crop damage.[19] Arguably one of the hottest spells widespread across California, including interior Central California in the last 75 years, occurred during a warm period that spanned from July 16 through July 27, 2006. The Southwest San Joaquin Valley maximum temperatures had 110-degree readings for a 6-day period from July 21 through July 26. Minimum temperatures during that warmest portion of the heat spell lowered only into the 80s for much of the Central and South San Joaquin Valley.

[18] The California Green Building Standards Code (CAL Green Code) is Part 11 of the California Building Standards Code and is the first statewide "green" building code in the US.

[19] County of Kern, *Kern Multi-Jurisdiction Hazard Mitigation Plan*, September 2012, Table 4.5, p. 4.27.

For community members who do not have access to a setting with temperature control (e.g., air conditioning), cooling centers have been established to provide somewhere to escape the heat. The opening of these centers is tied to a set of temperature triggers that vary by location. The specific triggers for opening the cooling centers, based on the National Weather Service forecast as of the previous day, are as follows:

- San Joaquin Valley/Kern River Valley Centers: 105 degrees
- Mountain Center(s): 95 degrees
- Desert Centers: 108 degrees

Cooling centers include a wide range of community facilities including senior centers, parks and recreation facilities, community centers, police departments, and veterans' centers. When they have been made available, announcements are made via TV, radio, and the Internet. Historically, the McFarland Parks and Recreation District has made its gym and Mouser Center available during periods of high heat.

5.7.3 LOCATION/GEOGRAPHIC EXTENT

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

According to the California Climate Change Research Center, overall temperatures are expected to rise substantially throughout this century. During the next few decades, scenarios project average temperatures to rise between 1 and 2.3°F in the Kern Region. These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand (California Climate Change Center 2006).

Figure 5-14, *July Decadal Average High Temperature Map: 2010*, and Figure 5-15, *July Decadal Average High Temperature Map: 2090*, provide Cal Adapt-modeled decadal July high temperature averages for 2010 and 2090.[20] These figures provide current decade-long July temperature averages and possible July high heating trends for the remaining portion of the century. The data presented in the figures represent a "projection" of potential future climate scenarios, they are not predictions. These figures illustrate how the climate may change based on a variety of different potential social and economic factors. The visualizations are comprised of average values from a variety of scenarios and models.

[20] Cal-Adapt has been funded to provide access to data and information that has been produced by the State's scientific and research community. The data available in this site offer a view of how climate change might affect California at the local level.

Figure 5-14: July Decadal Average High Temperature Map: 2010

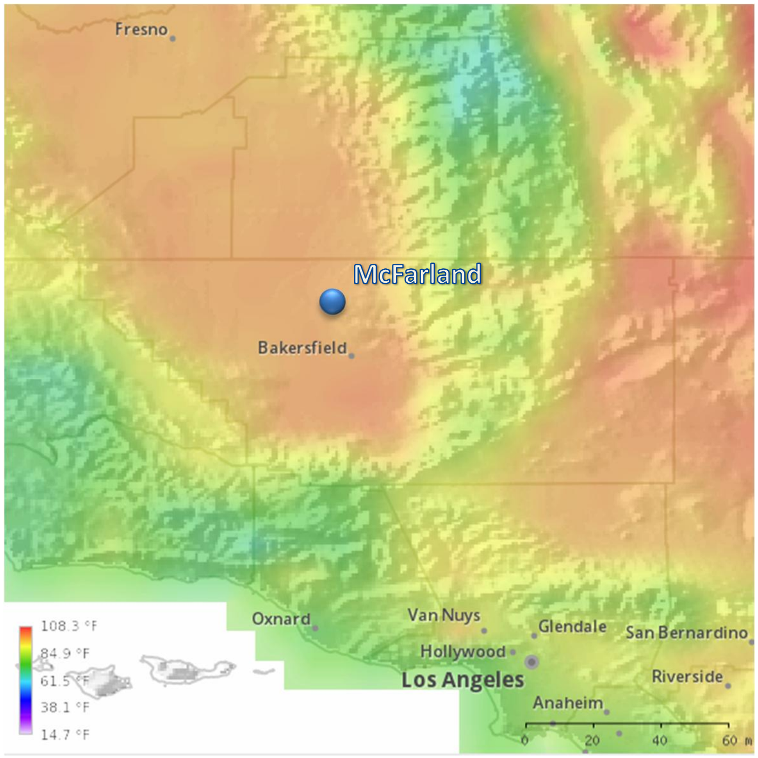
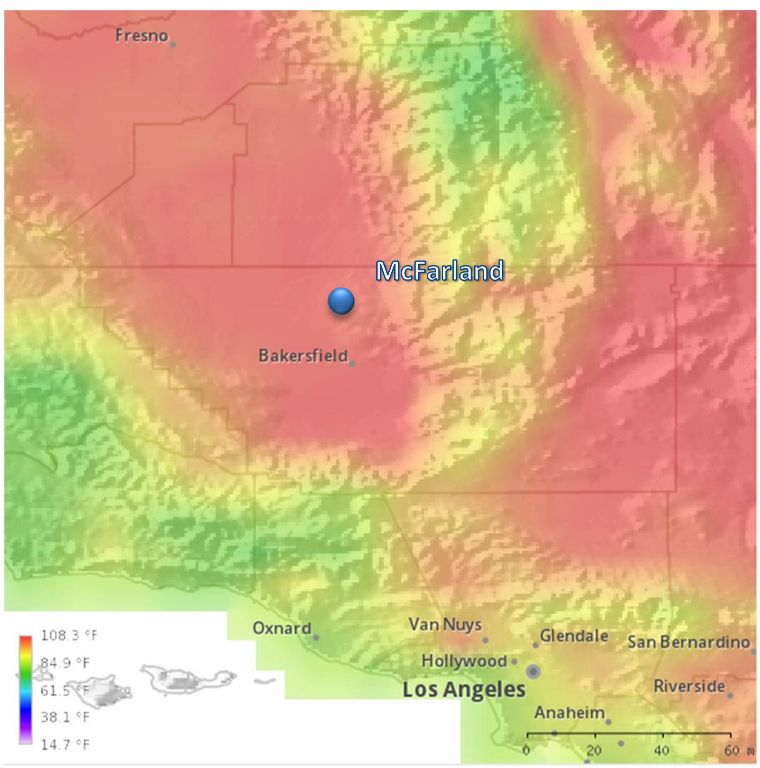


Figure 5-15: July Decadal Average High Temperature Map: 2090



5.7.4 MAGNITUDE/SEVERITY

Extremely high temperatures cause heat stress which can be divided into four categories; refer to Table 5-11, *Four Categories of Heat Stress*. Each category is defined by apparent temperature. Apparent temperature is the general term for the perceived outdoor temperature, caused by the combined effects of air temperature, relative humidity, and wind speed. Apparent temperature is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, fainting, heat exhaustion, heatstroke, and death. Note that while the temperatures in Table 5-11 serve as a guide for various danger categories, the impacts of high temperatures will vary from person to person based on individual age, health, and other factors.

Table 5-11: Four Categories of Heat Stress

Danger Category	Heat Disorders	Apparent Temperature (°F)
I (Caution)	Fatigue possible with prolonged exposure and physical activity.	80 to 90
II (Extreme Caution)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.	90 to 105
III (Danger)	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105 to 130
IV (Extreme Danger)	Heatstroke or sunstroke imminent.	>130
Source: FEMA, 1997.		

Temperature advisories, watches, and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in California. Exact thresholds vary across the State, but in general *Heat Advisories* are issued when the heat index will be equal to or greater than 100°F, but less than 105°F; *Excessive Heat Warning*s are issued when heat indices will attain or exceed 105°F; and *Excessive Heat Watches* are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours (NOAA NWS, 2010); refer also to Figure 5-16, *NOAA National Weather Service Heat Index*.

Figure 5-16: NOAA's National Weather Service Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Streuous Activity

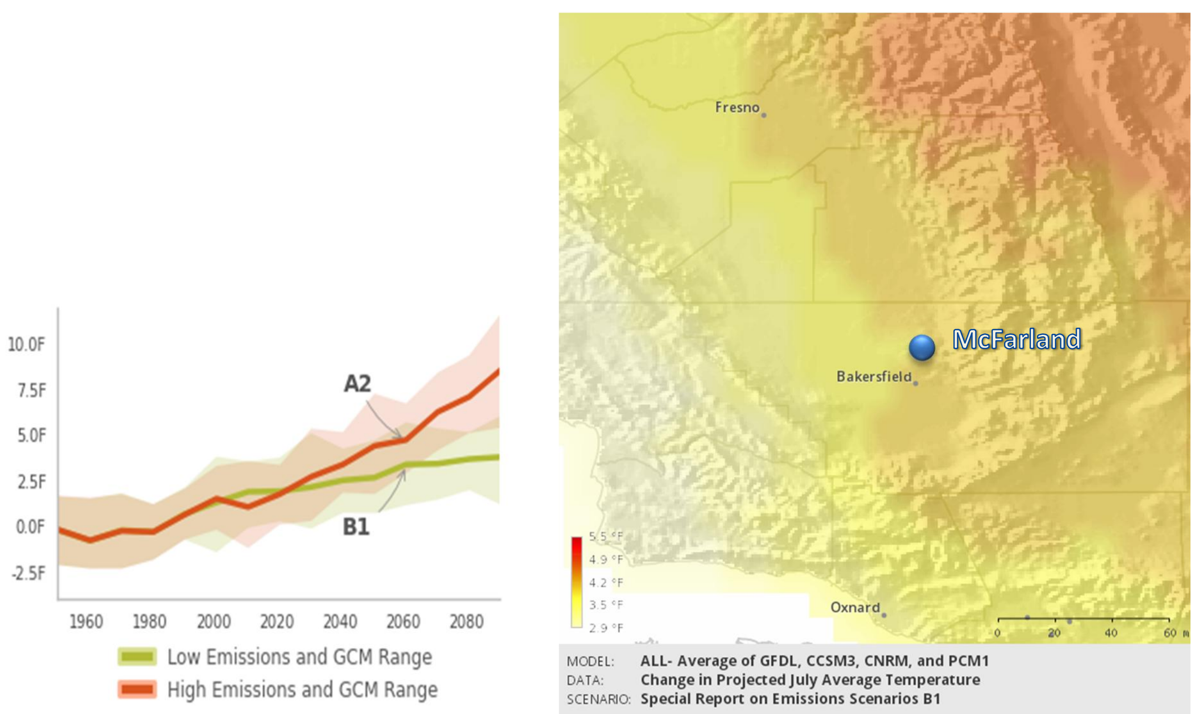
Caution Extreme Caution Danger Extreme Danger

5.7.5 FREQUENCY/PROBABILITY OF FUTURE OCCURRENCES

Climate change is expected to affect different areas of the world disproportionately. While some areas are expected to see a dramatic rise in temperatures, other areas may not see as much change. This is also true within the state of California. Some areas, particularly along the eastern border, may see up to 12 degrees rise in temperature in a given month, areas along the coast may only increase a few degrees. These temperature differences also vary throughout the state depending on the time of year.[21]

Cal Adapt climate modeling tools were used to create Figure 5-17, *Project July Average High Temperature Change*, which illustrates the projected July average high temperature rise for the area surrounding McFarland.[22] The map includes the projected change in annual average temperatures across the region under a low carbon emissions scenario (B1) and shows the projected difference in temperature between a baseline time period (1961-1990) and an end of century period (2070-2090). By 2100, hotter temperatures are expected, with an increase of 2.9-5.5°F under the lower emissions scenario (B1) and 5.2-10.6°F under the higher emissions scenario (A2).

Figure 5-17: Projected July Average High Temperature Change



21 Cal Adapt Website, http://cal-adapt.org/temperature/century/, accessed July 1, 2014.

22 A general circulation model (GCM), a type of climate model, is a mathematical model of the general circulation of a planetary atmosphere or ocean. A GCM is based on equations that use a rotating sphere with thermodynamic terms for various energy sources (radiation, heat etc.). These equations are the basis for complex computer programs commonly used for simulating the atmosphere or ocean of the Earth. GCMs and global climate models are widely applied for weather forecasting, understanding the climate, and projecting climate change. Versions designed for decade to century time scale climate applications were originally created by Syukuro Manabe and Kirk Bryan at the Geophysical Fluid Dynamics Laboratory in Princeton, New Jersey.

5.8 VULNERABILITY ASSESSMENT

The information in this section provides an explicit representation of what a community stands to lose in a disaster. This is useful for City staff and other decision makers who will need to balance the costs of mitigation against the potential harm to residents and damage to property. It provides comparable measurements of community natural hazard exposure and assists in determining which hazards and/or what parts of the City to focus on making resilient to disaster first.[23] Based upon possible assets at risk, hazard mitigation resources can be directed where need be, in-part, by a vulnerability assessment and information found in hazard profiles presented in Sections 5.3 through 5.7.

The vulnerability assessment is developed by providing the hazard mitigation analysts with quantitative and qualitative information for each hazard. Through an exposure analysis, quantitative data is developed for each hazard. An exposure analysis provides quantities of people and assets at risk to particular hazards. Qualitative data has been developed and presented in this section for hazards without measurable data. Qualitative data provides information beyond quantities of people and assets at risk, but rather a description of how the hazard could affect a region like McFarland.

Note: The hazard exposure analysis has been developed with best available data and follows methodology described in the FEMA How to Guide #2 (Publication No. 386-2) "Understanding Your Risks—Identifying Hazards and Estimating Losses."

5.8.1 METHODOLOGY

A vulnerability assessment was conducted for each of the identified priority hazards. Geospatial data is essential in determining population and assets exposed to particular hazards. Geospatial analysis can be conducted if a natural hazard has a particular spatial footprint that can be overlaid against the locations of people and assets. In McFarland, flood and earthquake have known geographic extents and corresponding spatial information about each hazard.

Several sources of data are necessary to conduct a vulnerability analysis. Figure 5-18, *Data Source and Methodology*, provides an exhibit of the data inputs and outputs used to create the vulnerability analysis results presented in this section. U.S. Census data is the primary source in determining natural hazard exposure to City residents. Census data has been used to determine the population at risk, which is generally referred to as population exposure. Population exposure is provided for flooding and earthquake potential hazards later in this section.

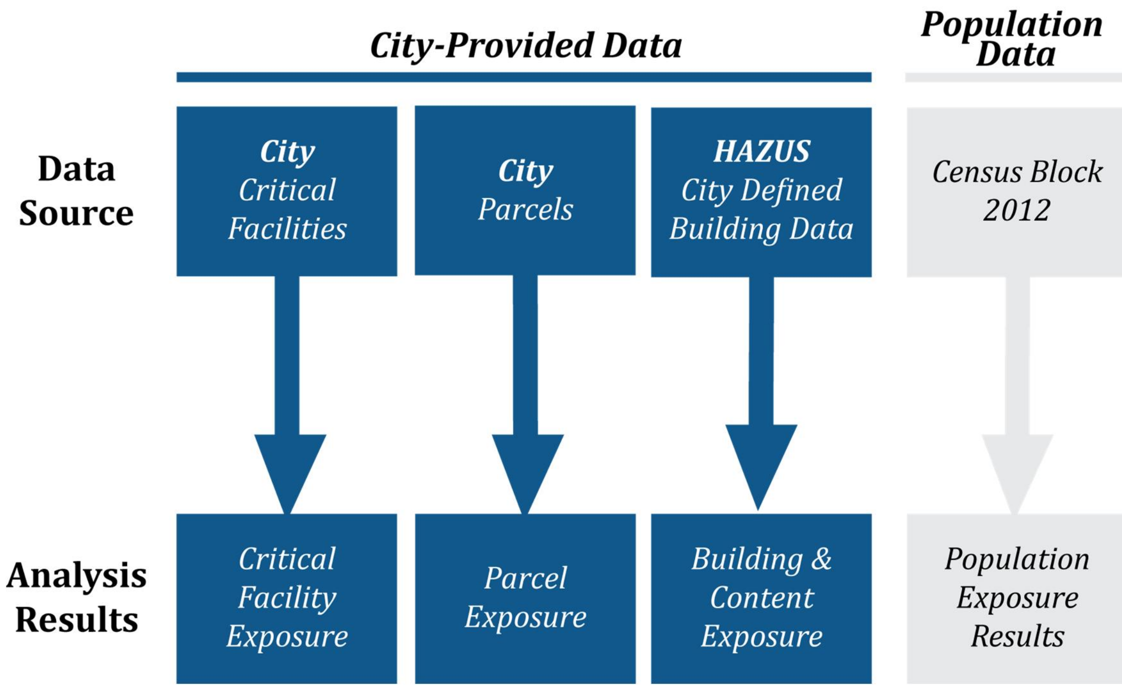
Together with the U.S. Census data, City asset data was used to provide a snapshot of how City assets are affected by natural hazards. For purposes of this study, asset data includes parcels and critical infrastructure within the City boundaries. Critical infrastructure is described as assets that are essential for people and a community to function. Critical infrastructure includes utilities, City-owned facilities, bridges, schools, and other community facilities that provide essential services to residents.

Critical facilities data was developed from a variety of sources including City-owned and maintained data, state and federal government datasets, and private industry datasets. A critical infrastructure spatial

[23] Elements at risk; Risk inventory; Exposure encompasses all elements, processes, and subjects that might be affected by a hazardous event. Consequently, exposure is the presence of social, economic, environmental, or cultural assets in areas that may be impacted by a hazard.

database was developed to translate critical facilities information into georeferenced points.[24] Critical facility points are overlaid with the spatial hazard layers to develop a list of "at risk" critical facilities. The City critical facilities that intersect with natural hazards are referred to as facilities with hazard "exposure". Exposure results are presented later in this section.

Figure 5-18: Data Source and Methodology



Lastly, FEMA's Hazus-MH MR5 (Hazus) software was implemented to conduct detailed loss estimation for flood and earthquake. Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. For purposes of this planning effort, Hazus was used to graphically illustrate the limits of identified high-risk locations due to possible earthquake and floods.

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analyses are discussed in more general terms in alphabetical order following the discussion on flooding and geologic hazards.

[24] To georeference something means to define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems. The term is used when both establishing the relation between raster or vector images and coordinates, and determining the spatial location of other geographical features.

5.8.2 POPULATION AND ASSET EXPOSURE

In order to describe exposure and loss estimation results for each hazard, it is important to understand the "total" population and "total" assets at risk. The risk for each hazard described in this section will refer to the percent of total population or percent of total assets exposed to a particular hazard. This provides the possible significance or vulnerability to people and assets during a "worst case scenario" for each hazard with spatial extents. Sections below provide a description of the total population, critical facilities, and parcel exposure inputs.

5.8.2.1 POPULATION EXPOSURE

In order to develop hazard-specific vulnerability assessments, population near natural hazard risks should be 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. According to the 2010 U.S. Census, the total population for the City is approximately 12,708.
Due to inherent earthquake risks, the entire population in McFarland could be exposed to one or multiple hazards in the future. 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 flood and earthquake hazards.

5.8.2.2 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.

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 5-19, *Low Income Housing*, shows the estimated median household income in the region in 2012 based on Census 2010 geographies. The "median" is the value that divides the distribution of household income into two equal parts (e.g., the middle). The average median household income in the United States was $51,371 in 2012.

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, are unable to provide for themselves.

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 City, state and federal emergency management agencies and organizations. Figure 5-20, *Percentage of Population Younger than 18 Years of Age*, and Figure 5-21, *Percentage of Population 65 Years of Age and Older*, identify the locations of vulnerable populations by age within the McFarland region.

SOCIAL VULNERABILITY

Social vulnerability is represented as the social, economic, demographic, and housing characteristics that influence a community's ability to respond to, cope with, recover from, and adapt to natural hazards. Emergency response and hazard mitigation planners can assess populations from a perspective of their vulnerability to various hazards (fire, flood, etc.).

Physical vulnerability refers to a population's exposure to specific potential hazards, such as living in a designated flood plain (shown later in this section). Social vulnerability refers to potential exposure due to population and housing characteristics including age, income, disabilities, home value, or other factors. For example, low-income seniors may not have access to a car to simply drive away from an ongoing hazard such as a flood.

A social vulnerability index created from analysis by the Hazard and Vulnerability Hazard Research Institute uses county-level socioeconomic and demographic data to construct an index of social vulnerability to natural hazards.[25] The Social Vulnerability Index (SoVI©) for the United States is based on data collected from 2005 to 2009. It models multiple hazards and other socioeconomic data. Figure 5-22, *Social Vulnerability Index*, models the SoVI© for populations within the region, using current year demographics at the block group level.[26, 27]

[25] The University of South Carolina Hazard and Vulnerability Hazard Research Institute conducts basic research on hazard vulnerability and resilience and through its outreach efforts, assist in the improvement of emergency preparedness, planning, response, and recovery at local, state, national, and international scales.

[26] From the Susan Cutter, University of South Carolina, Hazards Research Lab, Department of Geography (http://webra.cas.sc.edu/hvri/)

[27] ESRI's GIS (geographic information systems) mapping software helps you understand and visualize data to make decisions based on the best information and data.

Figure 5-19: Low Income Housing

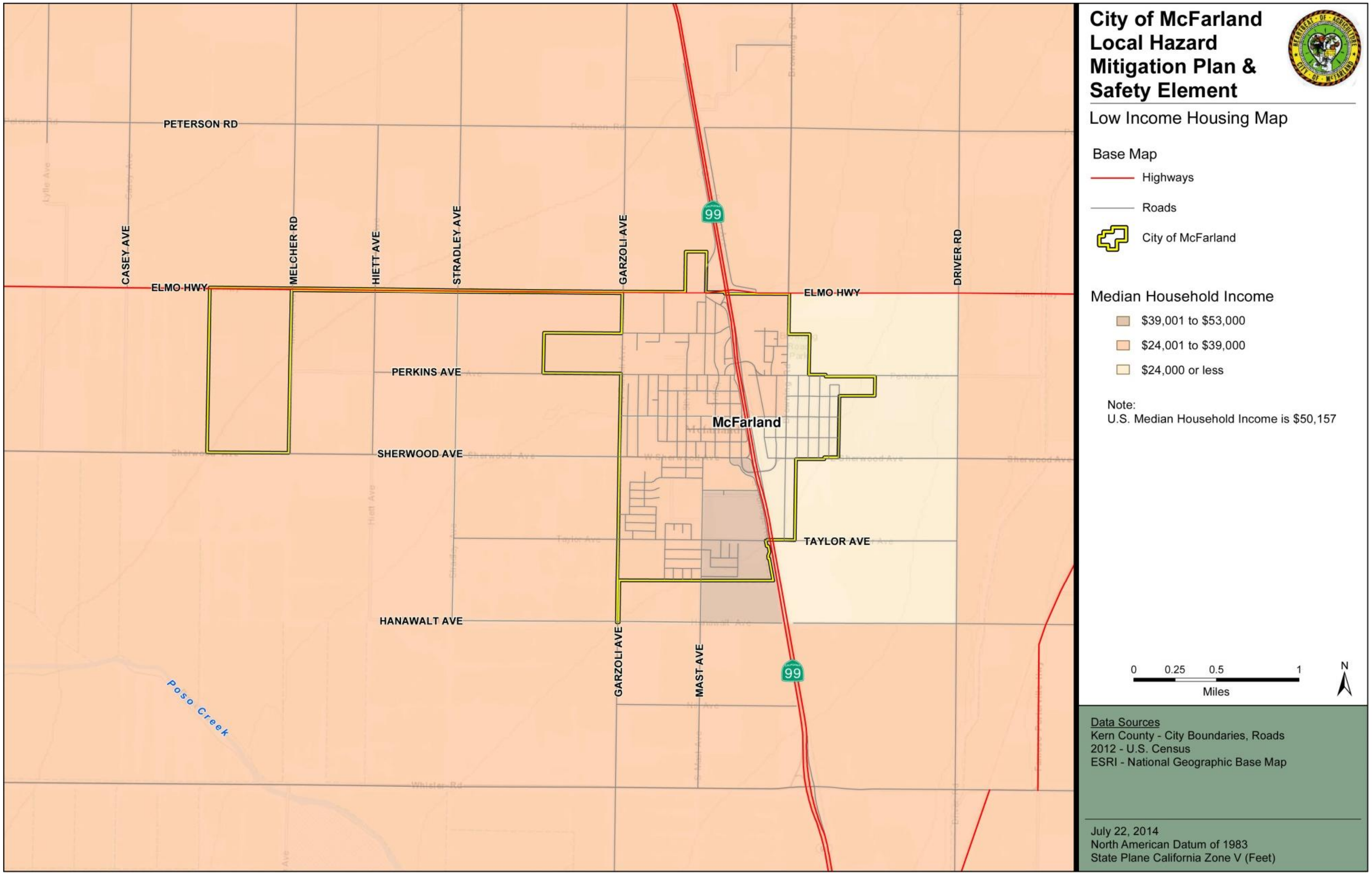


Figure 5-20: Percentage of Population Younger than 18 Years of Age

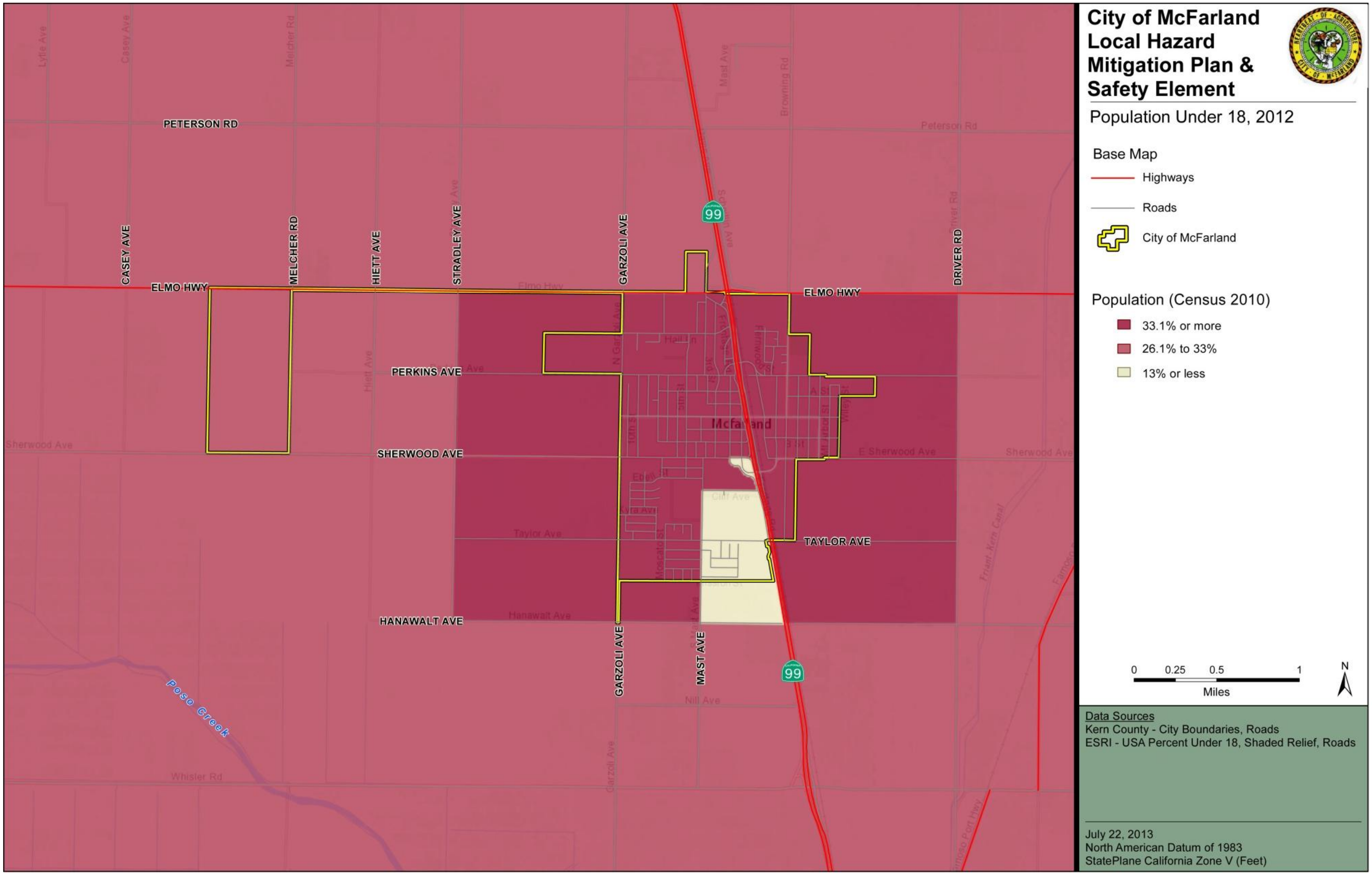


Figure 5-21: Percentage of Population 65 Years of Age and Older

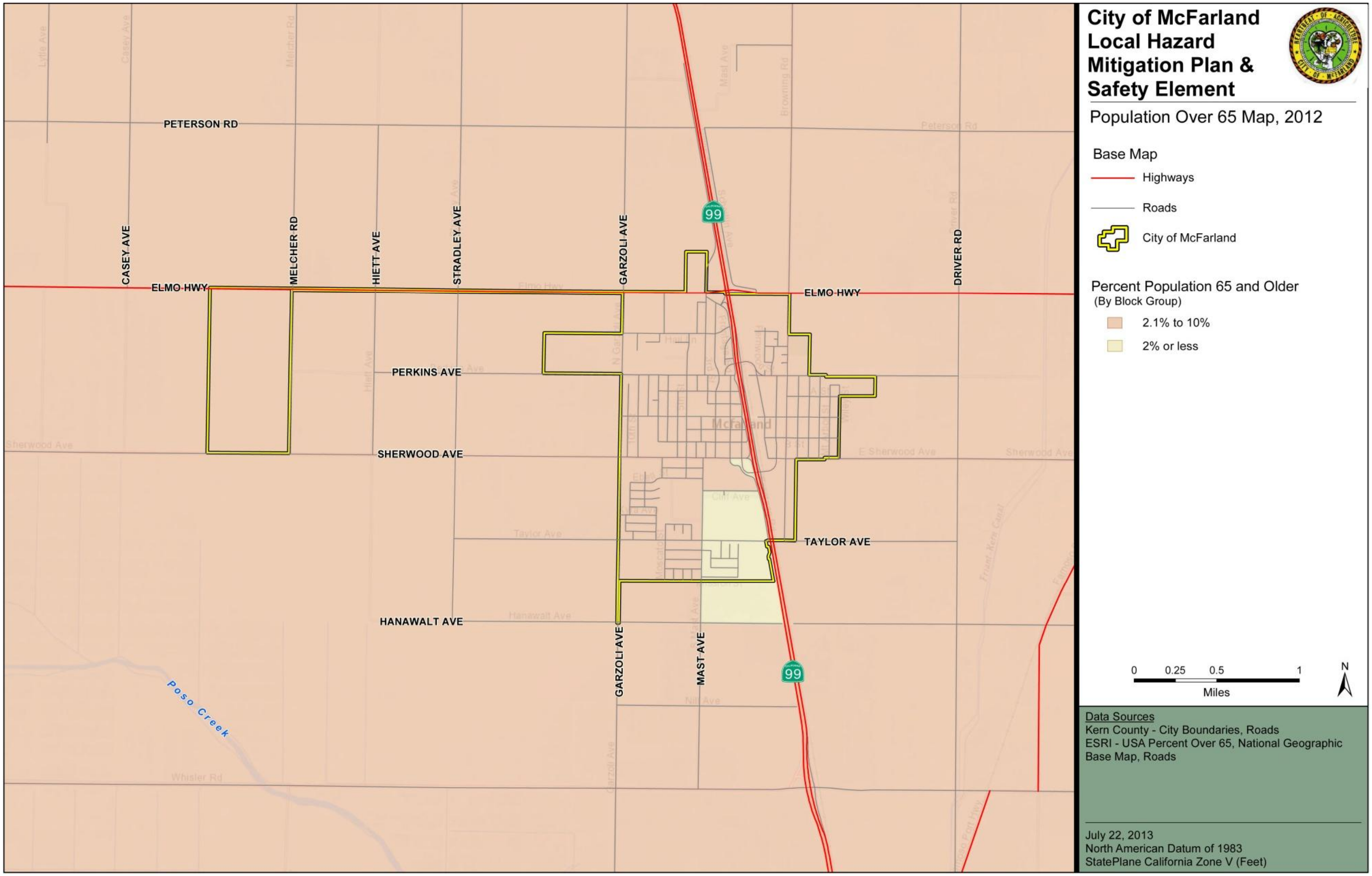
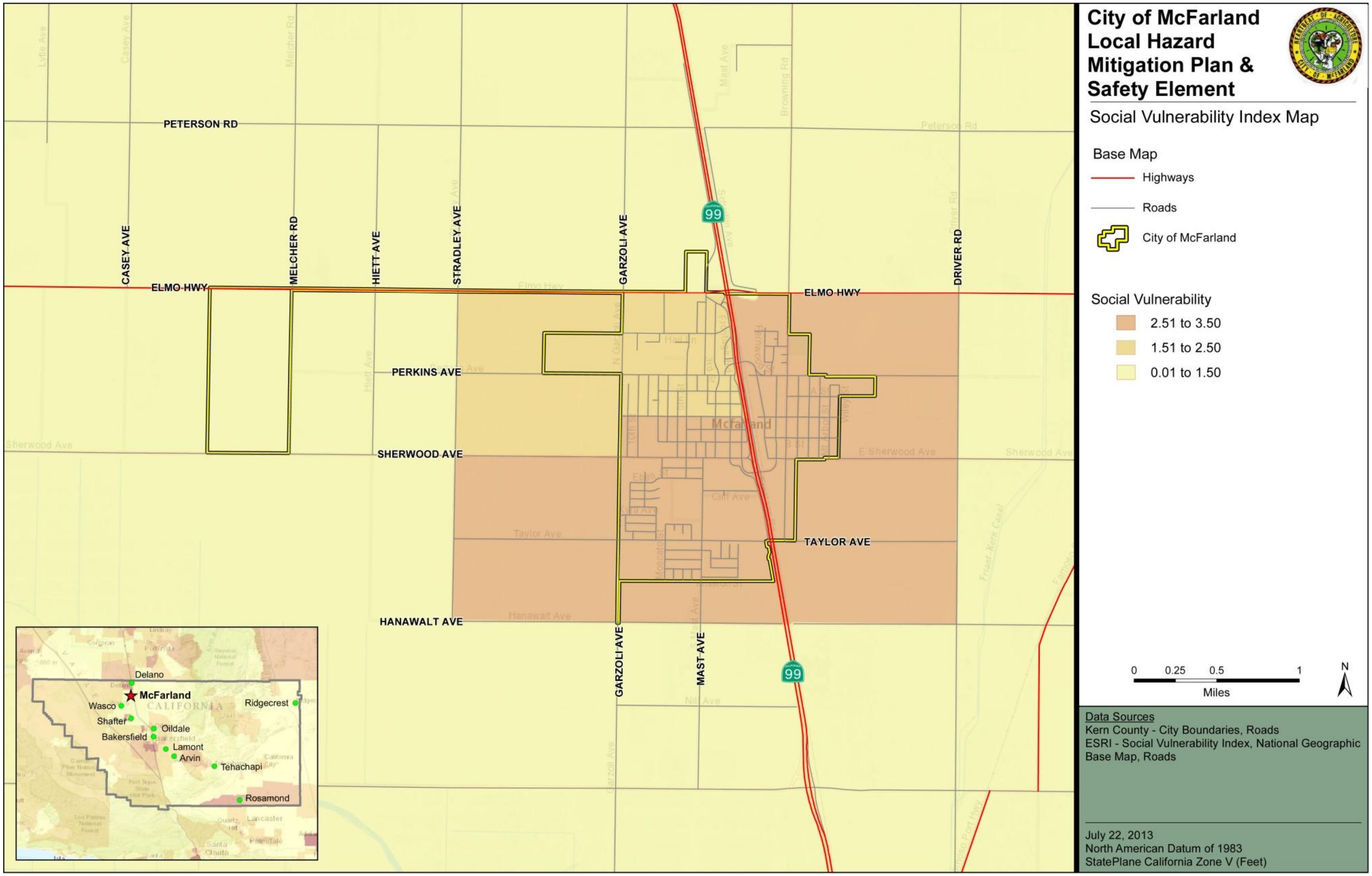


Figure 5-22: Social Vulnerability Index



5.8.2.3 CRITICAL FACILITIES EXPOSURE

Critical facility exposures to hazards are of particular concern when conducting hazard mitigation planning. Critical facilities are defined as providing essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public. An inventory of critical facilities was developed based on data from the City and other publicly sourced information. Figure 5-23, *McFarland Critical Facilities Inventory by Type*, provides a summary of critical facility points including schools, emergency response buildings, healthcare, utilities, and City facilities. A detailed list of critical facilities is provided in Table 5-12, *Critical Facilities Inventory*.

Figure 5-23: City Critical Facilities Inventory by Type

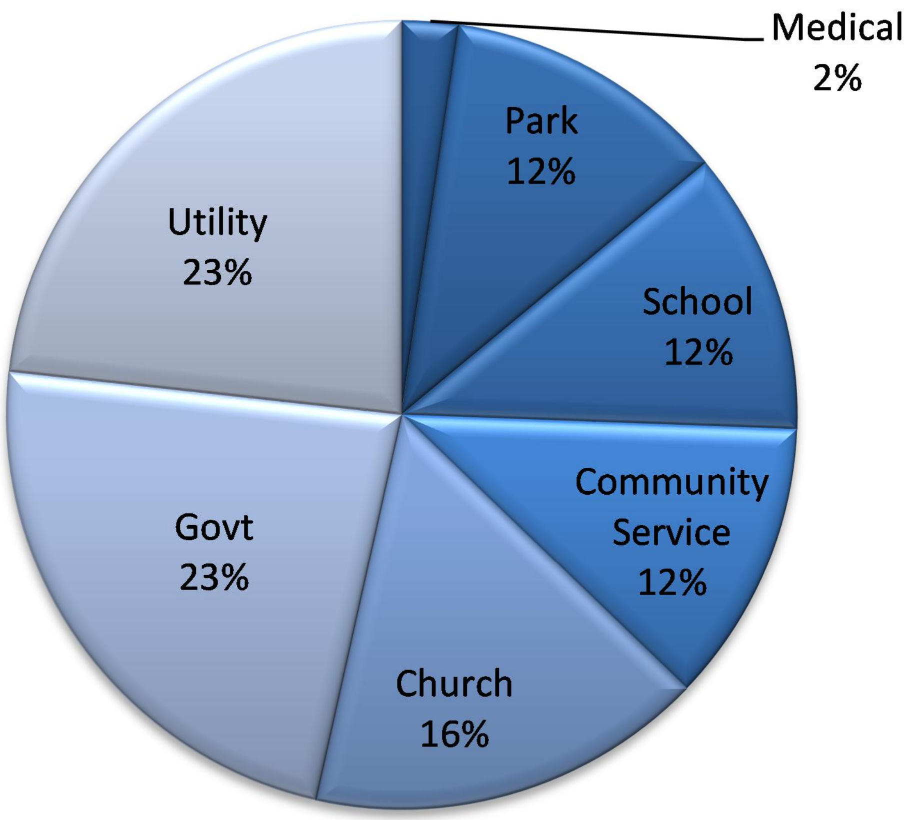


Table 5-12: Critical Facilities Inventory

Row Labels	County of Facility Type
Church	**7**
Church	7
Community Service	**5**
Community Center	1
Grocery Store	3
Community Hall	1
Government	**10**
City Hall/Police Council	1
City Hall/Police Station	1
City Hall/Police Station/Public Works	3
City Monument-Fine Art	1
Kern County Fire Station #33	1
Old Library	1
Public Works Building	1
Residential Bldg. for Police Activities	1
Medical	**1**
Medical Clinic	1
Park	**5**
Park	5
School	**5**
Browning Road Elementary School	1
Kern Ave Elementary School	1
McFarland High School	1
McFarland Middle School	1
San Joaquin Continuation High School	1
Utility	**10**
Browning Road Well (Browning Road)	1
Garzoli Well (between W Kern & W Sherwood)	1
Sewage Field	1
Sewage Field Control Building	1
Sewage Field-Old Pump House	1
Sewage Field-Pond Equip	1
Taylor Well	1
Water Building	1
Water Storage Tank	1
Well #6	1
Grand Total	**43**

5.8.2.4 IMPROVED PARCEL EXPOSURE

A standardized hazard overlay was conducted to develop hazard exposure results for improved City parcels. The Kern County Assessor's data is pivotal to developing the total parcel value (Land and Improvement Value) exposed to each hazard – the value of parcels exposed to each hazard within the study area is referred to as parcel exposure. The spatial overlay method identifies parcels and the associated value of each to a particular hazard, which allows parcel exposure results to be compared for each hazard.[28] The structure value, fixture value, and personal property value for each parcel is summed and provided in Table 5-13, *City Parcel Count and Value*. Table 5-14, *City Parcel Value by General Plan Land Use*, represents the total parcel count and associated value by general land use categories in McFarland.

Table 5-13: City Parcel Count and Value

Parcel Count	Land Value	Improvement Value	Personal Property Value	Exempt Value	Total Value
2,722	$ 96,991,859	$ 244,398,104	$ 253,461	$ 31,580,595	$373,224,019
Source: Kern County Assessor's Roll 2013.					

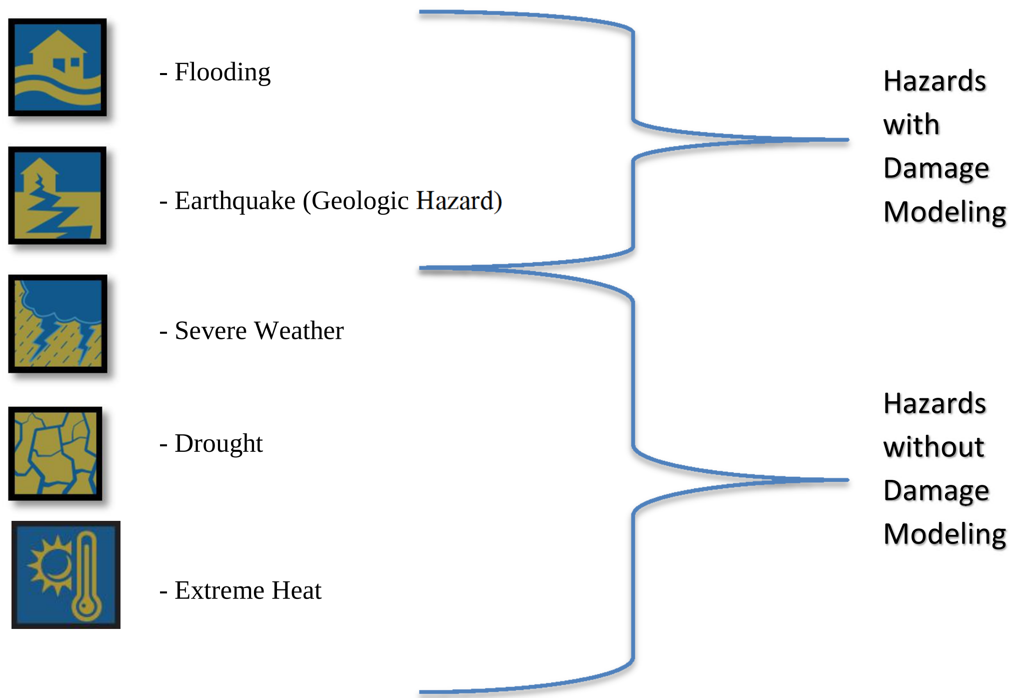
Table 5-14: City Parcel Value by General Plan Land Use

General Land Use Category	Sum of Total Value
Agriculture	2,074,107.00
Commercial	26,923,391.00
Existing Park	2,130,440.00
Government	2,553,408.00
Heavy Commercial	1,212,322.00
High Density	5,848,609.00
Highway Commercial	463,317.00
Low Density	196,581,581.00
Manufacturing	32,585,084.00
Medium Density	58,981,020.00
Proposed Park	5,477,673.00
Residential Reserve	33,498,184.00
School	1,317,311.00
SM	3,577,572.00
Grand Total	**373,224,019.00**
Source: Kern County Assessor's Roll 2013.	

[28] For City parcel data, it is important to note that replacement cost is different than assessed market value for taxation purposes. 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.

5.8.3 HAZARD SPECIFIC VULNERABILITY

FEMA Disaster Mitigation Act regulations require that the City of McFarland evaluate the risks associated with each of the hazards identified in the hazard mitigation planning process. This section summarizes the possible impacts and quantifies, where data permits, the City's vulnerability to each of the priority hazards identified in earlier in Section 5.0. Estimated community vulnerability from each hazard is provided in each hazard-specific section that follows. Vulnerability can be quantified in instances where there is a known hazard area, such as a mapped floodplain or high fire hazard area. The Planning Committee identified five hazards in the planning area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a vulnerability analysis. The hazards evaluated as part the vulnerability assessment include:



Hazards with known geographical extents include flooding and earthquake. Hazards with spatial extents have discrete hazard risk areas; their risk varies and will affect people and assets differently. For hazards with spatial extents, "at risk" population and assets were inventoried by hazard area. To the extent possible, population and assets are quantified to define vulnerability in identified hazard areas. The vulnerability analysis includes general hazard-related impacts, overall community impact, exposed population, assets, and critical facilities at risk (i.e., types, numbers, and value of land and improvements). Together, this information conveys the vulnerability of particular populations and assets allowing hazard mitigation planners to prioritize resources accordingly.

5.8.4 ASSIGNING RISK FACTORS

The LHMP Planning Committee assigned risk factors for each hazard profiled through a facilitated group exercise. During the group exercise, risk factor (RF) criteria worksheets were used to examine each identified hazard for potential risk. This methodology produces RF numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). Final RF values are obtained by assigning numerical criteria index values to five risk assessment categories. Risk assessment categories include *probability, impact, spatial extent, warning time,* and *duration*.

To obtain RF for each hazard, the Planning Committee assigned a numerical range (1-4) to each risk assessment category. Based upon unique concerns for the planning area, a weighting factor can be agreed upon for each RF category. The RF weighting scheme is used to establish a higher degree of importance to selected risk assessment categories. To calculate the RF value for a given hazard, the Planning Committee developed the RF weighting scheme below:

RF Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

The sum of all five categories shown in the equation above equals the RF final risk factor values presented in Table 5-15, *Risk Factor Criteria*. Table 5-15 provides a summary of the RF criteria the Planning Committee used to assign *criteria index values* during a group exercise. This RF approach uses hazard data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. The final RF developed can be used to evaluate hazards and classify perceived hazard risk in the City.

5.8.5 HAZARD RISK FACTOR

Table 5-16, *McFarland Risk Factor Results*, displays RF index criteria and weighting determinations from the LHMP Planning Committee. Final RF scores determine *High*, *Moderate*, or *Low* risk designations based upon the conclusion index. It should be noted that although some hazards are classified as posing "Low Risk", their occurrence of varying or unprecedented magnitudes is still possible and will continue to be re-evaluated during future updates of this plan. Due to the inherent errors possible in any disaster risk assessment, the results of the risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

Table 5-15: Risk Factor Criteria

Risk Assessment Category	Degree of Risk	Level	Criteria Index	Weight Value
PROBABILITY **What is the likelihood of a hazard event occurring in a given year?**	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 & 10% annual probability	2	
	Likely	Between 10 &100% annual probability	3	
	Highly likely	100% annual probability	4	
IMPACT **In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?**	Minor	Very few injuries, if any. Only minor property damage & minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
SPATIAL EXTENT **How large of an area could be impacted by a hazard event? Are impacts localized or regional?**	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 & 10% of area affected	2	
	Moderate	Between 10 & 50% of area affected	3	
	Large	Between 50 & 100% of area affected	4	
WARNING TIME **Is there usually some lead time associated with the hazard event? Have warning measures been implemented?**	More than 24 hrs.	Self-defined	1	10%
	12 to 24 hrs.	Self-defined	2	
	6 to 12 hrs.	Self-defined	3	
	Less than 6 hrs.	Self-defined	4	
DURATION **How long does the hazard event usually last?**	Less than 6 hrs.	Self-defined	1	10%
	Less than 24 hrs.	Self-defined	2	
	Less than 1 week	Self-defined	3	
	More than 1 week	Self-defined	4	

Table 5-16: McFarland Risk Factor Results

Rank	Natural Hazards	Probability Index	Wt. Value 1	Impact Index	Wt. Value 2	Spatial Extent Index	Wt. Value 3	Warning Time Index	Wt. Value 4	Duration Index	Wt. Value 5	RF Factor
1	Severe Weather	1	0.3	2	0.6	4	0.8	3	0.3	2	0.2	2.2
2	Earthquake	2	0.6	2	0.6	4	0.8	4	0.4	3	0.3	2.7
3	Flooding	3	0.9	3	0.9	3	0.6	1	0.1	3	0.3	2.8
4	Extreme Heat	4	1.2	3	0.9	4	0.8	1	0.1	3	0.3	3.3
5	Drought	4	1.2	4	1.2	4	0.8	1	0.1	4	0.4	3.7

Risk Factor Conclusion	
HIGH RISK (3.0 – 4.0)	High Heat, Drought
MODERATE RISK (2.0 – 2.9)	Severe Weather, Earthquake, Flooding
LOW RISK (0.1 – 1.9)	N/A

Wt. Value = Wt. Value 1 = PROBABILITY INDEX x .30
Wt. Value 2 = IMPACT INDEX x .30
Wt. Value 3 = SPATIAL EXTENT INDEX x .20
Wt. Value 4 = WARNING TIME INDEX x .10
Wt. Value 5 = DURATION INDEX x .10

RF Value = (Wt. Value 1) + (Wt. Value 2) + (Wt. Value 3) + (Wt. Value 4) + (Wt. Value 5)

Low Risk—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

Moderate Risk —Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.

High Risk—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

5.8.6 SEVERE WEATHER

Severe Weather Vulnerability Analysis		
Community Risk Factor Rating	2.2	Moderate Risk, Moderate potential impact.

Severe weather includes heavy rains or heavy snow and ice, often accompanied by strong winds or hail. Heavy rains or snow, coupled with low temperatures or other severe weather conditions, can result in increases in traffic accidents, disruptions in transportation, government, education, and cause damage to buildings, and communication towers. Most commonly, severe weather incidents can cause prolonged utility outages due to falling trees or other debris.

Environmental impacts of cold temperatures and heat include damage to shrubbery and trees and other vegetation. Personal property such as cars, RVs, and small equipment is extremely vulnerable to severe weather hazards especially hail and damage as a result of fallen trees and other storm debris.

Unusual heavy snow and high wind have resulted in broken tree limbs, fallen telephone lines, and a heavy accumulation of debris. Large amounts of downed, suspended, and standing vegetation has created a fuel hazard and left the area subject to an extreme fire threat in the past.

According to historical hazard data, severe weather is an annual occurrence in Kern County. Many of the historical severe weather events were state and federally declared disasters and have resulted in damages. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain, hail, and snow are the most frequent type of severe weather occurrences in the region. The secondary hazards caused by severe weather such as floods and tree and utility damage have impacted McFarland.

Despite the quick response by local safety personnel, many low-income residents of the region will continued to face individual vulnerability to severe weather. One of the primary reasons that low-income people are disproportionately affected by extreme weather is due to the quality of low-income housing. Shoddy construction, and the housing stock age that lack quality services and are supported by suboptimal infrastructure, puts low-income people at greater risk from the effects of severe weather.

5.8.7 EARTHQUAKE (GEOLOGIC HAZARD)

Earthquake Vulnerability Analysis		
Community Risk Factor Rating	2.7	Moderate Risk, Moderate potential impact.

Major impacts from earthquakes are primarily the probable number of casualties and damage to infrastructure occurring from ground movement along a particular fault (USGS 2009). The degree of infrastructure damage depends on the magnitude, focal depth, distance from fault, duration of shaking, type of surface deposits, presence of high groundwater, topography, and the design, type, and quality of infrastructure construction.

The City is not located within an Alquist-Priolo Earthquake Fault Zone.[29] One Alquist-Priolo Earthquake Fault Zone, the Pond Fault, is located six miles west of McFarland. While there are no known active faults residing within or near the City limits, City residents and property are likely to experience seismic-related events (i.e., ground shaking, etc.).

Seismic hazard mapping indicates that the City has low seismic hazard potential. To analyze the seismic risk in McFarland, USGS shake maps were used in a seismic modeling method to estimate community losses.[30] Loss estimation results for population, building stock and critical facilities were developed to provide a tool for planners to describe community vulnerability to earthquake.

5.8.7.1 POPULATION AT RISK

According to the 2010 U.S. Census, the City has a total population of 12,708 residents and a population density of approximately 6,000 people per square mile. A small urban core with various large building masses are located on Kern and Sherwood Avenues, while the remaining portion of the population resides in residential dwelling units. Though rural residential construction is not particularly vulnerable to earthquakes, an earthquake could directly or indirectly expose the entire population of the City to ground shaking. Depending on the time of day and year (the population differs significantly from day and night based upon localized and regional employment centers) and exact location of an earthquake epicenter, the majority of the population could experience strong ground shaking.

5.8.7.2 LOSS ESTIMATION

The Hazus Level 2 analysis was used to assess the risk from and vulnerability to earthquake shaking in McFarland.[31] Hazus building data is aggregated to the building type, which has an accuracy level acceptable for planning purposes. The following sections describe risk and vulnerability to building stock and critical facilities within the City from an earthquake scenario built upon the 1952 Kern County Earthquake. The modeled scenario replicates a 7.2 magnitude earthquake on the White Wolf fault south of Bakersfield. While there are several limitations to the FEMA Hazus earthquake model, it does allow for potential loss estimations for buildings, critical infrastructure, and bodily injury.

HAZUS BUILDING INVENTORY

The Hazus earthquake models estimates that there are 5,000 buildings in the region[32], which have an aggregate total replacement value of $1,266 million dollars. In terms of building construction, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between other general building constructions types. Approximately 95% of the buildings (and 74% of the building value) are associated with residential housing.

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[29] The Alquist-Priolo Earthquake Fault Zoning (AP) Act was passed into law following the destructive February 9, 1971 Mw 6.6 San Fernando earthquake. The AP Act provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the AP Act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep.

[30] One USGS shake map was used to develop the potential damage spatial layers. Shake maps from USGS replicated a 5.37 Magnitude event on November 26th, 1998. From this event GIS analysts used Peak Spectral Acceleration (PSA) and Peak Ground Velocity (PVG) from those events to provide potential damage estimates based on building type and local soil conditions.

[31] More accurate loss estimates are produced by including detailed information on local hazard conditions and/or by replacing the national default inventories with more accurate local inventories of buildings, essential facilities and other infrastructure.

[32] For purposes of this study the geographical size of the region is 216.35 square miles and contains 2 census tracts. There are over 5,000 households in the selected region which has a total population of 29,254 people (2002 Census Bureau data). Important to note: McFarland City populations and assets are contained within the selected census tracts.

HAZUS ESSENTIAL FACILITY INVENTORY

Hazus divides critical facilities into two groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations, and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants, and hazardous material sites.

For essential facilities, there are 11 schools, two fire stations, and one police station. There are no hospitals or emergency operation facilities within the area. With respect to high potential loss facilities (HPL), there is one dam identified within the region. The dam is not classified as 'high hazard'. The Hazus critical infrastructure inventory also includes one hazardous material site.

HAZUS LIFELINE INVENTORY

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven default transportation systems that include highways, railways, light rail, bus, ports, ferries, and airports. There are six default utility systems that include potable water, wastewater, natural gas, crude and refined oil, electric power, and communications. The replacement value of the transportation and utility lifeline systems is estimated to be $582 and $34 million dollars, respectively within the region. This inventory includes over 57 miles of highways, 39 bridges, and 1,176 miles of pipelines.

LOSS ESTIMATION

Hazus software calculates losses to structures from earthquake shaking by considering the amount of ground displacement and type of structures in the shake scenario explained above. Software modeling processes estimate the percentage of damage to structures and their contents by applying established building fragility curves. Damage estimates are then translated to estimated dollar losses for each structure.

For the modeled earthquake scenario, ground shaking data (a shake map) was acquired from the California Integrated Seismic Network (CISN) and imported into the Hazus software using the earthquake module. The CISN shake map data consists of peak ground velocity, peak ground acceleration, peak spectral acceleration at 0.3 seconds, and peak spectral acceleration at 1.0 seconds for each earthquake scenario.

BUILDING DAMAGE

To understand building damage, damage outputs from Hazus are categorized into slight, moderate, and extensive damage. Ranges of damage are used to provide the user with an understanding of the building's physical condition. Table 5-17, *Hazus Building Damage Descriptions*, provides a physical description of each damage state.

Table 5-17: Hazus Building Damage Descriptions

Damage State	Damage Description
Slight	Small plaster cracks at corners of door and window openings and wall/ceiling intersections; small cracks in masonry chimneys and masonry veneers. Small cracks are assumed to be visible with a maximum width of less than 1/8 inch (cracks wider than 1/8 inch are referred to as "large" cracks).
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations.
Complete	Structure may have large permanent lateral displacement or be in imminent danger of collapse due to cripple wall failure or failure of the lateral load resisting system; some structures may slip and fall off the foundation; large foundation cracks. Three percent of the total area of buildings with Complete damage is expected to be collapsed, on average.

Table 5-18, *Building Los Estimation Summaries for Earthquake*, demonstrates building loss estimation results from the earthquake. An important concept in loss data is the "probability" of damage to exceed a certain degree. It is highly unlikely that any building in McFarland would receive "moderate or extensive" damage from earthquake shaking.

Table 5-18: Building Loss Estimation Summaries for Earthquake

Type	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	67	1.19	2	1.87	0	4.29	0	22.75	0	0.00
Commercial	137	2.43	3	3.29	0	5.13	0	10.39	0	0.00
Education	11	0.19	0	0.15	0	0.15	0	0.07	0	0.00
Government	12	0.21	0	0.22	0	0.32	0	0.65	0	0.00
Industrial	25	0.45	1	0.79	0	1.65	0	5.53	0	0.00
Other Residential	723	12.83	35	38.12	4	81.40	0	59.99	0	0.00
Religion	15	0.26	0	0.27	0	0.33	0	0.63	0	0.00
Single Family	4,646	82.44	51	55.30	0	6.74	0	0.00	0	0.00
Total	**5,636**		**91**		**5**		**0**		**0**	

BUILDING-RELATED ECONOMIC LOSS

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses are estimated at 1.91 million dollars; 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 51% of the total loss. Table 5-19, *Building-Related Economic Loss Estimates*, provides a summary of the losses associated with the building damage.

Table 5-19: Building-Related Economic Loss Estimates

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	-	-	-	-	$10,000	$10,000
	Capital-Related	-	-	-	-	-	-
	Rental	-	-	-	-	-	$10,000
	Relocation	-	$10,000	$10,000	-	-	$20,000
	Subtotal	**-**	**$10,000**	**$10,000**	**-**	**$10,000**	**$40,000**
Capital Stock Losses							
	Structural	$40,000	$20,000	$10,000	$10,000	$20,000	$100,000
	Non Structural	$460,000	$190,000	$90,000	$120,000	$260,000	$1,130,000
	Content	$200,000	$60,000	$70,000	$90,000	$200,000	$620,000
	Inventory	-	-	-	$20,000	-	$20,000
	Subtotal	**$700,000**	**$270,000**	**$170,000**	**$240,000**	**$490,000**	**$1,870,000**
Total		**$710,000**	**$270,000**	**$180,000**	**$250,000**	**$500,000**	**$1,910,000**

CRITICAL FACILITIES LOSSES

Earthquakes pose numerous risks to critical facilities and infrastructure. However, most of the City's critical facilities have been built since the California Unified Building Code (UBC) was amended to include provisions for seismic safety. The harm or losses that are likely to result from exposure to seismic hazards include:

- Utility outages.
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.
- Indirect economic losses such as income lost during downtime resulting from damage to private property or public infrastructure.
- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.

Earthquake events can significantly impact roads, overpasses, and bridges which often provide the only access to some neighborhoods. Most of the City's bridges provide access over other transportation networks such as highways and rail ways, and failure dependent on seismic upgrades conducted by CalTrans and other bridge owners in the area. Key factors in the degree of vulnerability are the bridge's age and type of construction based on the standards to which the bridge was built.

Linear utilities and transportation infrastructure would likely suffer considerable damage in the event of a very strong earthquake. During these events major water and wastewater lines running through the City may be damaged. Due to the sensitivity of linear utilities to seismic shaking, local infrastructure is difficult to analyze without further investigation of individual system components. Table 5-20, *Critical Facilities Damage and Functionality Estimation*, Table 5-21, *Estimation of Utility System Leaks*, and Table 5-22, *Estimation of Household Utility System Leaks*, provide damage and functionality estimations for the modeled scenario. Limited outages and damage occurred with this scenario.

Table 5-20: Critical Facilities Damage and Functionality Estimation

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	11	0	0	11
EOCs	0	0	0	0
Police Stations	1	0	0	1
Fire Stations	2	0	0	2

Table 5-21: Estimation of Utility System Leaks

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	694	14	4
Waste Water	417	7	2
Natural Gas	46	0	0
Oil	18	0	0

Table 5-22: Estimation of Household Utility System Leaks

System	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	5,102	0	5	0	0	0
Electric Power		638	102	9	5	5

5.8.8 FLOODING

Flood Vulnerability Analysis		
Community Risk Factor Rating	2.8	Moderate Risk, Moderate potential impact.

As described in the flood hazard profile, flooding and stormwater management is a substantial problem in McFarland. Vulnerability to flooding is primarily during the winter months, when drainage systems are overwhelmed and soil is saturated from heavy rainfall. During the winter rains, storm drainage and flood control devices have difficulty moving water away from structures and roadways.

Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage to property. In residential areas, flooding in low lying areas is a persistent problem due to the lack of curb and gutter and other flood control structures. Flooding occurs on a continual basis throughout the City both within the FEMA identified 100-year floodplain (1% annual chance of flooding) and in other localized areas.

In order to determine the possible vulnerability to flood damage, GIS was used to estimate the possible impact across the City. FEMA regulatory Digital Flood Insurance Rate Map (DFIRM) data along with U.S. Census and City asset data was utilized to quantify community flood exposure and possible losses as a result of flooding during a 100-year flood event. The information in this section describes flood vulnerability methodologies for determining people and assets at risk to the 100- and 500-year flood events. Table 5-23, *Flood Vulnerability Analysis Summary*, provides a risk factor snap shot and a summary of community vulnerability in terms of total assets vs. assets exposed to flooding hazards within the McFarland area.

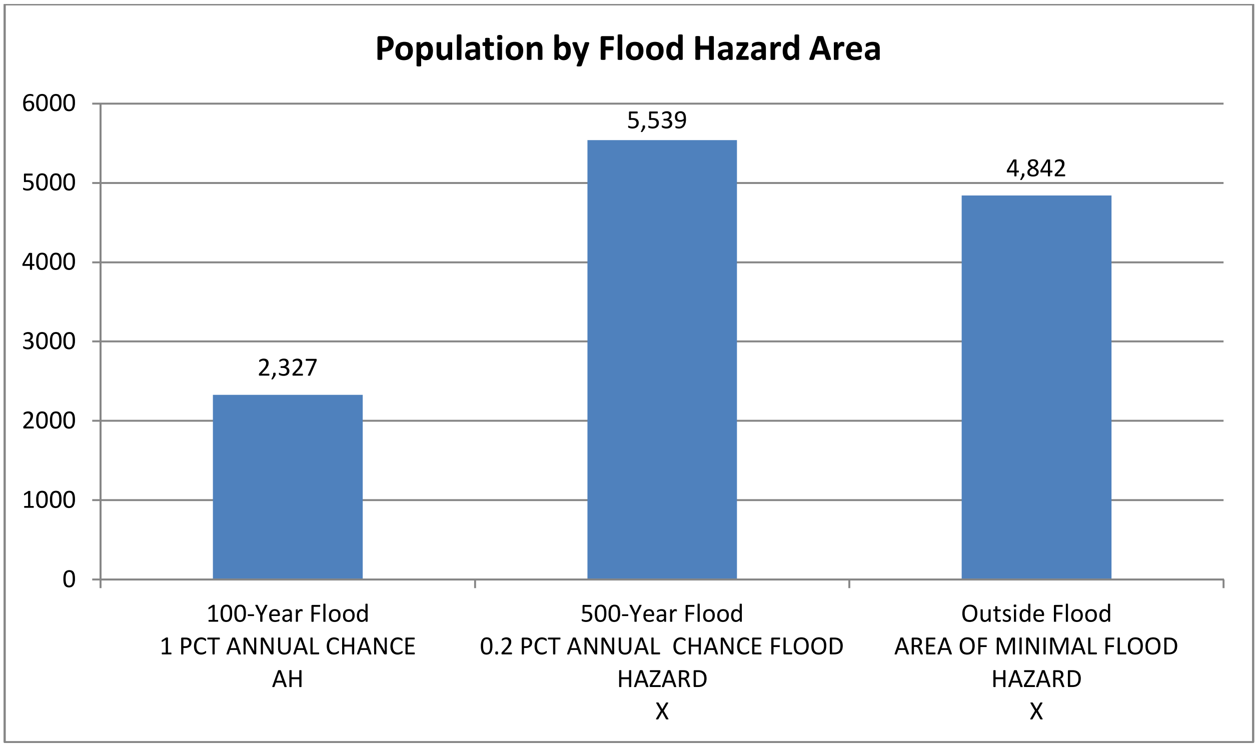
Table 5-23: Flood Vulnerability Analysis Summary

Exposure Type	Total Assets	Assets at Risk	% of Total Asset	Assets in 100-YR. Flood Zone	% of Assets in 100-YR. Flood Zone
Population	12,708	7,866	14.5%	2,327	18%
Critical Facilities	43	29	67%	0	0%
Parcels Count	2,722	1,538	57%	457	17%

5.8.8.1 POPULATION AT RISK

Using 2012 population data aggregated by census blocks, an estimate was made of the population within the 100- and 500-year floodplain. To account for census blocks that were partially within the floodplain, a weighted average was employed to calculate the proportion of the population within the floodplain. The results of the population overlay are shown in Figure 5-24, *Population Exposed to Potential Flood Risk*. Approximately 2,377 people live within the 100-year floodplain and 145 people live within the 500-year floodplain.

Figure 5-24: Population Exposed to Potential Flood Risk



5.8.8.2 CITY PARCEL VALUE AT RISK

The County Assessor's parcel layer was used as the basis for the inventory of individual parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon. The parcel point centroid was then moved to the location of the largest structure on the lot for analysis purposes. The parcel centroids were overlaid with the FEMA floodplain layer to determine flood risk for each structure and assigned values based upon flood zone classification. Through this analysis, 457 parcels were found to be within a 100-Year flood zone, and 1081 parcels within a 500-Year flood zone. Therefore, the total parcel exposure equals 1,538 parcels (or 39% of City parcels). Table 5-24, *Parcel Value Exposed to Flooding*, provide additional information on parcel values exposed to flooding hazards.

Table 5-24: Parcel Value Exposed to Flooding

Flood Hazard	Values Parcel Count	City Total %	Sum of Improvement Value	Sum of Total Value	Total City Value %
100-YR. (1 PCT. / YR.)	457	16%	$22,660,565	$32,871,202	8.81%
500-YR. (0.2 PCT. / YR.)	1081	39%	$94,314,325	$152,840,623	40.95%
Exposure Total	**1,538**	**55%**	**$116,974,890**	**$185,711,825**	**49.76%**

5.8.8.3 CRITICAL FACILITIES AT RISK

Similar to population and parcel data, critical facilities information was used in a spatial overlay analysis to determine the type and number of facilities within the 100- and 500-year floodplain. Flooding poses numerous risks to critical facilities and infrastructure:

- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.
- Bridges washed out or blocked by floods or debris from floods also can cause isolation.
- Creek or river floodwaters can back up drainage systems causing localized flooding.
- Floodwaters can get into drinking water supplies causing contamination.
- Sewer systems can be backed up causing waste to spill into homes, neighborhoods, rivers, and streams.
- Underground utilities can also be damaged.

Table 5-25, *Critical Facilities Exposed to Potential Flood Risk*, provides an inventory of the City's critical facilities within the 100- and 500-Year flood zones. Important to note, there are no known critical facilities within the 100-Year flood zone. Facilities that contain hazardous materials account for most of the "at risk" facilities within the 500-Year flood zone. One City-owned utility (Ejector Station 2) may have some degree of flood risk during a major flood event. A minor impact to the community could be experienced if the Ejector Station was damaged or destroyed during a flood event.

5.8.8.4 LOSS ESTIMATION

Similar to the earthquake loss estimation method, a FEMA Hazus modeling was used to estimate losses from flooding. The Hazus software calculates losses to structures from flooding by considering the depth of flooding and type of structure. The Hazus flood module uses estimates of flood depth along with depth-damage functions to compute the possible damage to buildings and infrastructure that may result from flooding. Important inputs to the damage Hazus flood module required to estimate building damage include:

- Building occupancy type;
- First floor elevation; and
- Depth of flooding, where the building is located.

Using historical flood insurance claim data, the Hazus software estimates the percentage of damage to structures and their contents by applying established depth-damage curves. Damage estimates are then translated to estimated dollar losses.

Table 5-25: Critical Facilities Exposed to Potential Flood Risk

Critical Facility Type	500-Year Flood Zone (0.2 PCT. Annual Chance Flood)
Church	**5**
Government	**9**
City Hall/Police Council	1
City Hall/Police Station	1
City Hall/Police Station/Public Works	3
City Monument-Fine Art	1
Old Library	1
Public Works Building	1
Residential Building for Police Activities	1
Medical	**1**
Medical Clinic	1
Parks	**3**
Sherwood Park	4
Browning Road Park	1
School	**3**
Browning Road Elementary School	1
Kern Ave Elementary School	1
McFarland High School	1
Utility	**3**
Browning Road Well (Browning Road)	1
Water Building	1
Water Storage Tank	1
Community Service	**5**
Community Center	1
Grocery Store	3
Community Hall	1
Grand Total	**29**

5.8.8.5 HAZUS BUILDING INVENTORY

The geographical area within the Hazus study region is 13 square miles and contains 142 census blocks. The study region contains over 2,000 households, and has a total population of 10,058 people (2000 Census Bureau data).[33] Hazus modeling estimates that there are 2,315 buildings in the region which have an aggregate total replacement value of 382 million (in 2006 dollars). Approximately 95.12% of the buildings (and 67.67% of the building value) are associated with residential housing. Table 5-26, *Building Exposure*

[33] Based upon custom study region specific to flooding for the City of McFarland. FEMA Hazus modeling utilizes 2000 Census data.

by Occupancy Type for 100-Year Flood Scenario, presents the relative distribution of the value with respect to the general occupancies by the flood Scenario.

Table 5-26: Building Exposure by Occupancy Type for 100-Year Flood Scenario

Building Category	Estimated Building Value (in Millions)	% of Total
Residential	$ 81,511	67.0%
Commercial	$ 3,527	2.9%
Industrial	$ 23,122	19.0%
Agricultural	$ 1,017	0.8%
Religion	$ 1,225	1.0%
Government	0	0.0%
Education	$ 11,325	9.3%
Exposure Total	**$ 121,727**	**100%**

5.8.8.6 HAZUS ESSENTIAL FACILITIES INVENTORY

Essential facilities in the Hazus modeling include seven schools, one fire station, one police station, and no emergency operation centers.

5.8.8.7 GENERAL BUILDING STOCK DAMAGE

Estimated building and content losses within the study region census tracks was generated using Hazus modeling. The flood modeling for the region estimated that approximately 213 buildings will be at least moderately damaged during a “worst case” 100 year flood event. This is over 52% of the total number of buildings in the flood scenario. No buildings are expected to be completely destroyed. The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

A “worst case” 100-year flood event in the City’s regulatory floodplain could result in $43.34 million of damage. None of the estimated losses were related to the business interruption of the region. The residential occupancies made up 31.36% of the total loss. Table 5-27, *Building-Related Economic Loss Estimates*, below provides a summary of the losses associated with the building damage.

While there are several limitations to the FEMA Hazus model, it does allow for potential loss estimation planning. It should be noted the analysis may include structures in the floodplain that are elevated at or above the level of the base flood elevation, which will likely mitigate flood damage. Also, the study region includes buildings generated from 142 census blocks, some of which are located outside the City boundaries. Also, the replacement costs are much higher than the assessor values demonstrated in Table 5-27, thus, the actual value of assets at risk may be significantly higher than those included herein.

Table 5-27: Building-Related Economic Loss Estimates

Category	Residential	Commercial	Industrial	Others	Total
Building Loss					
Building	$8,350,000	$230,000	$4,880,000	$50,000	$13,510,000
Content	$5,230,000	$770,000	-	$390,000	$6,390,000
Inventory	-	$30,000	$3,290,000	-	$3,320,000
Subtotal	*$13,580,000*	*$1,030,000*	*$8,170,000*	*$440,000*	*$23,220,000*
Business Interruption					
Income	-	-	$10,000	-	$10,000
Relocation	$20,000	-	$10,000	-	$30,000
Rental Income	-	-	-	-	-
Wage	-	-	$10,000	-	$10,000
Subtotal	*$20,000*	-	*$30,000*	-	*$50,000*
Total	**$13,600,000**	**$1,030,000**	**$8,200,000**	**$440,000**	**$23,270,000**

5.8.8.8 DEBRIS GENERATION

Hazus estimates the amount of debris that will be generated by the flood scenario. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made as different types of material handling equipment are required to handle the various debris types.

The model estimates that a total of 1,227 tons of debris will be generated. Of the total amount, finishes comprise 94% of the total, Structure comprises 3% of the total, and Foundations comprise 3% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 49 truckloads (25 tons/truck) to remove the debris generated by the flood.

5.8.9 EXTREME HEAT

Extreme Heat Vulnerability Analysis		
Community Risk Factor Rating	3.3	High risk, Widespread potential impact.

Extreme heat can increase water supply demands and cause health risks to vulnerable populations. During periods of extreme heat emergencies, the elderly and the very young are more vulnerable to the loss of cooling systems requiring power sources.

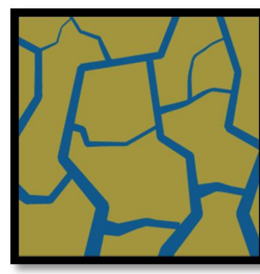
Extreme heat emergencies are often slow to develop. It could take a number of days of oppressive heat for a heat wave to have a significant or quantifiable impact. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. As temperatures rise, City residents will face greater risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. By mid-century, extreme heat events in urban centers could cause two to three times more heat-related deaths than occur today (California Climate Change Center 2006).

Though heat does not cause much economic damage or damage to the built environment, the number of people it has killed underscores the importance of mitigating its impacts. Extreme heat events highlight the importance of social vulnerability. While changes to the built environment can greatly alter vulnerability to different hazards, social vulnerability and resiliency are especially important during heat events.

Socially isolated elderly persons are especially vulnerable. Increased use of air conditioners during heat waves can lead to power outages, which makes the events even more deadly due the loss of cooling systems requiring power sources. Those who rely on electric power for life-saving medical equipment, such as respirators, are extremely vulnerable to power outages. Any mitigation efforts aimed at reducing heat losses will focus on ways to reduce social isolation as well as changes to the built environment.

5.8.10 DROUGHT

Drought Vulnerability Analysis		
Community Risk Factor Rating	3.7	High risk, Widespread potential impact.



Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected) and the demand humans place on the water supply.

Due to the lack of defined geographical boundaries, the vulnerability assessment for drought differs from other natural hazards discussed earlier. The impacts of drought can be categorized as economic, environmental, or social. The incidence of forest and range fires increases substantially during extended droughts, which in turn places human and critical facilities, at higher levels of risk. Drought vulnerability is primarily measured by its potential impact to sectors of the City's economy and natural resources. Some of the potential impacts to the economy include the following:

- Decreased municipal and industrial water supply; and
- Loss of recreation/tourism.

Direct costs such as increased pumping due to lowering of groundwater levels and costs to expand water infrastructure to compensate for reduced yields or to develop alternative water sources are a significant factor. Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Below is a summary of vulnerable water deliveries provided to the City of McFarland.

5.8.10.1 VULNERABLE WATER DELIVERIES

CITY OF MCFARLAND

Water is supplied to the residents of McFarland by the City's Public Works Department Water Division. The underlying groundwater basin is the sole source of municipal water for McFarland, as well as for other cities in northern Kern County including Delano, Wasco, and Shafter. The groundwater is pumped from the Poso Creek Aquifer in the Kern County subbasin of the Tulare Lake Basin. There are no nearby surface waters. The City currently provides 2,714 connections for primarily urban and residential uses.

SECTION 6.0 MITIGATION STRATEGY

The intent of the mitigation strategy is to provide the City of McFarland with a guidebook for 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 help City staff to achieve compatibility with existing planning mechanisms, and ensures that mitigation activities provide specific roles and resources for implementation success.

6.1 PLANNING PROCESS FOR SETTING HAZARD MITIGATION GOALS AND OBJECTIVES

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

- Estimate the impacts the problem could cause (*Section 5.0*, *Vulnerability Assessment*);
- Describe the problem (*Section 6.2*, *Problem Statements*);
- Assess what safeguards and resources exist that could potentially lessen those impacts (*Section, 6.3 Capability Assessment,*);
- Develop Goals and Objectives with current capabilities to address the problems (*Section 6.4.1 Goals and Objectives*); and
- Using this information, determine what, if anything, can be done, and select those actions that are appropriate for the community (*Section 6.4.3.2, Mitigation Action Matrix*).

6.2 IDENTIFYING THE PROBLEM

As part of the mitigation actions identification process, the LHMP 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 6-1, *Identified Issues/Weakness to be Addressed by Mitigation Actions*.

6.3 CAPABILITIES ASSESSMENT

The mitigation strategy includes an assessment of the City's planning and regulatory, administrative/ technical, fiscal, and political capabilities to augment known issues and weaknesses from identified natural hazards.

6.3.1 LOCAL PLANNING AND REGULATORY MITIGATION CAPABILITIES

The information in Table 6-2, *Planning and Regulatory Mitigation Capabilities Summary*, is used to construct mitigation actions aligned with existing planning and regulatory capabilities of the City. Planning and regulatory tools typically used by local jurisdictions to implement hazard mitigation activities are building codes, zoning regulations, Floodplain management policies, and other municipal planning documents.

Table 6-1: Identified Issues/Weaknesses to be Addressed by Mitigation Actions

Hazard ID	Issues/Weakness Statements
Severe Storms	▪ Short periods of extreme events ▪ High winds have resulted in broken tree limbs, fallen telephone lines, and a heavy accumulation of debris ▪ Substandard construction and the age of the housing stock have resulted in the lack of quality infrastructure (overhead vs. underground utility lines, lack of curb and gutter etc.). ▪ Road damage and quality (freeze/thaw/moving water) ▪ Lighting protection for electrical grid (PG&E and Southern California Edison)
Flood	▪ Northeastern area of the City is a historic loss area ▪ Regional flood control beyond City limits and the City's control (Railroad Mainline & State Route 99) ▪ Long periods of winter rains ▪ Access to transportation - lack of mobility during high water event (Kern Regional Transit/Dial-a-Ride could become City assets) ▪ Health issues as a result of flood water; mold/contaminated flood waters/West Nile Virus/agricultural waste ▪ Lack of above ground and underground storm drain/flood control infrastructure ▪ Impact on households; structure and contents ▪ Displacement due to flood; food and sheltering ▪ Loss of business income/tax revenue/Sphere of Influence crop damage ▪ Damage to schools (three schools within 500-year floodplain; specifically Browning Road Elementary School
Geo Hazards	▪ Unknown location of hazard (unmapped faults) ▪ No warning time ▪ Injury and damage caused by failing debris inside and outside buildings ▪ Subsidence due to ground water pumping and oil pumping ▪ Lifeline/linear utility damage both from earthquake and subsidence
Drought	▪ Poor retention of precipitation ▪ Continued extraction ▪ Reduced recharge during dry periods ▪ Depletion of aquifers (not all drought related) ▪ Groundwater supply contamination ▪ Socioeconomic impact (unemployment due to water restrictions) ▪ Economic loss due to water restrictions; farmers/workers/related industries ▪ Large disaster footprint ▪ Loss of local food supply and local produce
Extreme Heat	▪ Changes in variability and the frequency/severity of high heat events ▪ Scenarios project average temperatures to rise between 1 and 2.3°F in the Kern Region ▪ Heat Related Injuries/vulnerable populations (elderly and children) ▪ Water consumption can rise ▪ Rolling brownouts ▪ Socioeconomic impact (residents cooling property and other locations; low income population with limited mobility) ▪ Affects on local agricultural industry

Table 6-2: Planning and Regulatory Mitigation Capabilities Summary

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Multi-Hazard	McFarland/2010 California Building Codes	Building Department	The City adopts the latest edition of the California Building Codes. The California Building codes protect buildings to the extent possible from natural occurring hazards. California Residential Code California Code of Regulations, Title 24, Part 2.5. California Building Code California Code of Regulations, Title 24, Part 2, Volumes 1 and 2.
Multi-Hazard	Zoning Regulations	Community Development Department	City of McFarland Municipal Code Title 17, Zoning, is the Land Use Zoning Ordinance of the City. https://www.municode.com/library/ca/mcfarland/codes/code_of_ordinances
Multi-Hazard	Subdivision Regulations	Community Development Department	City of McFarland Municipal Code Title 16, Subdivisions, is the Subdivision Ordinance of the City. https://www.municode.com/library/ca/mcfarland/codes/code_of_ordinances
Multi-Hazard	On-Call Professional Services Contract	McFarland Public Works Department	A professional and technical services contract for the delivery of various types of engineering projects is currently in place.
Multi-Hazard	City of McFarland General Plan Safety Element	Community Development Department	The City's Safety and Seismic Safety Element was originally adopted in 1991. An update to the General Plan Safety Element Update is currently being prepared and is anticipated to be adopted in 2015.
Multi-Hazard	McFarland Capital Improvement Plans	Public Works Department	This can be used to catalog and fund hazard mitigation projects throughout the city.
Drought	Well Head Protection Measures	McFarland Public Works Department	The City complies with State regulations for well head protection measures for all of the City wells, including: 1) A 50-foot cement annular seal to protect surface contamination from reaching the well interior if leaching into the ground; 2) A concrete foundation around the well, a minimum of 18 inches above the ground surface to prevent any contamination from entering into the well casing; 3) A site security fence, block wall, or enclosure to keep the public away from the well facility and to protect the well; and 4) Future water wells will be construction to be a minimum 50-feet away from all property lines to that there is a protection buffer around the well.
Drought	Urban Water Management Plan (UWMP)	McFarland Public Works Department	The City is not required to prepare an UWMP as it does not meet the requirement for the minimum number of connections.
Drought	Water Conservation	Building Dept./ Community Development Department	City of McFarland Municipal Code Chapter 15.30, Landscape Water Conservation, addresses water conservation in the landscaping requirements.
Drought	2010 California Drought Contingency Plan	California Department of Water Resources	Section VI provides an overview of drought preparedness strategies from the California Water Plan Update (see separate entry). Section VII provides a brief description of local, utility, and State agency drought response roles. Situation and assessment reports will be distributed to appropriate agencies and will be posted on the DWR Drought website (www.water.ca.gov/ drought).

Table 6-2: Planning and Regulatory Mitigation Capabilities Summary [continued]

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Flood	Flood Resistant Construction	Community Development Department	Appendix G of the 2013 California Building Codes stipulates existing Flood Resistant Construction standards.
Flood	NFIP Administration	McFarland Community Development Department	NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, the City is dedicated to protecting homes of more than 60 policies currently in force.
Flood	Central Valley Flood Protection Plan	California Department of Water Resources (DWR)	State legislative requirements give the City local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions). Government Codes of particular importance to hazard mitigation planning are: Government Code 65302 & Government Code 8685.9

6.3.2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

Table 6-3, *City Administrative and Technical Mitigation Capabilities*, provides a summary of administrative and technical capabilities organized by staff type and department. It is important to understand current administrative and technical capabilities before developing mitigation activities.

Table 6-3: City Administrative and Technical Mitigation Capabilities

Staff/Personnel Resources	Department/Agency	Comments
Planners (with land use/land development knowledge)	McFarland Community Development Department	One employee in the Community Development Department.
Planners or engineers (with natural and/or human caused hazards knowledge)	McFarland Contracted Engineer(s)	The City utilizes three engineering firms: Helt Engineering, Inc. – Civil Dee Jaspar – Water Cannon Corporation – Sewer
Engineers or professionals trained in building and/or infrastructure construction practices (includes building inspectors)	McFarland Building Department, McFarland City Engineer McFarland Public Works Department	The City has two part-time building inspectors and one full-time Public Works Construction Manager.
Floodplain Management	McFarland Community Development Department	Community Development Department Director is the Floodplain Administration.
Land/Building surveyors	McFarland Contracted Engineer	The City utilizes Helt Engineering, Inc. for surveying services.
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's Hazus program	McFarland Community Development Department	The City does not have a GIS technician. Kern Council of Governments provided GIS maps at needed.
Grant writers or fiscal staff to handle large/complex grants	McFarland Community Development One employee in the Community Development Department	The City has one full-time grant writer. Numerous types of federal, state, local, and private grants have been administered by City staff.

Table 6-3: City Administrative and Technical Mitigation Capabilities [continued]

Staff/Personnel Resources	Department/Agency	Comments
Construction Equipment	McFarland Public Works Department	Public Works owns and maintains large pieces of equipment available for construction and land moving and removal.
County Emergency Management Personnel	McFarland Police Department Kern County Sheriff's Department Kern County Health Department	State Office of Emergency Services Access Mobile Emergency Personnel Cooling Center Coordination
Care and Sheltering	Regional Red Cross Personal (local office in Bakersfield, CA)	Care and sheltering during extreme heat conditions.
Weather Surveying	National Weather Service Weather Watchers	SKYWARN Weather Spotters Spotter training classes are by the National Weather Service (NWS). Volunteers attending these classes to become weather spotter for the NWS.

6.3.3 FISCAL CAPABILITIES

This section identifies the financial tools or resources that the City could potentially use to help fund mitigation activities. Fiscal capabilities include City-specific as well as state and federal resources.

6.3.3.1 LOCAL FISCAL RESOURCES

Table 6-4, *Fiscal Capabilities*, provides summary local fiscal capabilities. As indicated in Table 6-4, there are a number of governmental funds and revenue raising activities that can be allocated for hazard mitigation activities.

Table 6-4: Fiscal Capabilities

Financial Resources	Department/Agency	Comments
General Fund Revenue	McFarland City Council	No dedicated line items for hazard mitigation.
Enterprise Funds	McFarland City Council/McFarland Public Works	Fees must be based upon fee studies and approved by the City Council.
Engineering Line Item	McFarland City Council/McFarland Public Works	$25,000 in approved budget. 2014-2015.
Construction & Capital Improvements	McFarland City Council/McFarland Public Works	Approximately $ 12 Million approved in 2014-2015.
State and County Community Development Department Block Grants (CDBG)	California Department of Housing and Community Development Department (HCD)	Programs Include: ▪ Community Development (CD) ▪ Economic Development (ED) Disaster Recovery Initiative (DRI) ▪ Neighborhood Stabilization Program (NSP) Approximately $2 Million approved by city county for 2014/15.
Home Investments Partnership Program	California Department of Housing and Community Development	City is a non-entitlement city and must apply competitively for grant funds.
Source: City's Annual Financial Report, Fiscal Year Ended June 30, 2011.		

6.3.3.2 STATE AND FEDERAL FISCAL RESOURCES

To augment local resources, Table 6-5, *Potential Funding Programs/Grants from State and Federal Agencies*, provides a list of potential funding programs and resources provided by state and federal agencies and programs which can be used for local hazard mitigation activities.

Table 6-5: Potential Funding Programs/Grants from State and Federal Agencies

Agency/Grant Name	Potential Programs/Grants
California DWR Proposition 50/84: Integrated Regional Water Management (IRWM) Program.	DWR has a number of IRWM grant program funding opportunities. Current IRWM grant programs include planning, implementation, and stormwater flood management. http://www.water.ca.gov/irwm/grants/index.cfm Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act, which provides $1,000,000,000 (P.R.C. §75001-75130) for IRWM Planning and Implementation. CA Department of Water Resources' Flood Emergency Response Projects are posted on the webpage at: http://www.water.ca.gov/floodmgmt/hafoo/fob/floodER/
California Housing and Community Development (HCD) Emergency Solutions Grant (ESG) Program	To fund projects that serve homeless individuals and families with supportive services, emergency shelter/transitional housing, assisting persons at risk of becoming homeless with homelessness prevention assistance, and providing permanent housing to the homeless population. The Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2009 places new emphasis on assisting people to quickly regain stability in permanent housing after experiencing a housing crisis and/or homelessness. http://www.hcd.ca.gov/fa/esg/index.html
CalTrans Division of Local Assistance/Safe Routes to School Program	California Department of Transportation. Federal funding administered via Caltrans. Local 10% match is the minimum requirement. http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm
California State Office of Historic Preservation (OHP)/Statewide Historic Preservation Plan	Local Government; OHP's Local Government Unit (LGU) offers guidance and assistance to city and county governments to preserve historic properties including damage from natural hazards.
U.S. Department of Energy/Energy Efficiency and Conservation Block Grant Program	Provides funding for weatherization of structures and development of building codes/ordinances to ensure energy efficiency and restoration of older homes. http://www1.eere.energy.gov/wip/eecbg.html
Department of Homeland Security (DHS)/FEMA Grants	For more information on current grants visit: http://www.fema.gov/grants
California Emergency Management Agency (Cal EMA)/Proposition 1B Grants Programs	The Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006, approved by the voters as Proposition 1B at the November 7, 2006 general election, authorizes the issuance of nineteen billion nine hundred twenty five million dollars ($19,925,000,000) in general obligation bonds for specified purposes, including grants for transit system safety, security, and disaster response projects. http://hazardmitigation.calema.ca.gov/grants

6.4 MITIGATION GOALS, OBJECTIVES AND ACTIONS

Goals and objectives discussed in this section help describe what actions should occur, using increasingly narrow descriptors. Long-term goals are developed which can be accomplished by objectives. To achieve the stated objectives "mitigation actions" provide specific measurable descriptors on how to accomplish the objective. The goals, objectives, and actions form the basis for the development of a Mitigation Action Strategy and specific mitigation projects to be considered for implementation.

The process consists of 1) setting goals and objectives, 2) considering mitigation alternatives, 3) identifying strategies or "actions", and 4) developing a prioritized action plan resulting in a mitigation strategy.

6.4.1 GOALS AND OBJECTIVES

The Planning Committee discussed goals and objectives for this plan at distinct points in the planning process. In November 2014 (Planning Committee Meeting #3), the Planning Committee discussed the results of the risk assessment and the identified issues/weaknesses to be addressed by Mitigation Actions. The following goals and objectives have been developed as part of this planning effort:

ALL HAZARD GOAL: Maximize the use of mitigation actions to prevent losses from natural hazards identified in the LHMP.

- ALL HAZARD OBJECTIVE 1: Continuously improve hazard assessments.
- ALL HAZARD OBJECTIVE 2: Support mitigation planning in all City Operations.
- ALL HAZARD OBJECTIVE 3: Increase the City's capability to provide mitigation opportunities for residents.

GOAL 1: Minimize the effects of <u>Drought</u> in McFarland

- OBJECTIVE 1.1: Educate the citizens of McFarland on methods to reduce water consumption.
- OBJECTIVE 1.2: Protect water resources within McFarland watersheds from drought conditions.

GOAL 2: Minimize the losses of life and property due to <u>Extreme Heat</u> in McFarland

- OBJECTIVE 2.1: Reduce energy impacts related to high heat.
- OBJECTIVE 2.2: Provide protection to vulnerable populations in the event of extended high heat days.

GOAL 3: Minimize the losses of life and property due to <u>Flooding</u> in McFarland

- OBJECTIVE 3.1: Educate the public about flood risk and flood mitigation measures/ techniques.
- OBJECTIVE 3.2: Improve upon the City's flood risk assessment and flood risk reduction efforts.
- OBJECTIVE 3.3: Maintain and improve drainage systems.
- OBJECTIVE 3.4: Minimize flood risk to the community through participation in regional flood control project planning.

GOAL 4: Minimize the losses of life and property due to Earthquake in McFarland

- OBJECTIVE 4.1: Educate the public on how to minimize the effects of earthquakes in their homes.
- OBJECTIVE 4.2: Ensure the ability of government to function in a post-quake environment; upgrade City essential facilities to reduce loss from seismic events.
- OBJECTIVE 4.3: Upgrade high occupancy and commercial structures to reduce loss from seismic events.

GOAL 5: Minimize the losses of life and property due to Severe Weather in McFarland

- OBJECTIVE 5.1: Increase community capabilities to mitigate the impact of high wind events.
- OBJECTIVE 5.2: Increase community capabilities to mitigate freezing hazards.
- OBJECTIVE 5.3: Implement actions to enhance reliability of power supply during and after severe weather events.

6.4.2 MITIGATION ACTION DEVELOPMENT

Based upon planning committee priorities and risk assessment results, mitigation actions were identified to respond to the risk assessment information outlined in Section 5.0.

6.4.2.1 CONSIDERING MITIGATION ALTERNATIVES

During January 2015, the LHMP Planning Committee participated in the development and review of mitigation actions with a wide range of alternatives. To narrow mitigation alternatives for inclusion, FEMA's six broad categories of mitigation alternatives were used. Each FEMA category is described below:

Prevention (PRV). Preventative activities are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning ordinances;
- Building codes;
- Open space preservation;
- Floodplain regulations;
- Stormwater management regulations;
- Drainage system maintenance;
- Capital improvements programming; and
- Riverine/fault zone setbacks.

Property Protection (PP). Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Building elevation;
- Critical facilities protection;
- Retrofitting (e.g., wind proofing, flood proofing, seismic design techniques, etc.);
- Safe rooms, shutters, shatter-resistant glass; and
- Insurance.

Public Education and Awareness (PE&A). Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects including neighborhood and community outreach;
- Speaker series/demonstration events;
- Hazard mapping;
- Real estate disclosures;
- Materials Library;
- School children educational programs; and
- Hazard expositions.

Natural Resource Protection (NRP). Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples include:

- Floodplain protection;
- Watershed management;
- Vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.);
- Erosion and sediment control; and
- Wetland and habitat preservation and restoration.

Structural Projects (SP). Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Stormwater diversions/detention/retention infrastructure;
- Utility Upgrades;
- Seismic Retrofits; and
- New Construction.

Mitigation actions presented in Table 6-6, *Mitigation Action Abbreviated List*, establish 14 possible mitigation actions. Some mitigation actions support ongoing City activities, while other actions are intended to be completed when funding is available. Regardless, mitigation actions will be part of an annual review, as described in Section 7.0.

Table 6-6: Mitigation Action Abbreviated List

Hazard Goal	Specific Mitigation Action	Mitigation Type
Drought	**Action: DRT-1:** Increase awareness of drought conditions and residential water consumption by creating a program of public information.	PE&A
Drought	**Action: DRT-2:** Develop and implement source water protection (swp) programs and projects.	NRP
Extreme Heat	**Action: EH-1:** Improve HVAC and other weatherization items (insulation, windows/doors) in homes and businesses.	PP
Extreme Heat	**Action EH-2:** Construct shaded walkways and parking lots to curb heat island effects from urban development and provide pedestrians with relief from the sun.	NRP
Extreme Heat	**Action EH-3:** Construct back-up power facilities for community based Cooling Centers.	SP
Flood	**Action FL-1**: Increase awareness of flood risk and safety.	PE&A
Flood	**Action FL-2:** Maintain a flood risk database to track community exposure to flood risk and conduct verification studies for residents seeking explanation of flood risk.	PRV
Flood	**Action FL-3:** Implement drainage improvements from the City of McFarland 2015 Drainage Master Plan.	SP
Flood	**Action FL-4:** Assist in the preparation of a regional flood control plan to address local flooding issues.	PP
Earthquake	**Action EQ-1:** Develop and maintain an earthquake hazard community education program.	PE&A
Earthquake	**Action EQ-2:** Assist homeowners with resources to seismically retrofit homes with earthquake vulnerability.	PP
Earthquake	**Action EQ-3:** Strengthen essential facilities and infrastructure from earthquake hazards.	PP
Earthquake	**Action EQ-4:** Assist property owners with resources to seismically retrofit high-occupancy commercial buildings that don't meet 2013 California Building Codes.	PP
Severe Storms	**Action SS-1:** Develop mutual aid agreements with nearby public safety agencies.	PRV
Severe Storms	**Action SS-2:** Develop contractual agreements with private companies for debris clean up.	PRV
Severe Storms	**Action SS-3:** Harden critical facilities to the effects of a severe storm.	PP

Note: As a living document, project descriptions and actions in Table 6-6 will be modified to reflect current conditions over time.

6.4.2.2 MITIGATION COSTS

Cost effectiveness of each measure was a primary consideration when developing mitigation actions. Because mitigation is an investment to reduce future damages, it is important to select measures for which the reduced damages over the life of the measure are likely to be greater than the project cost. For structural projects, the level of cost effectiveness is primarily based on the likelihood of damages occurring in the future, the severity of the damages when they occur, and the level of effectiveness of the selected measure.

While detailed analysis was not conducted during the mitigation action development process, these factors were of primary concern when selecting measures. For measures that do not result in a quantifiable reduction of damages, such as public education and outreach, the relationship of the probable future benefits and the cost of each measure was considered when developing the mitigation actions. Costs are made available in individual Implementation Plans described in Section 7.0.

6.4.3 PRIORITIZATION OF MITIGATION ACTIONS

Common failures of a mitigation plan involve the prioritization of mitigation action for future implementation. Implementing the identified mitigation actions in Table 6-6 can be overwhelming for any community, especially with limited staffing and fiscal resources. To ensure that the City of McFarland's LHMP reflects a reality of what the City can do with its available resources, mitigation actions are prioritized with public input, risk factor scores, and LHMP Planning Committee agreement. This method assists the City to direct resources appropriately during particular planning windows.

6.4.3.1 PUBLIC INPUT

As part of the Community Open House, attendees were asked to provide input on issues and areas of concern pertaining to natural hazards within the community. They were also asked to provide recommendations to mitigate the potential impacts associated with the identified hazards. Recommendations included creating water barriers, sidewalks, curbs and gutters to address flooding, including expanding the drainage channel under SR-99. Other recommendations included more community education and open access to other agency resources. These comments assisted the Planning Team in developing and prioritizing mitigation actions.

6.4.3.2 GOAL, OBJECTIVE, AND MITIGATION ACTION MATRIX

Based upon the City's capabilities, Table 6-7, *Goal, Objective, and Mitigation Action Matrix*, shows primary objectives and corresponding mitigation actions selected for further implementation and development during the next planning cycle. Table 6-8, *2015-2020 Descriptions of Mitigation Strategies*, provides details for each mitigation action with mitigation action descriptions, FEMA mitigation category, responsible party, and timeframe. Implementation Action Plans for each action number highlighted in Table 6-7 are shown in Section 6.4.4.

Table 6-7: Goal, Objective, and Mitigation Action Matrix

Hazard	RF Factor	Mitigation Action Objectives	Primary Objective	Action No.
Drought	3.7	OBJECTIVE 1.1: Educate the citizens of McFarland on methods to reduce the effects of drought.		DRT-1
Drought	3.7	OBJECTIVE 1.2: Protect water resources within McFarland watersheds from drought conditions.		DRT-2
Extreme Heat	3.3	Objectives 2.1: Reduce energy impacts related to high heat.	Y	EH-1
Extreme Heat	3.3	OBJECTIVE 2.2: Provide protection to vulnerable populations in the event of extended high heat days.	Y	EH-2, EH-3
Flooding	2.8	OBJECTIVE 3.1: Educate the public about flood risk and flood mitigation measures/techniques.	Y	FL-1
		OBJECTIVE 3.2: Improve upon the City's flood risk assessment and flood risk reduction efforts.		FL-2
		OBJECTIVE 3.3: Maintain and improve drainage systems.	Y	FL-3
		Objective 3.4: Minimize flood risk to the community through participation in regional flood control project planning.		FL-4
Earthquake	2.7	OBJECTIVE 4.1: Educate the public on how to minimize the effects of earthquakes in their homes.		EQ-1
		OBJECTIVE 4.2: Identify resources and provide assistance to vulnerable populations residing in high-risk structures		EQ-2
		OBJECTIVE 4.3: Ensure the ability of government to function in a post-quake environment; upgrade City essential facilities to reduce loss from seismic events.	Y	EQ-3
		OBJECTIVE 4.3: Upgrade high occupancy and commercial structures to reduce loss from seismic events.		EQ-4
Severe Storm	2.2	OBJECTIVE 5.1: Increase community capabilities to mitigate the impact of high wind events.		SS-1
		OBJECTIVE 5.2: Increase community capabilities to mitigate freezing hazards.		SS-2
		OBJECTIVE 5.3: Implement actions to enhance reliability of power supply during and after severe weather events.	Y	SS-3

Risk Factor Conclusion	
HIGH RISK (3.0 – 4.0)	Drought & Extreme Heat
MODERATE RISK (2.0 – 2.9)	Flooding, Earthquake, & Severe Storms
LOW RISK (0.1 – 1.9)	N/A

Table 6-8: 2015-2020 Descriptions of Mitigation Strategies

Objective	Action	Description/Background	Responsible Party	Action Type	Time Frame	Implementation Plan
OBJECTIVE 1.1: Educate the citizens of McFarland on methods to reduce the effects of drought.	**Action: DRT-1: Increase awareness of drought conditions and residential water consumption by creating a program of public information.**	Public education and outreach programs are an efficient and cost-effective way to promote meaningful changes within a community. The City of McFarland Community Development Department will establish a public information program with the following offerings: ▪ Information on low or no-flow water fixtures and their benefit (Fixtures labeled with EPA WaterSense certification). ▪ Promote the use of drought-resistant landscaping features. ▪ Promote the use of covers on swimming pools to reduce evaporation and the need to refill. ▪ Promote the use of hot water on-demand fixtures that not only reduce water consumption, but will also reduce costs to the homeowner. ▪ Implement state law which requires the replacement of non-compliant plumbing fixtures with compliant fixtures prior to final permit approval or issuance of a certificate of occupancy (Senate Bill 407). ▪ Showcase city landscape projects as outreach examples on low water use native plant treatments. ▪ Promote the use of low water use/natives plants in small and large development projects.	McFarland Community Development Department	PA&E	5-10 Years	Y See Section 6.4.4
OBJECTIVE 1.2: Protect water resources within McFarland watersheds from drought conditions.	**Action: DRT-2: Develop and implement source water protection (swp) program and projects.**	The first phase in a SWP program is to conduct a 4-step source water assessment of your drinking water supply. A key output of SWP is an assessment of all public drinking water sources (surface and ground water). The assessments are a valuable planning tool which: identify and delineate protection areas surrounding sources of drinking water; inventory potential sources of contamination within those protection areas; evaluate the vulnerability of the sources of drinking water based on the proximity and frequency of sources of contamination; and provide key information necessary to develop and implement source water protection programs. Once an assessment is completed, a community can develop and implement a SWP program that mitigates the potential impacts identified to the drinking water source(s). Many communities began their SWP efforts under the Wellhead Protection Program (WHPP). The SWP has grown to go beyond the WHPP's scope of protecting only ground water sources by focusing on protecting all sources of drinking water, both ground and surface water sources. *http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/protectiontoolslinks.cfm*	McFarland Public Works Department	NRP	5-10 Years	N
Objectives 2.1: Reduce energy impacts related to high heat.	**Action: EH-1: Improve HVAC and other weatherization items (insulation, windows/doors) in homes and businesses.**	Extreme heat occurrences can often have a greater impact on those people who have older homes and equipment not capable of responding to the demands in 100-plus degree days. By using preexisting rebate programs the City will encourage residents to implement mitigation actions in preparation of high temperature days/seasons. The *Energy Upgrade California* rebate program can assist homeowners with rebates for making improvements to their homes. The rebates can be as high as $4,500 depending on the changes made to the home. These changes will not only make the home more energy efficient, but should also serve to make it able to better withstand extreme temperatures. Energy Upgrade California homepage: http://www.energyupgradeca.org/home	McFarland Community Development Department	PP	1-5 Years	Y See Section 6.4.4
Objective 2.2: Provide adequate infrastructure to address impacts to vulnerable populations.	**Action EH-2: Construct shaded walkways and parking lots to curb heat island effects from urban development and provide pedestrians with relief from the sun.**	Changes to building codes and development ordnances can be a very effective way to address certain issues, including extreme heat. The City of McFarland Community Development Department can use building codes and development standards to ensure new and retrofit construction will follow guidelines meant to reduce the heat island effect. Actions can include: ▪ Requiring the installation of trees around large asphalted areas in order to offset the heat created from the reflection off of the pavement. ▪ Providing tree shaded walkways for pedestrians. The U.S. EPA has published a guidebook for reducing the heat island effect with a variety of strategies outlined and described within here: *http://www.epa.gov/hiri/resources/pdf/TreesandVegCompendium.pdf* Other opportunities include coordination with transit providers, such as Kern Transit, to ensure bus stops provide shelters.	City of McFarland Community Development Department	NRP	5-10 Years	N

Table 6-8: 2015-2020 Descriptions of Mitigation Strategies [continued]

Objective	Action	Description/Background	Responsible Party	Action Type	Time Frame	Implementation Plan
	Action EH-3 Construct back-up power facilities for community based cooling centers.	Cooling centers are generally called for when high temperatures persist in an area, and residents are unable to cope with them. The elderly and the young are particularly sensitive to extreme temperatures. In addition, older homes are less likely to be properly insulated and offer protection for inhabitants from the heat. In these cases, the City may seek to set up cooling centers as a method of counteracting the effects of extreme heat. In order to ensure the operation of these centers, backup power is critical, especially if brownouts are causing the need. Funding the purchase and installation of backup power supplies (generators) at identified cooling centers throughout the City will help area residents escape the effects of extreme temperatures.	McFarland Public Works Department and McFarland Unified School District	SP	1-5 Years	Y See Section 6.4.4
OBJECTIVE 3.1: Educate the public about flood risk and flood mitigation measures/ techniques.	**Action FL-1: Increase awareness of flood risk and safety.**	Public education and outreach is one of the most efficient and cost effective methods of improving a community's resilience to a flood hazard. Citizens who fully understand the dangers they face are more likely to undertake mitigation actions and be more invested in protecting themselves against future hazards. The City of McFarland Community Development Department will establish public information program with the following offerings: ▪ Hazard mapping services for residents and development professionals. Mapping service can include establishing and publicizing a user-friendly, publicly-accessible repository for inquirers to obtain Flood Insurance Rate Maps and other information about flood risk mapping. ▪ Distribution of flood protection safety pamphlets or brochures to the owners of flood-prone property. ▪ Education for citizens about safety during flood conditions, including the dangers of flood water contamination and dangers of drainage systems. ▪ Using outreach activities to facilitate technical assistance programs to address measures citizens can take or facilitate funding for mitigation measures and annually notifying the owners of high risk properties of Flood Mitigation Assistance funding. ▪ Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance. ▪ Education about securing debris, propane tanks, yard items, or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters. ▪ Asking residents to help keep storm drains clear of debris during storms (not to rely solely on McFarland Public Works).	McFarland Community Development Department	PE&A	1-5 Years	Y See Section 6.4.4
OBJECTIVE 3.2: Improve upon the City's flood risk assessment and flood risk reduction efforts.	**Action FL-2: Maintain a flood risk database to track community exposure to flood risk and conduct verification studies for residents seeking explanation of flood risk.**	Development of a flood risk database can provide information on demand when needed most. Electronic mapping will allow the City to accurately predict future losses based on possible events. ▪ Using GIS to map areas that are at risk of flooding. ▪ Use depth grid data from the Hazard Mitigation Plan and illustrate flood risk to citizens. ▪ Incorporating Hazard Mitigation digital floodplain and topographic data into GIS, in conjunction with Hazus loss information to assess risk. ▪ Regularly calculating and documenting the amount of flood-prone property preserved as open space.	McFarland Community Development Department	PRV	5-10 Years	N
OBJECTIVE 3.3: Maintain and improve drainage systems.	**Action FL-3: Implement drainage improvements from the City of McFarland 2015 Drainage Master Plan.**	The 2015 McFarland Drainage Master Plan identified the existing drainage facilities, provided updated sub-basin information, and more accurately described existing conditions, and addressed identified drainage deficiencies that create localized flooding.	McFarland Public Works Department	SP	1-5 Years	Y See Section 6.4.4

Table 6-8: 2015-2020 Descriptions of Mitigation Strategies [continued]

Objective	Action	Description/Background	Responsible Party	Action Type	Time Frame	Implementation Plan
Objective 3.4: Minimize flood risk to the community through participation in regional flood control project planning.	**Action FL-4: Assist in the preparation of a regional flood control plan to address local flooding issues.**	The City of McFarland lies in a very flat portion of the Tulare-Buena Vista Basin with a gradual south to north grade. The Kern County Flood Insurance Study (Effective September 26, 2008) identified two sources of regional flooding into the City. Major flood problems on the eastern side of the City result from the overflow of Poso Creek and runoff from the mountains east of McFarland. Runoff from the mountains moves along the Friant-Kern Canal south to Highway 99. The runoff then combines with overflows from Poso Creek and moves north across the canal siphon into the City. The City of McFarland is also subject to 1-percent annual chance runoff from the east resulting from flow overtopping the Friant-Kern Canal levee. The amount of water that floods the City of McFarland from the sources discussed above is unknown. Although the effective Flood Insurance Study (FIS) identifies the source of flooding stated above, there is no current overflow analysis from FEMA for how much flow is coming from Poso Creek. Improving the regional flooding issue is a large task that would require coordination from many agencies. Kern County, FEMA, the Friant Water Authority, the Department of Water Resources, the Bureau of Reclamation, Caltrans, and the Southern Pacific Railroad all have vested interests in the area. In order to improve the existing regional hydrologic conditions for the areas in and around the City of McFarland, a restudy of the existing regional hydrology and hydraulic conditions of Poso Creek and the Friant-Kern Canal are needed. Ring levees could possibly be a solution that would redirect runoff around the City, as well as detention basins to capture the large overflow. However, if detention basins were to be built, they would be very large in size due to the volume of runoff from Poso Creek and the runoff east of the Friant-Kern Canal.	McFarland Public Works Department	SP	5-10 Years	
OBJECTIVE 4.1: Educate the public on how to minimize the effects of earthquakes in their homes.	**Action EQ-1: Develop and maintain an earthquake hazard community education program.**	Use a suite of partnerships, activities, and products to educate the public about earthquakes and opportunities to become prepared for and mitigate potential damage associated with earthquakes. The following can be used as part of a Program for Public Information (PPI) for earthquake awareness and mitigation: ▪ Advertise National Preparedness Month (September) through the City's publication systems, including the website. ▪ Participate in "The Great Shake Out" Statewide Drill http://www.shakeout.org/ ▪ Coordinate with local hardware/home improvement stores to educate residence on the importance of securing moveable items and possibly providing the materials needed (such as tie down straps, anchors, closed hooks, museum putty or wax, latches, etc.) ▪ Request educational materials from agencies and organizations, such as FEMA and Earthquake Country Alliance for distribution at City buildings. ▪ Work with McFarland Unified School District on opportunities to coordinate community events and disseminate information.	McFarland Community Development Department McFarland Unified School District	PE&A	1-5 Years	Y See Section 6.4.4
OBJECTIVE 4.2: Identify resources and provide assistance to vulnerable populations residing in high-risk structures.	**Action EQ-2 Assist homeowners with resources to seismically retrofit homes with earthquake vulnerability.**	Most of the property damage caused by earthquakes ends up being handled and paid for by the homeowner or renters. As a homeowner or renter, you can significantly reduce risk of damage to your home by fixing a number of known and common weaknesses, including interior falling hazards. There are no guarantees of safety during earthquakes, but properly constructed and strengthened homes are far less likely to collapse or be damaged during earthquakes. A "Home" within the City boundaries includes single family residences, duplexes, triplexes, four-plexes, and mobile homes. The City will provide the following as resources to citizens residing in high risk areas: ▪ City consultation services for compliance to local building codes to ensure that homes meet current seismic safety standards. ▪ Mobile home tie-down program. Encourage mobile home residents to better secure their homes by installing structural support bracing systems, leaving wheels on homes, rather than removing them, and securing awnings. A list of state-certified bracing systems is available from the California Department of Housing and Community Development. ▪ Encourage Elderly to take steps at reducing their vulnerability to earthquakes	McFarland Community Development Department	PP	5-10 Years	N

Table 6-8: 2015-2020 Descriptions of Mitigation Strategies [continued]

Objective	Action	Description/Background	Responsible Party	Action Type	Time Frame	Implementation Plan
OBJECTIVE 4.3: Ensure the ability of government to function in a post-quake environment; upgrade City essential facilities to reduce loss from seismic events.	**Action EQ-3: Strengthen essential facilities and infrastructure from earthquake hazards.**	Essential facilities are those facilities and parts of a community's infrastructure that must remain operational or can be restored quickly after an earthquake for a community to respond effectively. Fire stations, police stations, ambulance services, and emergency/City operation centers must have the ability to provide immediate response during an earthquake or other disaster. Those existing essential facilities which are identified as being potentially non-operable after an earthquake must be strengthened and their equipment secured so they will function after an earthquake. The overall impact and cost of a disaster is strongly influenced by how long it takes to recover. The time needed to recover depends on the level of damage sustained by essential facility buildings, the availability of utilities, and how quickly the City can return to fully functioning status. The City will harden and seismically retrofit city owned and or operated essential facilities. The City's Seismic Safety Program will include: ▪ Preparing recommended improvements to current construction aimed at improving the seismic safety of existing buildings and life-lines. ▪ Helping local government decision-makers by providing estimates of potential losses due to earthquake hazards i.e. what happens if the Fire Department building collapses on fire trucks. ▪ Estimate seismic upgrade costs, and develop benefit-cost models for upgrading City essential facilities. ▪ Determine what needs to be done to bring each facility up to an acceptable level. ▪ Determine funding streams/grants available to perform needed upgrades. ▪ Determine responsibility and schedule for remedial action.	City of McFarland Building Division	PP	1-5 Years	Y See Section 6.4.4
OBJECTIVE 4.4: Upgrade high occupancy and commercial structures to reduce loss from seismic events	**Action EQ-4: Assist property owners with resources to seismically retrofit high-occupancy commercial buildings that do not meet 2013 California Building Codes.**	Failure of a single high-occupancy structure can result in death and injuries. Seismic design is particularly important when the occupancy is involuntary, or when the occupants are in some way disabled, such as in hospitals, nursing homes and mental institutions. Unlike essential facilities necessary for emergency response, high-occupancy buildings do not have to function after an earthquake, however, it is critical that they do not collapse completely or catch on fire. The City will implement the following: ▪ High occupancy buildings should be identified as part of a hazardous building inventory. ▪ Potentially hazardous buildings (including City multi-family residential units and functional care) should be individually evaluated by a structural engineer and, if found hazardous, strengthened under hazardous building abatement program. ▪ Determine what needs to be done to bring each facility up to an acceptable level. ▪ Determine funding streams/grants available to perform needed upgrades. ▪ Determine responsibility and schedule for remedial action.	City of McFarland Building Division	PP	5-10 YEARS	N
OBJECTIVE 5.1: Increase community capabilities to mitigate the impact of high wind events.	**Action SS-1: Develop mutual aid agreements with nearby public safety agencies**	Mutual assistance agreements can help the City by having outside resources available in the event that City resources become overwhelmed and are unable to contend with the event. Steps to mutual aid agreement are as follows: ▪ Establish mutual aid partners ▪ Establish obligations of each party ▪ Establish mutual aid agreement template	McFarland City Manager and Police Department	PRV	5-10 Years	N
OBJECTIVE 5.2: Increase community capabilities to mitigate freezing hazards.	**Action SS-2: Develop contractual agreements with private companies for debris clean up.**	There are response activities that the City may not be equipped to address. These activities may include debris cleanup on a large scale or extensive tree-trimming programs. In that case, there are companies in the area with the equipment and staff to assist the City. Developing contracts with these companies ahead of time will not only ensure that their resources are available when needed; it can also help in securing a better cost structure.	McFarland City Manager and Public Works Department	PRV	5-10 Years	N
OBJECTIVE 5.3: Implement actions to enhance reliability of power supply during and after severe weather events.	**Action SS-3: Harden critical facilities to the effects of a severe storm.**	Ensuring that critical facilities are equipped to handle the effects of severe storms can help ensure that services continue even during and after a severe storm. Hardening actions can include: ▪ Installation of backup generators that will provide power in case the power grid loses power. ▪ Ensuring that roof systems are capable of withstanding the potential wind load that can result from a severe storm.	McFarland Public Works Department	PP	1-5 Years	Y See Section 6.4.4

6.4.4 LHMP MITIGATION ACTION IMPLEMENTATION PLANS

6.4.4.1 ACTION DRT-1

Mitigation Action Implementation Plan	
Action DRT-1: Increase awareness of drought conditions and residential water consumption by creating a program of public information.	
Implementing Agencies	
Lead Agency (ies):	City of McFarland Community Development and Public Works Departments
Roles and Responsibilities:	Promote rebate assistance programs for local residents and specifically low-income residents
Support Agency (ies):	City of McFarland Building Division
Roles and Responsibilities:	Public Outreach and Education; Programs
Preliminary Identified Tasks: McFarland Community Development Department	
1. Obtain education materials and resources from State agencies and other organizations.	
2. Provide information on the City's website and determine opportunities to organize an educational event or program within the City to educate and disseminate information.	
3. Determine rebate programs currently in effect and their eligibility requirements.	
4. Promote the available programs to their target audiences and provide assistance to those residents seeking to apply for rebates.	
Implementation Costs	
Estimated Capital Costs:	Staff time and resources
Estimated Maintenance Costs:	Staff time and resources
Implementation Resources	
Financial Resources (Funding):	Energy Upgrade California rebate program: *https://energyupgradeca.org/your_energy_page0* Energy Efficiency and Conservation Block Grant Program: http://www1.eere.energy.gov/wip/eecbg.html
Technical Assistance Resources:	Paperwork assistance for interested residents
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	Ongoing

6.4.4.2 ACTION EH-1

Mitigation Action Implementation Plan	
Action EH-1: Improve HVAC and other weatherization items (insulation, windows/doors) in homes and businesses.	
Implementing Agencies	
Lead Agency (ies):	City of McFarland Community Development Department; City Program Manager
Roles and Responsibilities:	Promote rebate assistance programs for local residents and specifically low-income residents
Support Agency (ies):	City of McFarland Building Division
Roles and Responsibilities:	Public Outreach
Preliminary Identified Tasks: McFarland Public Works Department	
5. Determine rebate programs currently in effect and their eligibility requirements	
6. Promote the available programs to their target audiences	
7. Provide assistance to those residents seeking to apply for rebates	
Implementation Costs	
Estimated Capital Costs:	Staff time and resources
Estimated Maintenance Costs:	Staff time and resources
Implementation Resources	
Financial Resources (Funding):	Energy Upgrade California rebate program: *https://energyupgradeca.org/your_energy_page0* Energy Efficiency and Conservation Block Grant Program: http://www1.eere.energy.gov/wip/eecbg.html
Technical Assistance Resources:	Paperwork assistance for interested residents
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	Ongoing

6.4.4.3 ACTION EH-3

Mitigation Action Implementation Plan	
Action EH-3: Construct back-up power facilities for community based Cooling Centers.	
Implementing Agencies	
Lead Agency (ies):	McFarland Public Works Department
Roles and Responsibilities:	Determine the power needs for each Cooling Center location
Support Agency (ies):	McFarland Unified School District, McFarland Recreation and Parks District, and McFarland Community Development Department, Grants Administrator
Roles and Responsibilities:	Provide on-site assistance, Apply for grant funding
Preliminary Identified Tasks: McFarland Public Works Department	
1. Identify power needs for cooling center locations	
2. Find equipment capable of providing that power and determine costs	
3. Apply for grant funding to provide capital for power systems	
4. Coordinate with school district and local contractors to install units as they are purchased	
Implementation Costs	
Estimated Capital Costs:	$5,000 to determine needs of each facility
Estimated Maintenance Costs:	$250,000 - $400,000 to complete each project
Implementation Resources	
Financial Resources (Funding):	Hazard Mitigation Grant Program http://www.fema.gov/hazard-mitigation-grant-program Community Development Department Block Grant (CDBG) Program http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
Technical Assistance Resources:	Electrical contractors to help determine power levels
Required Equipment, Vehicles, and Supplies	
Large Generators	
Large equipment and equipment operators	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	01/2021

6.4.4.4 ACTION FL-1

Mitigation Action Implementation Plan		
Action FL-1: Increase Awareness of Flood Risk and Safety.		
Implementing Agencies		
Lead Agency (ies):	City of McFarland Community Development Department	
Roles and Responsibilities:	Organization of resources/implementation of program	
Support Agency (ies):	Cal OES/FEMA	
Roles and Responsibilities:	Education and Technical Guidance	
Preliminary Identified Tasks: McFarland Community Development Department		
1. Determine best method to provide hazard mapping services to the community		
2. Identify initial target audience based on information in the mitigation plan, as well as NFIP maps		
3. Schedule and conduct public outreach sessions, possibly paired with other publicly attended functions		
4. Assess the impact of the program and determine next steps		
Implementation Costs		
Estimated Capital Costs:	$5,000 - $10,000 for mapping portal for residents	
Estimated Maintenance Costs:	Staff time and resources	
Implementation Resources		
Financial Resources (Funding):	Emergency Management Performance Grants Program http://www.fema.gov/fy-2012-emergency-management-performance-grants-program	
Technical Assistance Resources:	Cartographers	
Required Equipment, Vehicles, and Supplies		
GIS Analyst	Large Scale Plotter	
Arc GIS/ESRI Software	Flood Proofing Literature	
Implementation Timeframe		
Estimated Mitigation Action Start Date:		11/2016
Estimated Mitigation Action Completion Date:		Ongoing

6.4.4.5 ACTION FL-3

Mitigation Action Implementation Plan	
Action FL-3: Implement Drainage Improvements from the City of McFarland 2015 Drainage Master Plan.	
Implementing Agencies	
Lead Agency (ies):	City of McFarland Public Works Department
Roles and Responsibilities of Lead Agency (ies):	Capital Improvements Planning
Support Agency (ies):	City of McFarland Community Development Department, City of McFarland Grant Writer
Roles and Responsibilities of Support Agency (ies):	Grant Applications, General Fund
Preliminary Identified Tasks: McFarland Community Development Department and Public Works Department	
1. Choose from identified solutions for each of the problem areas in the Drainage Master Plan	
2. Validate Estimate costs for chosen solutions	
3. Complete Benefit-Cost-Analysis and apply for grant funding (if applicable)	
4. Coordinate with local contractors to execute improvements	
Implementation Costs	
Estimated Capital Costs:	$50,000 - $300,000 per project
Estimated Maintenance Costs:	Annual Maintenance of $5,000
Implementation Resources	
Financial Resources (Funding):	Hazard Mitigation Grant Program: http://www.fema.gov/hazard-mitigation-grant-program
Technical Assistance Resources:	Benefit Cost Analysis
Required Equipment, Vehicles, and Supplies	
TBD by Project	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	Ongoing

6.4.4.6 ACTION EQ-1

Mitigation Action Implementation Plan	
Action EQ-1: Develop and maintain an earthquake hazard community education program.	
Implementing Agencies	
Lead Agency (ies):	McFarland Unified School District/McFarland Community Development Department
Roles and Responsibilities:	Development and execution of program
Support Agency (ies):	McFarland Chamber of Commerce
Roles and Responsibilities:	Assist with secondary tasks (dispersal of materials, participation in events)
Preliminary Identified Tasks: McFarland Community Development Department	
1. Use information from the mitigation plan to identify the initial target audience for this program	
2. Acquire materials to support the education program	
3. Plan to participate in the next statewide earthquake drill	
4. Distribute information at Back-to School/Open House nights or host a Safety Night	
Implementation Costs	
Estimated Capital Costs:	Initial Cost of $5,000 to gather and distribute materials
Estimated Maintenance Costs:	Annual costs of $3,000 - $5,000 to maintain program and participate in exercises
Implementation Resources	
Financial Resources (Funding):	Emergency Management Performance Grants Program http://www.fema.gov/fy-2012-emergency-management-performance-grants-program
Technical Assistance Resources:	Websites and agencies listed in Mitigation Table.
Required Equipment, Vehicles, and Supplies	
Earthquake publications from FEMA and Cal OES	
Training and Exercise Materials	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	Ongoing

6.4.4.7 ACTION EQ-3

Mitigation Action Implementation Plan	
Action EQ-3: Strengthen essential facilities and infrastructure from earthquake hazards.	
Implementing Agencies	
Lead Agency (ies):	McFarland Public Works Department/City Engineer
Roles and Responsibilities:	Project Management
Support Agency (ies):	City of McFarland Building Division
Roles and Responsibilities:	Routine Inspection and Maintenance
Preliminary Identified Tasks: McFarland Public Works Department/City Engineer	
1. Prioritize city-owned buildings and other critical facilities and begin initial examinations.	
2. Use inspection reports to develop upgrade plans for each structure.	
3. Prioritize upgrades based on funding availability.	
4. Complete projects based on priority.	
Implementation Costs	
Estimated Capital Costs:	$30,000 to conduct building inspections
Estimated Maintenance Costs:	$30,000 - $50,000
Implementation Resources	
Financial Resources (Funding):	Hazard Mitigation Grant Program http://www.fema.gov/hazard-mitigation-grant-program Pre-Disaster Mitigation Grant Program: http://www.fema.gov/pre-disaster-mitigation-grant-program City General Fund
Technical Assistance Resources:	Building Inspectors, Seismic Engineers
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	TBD
Estimated Mitigation Action Completion Date:	TBD

6.4.4.8 ACTION SS-3

Mitigation Action Implementation Plan	
Action SS-3: Harden critical facilities to the effects of a severe storm.	
Implementing Agencies	
Lead Agency (ies):	McFarland Public Works Department
Roles and Responsibilities:	Coordinate with Building Official
Support Agency (ies):	McFarland Community Development Department, McFarland Program Manager
Roles and Responsibilities:	Apply for and administer grant funds
Preliminary Identified Tasks: McFarland Community Development Department	
5. Develop an inventory of critical facilities to be examined	
6. Coordinate with building inspector to examine these facilities	
7. Develop a list of suggested upgrades to the buildings to harden them to the effects of severe storms	
8. Prioritize actions and seek out funding options to help defray the costs associated with the upgrades	
Implementation Costs	
Estimated Capital Costs:	$10,000 for initial inspections
Estimated Maintenance Costs:	$50,000 - $250,000 for each project
Implementation Resources	
Financial Resources (Funding):	Hazard Mitigation Grant Program http://www.fema.gov/hazard-mitigation-grant-program City General Fund
Technical Assistance Resources:	Building Inspectors, Contractors
Required Equipment, Vehicles, and Supplies	
TBD	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	11/2016
Estimated Mitigation Action Completion Date:	06/2021

SECTION 7.0 PLAN IMPLEMENTATION AND MAINTENANCE

As a living document, it is important that this plan becomes a tool in the City's resources to ensure reductions in possible damage from a natural hazard event. This section discusses plan adoption, implementation, monitoring, evaluating, and updating the LHMP. Plan implementation and maintenance procedures will ensure that the LHMP remains relevant and continues to address the changing environment in the City. This section describes the incorporation of the LHMP into existing City planning mechanisms, and how City staff will continue to engage the public.

7.1 PLAN ADOPTION

To comply with DMA 2000, the City Council has officially adopted the 2015 City of McFarland LHMP. The adoption of the LHMP recognizes the City's commitment to reducing the impacts of natural hazards within the City limits. A copy of the 2015 LHMP adoption resolution is included in Appendix A.

7.2 IMPLEMENTATION

Over time, Implementation Strategies will become more detailed and the City's mitigation planners will work to provide more detail for priority mitigation actions. In conjunction with progress report processes outlined in Section 7.4.2, implementation strategy worksheets provided in Section 6.4.4 will be extremely useful as a plan of record tool for updates. Each implementation strategy worksheet provides individual steps and resources need to complete each mitigation action. The following provides several options to consider when developing implementation strategies in the future:

- *Use Processes That Already Exist*. Initial strategy is to take advantage of tools and procedures identified in the capability assessment in Section 6.0. By using planning mechanisms already in use and familiar to City departments and organizations, it will give the planning implementation phase a strong initial boost, especially if a mitigation strategy calls for expanding existing programs, or creating new programs or processes at a later date. Section 6.0 provides more information on existing planning mechanisms.

- *Updated Work Plans, Policies, or Procedures*. Hazard mitigation concepts and activities can help integrate the 2015 LHMP into daily operations. These changes can include how major development projects and subdivision reviews are addressed in hazard prone areas or ensure that hazard mitigation concerns are considered in the approval of major capital improvement projects.

- *Job Descriptions*. Working with department or agency heads to revise job descriptions of government staff to include mitigation-related duties could further institutionalize hazard mitigation. This change would not necessarily result in great financial expenditures or programmatic changes.

7.3 FUTURE PARTICIPATION

The City of McFarland LHMP Planning Committee established for this Plan (refer to Table 4-2, LHMP Planning Committee), will become a permanent advisory body to administer and coordinate the implementation and maintenance of the 2015 LHMP. The Community Development Department will lead the 2015 LHMP plan development and updates and all associated LHMP maintenance requirements. On an annual basis, the LHMP Planning Committee will report to the City Council and the public on the status of plan implementation and mitigation opportunities in the City. Other duties include reviewing and promoting mitigation opportunities, informing and soliciting input from the public and developing grant applications for hazard mitigation assistance.

7.4 MONITORING, EVALUATING, AND UPDATING THE LHMP

This section describes the schedule and process for monitoring, evaluating, and updating the 2015 LHMP.

7.4.1 SCHEDULE

Monitoring the progress of the mitigation actions will be on-going throughout the five-year period between the adoption of the 2015 LHMP and the next update effort. The LHMP Planning Committee will meet on an annual basis to monitor the status of the implementation of mitigation actions and develop updates as necessary.

Meetings will be held two months before City pre-budget planning meetings. The LHMP Planning Committee will meet during this time to prepare an evaluation report on the success and failures of the 2015 LHMP and provide formal budget request for approval by the City at a later date.

The LHMP will be updated every five years, as required by DMA 2000. The update process will begin at least one year prior to the expiration of the 2015 LHMP. However, should a significant disaster occur within the City, the LHMP Planning Committee will reconvene within 30 days of the disaster to review and update the LHMP as appropriate. The City Council will adopt written updates to the LHMP.

7.4.2 PROCESS

The LHMP Planning Committee will coordinate with responsible City departments and agencies/ organizations identified for each mitigation action. These responsible departments and agencies/ organizations will monitor and evaluate the progress made on the implementation of mitigation actions and report to the LHMP Planning Committee on an annual basis. Working with the LHMP Planning Committee, these responsible departments and agencies/organizations will be asked to assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate. The LHMP Mitigation Action Progress Report worksheet, provided in Appendix D, will assist mitigation leads in reporting on the status and assessing the effectiveness of the mitigation actions.

Information culminated from the mitigation leads or "champions" will be used to monitor mitigation actions and annual evaluation of the LHMP. The following questions will be considered as criteria for evaluating the effectiveness of the LHMP:

- Has the nature or magnitude of hazards affecting the City changed?
- Are there new hazards that have the potential to impact the City?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the LHMP?
- Should additional local resources be committed to address identified hazards?

An Annual LHMP Review Questionnaire worksheet, provided in Appendix D, has been developed as part of this LHMP to provide guidance to the LHMP Planning Committee on what should be included in the evaluation. Future updates to the LHMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the LHMP, which require changes to the risk assessment, mitigation strategy and other components of the LHMP, will be incorporated into the next update of the 2015 LHMP in 2020. The questions identified above would remain valid during the preparation of the 2020 update.

7.5 INCORPORATION INTO EXISTING PLANNING MECHANISMS

An important implementation mechanism is to incorporate the recommendation and underlying principles of the LHMP into community planning and development such as capital improvement budgeting, building and zoning codes, general plans, and regional plans. Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of the jurisdiction attempting to implement risk reducing actions. The integration of a variety of City departments on the LHMP Planning Committee provides an opportunity for constant and pervasive efforts to network, identify, and highlight mitigation activities and opportunities at all levels of government. This collaborative effort is also important to monitor funding opportunities which can be leveraged to implement the mitigation actions. LHMP mitigation planners will actively incorporate information from:

- *City Building/Development Codes and Zoning Ordinances*. The 2015 LHMP will provide information to enable the City to make decisions on appropriate building/development codes and ordinances. Appropriate building codes and ordinances can increase the City's resilience against natural disasters.

- *City of McFarland General Plan*. The 2015 LHMP will provide information that can be incorporated into the Land Use and Public Safety Elements during the next general plan update. Specific risk and vulnerability information from the City of McFarland LHMP will assist to identify areas where development may be at risk to potential hazards.

- *City of McFarland Storm Drainage Master Plan*. The 2015 LHMP identifies flood risk areas of concern in the City. The Storm Drain Master Plan identifies recommended improvements that will be a priority in high risk areas identified in Section 5.0.

7.6 CONTINUED PUBLIC INVOLVEMENT

During the five year update cycle (2015-2020), City staff will involve the public using public workshops and meetings. Information on upcoming public events related to the LHMP or solicitation for comments will be announced via newspapers, mailings, and on the City website (http://www.mcfarlandcity.org). An electronic copy of the current LHMP document will be accessible through the City website, with a hard copy available for review at the City of McFarland Community Development Department. The LHMP Planning Committee will, as much as practicable, incorporate the following concepts into its public outreach strategy to ensure continued public involvement in the LHMP planning process:

- Collaborate with Kern County on hazard mitigation efforts specifically addressing regional flooding issues.
- Work with public service clubs, i.e., Lions, Rotary, and other NGOs (non-government organizations).
- Collaborate with faith based organizations.
- Create story ideas for media outlets, such as newspapers, local radio, and TV.
- Distribute emails and postcards/mailers to City residents about hazard mitigation updates.
- Post meeting announcements at coffee houses, grocery stores, libraries, etc.
- Educate and collaborate with insurance companies.
- Coordinate with other existing local community meetings/events.
- Distribute information through K-12 schools.
- Continue to use the City website as a distribution point of hazard mitigation information.

SECTION 8.0 REFERENCES

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