Fresno County
Multi-Hazard Mitigation Plan

January 2009

Lower San Joaquin Levee District

SIERRA RESOURCE CONSERVATION DISTRICT

1 INTRODUCTION

1.1 Purpose

Fresno County and 12 other jurisdictions prepared this local hazard mitigation plan to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to make Fresno County and participating jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program and Pre-Disaster Mitigation program, and to earn points for the National Flood Insurance Program's Community Rating System (CRS), which could lower flood insurance premiums in CRS communities.

1.2 Background and Scope

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

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This plan documents Fresno County's hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in Fresno County.

The Fresno County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that geographically covers everything within Fresno County's jurisdictional boundaries (hereinafter

referred to as the planning area). Unincorporated Fresno County and the following communities participated in the planning process:

- City of Clovis
- City of Coalinga
- City of Fresno
- City of Huron
- City of Kerman
- City of Kingsburg
- City of Mendota
- City of Sanger
- City of Selma
- Fresno Metropolitan Flood Control District
- Lower San Joaquin Levee District
- Sierra Resource Conservation District/Highway 168 Fire Safe Council

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

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Fresno County planning area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and becoming eligible for mitigation-related federal funding.

1.3 Plan Organization

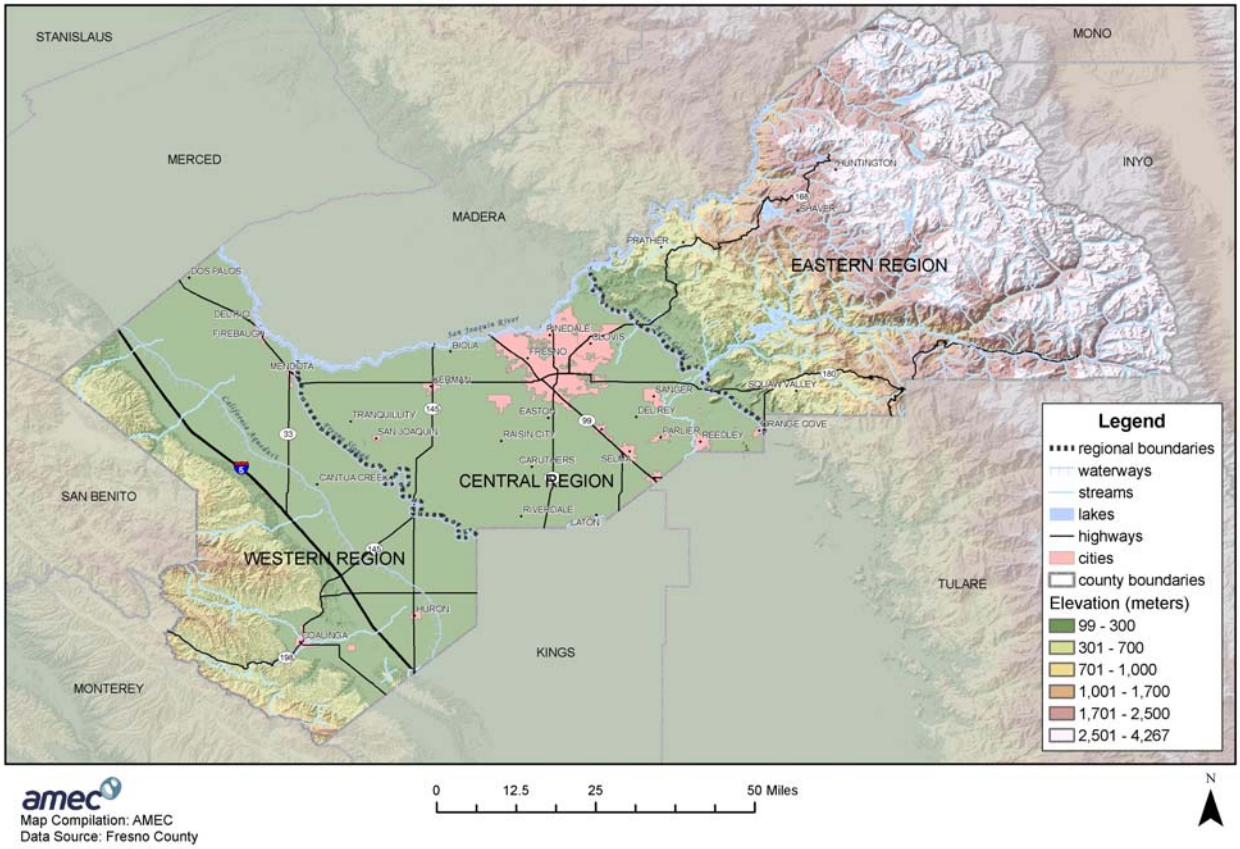
The Fresno County Multi-Hazard Mitigation Plan is organized as follows:

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

2 COMMUNITY PROFILE

Fresno County is illustrated in Figure 2.1.

Figure 2.1. Fresno County



2.1 History

When the first European settlers came to the Fresno area in the early 1800s, the Yokuts tribe was living on the valley floor and in the foothills along the San Joaquin and the Kings Rivers. The Monache tribe lived further up the rivers. After the initial Spanish explorers came, others began to arrive, including trappers, hunters, and miners. Kit Carson, the famous mountain man, explored the area during the 1840s. Named for the Spanish word for ash or ash tree, Fresno County was created in 1856, yet its present day boundaries were not established until 1909.

The County was a part of the mining boom of California from its early years until the mid 1860s. Once gold fever subsided, the County turned to livestock and general farming, which received its impetus from the arrival of the Central Pacific Railroad in 1872. As more water became available, the County shifted from general farming to orchards and vineyards.

2.2 Geography and Climate

California's 10th largest county, Fresno County covers an area of over 6,000 square miles in central California. It is approximately 200 miles north-northwest of Los Angeles and approximately 160 miles southeast of San Francisco.

The County is located near the center of California's San Joaquin Valley and is part of the Great Central Valley, one of the state's distinct physical regions. The County's topography is characterized by broad, flat valley floors that generally slope from southeast to northwest; foothills and moderately high mountains (Coast Ranges) in the west; and foothills and high mountains (Sierra Nevada) in the east. Approximately 55 percent of the County is mountainous, and 45 percent is valley land. Elevations range from 100 to 400 feet on the valley floor to 4,000 feet in the Coast Ranges and more than 14,000 feet in the Sierra Nevada. There are two major rivers in Fresno County, both which originate in the Sierra Nevada: the San Joaquin and Kings rivers.

The climate varies among the County's three regions. Summers are long, hot, and dry in the valley; moderate to hot in the Coast Ranges; and relatively cool in the high elevations of the Sierra Nevada. There is little precipitation in the County during the summer. Winters in the valley and Coast Ranges are short and mild with light rain in the valley and moderate rainfall in the Coast Ranges. In the Sierra Nevada, winters vary from short and mild with frequent rain and some snow to moderately severe with frequent snow. Most of the seasonal precipitation occurs between October and April. More specific information about Fresno County's climate can be found in Chapter 4 Risk Assessment.

2.3 Economy

Fresno County is the richest and most productive agricultural county in America. Agriculture is Fresno County's primary industry and is a driving force in the County's economy. In 2006, gross agricultural production exceeded $4.8 billion, a 4.41 percent increase over 2005's production value. The 2006 Fresno County Agricultural Crop and Livestock Report states that while the agricultural economy is improving, the industry struggles with labor shortages during peak harvest periods, increased production expenses, and hazard-related losses (losses from frost, hail, rain, and excessive heat were almost $115 billion in 2006). The 10 leading crops, in order of dollar value, were grapes, cotton, almonds, tomatoes, turkeys, cattle, milk, plums, oranges, peaches, and nectarines.

The most comprehensive economic data available for Fresno County comes from the U.S. Census Bureau by way of the American Community Survey. Select estimates of economic characteristics for Fresno County are shown in Table 2.1.

Table 2.1. Fresno County's Economic Characteristics, 2006

Characteristic	Fresno County
Families below Poverty Level	16.3%
All People below Poverty Level	20.9%
Median Family Income	$47,640
Median Household Income	$42,732
Per Capita Income	$18,791
Population in Labor Force	406,053
Population Employed*	366,707
Unemployment	8%

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/
*Excludes armed forces

More recent data from the California Employment Development Department indicates that, in 2007, there were 428,000 people in the Fresno County labor force. Of these, 391,200 were employed; 36,800 were not. The unemployment rate was 8.6 percent. Areas with seasonal economies, such as the County's agriculture industry, tend to have higher unemployment.

Table 2.2 illustrates the breakdown of employment by industry in Fresno County in 2006, and Table 2.3 lists the County's major employers.

Table 2.2. Fresno County's Employment by Industry, 2006

Industry	# Employed	% Employed
Educational Services, and Health Care, and Social Assistance	75,836	20.7
Retail Trade	45,121	12.3
Manufacturing	33,980	9.3
Agriculture, Forestry, Fishing and Hunting, and Mining	30,046	8.2
Professional, Scientific, and Management, and Administrative and Waste Management Services	29,434	8.0
Construction	29,246	8.0
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	26,374	7.2
Finance and Insurance, and Real Estate and Rental and Leasing	20,979	5.7
Public Administration	19,356	5.3
Wholesale Trade	18,567	5.1
Transportation and Warehousing, and Utilities	16,718	4.6
Other Services, Except Public Administration	15,006	4.1
Information	6,044	1.6
Totals	**366,707**	**100.0**

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/

Table 2.3. Major Employers in Fresno County

Employer	Products and Services	# of Employees
Fresno Unified School District	Education	7,418
County of Fresno	Government	7,050
Community Medical Center	Healthcare	4,360
City of Fresno	Government	3,610
Clovis Unified School District	Education	3,221
Foster Farms	Food Processing, Poultry	2,500
Saint Agnes Medical Center	Healthcare	2,383
California State University, Fresno	Education	1,993
Pelco	Video Security Systems	1,900
Gottschalks	Retail	1,005
Zacky Farms	Food Processing, Poultry	997
Harris Ranch Beef	Food Processing, Beef	650
The Fresno Bee	Newspaper	603
The Gap, Pacific Distribution Center	Distribution, Apparel	525
Sun-Maid Growers of California	Food Processing, Raisins	600
Sunrise Medical	Manufacturing, Wheelchairs	450
Guardian Industries	Manufacturing, Glass	280
Grundfos Pumps	Manufacturing, Water Pumps	275
Wawona Frozen Foods	Food Processing, Fruit	175

Source: Economic Development Corporation Fresno County, www.fresnoedc.com/

2.4 Population

Fresno County is one of the largest, fastest growing, and most diverse counties in California. It is the state's 10th most populous county with an estimated 917,515 residents (2007), according to the California Department of Finance. Fresno County added more than 17,000 residents from 2006 to 2007, making it the 9th fastest growing county in California (numerically).

Select demographic and social characteristics for Fresno County from the U.S. Census Bureau's 2006 American Community Survey are shown in Table 2.4.

Table 2.4. Fresno County's Demographic and Social Characteristics, 2006*

Characteristic	Fresno County
Gender/Age	
Male	50.3%
Female	49.7%
Median Age	30
Under 5 Years	8.7%
65 Years and Over	9.6%
Race/Ethnicity**	
White	65.1%
Some Other Race	19.3%
Asian	9.2%
Black or African American	5.1%
American Indian/Alaska Native	1.2%
Hispanic or Latino (Any Race)	47.6%
Education	
High School Graduate or Higher	72.8%

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/
*Based on a 2006 estimated population of 891,756
**Of the 96.2% reporting one race

More demographic information and information on growth can be found in Section 4.3.1 Fresno County Vulnerability and Assets at Risk.

3 PLANNING PROCESS

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

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

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

Fresno County recognized the need and importance of a local hazard mitigation plan and initiated its development. After receiving a grant from the Federal Emergency Management Agency (FEMA), which served as the primary funding source for this plan, the County contracted with AMEC Earth and Environmental (AMEC) to facilitate and develop the plan. AMEC's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA),
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance,
- Support objectives under the National Flood Insurance Program's Community Rating System and the Flood Mitigation Assistance program,
- Facilitate the entire planning process,
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process,
- Produce the draft and final plan documents, and
- Coordinate the California Governor's Office of Emergency Services and FEMA Region IX plan reviews.

3.1 Local Government Participation

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC
- Detail areas within the planning area where the risk differs from that facing the entire area
- Identify potential mitigation actions
- Formally adopt the plan

For the Fresno County planning area's HMPC, "participation" meant the following:

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

The County and all jurisdictions with annexes to this plan and seeking FEMA approval met all of these participation requirements. In most cases one or more representatives for each jurisdiction attended the multi-jurisdictional meetings described in Table 3.2, Schedule of Planning Meetings, and also brought together a local planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on annex drafts. Appendix E provides additional information and documentation of the planning process.

In addition, at the beginning of the planning process, each participating jurisdiction provided the county with an executed resolution indicating their intent to participate in the planning process and to prepare an annex to the Fresno County LHMP. A sample resolution is included in the Jurisdictional Annex Information Packet included in Appendix E.

3.2 The 10-Step Planning Process

AMEC established the planning process for the Fresno County Multi-Hazard Mitigation Plan using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

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

Into this process, AMEC integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program, Pre-Disaster Mitigation program, Community Rating System, Flood Mitigation Assistance Program, Severe Repetitive Loss program, and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 3.1 shows how the modified 10-step process fits into FEMA's four-phase process.

Table 3.1. Mitigation Planning Processes Used to Develop the Fresno County Multi-Hazard Mitigation Plan

DMA Process	Modified CRS Process
1) Organize Resources	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i)	4) Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
3) Develop the Mitigation Plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

3.2.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With Fresno County's commitment to participate in the DMA planning process, AMEC worked with the County's assistant emergency services coordinator to establish the framework and organization for development of the plan. Organizational efforts were initiated with a series of public outreach/multi-jurisdictional meetings to inform and educate the public and jurisdictions within the County of the purpose and need for a countywide hazard mitigation plan. Three separate outreach meetings were held on June 12 and 13, 2007, as detailed in Table 3.2. Email invitations were sent to all city managers (15); all city OES coordinators (15); all school districts (45); and all special districts in the County (42). The list of initial invites is included in Appendix

E detailing the Planning Process. The HMPC was established as a result of these meetings. The HMPC, which included key County, City, and other local government and stakeholder representatives, developed the plan with leadership from the County's assistant emergency services coordinator and facilitation by AMEC. The following participated on the HMPC:

Fresno County

- Agriculture Department
- Assessor-Recorder Department
- Auditor-Controller/Treasurer-Tax Collector Department
- Public Health Department
- Development Services
- Environmental Health and Safety
- Fresno County Fire Protection District (CAL FIRE)
- General Services Department
- Information Technology Services Department
- Library
- Office of Emergency Services
- Public Works and Planning Department
- Roads
- Sheriff's Department

Participating Jurisdictions

- City of Clovis
  - Fire
- City of Coalinga
  - Fire
- City of Fresno
  - Office of Emergency Services
- City of Huron
  - Police
- City of Kerman
  - Police
  - Public Works
- City of Kingsburg
  - Fire
- City of Mendota
- City of Sanger
  - Fire
- City of San Joaquin
- City of Selma

- Fresno Metropolitan Flood Control District
- Lower San Joaquin Levee District
- Sierra Resource Conservation District/Highway 168 Fire Safe Council

Other Government and Stakeholder Representatives:

- California Department of Water Resources
- California Department of Forestry and Fire (CAL FIRE: Fresno County)
- Fresno Irrigation District
- Fresno Mosquito District
- Oak to Timberline Fire Safe Council
- San Joaquin Valley Resource Conservation Development
- U.S. Army Corps of Engineers Pine Flat
- U.S. Bureau of Reclamation

A list of the primary HMPC representatives for each jurisdiction and a more detailed list of participating HMPC members are included in Appendix E. This second list details all HMPC members that attended one or more HMPC meetings detailed in Table 3.2. Each jurisdiction also utilized the support of many other support staff in order to collect and provide requested data and conduct timely reviews of the draft documents. Note that the above list of HMPC members also includes several other government and stakeholder representatives that contributed to the planning process. Specific participants from these other agencies are also identified in Appendix E.

The planning process officially began with a kick-off meeting on June 27, 2007. The meeting covered the scope of work and an introduction to the DMA requirements. Participants were provided with a Data Collection Guide, which included worksheets to facilitate the collection of information necessary to support development of the plan. Using FEMA guidance, AMEC designed these worksheets to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. A copy of AMEC's Data Collection Guide for this project is included in Appendix E. The County and each jurisdiction seeking FEMA approval of their plan completed and returned the worksheets in either the data collection guide, or the Jurisdictional Annex Template (described further below) to AMEC for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, telephone conversations, and a project-based website. Draft documents were posted on this website so that the HMPC members could easily access and review them. The HMPC met six times during the planning period (June 27, 2007-May 13, 2008). The purposes of these meetings are described in Table 3.2.

Table 3.2. Schedule of Planning Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
Public/ Jurisdictional	Three multi-jurisdictional outreach/public education meetings: introduction to DMA and the planning process	June 12 and 13, 2007	Kerman/ Clovis/Fresno
HMPC #1	Kick-off meeting: introduction to DMA, the planning process, and hazard identification	June 27, 2007	Clovis
HMPC #2	Hazard identification overview and work session	September 26, 2007	Clovis
Jurisdictional Meetings	Eight jurisdictional kick-off meetings covering risk assessment/DMA process overview	October 1-4, 2007	Clovis, Fresno, Huron, Mendota, Shaver Lake, Kingsburg
HMPC #3	Risk assessment overview and work session	February 13, 2008	Clovis
HMPC #4	Development of mitigation goals and objectives	March 4, 2008	Clovis
HMPC #5	Development and prioritization of mitigation recommendations	March 5, 2008	Clovis
HMPC #6	Review of final HMPC, jurisdictional and public comments and input to plan	May 13, 2008	Clovis

In addition to the six HMPC meetings, eight additional coordination/working meetings were held with other participating jurisdictions as detailed above in Table 3.2. A template for the jurisdictional annexes was distributed at these meetings. Similar to the Data Collection Guide described above, this template included blank tables and other directional information to facilitate the collection of key jurisdictional information for the plan. A copy of the Jurisdictional Annex Template is included in Appendix E, contained within the Jurisdictional Annex Information Packet. The project website was used to coordinate the population of the templates. Each jurisdiction with an annex in this plan provided data as requested in the annex template and reviewed and commented on the draft annexes throughout the development of the plan. Note, that much of the information and tables in the Annex Template are similar to those detailed in the Data Collection Guide described above, but were developed in slightly different formats to best facilitate the collection of data from all participating jurisdictions.

Agendas for each of the meetings and lists of attendees are on file with the Fresno County Office of Emergency Services and participating jurisdictions.

Planning Step 2: Involve the Public

Early discussions with the Fresno County Office of Emergency Services (OES) established the initial plan for public involvement. As previously described, public outreach began early in the process with three meetings to inform the public of the purpose of the DMA and the hazard mitigation planning process for the Fresno County planning area. At the kick-off meeting, the

HMPC discussed additional options for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities included press releases, website postings, newsletter articles, additional public meetings, and the collection of public comments on the draft plan. The Fresno County Multi-Hazard Mitigation Plan was also discussed on the local edition of National Public Radio prior to the second set of public meetings. Public meetings were held during the draft-plan development and prior to finalizing the plan as further described in Table 3.3. Where appropriate, stakeholder and public comments were incorporated into the final plan, including the sections that address mitigation goals and strategies. All press releases and website postings are on file with the Fresno County Office of Emergency Services (see Figure 3.1 for an example of the press releases). The plan is available online on the Fresno County OES website. The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this plan.

Table 3.3. Schedule of Public Meetings

Meeting Topic	Meeting Date	Meeting Locations
Three multi-jurisdictional outreach/public education meetings: introduction to DMA and the planning process	June 12 and 13, 2007	Kerman/ Clovis/Fresno
Two public meetings: risk assessment overview and update on planning process	March 4 and 5, 2008	Clovis/Fresno
Final public meeting: plan overview and public comments	May 12, 2008	Clovis/Fresno

Figure 3.1. Example of Press Releases Used to Involve the Public

County of Fresno
DEPARTMENT OF PUBLIC HEALTH
EDWARD L. MORENO, M.D., M.P.H.
DIRECTOR-HEALTH OFFICER

NEWS RELEASE

FOR IMMEDIATE RELEASE:
April 22, 2008

Contact: Wayne Fox
(559) 445-3391

Fresno County Residents Are Invited to Hazard Plan Meeting

Fresno County has completed a draft Multi-Jurisdictional Local Hazard Mitigation Plan which addresses potential natural and man-made hazards before they occur, and to maintain eligibility for Federal Emergency Management Agency (FEMA) mitigation grants. The plan was developed by a Hazard Mitigation Planning Committee with participation from county and city departments, county districts, state and federal agencies.

The plan addresses a comprehensive list of hazards, such as, earthquake, flooding, extreme heat, drought, and exposures to hazardous materials. The plan also assesses the likely impacts of these hazards to residents of Fresno County as well as sets goals and prioritizes projects to reduce those impacts on people and property.

Your comments and recommendations can be shared at an upcoming meeting where the draft will be presented with a description of the plan, plan findings, and potential projects. The LHMP with the public comments included, will eventually be presented to the Fresno County Board of Supervisors, governing bodies of each participating jurisdiction, California Office of Emergency Services, and FEMA for review and approval.

The draft plan may be reviewed online at http://im.na.amec.com/FresnoDMA/. Select the "Public Log On" button and then select the documents tab. Once inside the documents folder, select the "LHMP Draft Plan" document. No password or user name is needed.

The meeting is scheduled as follows:

Date: **May 12th, 2008**
Time: **5:00 pm**
Location: **Woodward Park Library**
944 East Perrin Avenue
Fresno, CA

For more information, contact Wayne Fox, Fresno County Office of Emergency Services, at (559) 445-3391, wafox@co.fresno.ca.us

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Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, their landowner status in the County, and/or their interest as a neighboring jurisdiction, representatives from the following agencies were invited to participate on the HMPC:

- California Department of Forestry and Fire Protection (CAL FIRE: Fresno County)*
- California Department of Water Resources*
- California Governor's Office of Emergency Services
- FEMA Region IX

- Fresno Irrigation District*
- Fresno/Madera Red Cross
- Fresno Metropolitan Flood Control District*
- Fresno Mosquito District*
- Highway 168 Fire Safe Council*
- Lower San Joaquin Levee District*
- Madera County Office of Emergency Services
- Oak to Timberline Fire Safe Council*
- San Joaquin Valley Resource Conservation Development*
- Sierra Resource Conservation District*
- Table Mountain Rancheria
- Upper San Joaquin River Watershed Program
- U.S. Army Corps of Engineers Pine Flat*
- U.S. Bureau of Reclamation*
- Westlands Water District*

* Participated on HMPC

The HMPC also used technical data, reports, and studies from the following agencies and groups:

- Bureau of Land Management
- California Department of Forestry and Fire Protection*
- California Department of Parks and Recreation Office of Historic Preservation
- California Geological Survey
- Fresno Bee
- Fresno County Agricultural Department*
- Fresno County Health Department*
- Fresno County Information Technology/Geographic Information Systems Department*
- Fresno County Land Use Department
- Fresno County Public Works and Planning Department*
- National Oceanic and Atmospheric Administration National Climatic Data Center
- National Register of Historic Places
- Natural Resource Conservation Service (formerly the Soil Conservation Service)
- National Weather Service
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- Western Regional Climate Center

* Participated on HMPC

Several opportunities were provided for the above groups to participate in the planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the HMPC. These groups were also invited to participate through the public outreach process which included three sets of public meetings held throughout the year long process as previously described. The initial series of three multi-jurisdictional outreach/public education meetings was developed to provide an overview of the Disaster Mitigation Act of 2000 and the LHMP development process in order to get as many active participants involved in the planning process. As noted by the asterisks next to the above names, many of these groups found it beneficial to participate on the HMPC. Specific participants from these groups are detailed in Appendix E. Others assisted in the process by providing data directly as requested in the Data Collection Guide or through data contained on their websites. Further as part of the both HMPC and public outreach processes, all groups were invited to review and comment on the plan prior to submittal to CA-OES and FEMA.

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Fresno County uses a variety of comprehensive planning mechanisms, such as general plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- Fresno County General Plan and Background Report
- Fresno County Operational Area Master Emergency Services Plan(s)
- Fresno County Flood Insurance Study
- Highway 168, Community Wildfire Protection Plan
- State of California Multi-Hazard Mitigation Plan

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

3.2.2 Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

AMEC led the HMPC in an exhaustive research effort to identify and document all the hazards that have, or could, impact the planning area. Data collection worksheets and jurisdictional annex templates were developed and used in this effort to aid in determining hazards and vulnerabilities and where risk varies across the planning area. Geographic information systems (GIS) were used

to display, analyze, and quantify hazards and vulnerabilities. The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk and vulnerability from hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. AMEC produced two drafts during these planning steps for the HMPC to review in advance of the mitigation planning goals and strategy meetings. The first draft contained the hazard identification. The second draft included the entire risk assessment, which contained the hazard identification, the vulnerability assessment, and the capability assessment. A more detailed description of the risk assessment process and the results are included in Chapter 4 Risk Assessment.

3.2.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

AMEC facilitated brainstorming and discussion sessions with the HMPC that described the purpose and the process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and strategy is in Appendix C: Mitigation Categories, Alternatives, and Selection Criteria.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, AMEC produced a complete first draft of the plan. This complete draft was posted for HMPC review and comment on the project website. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. AMEC integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the California Office of Emergency Services and FEMA Region IX to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.2.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

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

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

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

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

4 RISK ASSESSMENT

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

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

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

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

1) Identify hazards
2) Profile hazard events
3) Inventory assets
4) Estimate losses

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

- **Section 4.1 Hazard Identification: Natural Hazards** identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2 Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 4.3 Vulnerability Assessment** assesses the County's total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends.
- **Section 4.4 Human-Caused Hazards** identifies the areas most susceptible to potential human-caused hazard events by evaluating which populations and facilities are most vulnerable to such hazards.
- **Section 4.5 Capability Assessment** inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

Note: Neither the examination of human-caused hazards nor the capability assessment are required by FEMA.

This risk assessment covers the entire geographical extent of Fresno County. Since this plan is a multi-jurisdictional plan, the HMPC was required to evaluate how the hazards and risks vary from jurisdiction to jurisdiction. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating jurisdictions. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Fresno County planning area.

4.1 Hazard Identification: Natural Hazards

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

The Fresno County HMPC conducted a hazard identification study to determine the hazards that threaten the planning area.

4.1.1 Methodology and Results

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect Fresno County. Hazards data from the California Governor's Office of Emergency Services (CA-OES), FEMA, the National Oceanic and Atmospheric Administration, and many other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries and property and economic damage. The natural hazards evaluated as part of this plan include those that occurred in the past or have the potential to cause significant human and/or monetary losses in the future. Only the more significant (or priority) hazards have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment.

In alphabetical order, the natural hazards identified and investigated for the Fresno County Multi-Hazard Mitigation Plan include:

- Agricultural Hazards
- Avalanche
- Dam Failure
- Drought
- Earthquake
- Flood
- Human Health Hazards
  - Epidemic/Pandemic
  - West Nile Virus

- Landslide
- Severe Weather
  - Extreme Temperatures
    - Extreme Cold/Freeze
    - Extreme Heat
  - Fog
  - Heavy Rain/Thunderstorm/Hail/Lightning/Wind
  - Snow
  - Tornado
- Soil Hazards
  - Erosion
  - Expansive Soils
  - Land Subsidence
- Volcano
- Wildfire

The HMPC eliminated the natural hazards listed below from further consideration in this risk assessment because they occur rarely or not at all in Fresno County.

- Coastal Erosion
- Coastal Storm
- Hurricane
- Tsunami

4.1.2 Disaster Declaration History

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

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Fresno is among the many counties in California that are susceptible to disaster. Details on federal and state disaster declarations were obtained by the HMPC, FEMA, and CA-OES and compiled in chronological order in Table 4.1. A review of state and federal declared disasters indicates that Fresno County received 22 state declarations between 1950 and July 2007, 14 of which also received federal disaster declarations. Of the 22 state declarations, 15 were associated with severe winter storms, heavy rains, or flooding; 4 were for freeze; 1 was for drought; 1 was for earthquake; and 1 was for wildfire. USDA declarations for the planning area are discussed in Section 4.2.7 Agricultural Hazards.

This disaster history (combined federal and state) suggests that Fresno County experiences a major event worthy of a disaster declaration every 2.6 years. The County has a 38.9 percent chance of receiving a disaster declaration in any given year. With the exception of the declarations for earthquake and wildfire, every declaration resulted directly or indirectly from severe weather. Similarly, most disaster-related injuries to people and damage to property and crops resulted from severe weather.

Table 4.1. Fresno County's State and Federal Disaster Declarations, 1950-2007

Hazard Type	Disaster #	Year	State Declaration	Federal Declaration	Location	Damage*
Floods	CDO 50-01	1950	11/21/50	--	Fresno County (statewide)	9 deaths; $32,183,000
Floods	DR-47	1955	12/22/55	12/23/55	Fresno County (statewide)	74 deaths; $200,000,000
Unseasonal and Heavy Rainfall	--	1957	5/20/57	--	Fresno County (other cherry producing areas)	2 injuries; $6,000,000
Storm & Flood Damage	--	1958	4/2/58	4/4/58	Fresno County (statewide)	13 deaths $24,000,000
Unseasonal and Heavy Rainfall	--	1959	9/17/59	--	Fresno County (other Tokay grape producing areas)	2 deaths $100,000
Abnormally Heavy and Continuous Rainfall	--	1963	2/14/64	--	Fresno County (and 50 other counties)	--
1969 Storms	OEP 253-DR-CA	1969	1/25/69	1/26/69	Fresno County (and 39 other counties)	47 deaths 161 injuries $300,000,000

Hazard Type	Disaster #	Year	State Declaration	Federal Declaration	Location	Damage*
Freeze and Severe Weather Conditions	--	1972	4/17/72	--	Fresno County (and 16 other counties)	$111,517,260
Drought	--	1976	2/9/76	--	Fresno County (and 30 other counties)	$2,664,000,000
Rains Causing Agricultural Losses	--	1982	10/26/82	--	Fresno County (and 10 other counties)	$345,195,974
Winter Storms	DR-682	1982/ 1983	3/15/83	2/9/83	Fresno County (and 43 other counties)	$523,617,032
Coalinga Earthquake	DR-682	1983	5/02/83	5/3/83	Fresno County	No deaths 47 injuries $31,076,300
Storms	DR-758	1986	2/26/86	2/18/86	Fresno County (and 38 other counties)	13 deaths 67 injuries $407,538,904
Wildland Fires	--	1987	9/03/87	--	Fresno County (and 23 other counties)	3 deaths 76 injuries $18,000,000
Freeze	DR-894	1990	1/11/91	2/11/91	Fresno County (and 32 other counties)	$856,329,675
Late Winter Storms	DR-979	1992	1/21/93	1/15/93	Fresno County (and 23 other counties)	20 deaths 10 injuries $600,000,000
Severe Winter Storms	DR-1044	1995	1/17/95	1/13/95	Fresno County (and 44 other counties)	11 deaths $741,400,000
Late Winter Storms	DR-1046	1995	--	1/10/95	Fresno County (and all other counties except Del Norte)	17 deaths $1,100,000,000
January 1997 Floods	DR-1155	1997	1/5/97	1/4/97	Fresno County (and 46 other counties)	8 deaths $1,800,000,000
Severe Winter Storms and Flooding	DR-1203	1998	--	2/9/98	Fresno County (and 39 other counties)	17 deaths $550,000,000
Freeze	DR-1267	1998-1999	--	2/7/99	Fresno County (and 7 other counties)	--
Severe Freeze	DR-1689	2007	--	3/14/07	Fresno County (and 11 other counties)	$1,400,000,000

Source: California Governor's Office of Emergency Services, www.oes.ca.gov/

*Damage amount and deaths and injuries reflect totals for all impacted counties

4.2 Hazard Profiles

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

The hazards identified in Section 4.1 Hazard Identification: Natural Hazards are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources, such as those mentioned in Section 4.1. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified, where possible, for each of the priority hazards.

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Fresno County planning area. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or secondary effects.
- **Past Occurrences**—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near the Fresno County planning area is also included here. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.
- **Frequency/Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of an event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:
  - **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year.
  - **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
  - **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
  - **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

Section 4.2.21 Natural Hazards Summary provides an initial assessment of the profiles and assigns a level of significance to each hazard. Those hazards determined to be of high significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Those hazards that occur infrequently or have little or no impact on

the planning area were determined to be of low significance. Significance was determined based on the hazard profile, focusing on key criteria such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damage. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the planning area; thus enabling the County to focus resources where they are most needed.

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Identifying Hazards. The severe weather hazards are discussed first because it is the secondary hazards generated by severe weather (e.g., flood and wildfire) that can result in the most significant losses. The other hazards follow alphabetically.

4.2.1 Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in the Fresno County planning area as localized thunderstorms that bring heavy rain, hail, lightning, and strong winds.

The National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 275 severe weather events that occurred in Fresno County between January 1, 1950, and March 31, 2007. Table 4.2 summarizes these events.

Table 4.2. NCDC Hazard Event Reports for Fresno County, 1950-2007*

Type	# of Events	Property Loss ($)	Crop Loss ($)	Deaths	Injuries
Dense Fog	2	505,000	0	3	32
Dry Microbursts	2	10,000	0	0	0
Flash Floods	8	50,000	0	0	0
Floods	4	1,400,000	0	0	0
Funnel Clouds	29	0	0	0	0
Gusty Wind	1	0	10,000	0	0
Hail	62	521,000	131,985,000		4
Heavy Rain	47	2,016,000	55,000,000	0	0
High Winds	1	5,000	0	0	0
Lightning	30	1,563,000	300,000	0	1
Rain	1	0	0	0	0
Severe Thunderstorms/Wind	2	100,000	26,000,000	0	0
Severe Thunderstorms	1	500,000	17,000,000	0	0
Small Hail	5	40,000	10,200,000	0	4
Thunderstorm	3	0	0	0	0
Thunderstorm/Wind	19	866,000	10,000	1	15
Thunderstorm/Wind/Hail	1	0	0	0	0
Tornado: F0	17	298,000	26,000	0	0
Tornado: F1	6	2,628,000	0	0	3
Tornado: F2	1	3,000	0	0	0
Urban/Small Stream Flood	20	115,000	50,000	0	0
Wildfires	13	7,785,000	0	0	0
Totals	**275**	**18,405,000**	**240,581,000**	**4**	**59**

Source: National Climatic Data Center Storm Events Database, www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms
*Losses reflect totals for all impacted areas

The HMPC supplemented NCDC data with data from SHELDUS (Spatial Hazard Events and Losses Database for the United States). SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-2005. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCDC). From 1960 to 1995, only those events that generated more than $50,000 in damage were included in SHELDUS. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). From 1995 to 2005, all events that were reported by the NCDC with a specific dollar amount are included in SHELDUS.

SHELDUS contains information on 201 severe weather events that occurred in Fresno County between 1960 and 2005. Table 4.3 summarizes these events.

Table 4.3. SHELDUS Hazard Event Reports for Fresno County, 1960-2005*

Type	# of Events	Property Loss ($)	Crop Loss ($)	Deaths	Injuries
Drought	1	86,207	8,620,690	.05	0
Earthquake	1	50,000	0	2	32
Flooding	13	33,296,405	189,605,958	23.38	226.14
Flooding, Severe Storm, Thunderstorm	2	66,250	13,000,000	0	0
Flooding, Wind	1	0	11,241,379	0	0
Flooding, Wind, Winter Weather	1	0	21,000,000	0	0
Flooding, Winter Weather	2	96,166,667	5,000,000	0.5	0
Fog	16	1,102,500	0	6.17	98.86
Hail	17	2,437,084	86,454,282	0.78	5.17
Hail, Severe Storm/ Thunderstorm	1	50,000	0	0	0
Hail, Wind	1	5,000	0	0	0
Heat	4	1,316	7,700,000	0.18	0
Landslide	2	0	22,100,000	0	0
Lightning	8	169,404	28,676	1.06	1.33
Lightning, Wind, Winter Weather	1	20,000	0	0	0
Severe Storm, Thunderstorm	23	6,883,517	2,492,779	2.48	2.32
Severe Storm, Thunderstorm, Wind	21	1,103,636	58,892,468	0.02	20.1
Severe Storm, Thunderstorm, Winter Weather	1	5,000	0	0	0
Tornado	9	2,536,086	20,862	0.2	0
Wildfire	9	1,531,730	438	0.16	0.34
Wind	41	38,736,053	188,412	1.91	27.82
Winter Weather	26	73,000	26,311,400	0	3.86
Totals	**201**	**184,372,355**	**452,767,760**	**32.89**	**328.08**

Source: SHELDUS, Hazards Research Lab, University of South Carolina, www.sheldus.org/
*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 Fresno County

The NCDC and SHELDUS tables above summarize severe weather events that occurred in Fresno County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often different information specific to the same events. While the HMPC recognizes these inconsistencies, they see the value this data provides in depicting the County's "big picture" hazard environment.

As previously mentioned, all of Fresno County's state and federal disaster declarations have been a result of severe weather. For this plan, severe weather is broken down as follows:

- Extreme Temperatures (Extreme Cold/Freeze and Extreme Heat)
- Fog
- Heavy Rain/Thunderstorm/Hail/Lightning/Wind
- Snow
- Tornado

Due to size of the County and changes in elevation and climate, weather conditions can vary greatly across the County. The profiles that follow provide information, where possible, from three weather stations in different parts of the County: Huntington Lake (elevation: 7,000 feet) in east Fresno County, Fresno WSO AP (elevation: 33 feet) in central Fresno County, and Coalinga (elevation: 66 feet), in west Fresno County.

4.2.2 Severe Weather: Extreme Temperatures

Hazard/Problem Description

Extreme temperature events, both cold and hot, can have severe impacts on human health and mortality, natural ecosystems, and agriculture and other economic sectors.

Extreme Cold/Freeze

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures can cause significant damage to the agricultural industry. The effects of freezing temperatures on agriculture in Fresno County are discussed further in Section 4.2.7 Agricultural Hazards.

In 2001, the National Weather Service implemented an updated Wind Chill Temperature index (see Figure 4.1). This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.1. National Weather Service Wind Chill Chart

Wind (mph)	Temperature (°F)																	
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: National Weather Service Forecast Office, San Joaquin Valley/Hanford, California, www.wrh.noaa.gov/hnx/

Extreme Heat

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the NWS, among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died. Extreme heat can also affect the agricultural industry. Extreme heat, as it affects agriculture in Fresno County, is discussed further in the section on agricultural hazards.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. The elderly, small children, chronic invalids, those on certain medications or drugs, and people with weight and alcohol problems are particularly susceptible to heat reactions.

According to the Fresno County Heat Emergency Contingency Plan, the average high and low temperatures for Fresno County in July are 98.6°F and 65.1°F, respectively. Temperatures that are 10 degrees above normal are considered excessive. The NWS has in place a system to initiate

alert procedures (advisories, watches, and warnings) when high temperatures are expected to have a significant impact on public safety. The expected severity of the heat determines which type of alert is issued. A common guideline for the issuance of excessive heat alerts in Fresno County is when the maximum daytime high is expected to equal or exceed 110°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days.

Fresno County begins to experience hot weather in May or June of each year, and the heat continues throughout the summer months. The Fresno County Heat Emergency Contingency Plan provides a two phase approach to mitigate and reduce the effects of extreme heat. Phase I calls for a heat awareness campaign to be initiated at the beginning of the heat season. Phase II calls for an operational area response to be activated once the County health officer declares a heat emergency. The following factors help the health officer determine if the threat to public health and safety is significant enough to declare a heat emergency:

- The NWS has issued an excessive heat watch or warning.
- Heat-related illnesses and deaths are above average.
- Heat-related animal deaths are above average.
- There are successive days when daytime temperatures exceed normal ranges, and nighttime temperatures do not drop low enough to allow for three-four hours of cooling (temperatures dropping below 80°F).
- The California Independent System Operator has issued a stage 3 electrical emergency.
- High heat is accompanied by electrical blackouts or rotating power outages.
- Two or more jurisdictions within the County have declared heat emergencies.
- The state has declared a heat emergency.

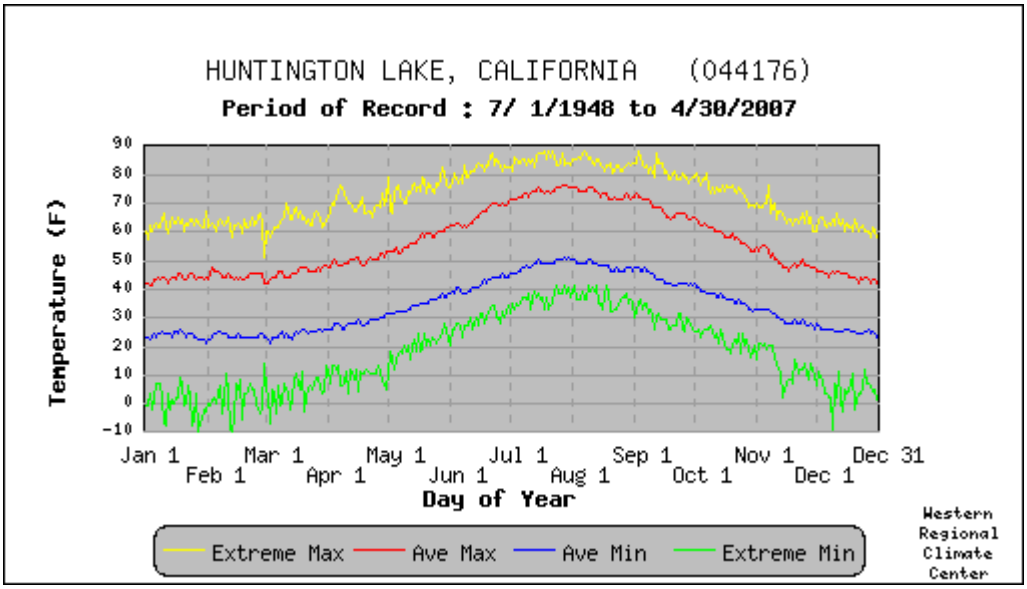
Past Occurrences

Information from the three representative weather stations introduced in Section 4.2.1 Severe Weather: General is summarized below and in Figures 4.2-4.4.

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2007)

In the eastern portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the mid 50s to the mid 70s. Monthly average minimum temperatures from November through April range from the low to high 20s. The highest recorded daily extreme was 88°F on September 3, 1955, August 7, 1981, and July 18, 1988. The lowest recorded daily extreme was -10°F on February 13, 1949, and January 27, 1957. In a typical year, maximum temperatures do not exceed 90°F and may be less than 32°F on 16.2 days, and minimum temperatures fall below 32°F on 169.3 days and below 0°F on .8 days.

Figure 4.2. Fresno County—East Daily Temperature Averages and Extremes

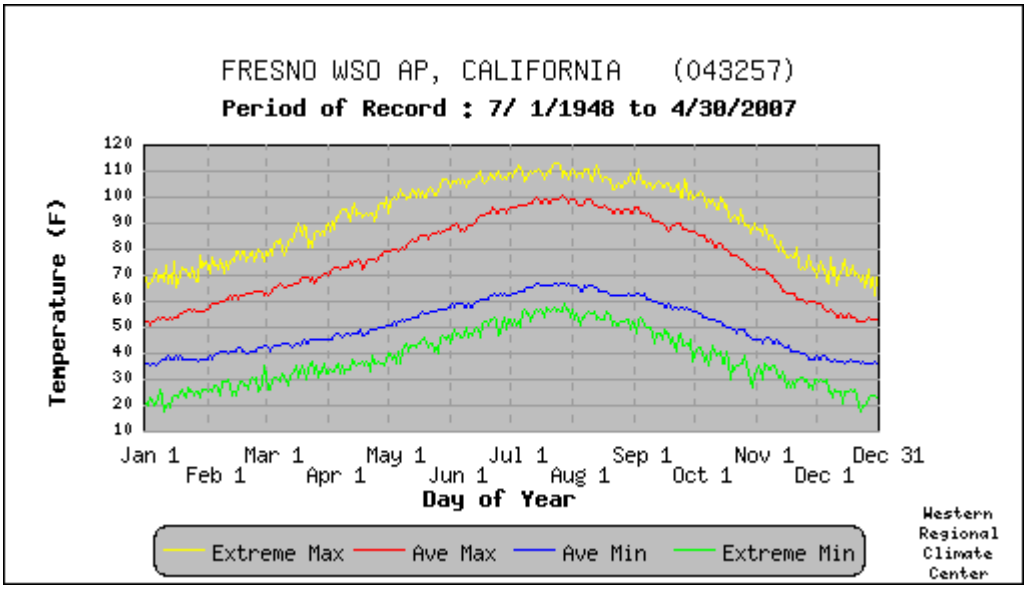


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2007)

In the central portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the high 70s to the high 90s. Monthly average minimum temperatures from November through April range from the high 30s to the high 40s. The highest recorded daily extreme was 113°F on July 23, 2006. The lowest recorded daily extreme was 18°F on January 10, 1949, and December 23, 1990. In a typical year, maximum temperatures exceed 90°F on 106.3 days and are less than 32°F on 21.3 days, and minimum temperatures fall below 32°F on 169.4 days.

Figure 4.3. Fresno County—Central Daily Temperature Averages and Extremes

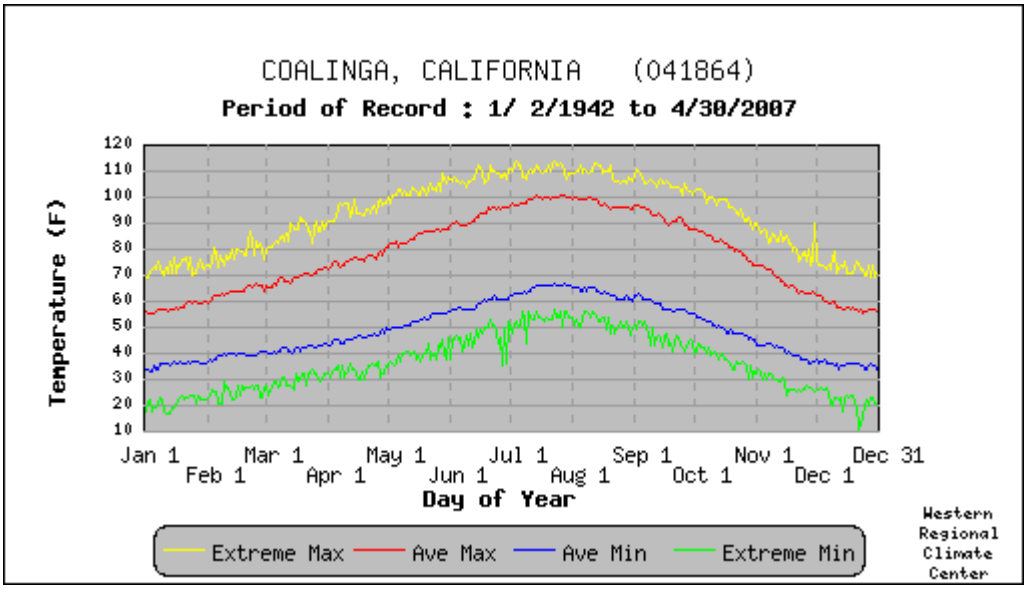


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2007)

In the western portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the low 80s to the high 90s. Monthly average minimum temperatures from November through April range from the mid 30s to the high 40s. The highest recorded daily extreme was 114°F on July 4, 1991. The lowest recorded daily extreme was 11°F on December 22, 1990. In a typical year, maximum temperatures exceed 90°F on 115.5 days and do not fall below 32°F, and minimum temperatures fall below 32°F on 32.8 days.

Figure 4.4. Fresno County—West Daily Temperature Averages and Extremes



Source: Western Regional Climate Center, www.wrcc.dri.edu/

The HMPC identified the following events related to extreme temperatures in the Fresno County planning area:

Events of Note

Extreme Cold/Freeze

- **1990**—This freeze event is on record as the most economically devastating freeze event to date due to the loss of production citrus trees, not just the loss of the fruit crop.
- **December 20-28, 1998**—Extreme low temperatures adversely affected agricultural crops in the County. Citrus crops were impacted the most, but winter vegetables were also damaged. Total crop damage was estimated at $74 million. The loss to crops also resulted in unemployment and loss of income to small towns and industry throughout the planning area. An estimated 14,000 or more agricultural workers were out of work. Estimated economic impacts to the community were $220 million. This freeze resulted in local, state, and federal declarations (2/9/99). The County also incurred $223,700 in damage to government facilities and roads. Statewide, $2.5 million was paid out in claims.
- **January 2007**—Freezing temperatures destroyed citrus crops and put a large number of people out of work. Within the agricultural citrus belts, temperatures ranged from 19-24°F during the morning. Damage to County facilities was estimated at $15,000. Crop damage was estimated at roughly $128 million. Residual effects from loss of sales and resulting unemployment were considered to be three times the cost of the crop damage ($383 million). Local, state, and federal disasters were declared. The state provided monies for mortgage and rental assistance. Federal and state donations to local food banks were increased.

Unemployment insurance benefits were also increased. Central and South Valley estimated combined property damage was $250,000, and agricultural damage was $710 million.

Extreme Heat

- **July 16-22, 2006**—The planning area experienced six days of triple digit temperatures. The state declared a heat emergency for Fresno County. Cooling centers were opened by the state and some local jurisdictions. 24 people died between July 14 and August 1. 16,500-25,000 dairy cattle died in the Central Valley, and up to 700,000 poultry died. Milk production was down 30 percent, with dairy losses estimated to exceed $80 million. Residual effects from loss of sales and resulting unemployment were considered to be three times the cost to the livestock industry. A local declaration was also declared to dispose of dead livestock at the County landfill. Federal/state disaster relief included $16 million for lost milk production. Federal loans were made available to farmers.
- **July 2007**—Extreme, prolonged heat caused a mass die-off of farm animals such as diary cattle and poultry. An estimated 50,000 turkeys, weighing up to 40 pounds each, died, which created a disposal issue. Zacky Farms was hit hardest, but other losses were incurred at various locations throughout the County. A local emergency was declared to legally dispose of these animals at the local landfill.

Likelihood of Future Occurrences

Highly Likely—Temperature extremes are likely to continue to occur annually in the Fresno County planning area.

4.2.3 Severe Weather: Fog

Hazard/Problem Description

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. For example, rain can cool and moisten the air near the surface until fog forms. A cloud-free, humid air mass at night can lead to fog formation, where land and water surfaces that have warmed up during the summer are still evaporating water into the atmosphere. This is called radiation fog. A warm moist air mass blowing over a cold surface also can cause fog to form, which is called advection fog.

The interior California valleys have a unique fog problem called the tule fogs. The tule fog is a radiation fog, which condenses when there is a high relative humidity, typically after a heavy rain, calm winds, and rapid cooling during the night. The longer nights during the winter months create this rapid ground cooling and results in a pronounced temperature inversion at a low altitude, creating a thick ground fog. Above the cold, foggy layer, the air is typically warm and dry. Once the fog has formed, turbulent air is necessary to break through the inversion. Daytime heating can also work to evaporate the fog in some areas. The tule fogs get their name from the

tule reeds, which grew around the swamps and deltas of the great Tulare Lake that once covered the southern end of the San Joaquin Valley.

The tule fog season in Fresno County is typically in the late fall and winter (November through March) but can occur as late as May. Fog typically forms rapidly in the early morning hours. Tule fogs can last for days, sometimes weeks. Fog can have devastating effects on transportation corridors in the County. Nighttime driving in the fog is dangerous and multi-car pileups have resulted from drivers using excessive speed for the conditions and visibility.

Fog contributes to transportation accidents and is a significant life safety hazard. These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures.

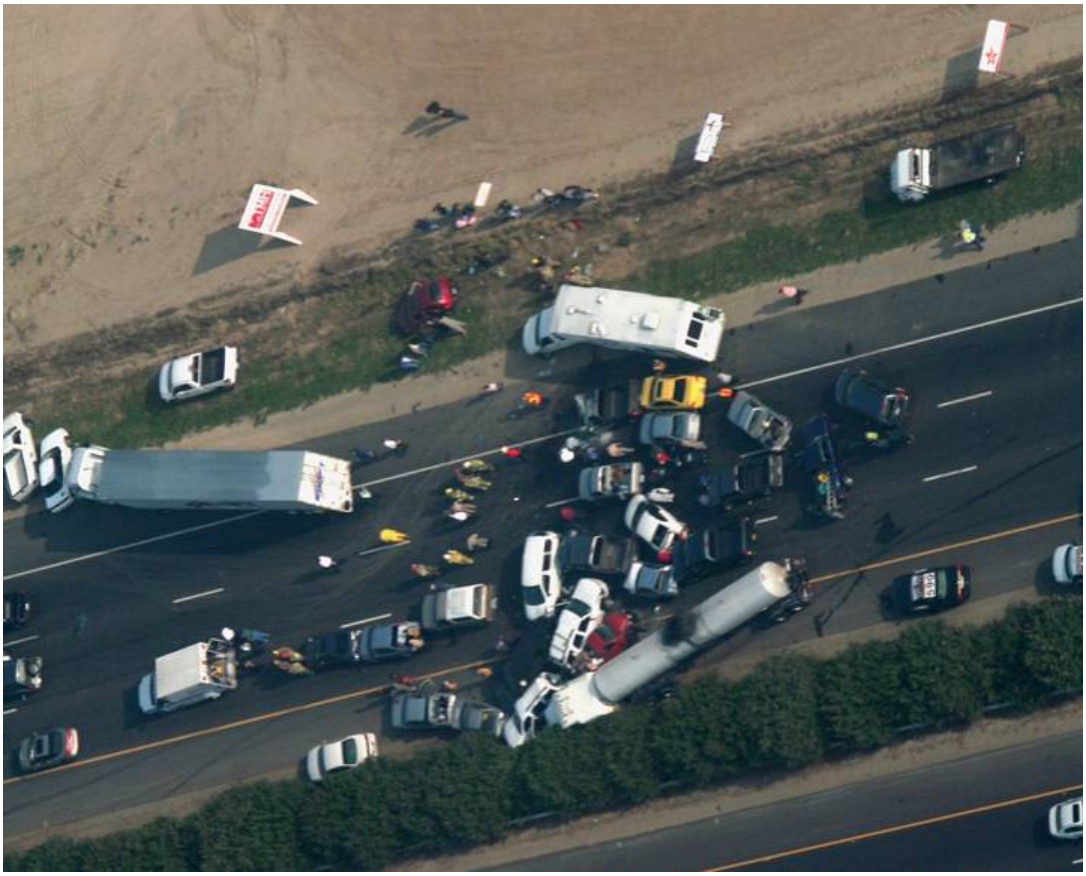
Past Occurrences

Between 1960 and 2007, the NCDC Storm Events Database and SHELDUS recorded 17 incidents of fog, collectively responsible for 7 deaths, 99 injuries, and $1.6 million in property losses. Most of these incidents occurred between November and March; one was in October.

According to the HMPC, severe fog is a recurring problem within the planning area, and most damage results from automobile accidents. Notable fog incidents reported by the HMPC include the following:

- **February 1991**—A series of accidents involving 74 vehicles occurred along a three-mile, fog-shrouded stretch of Highway 99 south of Fresno. Three people were killed and 30 were injured.
- **January 16, 1994**—Dense fog caused a 56-vehicle pileup on Highway 99 near Selma, killing two people and injuring 42 others.
- **November 1998**—Dense fog caused a chain-reaction accident involving 74 vehicles along a one-mile stretch on Highway 99 near Kingsburg. Two people were killed, 51 others injured.
- **February 2002**—Fog was a factor in a string of crashes on Highway 99 near Selma that killed two people. More than 30 others were injured in the accident, which involved 87 cars, trucks, and big rigs over a four-mile stretch.
- **November 20, 2002**—Fog was a major factor in a 50-vehicle collision on Highway 99 near Merced that resulted in 32 injuries.
- **February 7, 2006**—Fog was a factor in a 20-vehicle collision on Highway 99 near Tulare that resulted in one death and multiple injuries.
- **November 3, 2007**—Dense fog contributed to the worst traffic accident in Fresno County on Highway 99 just south of Fresno (see Figure 4.5). At least two people were killed in the 108 car chain-reaction crash, which involved 18 big rigs, and 39 individuals were sent to local hospitals. Drunk driving was also cited as a contributing factor.

Figure 4.5. Traffic Accident Caused by Fog, November 2007



Source: Donavan, California Highway Patrol

All of these notable fog-related accidents occurred on Highway 99. In addition to these events, other, less notable collisions occurred on other roads during foggy conditions. Records provided by the HMPC indicated that from January 1, 1999, through December 31, 2006, 22 collisions occurred during foggy weather on multiple roads, resulting in five injuries. It is unclear the extent that fog played in these accidents as there were other contributing factors, such as driver negligence.

Likelihood of Future Occurrences

Likely—Based on the NCDC and SHELDUS data, 17 major fog incidents over a 48-year period equates to a major fog event every 2.8 years and a 35.4 percent chance of a major fog event in any given year. Based on input from the HMPC, it is likely that minor fog events will continue to occur annually in the Fresno County planning area.

4.2.4 Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind

Hazard/Problem Description

Storms in the Fresno County planning area are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado.

Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is usually associated with severe storms within the Fresno County planning area. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in Fresno County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph, that represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. These winds can overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire. Tornadoes (see Section 4.2.6 Tornado) and funnel clouds can also occur during these types of storms.

Past Occurrences

Heavy rains and severe storms occur in the Fresno County planning area primarily during the late fall, winter, and spring, but have been documented in every month of the year. According to the Fresno County General Plan Background Report, the majority of precipitation is produced by storms during the winter months. Precipitation during the summer months is in the form of convective rain showers and is rare. Fresno County receives about 10 inches of rain per year. Snowstorms, hailstorms, and ice storms occur infrequently in the San Joaquin Valley and severe occurrences of any of these are very rare. Damaging winds often accompany winter storm systems moving through the area. Although summer winds are a frequent occurrence, with

afternoon winds of 10 to 20 mph being common, it is the winds experienced during the winter storms that result in the most wind-related damage.

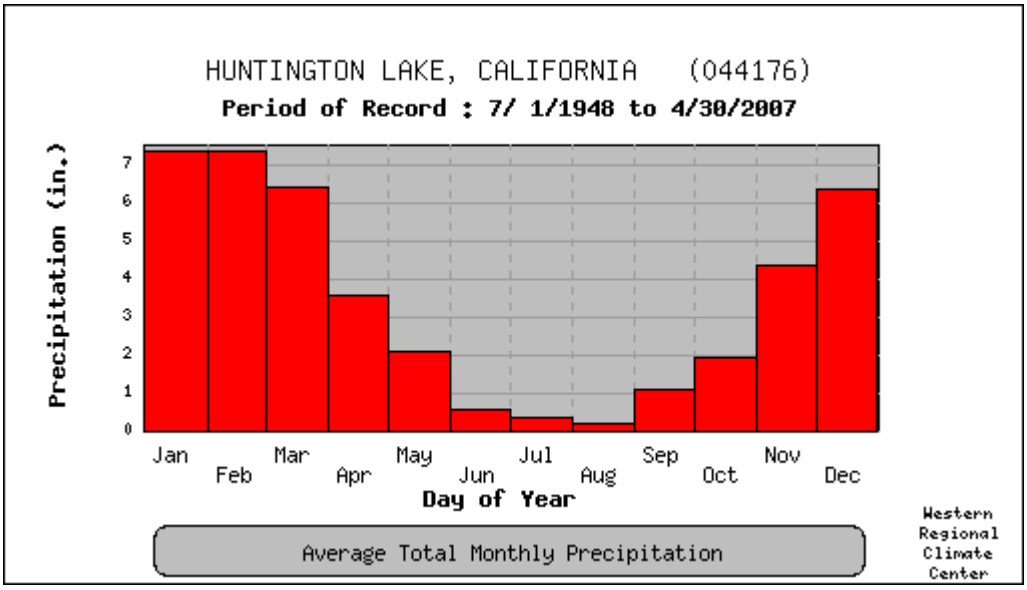
According to the HMPC, short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues. With the increased growth of the area, the lack of adequate drainage systems has become more of an issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees.

Information from the three representative weather stations introduced in Section 4.2.1 Severe Weather: General is summarized below and in Figures 4.6-4.11.

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2007)

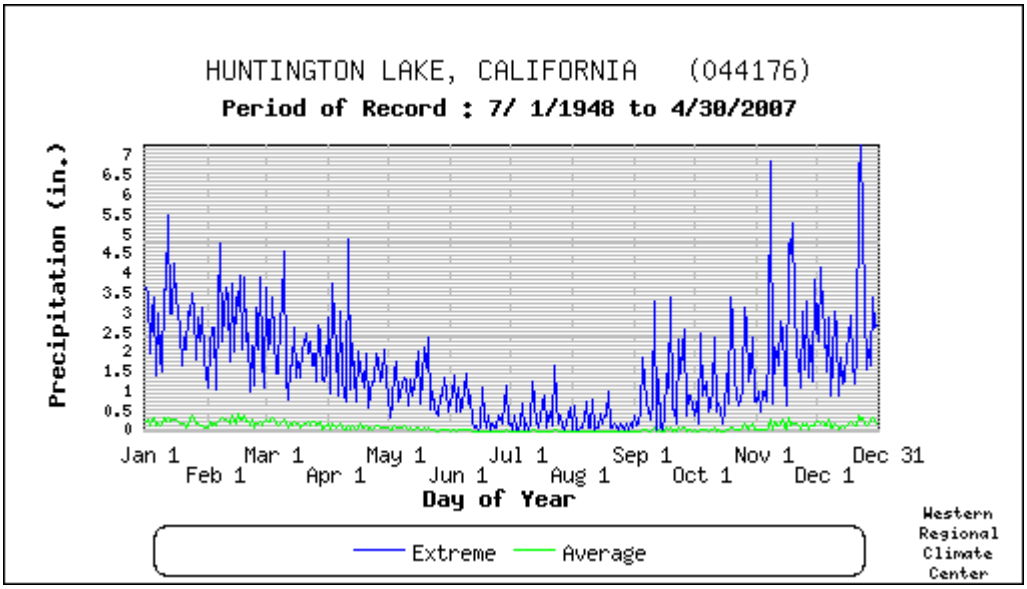
Average annual precipitation in the eastern portion of Fresno County is 41.35 inches per year. The highest recorded annual precipitation is 82.90 inches in 1982; the highest recorded precipitation for a 24-hour period is 7.28 inches on December 23, 1955. The lowest recorded annual precipitation is 19.38 inches in 1953.

Figure 4.6. Fresno County—East's Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.7. Fresno County—East's Daily Precipitation Average and Extreme

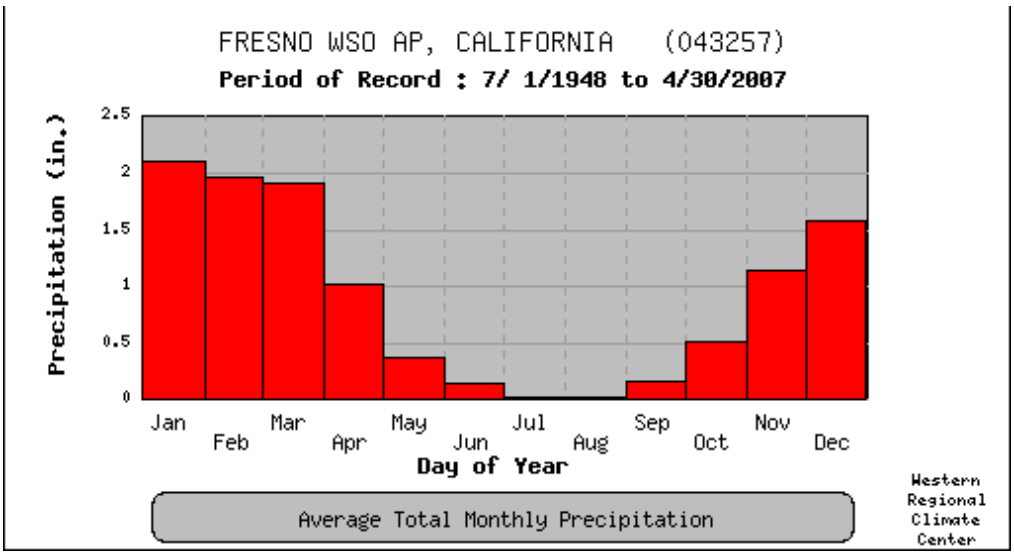


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2007)

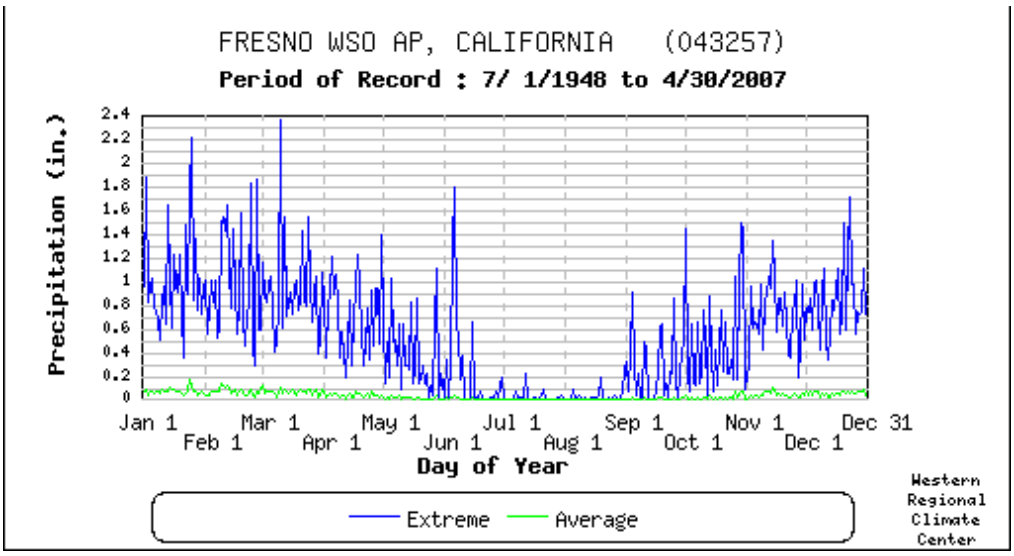
Average annual precipitation in the central portion of Fresno County is 10.90 inches per year. The highest recorded annual precipitation is 21.61 inches in 1983; the highest recorded precipitation for a 24-hour period is 2.38 inches on March 10, 1995. The lowest recorded annual precipitation is 6.07 inches in 1966.

Figure 4.8. Fresno County—Central's Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.9. Fresno County—Central's Daily Precipitation Average and Extreme

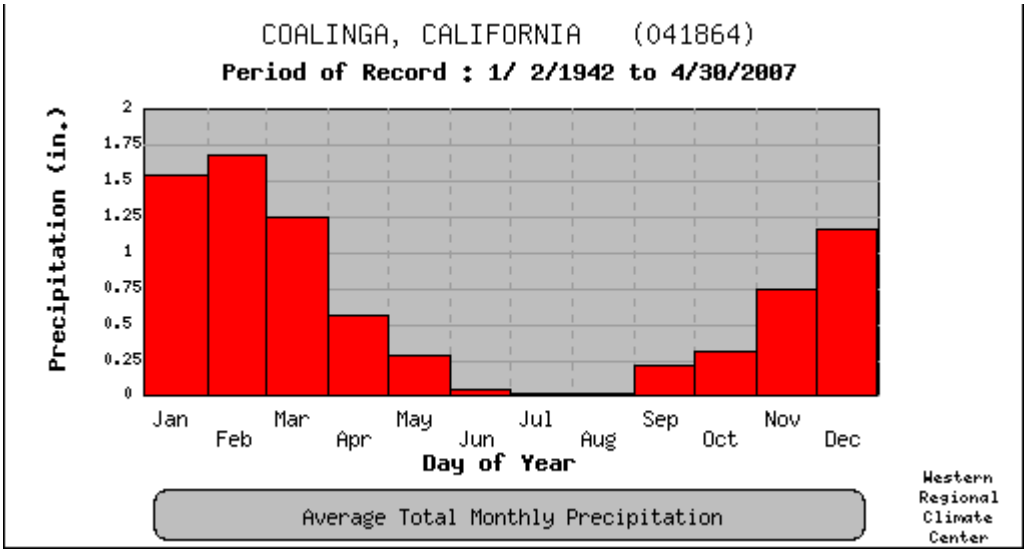


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2007)

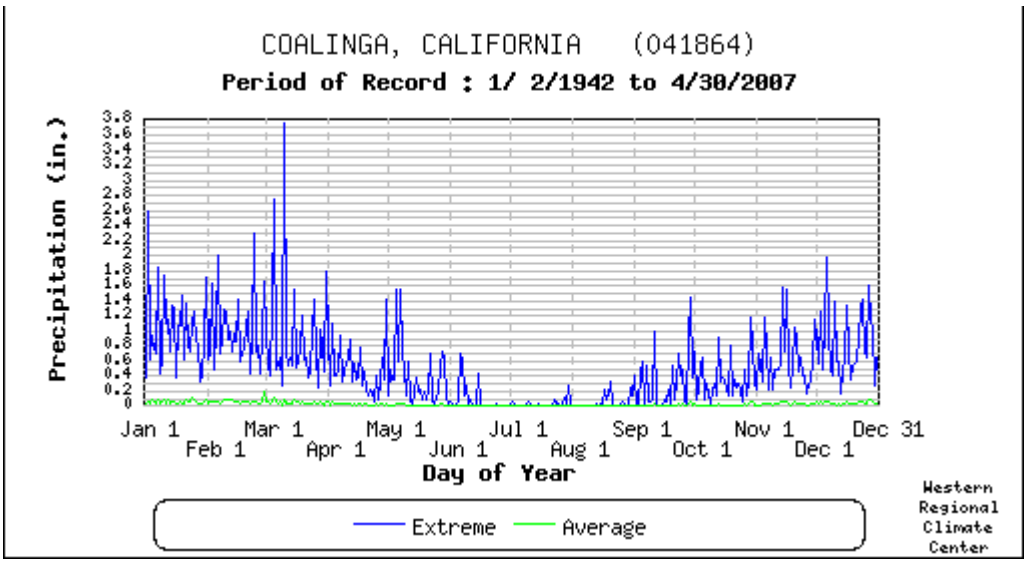
Average annual precipitation in the western portion of Fresno County is 7.69 inches per year. The highest recorded annual precipitation is 16.03 inches in 1998; the highest recorded precipitation for a 24-hour period is 3.74 inches on March 10, 1995. The lowest recorded annual precipitation is 1.98 inches in 1947.

Figure 4.10. Fresno County—West's Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.11. Fresno County—West's Daily Precipitation Average and Extreme



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Severe weather events associated with heavy rain/thunderstorm/hail/lightning/wind include those listed in Tables 4.2 and 4.3 in Section 4.2.1 Severe Weather: General.

Also related to severe weather is the issue of dust storms caused by blowing dust during high wind events. Similar to fog conditions, blowing dust can cause extreme visibility problems resulting in traffic accidents. Given the agricultural nature of much of the planning area, recently plowed fields can create the potential for blowing dust and debris. The HMPC provided the following information on a deadly dust-related traffic accident:

- **November 29, 1991**—The day after Thanksgiving, furious winds stoked a huge dust storm on Interstate 5 in western Fresno County, reducing visibility to zero and causing multiple traffic collisions. At least 164 vehicles were involved in 33 collisions clustered along a two-mile segment of the highway. A total of 349 people were involved in the collisions; 17 were killed and 151 were injured.

Likelihood of Future Occurrences

Highly Likely—Heavy rain, thunderstorms, hail, lightning, and wind are well-documented seasonal occurrences that will continue to occur annually in the Fresno County planning area.

4.2.5 Severe Weather: Snow

Winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down

trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

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

The central and western portions of the Fresno County planning area generally do not experience snowfall on a seasonal basis; however, the higher elevations in the eastern portion of the County receive an abundance of snow, mostly between the months of November through April. Winter snow storms in this part of the County, including strong winds and blizzard conditions, can result in localized power and phone outages and closures of streets, highways, schools, business, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

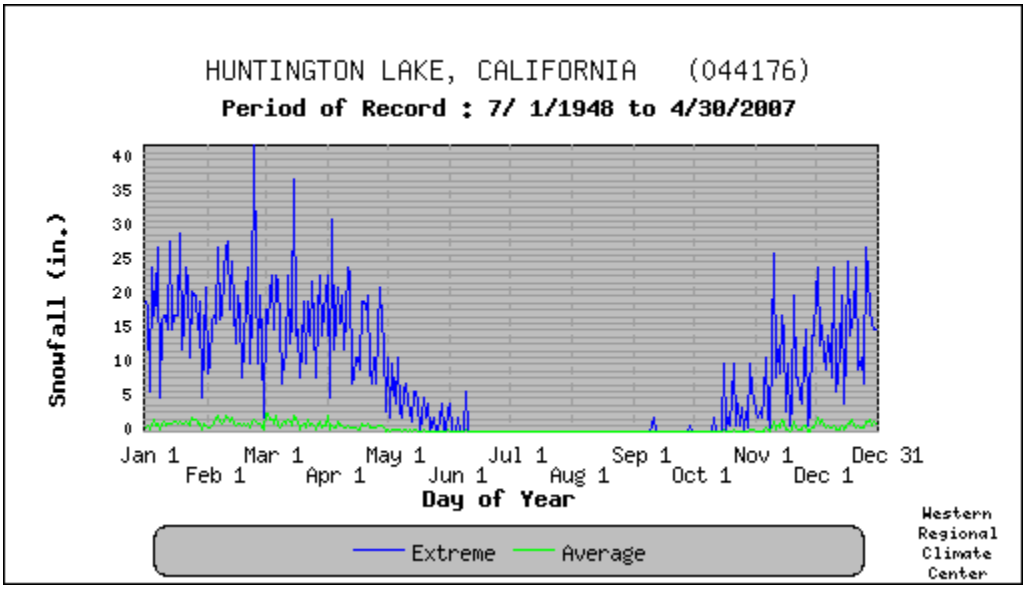
Past Occurrences

Information from the three representative weather stations introduced in Section 4.2.1 Severe Weather: General is summarized below.

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2007)

Average annual total snowfall for the eastern portion of Fresno County is 183.2 inches. The snowiest months include December, January, February, and March, with 29.4, 35.2, 36.9, and 38.6 average inches of snow, respectively. April follows close behind with an average snowfall of 23.2 inches. The highest annual snowfall on record was 488 inches in 1968-69. The highest recorded monthly snowfall for the period of record was 191 inches in February 1969. The average snow depth ranges from 3 inches in November and May to 40 inches in February. Figure 4.12 illustrates the Daily Snowfall Average and Extreme for the Huntington Lake Weather Station in eastern Fresno County.

Figure 4.12. Fresno County—East's Daily Snowfall Average and Extreme



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2007)

Snow in central Fresno County is quite rare. During the period of record, snow fell only four times: .10 inches in January 1957, 2.2 inches in January 1962, 1.2 inches in December 1968, and .5 inches in December 1998.

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2007)

Snow in western Fresno County is even rarer than in central Fresno County. During the period of record, snow fell only once: five inches were recorded in January of 1957.

The Fresno County Office of Emergency Services is not aware of any incidents where snow caused enough damage to declare a countywide emergency. According to the HMPC, the following winter snow event impacted the eastern portion of the Fresno County planning area:

- **January 2005—**Heavy wet snow fell in eastern Fresno County above 4,000 feet resulting in a regionwide closure of roads and loss of power for up to three weeks in three communities. Eight injuries were reported due to vehicle accidents from poor road conditions. Property damage was estimated at $3.5 million from trees falling on homes, cabins, and out buildings. Infrastructure damage was estimated at $2.5 million to the power distribution grid and $250,000 to the road system. An estimated 10-15,000 merchantable trees were damaged or destroyed. Most roads in the area were closed for three weeks; schools were closed for two weeks.

Likelihood of Future Occurrences

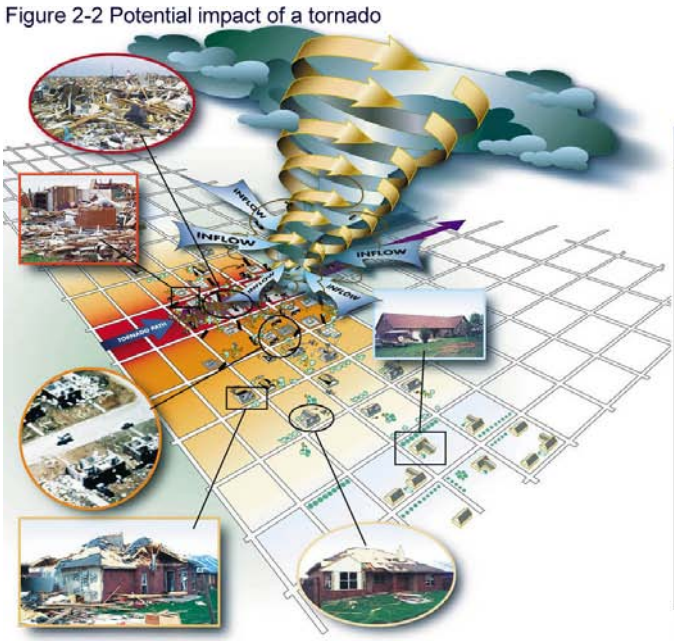
Highly Likely—Snow in the eastern region of the County is a well-documented seasonal occurrence that will continue to occur annually.

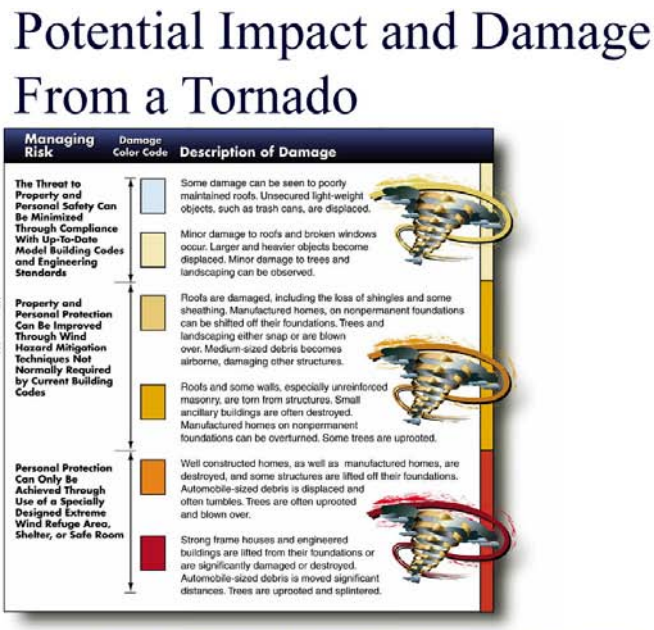
4.2.6 Severe Weather: Tornado

Hazard/Problem Description

Tornadoes are another severe weather hazard that can affect the Fresno County planning area, primarily during the rainy season. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential that fuels 300-mile-wide hurricanes across a path only 300-yards wide or less. Figure 4.13 illustrates the potential impact and damage from a tornado.

Figure 4.13. Potential Impact and Damage from a Tornado





Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 4.4 shows the wind

speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4.5 shows the wind speeds associated with the Enhanced Fujita Scale ratings. The Enhanced Fujita Scale's damage indicators and degrees of damage can be found online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 4.4. Original Fujita Scale

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

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

Table 4.5. Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

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

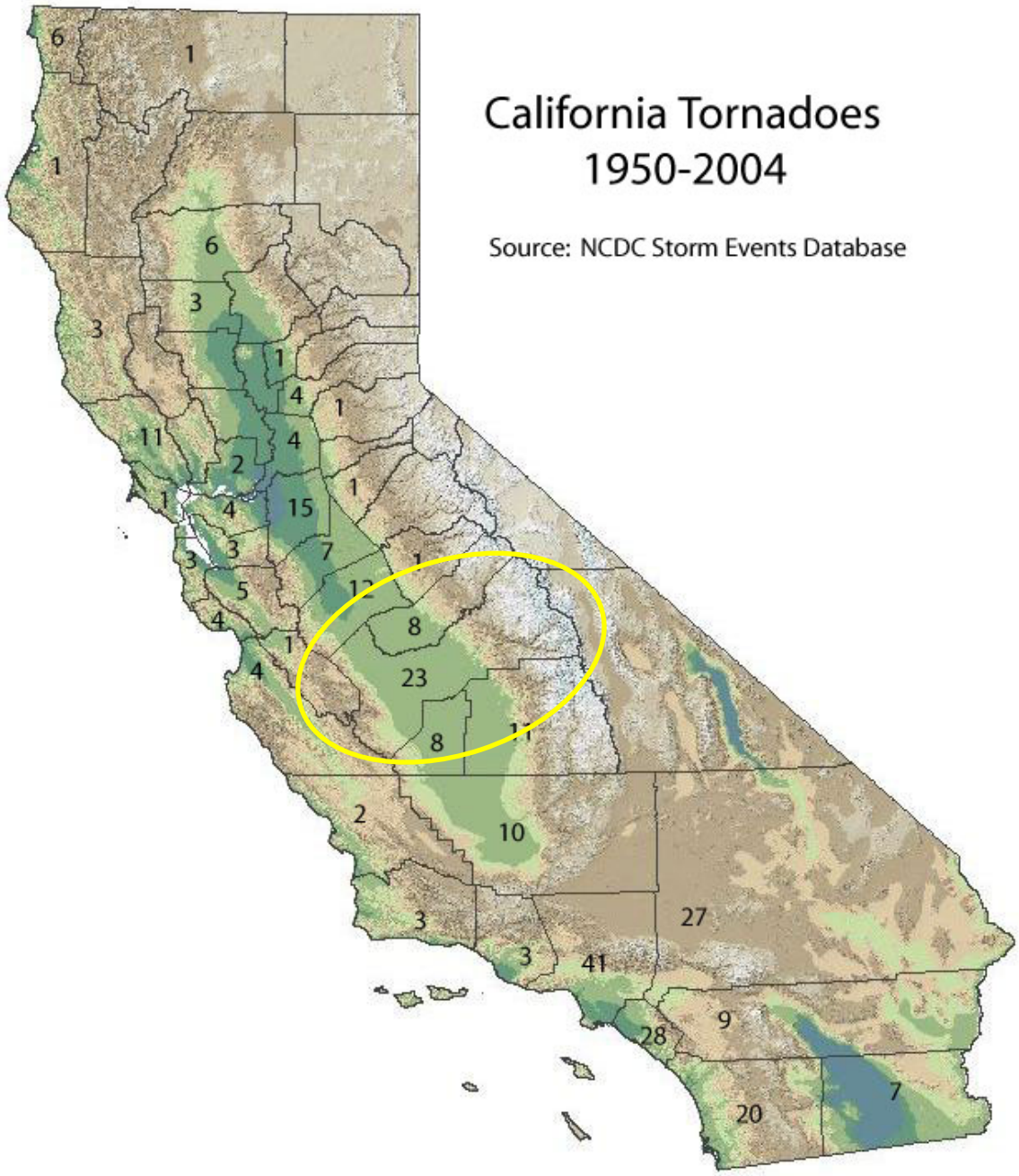
Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak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

Past Occurrences

Based on data from 1950 to1995, California ranks 32nd among the 50 states for frequency of tornadoes, 36th for injuries, and 31st for cost of damage. When compared to other states by the

frequency per square mile, California ranks 44th for frequency and injuries per area and 40th for cost of damage per area. Figure 4.14 shows tornado frequency by California county using NCDC data from 1950 to 2004.

Figure 4.14. California Tornadoes, 1950-2004



Source: Golden Gate Weather Services, http://ggweather.com/ca-tornado.jpg

According to the HMPC, during the rainy season, the Fresno County planning area is prone to relatively strong thunderstorms, sometimes accompanied by funnel clouds and tornadoes. While tornadoes do occur occasionally, most often they are of F0 or F1 intensity. Documented incidents of tornadoes in the Fresno County planning area from the NCDC Storm Events Database are listed in Table 4.6.

Table 4.6. Fresno County's Tornadoes, 1950-2007

Type	# of Events	Property Loss ($)	Crop Loss ($)	Deaths	Injuries
Tornado: F0	17	298,000	26,000	0	0
Tornado: F1	6	2,628,000	0	0	3
Tornado: F2	1	3,000	0	0	0
Totals	**24**	**2,929,000**	**26,000**	**0**	**0**

Source: National Climatic Data Center Storm Events Database, www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

Likelihood of Future Occurrences

Occasional—Twenty-four tornadoes occurred in Fresno County over 58 years of record keeping, which equates to one tornado every 2.4 years, on average, and a 42.1 percent chance of a tornado occurring in any given year. Historical tornadic activity within the planning area indicates that the area will likely continue to experience the formation of funnel clouds and low intensity tornadoes during adverse weather conditions. The actual risk to the County is dependent on the nature and location of any given tornado.

4.2.7 Agricultural Hazards

Hazard/Problem Description

Located in the Central San Joaquin Valley, Fresno County's farming and agricultural industry is ranked as the top agriculture-producing county in California and the country. Farming and agriculture-related businesses are a significant component of the local economy and are responsible for no less than one out of every three jobs. According to the California Department of Conservation's Farmland Mapping and Monitoring Program, the County has approximately 722,584 acres of prime agricultural land, 483,786 acres of farmland of statewide importance, and 834,253 acres of grazing land (see Table 4.7).

Table 4.7. Fresno County's Farmland Inventory, 2004

Soil Category	Acres
Prime Farmland	722,584
Farmland of Statewide Importance	483,768
Unique Farmland	100,316
Farmland of Local Importance	84,858
Grazing Land	834,253
Urban and Built-Up Land	110,897
Water	4,911
Other Land	100,011

Source: State of California Department of Conservation Farmland Mapping and Monitoring Program, www.conservation.ca.gov/

According to the 2006 Fresno County Agricultural Crop and Livestock Report, the total gross value of agricultural commodities in Fresno County in 2006 was $4.8 billion, exceeding the four billion dollar mark for the fourth consecutive year. This value represents a 4.41 percent increase from the 2005 production value. The County's leading agricultural products included grapes, almonds, tomatoes, poultry, cattle and calves, milk, cotton, onions, peaches, and nectarines. In spite of the record setting year, the report indicates that agricultural crop production was compromised in 2006 by several factors: labor shortages during peak harvest periods, high production and overhead costs, and losses exceeding $114.6 million as a result of frost, hail, rain, and excessive heat.

According to the HMPC, agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, floods, hail, freeze, and drought. The State of California Multi-Hazard Mitigation Plan attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations. Other agricultural hazards include fires, crop and livestock disease, noxious weeds, and contamination of animal food and water supplies.

Fresno County is threatened by a number of insects that, under the right circumstances, can cause severe economic and environmental harm to the agricultural industry. Insects of concern to plants and crops include the medfly, peach fruit fly, Mexican fruit fly, guava fruit fly, oriental fruit fly, melon fly, gypsy moth, Japanese beetle, glassy-winged sharpshooter, paper wasp, and Turkestan roach. Livestock disease can also cause large-scale economic losses in any area that raises large amounts of livestock.

Noxious weeds, which are any plant that is or is liable to be troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species and that is difficult to control or eradicate, are also of concern. Noxious weeds within the planning area include yellow starthistle, purple loosestrife, and Japanese dodder.

Noxious weeds have been introduced in the planning area by a variety of means, including through commercial nurseries. An absence of natural controls combined with the aggressive

growth characteristics and unpalatability of many of these weeds allows these weeds to dominate and replace more desirable native vegetation. Negative effects of weeds include the following:

- Loss of wildlife habitat and reduced wildlife numbers
- Loss of native plant species
- Reduced livestock grazing capacity
- Increased soil erosion and topsoil loss
- Diminished water quality and fish habitat
- Reduced cropland and farmland production
- Reduced land value and sale potential

Another, more recent threat to the agricultural industry is the wild hogs that run free in the eastern and western foothills of the County. These wild hogs can cause extensive agricultural crop and property damage to farm and private land. Wild hogs are known to carry and transmit 30 different diseases both to humans and livestock. E. coli contamination of leafy vegetables has been linked to wild hogs foraging in vegetable fields.

In addition to issues associated with wildhogs, the proper management of other wildlife within the planning area is of significant concern to the County Department of Agriculture. Wildlife such as coyotes, ground squirrels, and others can cause extensive livestock, crop, and property damage. Such wildlife is also known to carry and transmit disease (e.g., bubonic plague and rabies) to livestock and domestic animals as well as to humans.

According to the Fresno County Operational Area Master Emergency Services Plan, the consequences of agricultural disasters to the planning area include ruined plant crops, dead livestock, ruined feed and agricultural equipment, monetary loss, job loss, and possible multi-year effects (i.e., trees might not produce if damaged, loss of markets, food shortages, increased prices, possible spread of disease to people, and loss or contamination of animal products). When these hazards cause a mass die-off of livestock, other issues arise that include the disposal of animals, depopulation of affected herds, decontamination, and resource problems. Those disasters related to severe weather may also require the evacuation and sheltering of animal populations. Overall, any type of severe agricultural disaster can have significant economic impacts on the agricultural community as well as the entire Fresno County planning area.

Past Occurrences

The Fresno County Department of Agriculture provided information on disaster declarations from 1991 through 2007. Based on these records, Fresno County received 21 USDA disaster declarations between 1991 and 2007 (see Table 4.8). All of the declarations were associated with severe weather events.

Table 4.8. Fresno County's USDA Disaster Declarations

Incident Type	Incident Date	Damage ($)
Freeze	1/7/1991	98,851,213
Severe Spring Storms: Rain, Hail, High Winds	5/1/1995 and 6/15/1995	198,401,571
Severe Storm: Rain, Hail, High Winds	4/16/1996	8,467,000
Severe Storms: Rain and Hail	3/23-29/1998	4,972,477
Freeze	12/20-30/1998	313,327,062
Adverse Weather Conditions: Freezing Temperatures, Rain, Hail, and High Winds.	4/2-10/1999	104,374,228
Severe Storms: Rain and Hail	6/2/1999	4,661,009
Adverse Weather Conditions: Freeze and Hail	4/4/2001 and 4/8/2001	26,174,352
High Winds	5/2/2001	1,962,230
Severe Storm: Rain and Hail	5/20/2002	24,269,042
Drought: Reduced Forage Production	2001/2002	2,488,800
Spring Rainstorms	Spring 2003	7,814,100
Severe Storms: Rain and Hail	April/May 2003	7,864,528
Cool/Wet Weather and Extended Winter Hot Spell	Winter 2003	13,440,969
Extreme Heat	May 2004	4,500,560
Drought: Reduced Forage Production	2003/2004	3,604,000
Severe Storms: Rain and Hail	4/28-5/9/2005	21,941,337
Extreme Heat	2006/2007	114,733,960
Adverse Weather Conditions: Freeze, Rain, and Hail	2/2006-4/2006	21,270,306
Freeze	1/2007	574,479,585
Drought: Reduced Forage Production	10/2006-3/2007	4,420,000

Source: Fresno County Department of Agriculture

Historical occurrences identified by the HMPC include the following:

Fresno County

- **1970s**—A local outbreak of scabies occurred.
- **1991**—There was an outbreak of bovine tuberculosis in Fresno County.
- **1997/1998**—One bird in downtown Fresno was discovered with exotic Newcastle disease, a contagious and fatal viral disease affecting all species of birds that does not affect humans. The bird and all chickens within a one-kilometer radius were destroyed.
- **1998**—Freeze resulted in almost $70 million in losses, including crop loss, broken water pipes and water damage, damaged water treatment plants, and damaged fire sprinkler systems. Other impacts included almost 18,000 applications for services and assistance and over 1,700 unemployment insurance claims filed.
- **1999**—Severe weather caused a crop loss of over $89 million.
- **2006**—Fresno County growers were impacted by adverse spring weather with $21 million in losses.
- **2006**—Twenty-one days of over 100 degrees, including three days over 113 degrees, caused crop, livestock, poultry, and milk production losses of $93 million.

- **2008**—A Fresno County dairy was quarantined after state and federal agriculture officials found bovine tuberculosis in five cows.

Neighboring Counties

- **2002**—Merced County had an outbreak of avian influenza H5 (which is different from the severe variety found in Asia).
- **2002/2003**—After more than 10 years without a case of bovine tuberculosis in California, two dairy herds in Tulare County and one in Kings County were infected with bovine tuberculosis. All three herds were quarantined, 152,000 cattle were tested, 8,000 cattle destroyed, and the affected premises were cleaned and disinfected.
- **2002/2003**—There was an outbreak of exotic Newcastle disease in Southern California.

Likelihood of Future Occurrences

Highly Likely—As long as the hazards discussed in this section continue to be an ongoing concern to the Fresno County planning area, the potential for agricultural losses remains.

4.2.8 Avalanche

Hazard/Problem Description

Avalanches occur when loading of new snow on a slope increases stress at a rate faster than strength develops, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The vast majority of avalanches occur during and shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers, who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement creates avalanches. Areas prone to avalanche hazards include hard to access areas deep in the backcountry. Avalanche hazards exist in eastern Fresno County, where combinations of the above criteria occur.

Past Occurrences

Historically, avalanches occur within the County between the months of December and April, following snowstorms. According to the HMPC, there has been some historical avalanche activity involving people, but specific details are unknown.

Likelihood of Future Occurrences

Likely—Injuries and loss of life from an avalanche are usually due to people recreating in remote areas at the wrong time. Given the topography and amount of snow falling on an annual basis in eastern Fresno County, avalanches will continue to occur, but damage from avalanches should continue to be limited.

4.2.9 Dam Failure

Hazard/Problem Description

Dams are manmade structures built for a variety of uses, including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

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

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

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth-rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously: the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach: a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

According to the Fresno County Operational Area Master Emergency Services Plan, there are several hundred dams in Fresno County constructed for flood control, irrigation storage, electrical generation, recreation, and stock watering purposes. Twenty-three dams present a significant safety risk to downstream populations if one or more were to fail. One, Crane Valley,

is in Madera County (see Table 4.9). Most of these dams are located on the east side of the County in the San Joaquin River or Kings River watersheds. Three of the dams protect the Fresno-Clovis metropolitan area from stream run-off from the County's northeast foothills. One dam protects the valley floor in the northern part of the County from stream run-off on the County's west side foothills.

Table 4.9. Dams with Potential to Cause Damaging Floods in Fresno County

Dam	Owner	Stream	Type	Capacity (Acre-feet)*
Balch Afterbay	Pacific Gas & Electric	North Fork Kings River	Constant Radius Arch	318
Balch Diversion	Pacific Gas & Electric	North Fork Kings River	Variable Radius Arch	1,295
Balsam Meadow	S. California Edison Co.	West Fork Balsam Creek	Rockfill	2,040
Big Creek No. 4	S. California Edison Co.	Big Creek	Constant Radius Arch	100
Big Creek No. 6	S. California Edison Co.	San Joaquin River	Constant Radius Arch	993
Big Creek No. 7	S. California Edison Co.	San Joaquin River	Gravity	35,000
Big Dry 1017-	Fresno Metro. Flood Control District	Big Dry Creek/ Dog Creek	Earth	30,200
Courtright	Pacific Gas & Electric	Helms Creek	Rockfill	123,300
Crane Valley	Pacific Gas & Electric	North Fork Willow Creek	Hydraulic Fill	45,410
Fancher Creek	Fresno Metro. Flood Control District	Fancher Creek & Hog Creek	Earth	9,600
Florence Lake	S. California Edison Co.	South Fork San Joaquin River	Multiple Arch	64,406
Friant	U.S. Bureau of Reclamation	San Joaquin River	Gravity	520,500
Giffen Reservoir	Harris Farms, Inc.	Tributary Holland Creek	Earth	900
Hume Lake	U.S. Forest Service	Ten Mile Creek	Multiple Arch	1,410
Huntington Lake	S. California Edison Co.	Big Creek	Gravity	88,834
Little Panoche	U.S. Bureau of Reclamation	Little Panoche Creek	Earth	5,580
Mammoth Pool	S. California Edison Co.	San Joaquin River	Earth	123,000
Pine Flat	U.S. Corps of Engineers	Kings River	Gravity	1,000,000
Redbank	Fresno Metro. Flood Control District	Redbank Creek	Earth	1,100
Sequoia Lake	YMCA, Inc.	Mill Flat Creek	Earth & Rock	1,370
Shaver Lake	S. California Edison Co.	Stevenson Creek	Gravity	135,283
Vermilion Valley	S. California Edison Co.	Mono Creek	Earth	125,000
Wishon	Pacific Gas & Electric	North Fork Kings River	Rockfill	118,000

Source: Fresno County Operational Area Dam Failure Evacuation Plan, 2003
*One acre-foot=326,000 gallons

Both unincorporated and incorporated areas of the County are identified on dam failure inundation maps included in the County's dam failure evacuation plan. The inundation areas for each of the dams are generally downstream and include large rural and urban areas on the valley floor below the dams. Adjacent jurisdictions could also be affected by a dam failure in Fresno

County. These include, depending on the dam involved, the Counties of Tulare, Kings, Madera, and Merced.

Figure 4.15 illustrates the locations of identified dams of concern within Fresno County, and Figure 4.16 illustrates their water routes.

Figure 4.15. Fresno County's Dams of Concern

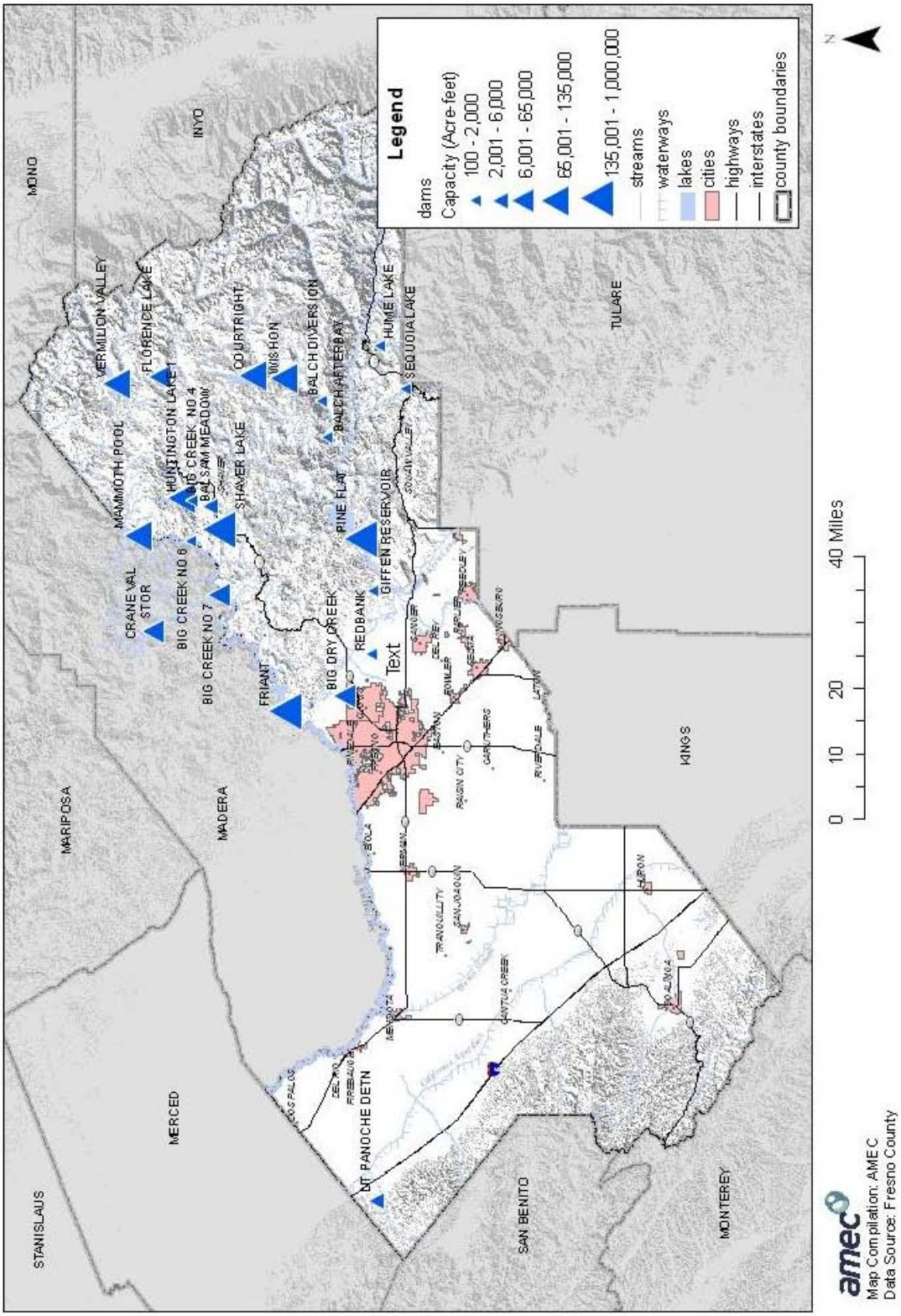
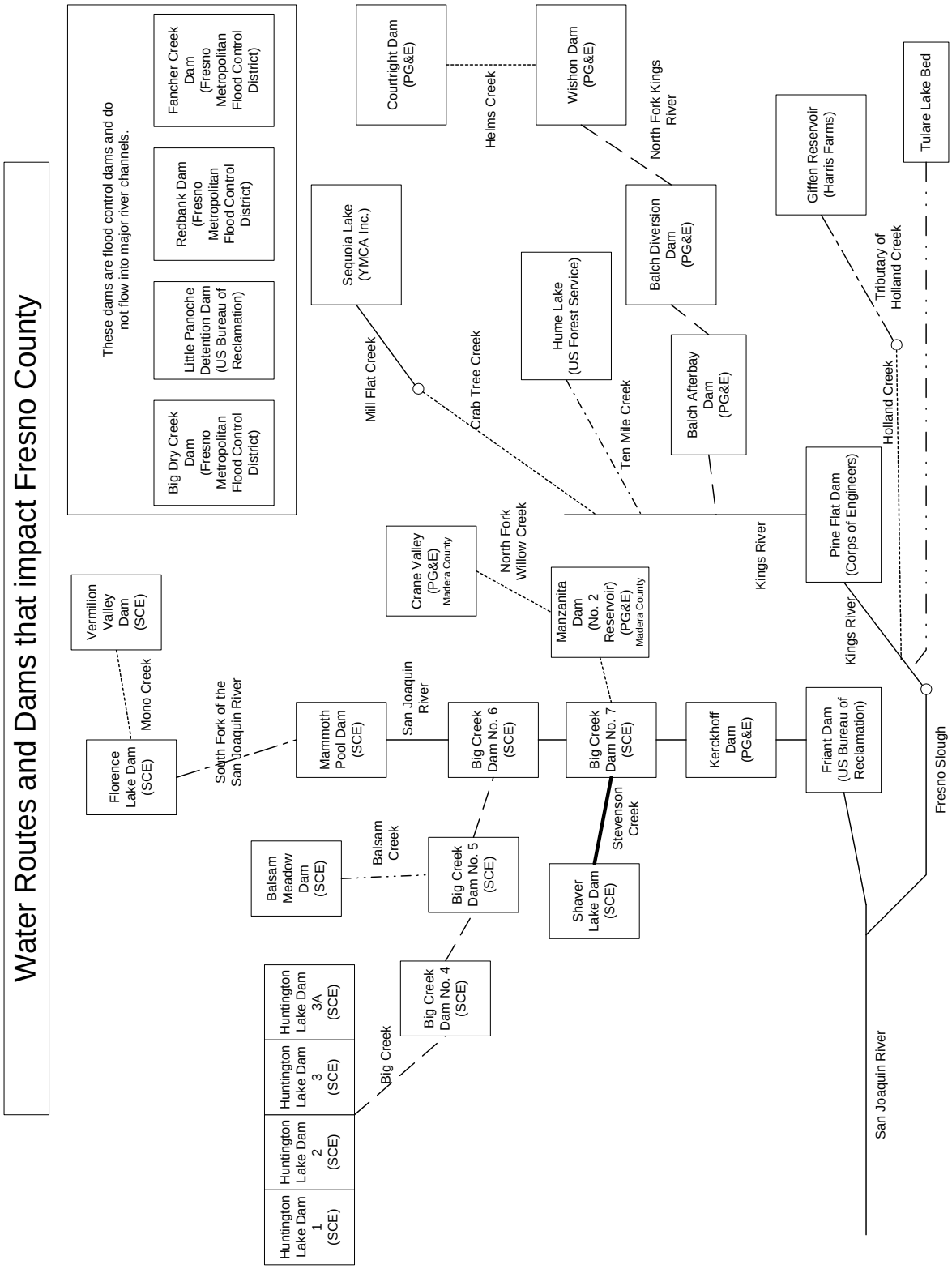


Figure 4.16. Water Routes and Dams that Impact Fresno County



Source: Fresno County Operational Area Dam Failure Evacuation Plan, 2003

Past Occurrences

According to the Fresno County Operational Area Master Emergency Services Plan, there were 14 dam failures in Fresno County between 1976 and 1983, but all were earthen dams on private property. None of the County's 23 major dams were involved. The failures were due to inadequate rodent and vegetation control, unauthorized and inadequate construction, and failure to consult an engineer. The main impacts from these failures were silting of downstream waters, properties, and dams; flooded or undermined roadways; and eroded embankments. Main losses were flooding of a residence and construction lumber washed downstream. In 1986, Friant Dam experienced a small, uncontrolled release. The lock on a drum gate opened, releasing 3,000 cubic feet per second. No major flooding resulted.

Likelihood of Future Occurrences

Likely—The County remains at risk to dam failures from numerous dams under a variety of ownership and control and of varying ages and conditions. Given the high number of dams in the County and the history of past dam failures, the potential exists for future dam failures in the Fresno County planning area. Nonetheless, it should be noted that there have not been any failures of major dams in the County. Future failures are more likely to involve small dams and cause little or no damage.

4.2.10 Drought

Hazard/Problem Description

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

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

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

The California Department of Water Resources (DWR) says the following about drought:

> One dry year does not normally constitute a drought in California. California's extensive system of water supply infrastructure—its reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

The drought issue in California is further compounded by water-rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California is part of this issue.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the planning area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

Past Occurrences

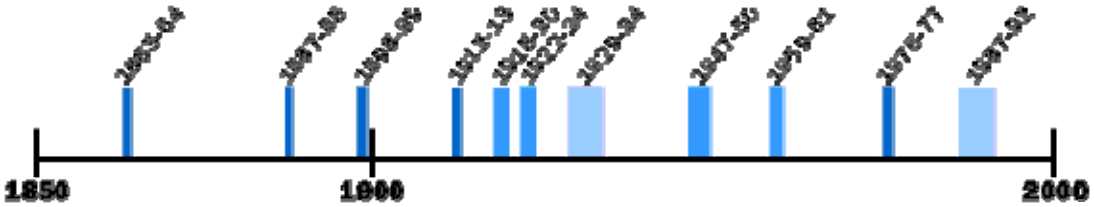
Historically, California has experienced multiple severe droughts. According to the DWR, droughts exceeding three years are relatively rare in Northern California, the source of much of the state's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California reservoirs. Table 4.10 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77 and 1987-92 (California's most recent multi-year drought) droughts. The driest single year of California's measured hydrologic record was 1977. Figure 4.17 depicts California's multi-year historical dry periods, 1850-2000.

Table 4.10. Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf*/yr)	(% Average1901-96)	(maf*/yr)	(% Average 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47

Source: California Department of Water Resources, www.water.ca.gov/
*Million acre-feet

Figure 4.17. California's Multi-Year Historical Dry Periods, 1850-2000



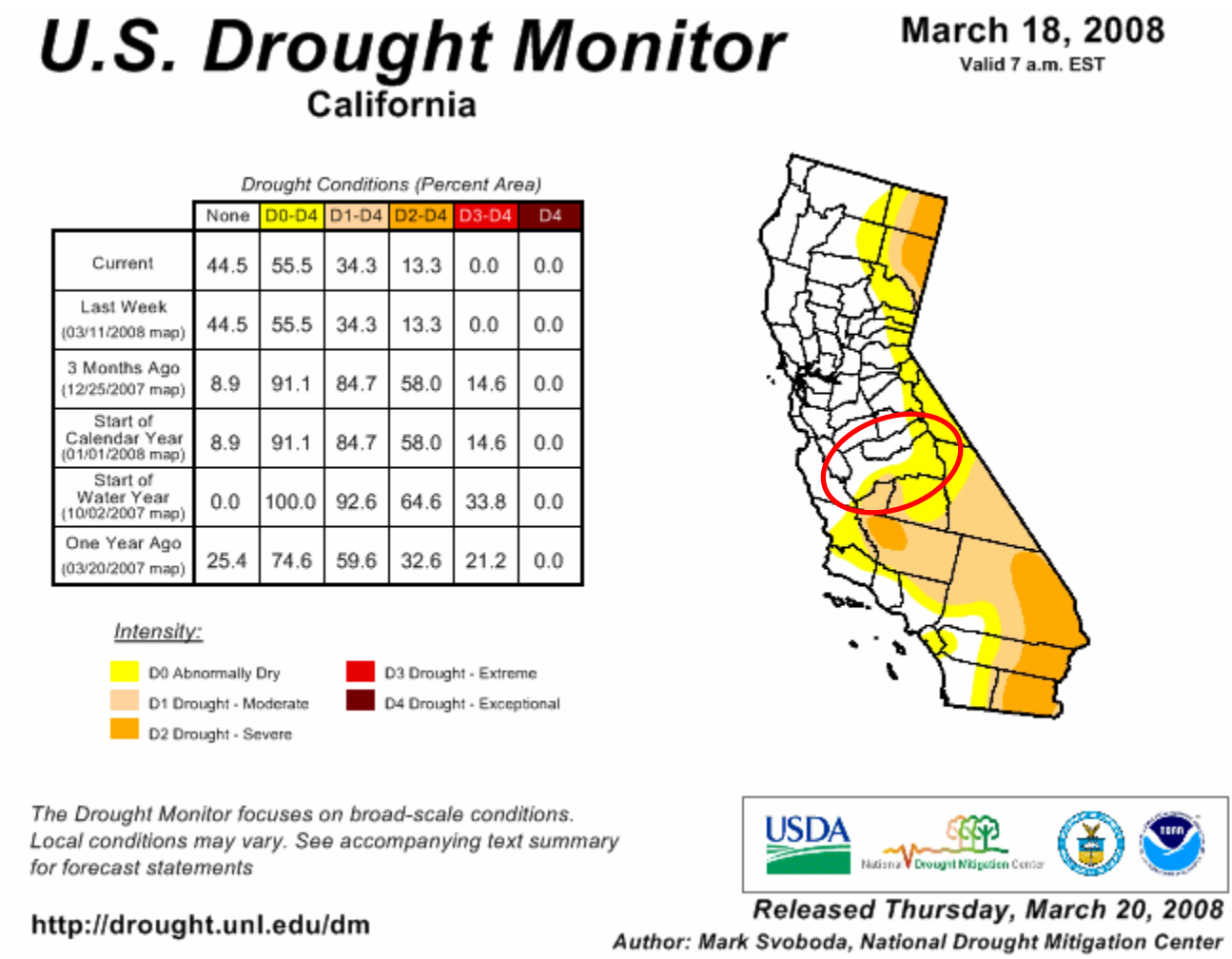
Source: California Department of Water Resources, www.water.ca.gov/
Notes: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

The HMPC identified the following droughts as having significant impacts on the planning area:

- **1976**—A federal disaster declaration was declared as a result of a drought affecting Fresno County and much of California.
- **1987-1992**—Fresno County also suffered adverse effects resulting from this statewide drought.
- **2002**—Abnormally dry to moderate drought conditions lingering from 2001 into 2002 reduced rangeland grasses and feed for cattle. Losses to rangeland and loss of feed were estimated at $2.5 million. An estimated 850,000 acres were affected in both the east and west side of the valley. A USDA disaster declaration on November 22 made low interest loans available to family-size operations.

Figure 4.18 provides a "snapshot in time" of the drought conditions in California in March 2008 from the National Drought Mitigation Center. Fresno County's drought conditions varied from none in the northern portion of the County, abnormally dry in the southern portion of the County, and moderate drought in the south central portion of the County. This map considers several factors, including the Palmer Drought Index, Soil Moisture Models, U.S. Geological Survey Weekly Streamflows, Standardized Precipitation Index, and Satellite Vegetation Health Index.

Figure 4.18. U.S. Drought Monitor for California, March 18, 2008



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	44.5	55.5	34.3	13.3	0.0	0.0
Last Week (03/11/2008 map)	44.5	55.5	34.3	13.3	0.0	0.0
3 Months Ago (12/25/2007 map)	8.9	91.1	84.7	58.0	14.6	0.0
Start of Calendar Year (01/01/2008 map)	8.9	91.1	84.7	58.0	14.6	0.0
Start of Water Year (10/02/2007 map)	0.0	100.0	92.6	64.6	33.8	0.0
One Year Ago (03/20/2007 map)	25.4	74.6	59.6	32.6	21.2	0.0

Likelihood of Future Occurrences

Occasional—Historical drought data for the Fresno County planning area and the Central Valley region indicate there have been five significant droughts in the last 79 years. This equates to a drought every 15.8 years on average or a 6.3 percent chance of a drought in any given year. Based on this data, droughts will occasionally affect the planning area.

4.2.11 Earthquake

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a 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 Table 4.11). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.11. Modified Mercalli Intensity (MMI) Scale

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

Source: Multi-Hazard Identification and Risk Assessment, FEMA, 1997

Seismic Hazards

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. The degree of damage depends on many interrelated factors. Among these are the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction. The following analysis of seismic hazards from the Fresno County General Plan Background Report (2000) discusses some of these factors in more detail.

Ground Shaking

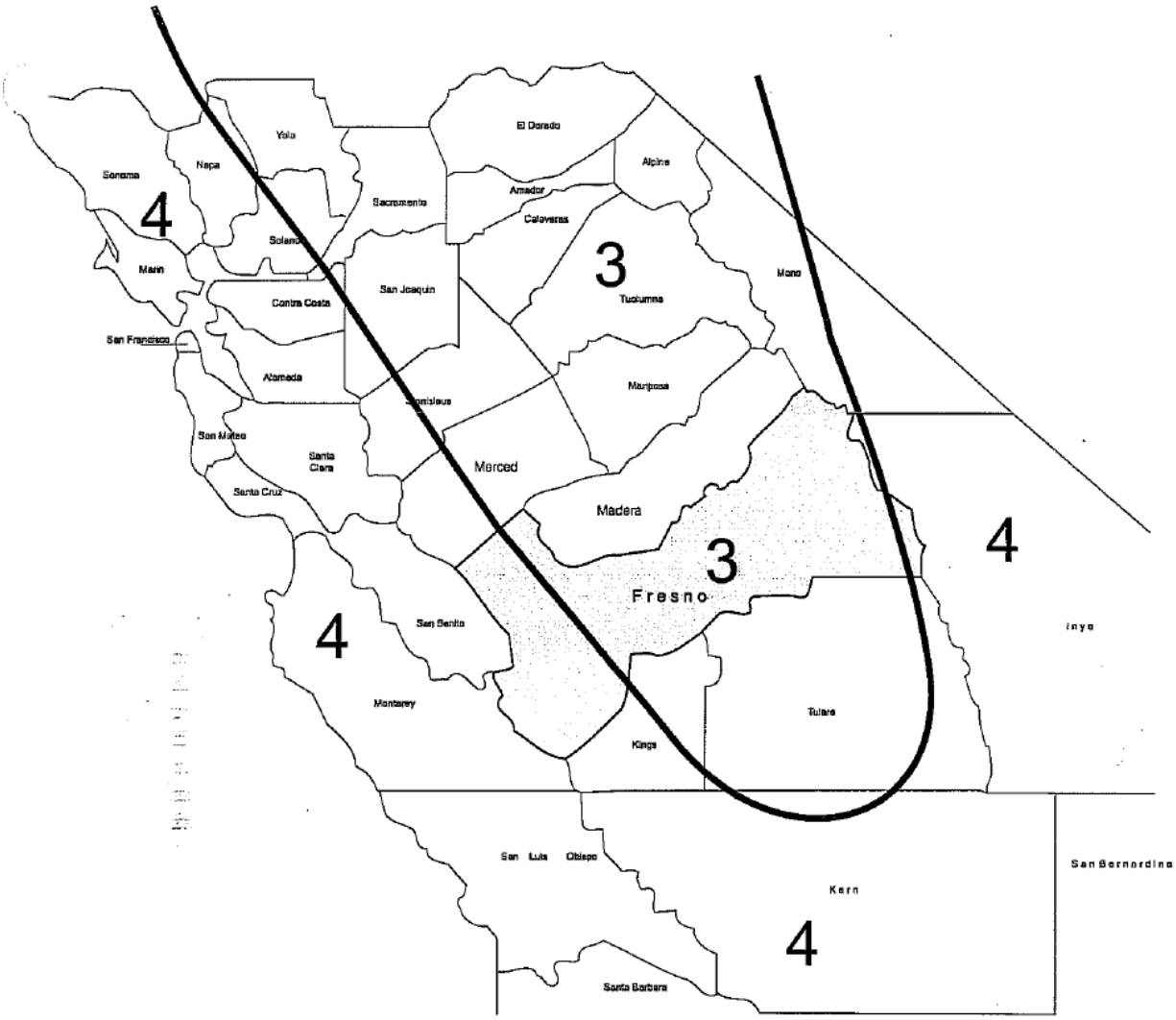
When movement occurs along a fault, the energy generated is released as waves, which cause ground shaking. Ground shaking intensity varies with the magnitude of the earthquake, the distance from the epicenter, and the type of rock or sediment through which the seismic waves move. The geological characteristics of an area thus can be a greater hazard than its distance to the earthquake epicenter.

Although most of Fresno County is situated within an area of relatively low seismic activity, the faults and fault systems that lie along the eastern and western boundaries of Fresno County, as

well as other regional faults, have the potential to produce high-magnitude earthquakes throughout the County. A high-magnitude earthquake on one of these faults could cause moderate intensity ground shaking in Fresno County. The valley portion of Fresno County is located on alluvial deposits, which tend to experience greater ground shaking intensities than areas located on hard rock. Therefore, structures in the valley areas would tend to suffer greater damage from ground shaking than those located in the foothill and mountain areas.

Most of Fresno County, from approximately Interstate 5 east, is located in Seismic Zone 3, as defined by the most recent California Uniform Building Code. Areas in the Coast Range and foothills and a small area along the Fresno County-Inyo County boundary are located in Seismic Zone 4 (see Figure 4.19).

Figure 4.19. California Building Code Seismic Zones



NORTH No Scale	Seismic Zone Boundaries	Fresno County General Plan **California Building Code Seismic Zones** Figure 9-4

SOURCE: California Code of Regulations, Title 24, Figure 23-2, 1991; Structural Engineers Association of California, Seismology Committee, Recommended Lateral Force Requirements and Tentative Commentary, 1988, Figure 1A and p. 5-C; EIP Associates, March 1997.

Source: Fresno County General Plan, 2000

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are considered to be the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry) are the most susceptible to the type of structural failure that causes injury or death.

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions, which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include, but are not limited to, building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained ground shaking.

Liquefaction Potential

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction. Scientific studies have shown that the ground acceleration must approach 0.3g before liquefaction occurs in a sandy soil with relative densities typical of the San Joaquin alluvial deposits.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, titling, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

No specific countywide assessments to identify liquefaction hazards have been performed. Areas where groundwater is less than 30 feet below the surface are primarily in the valley. However, soil types in the area are not conducive to liquefaction, because they are either too coarse or too high in clay content. Areas subject to 0.3g acceleration or greater are located in a small section of the Sierra Nevada along the Fresno-Inyo border and along the Coast Range foothills in western

Fresno County. However, the depth to groundwater in such areas is greater than in the valley, which would minimize liquefaction potential as well. Detailed geotechnical engineering investigations would be necessary to more accurately evaluate liquefaction potential in specific areas and to identify and map the areal extent of locations subject to liquefaction.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence is not available. The only urban area directly affected by settlement is the City of Coalinga. Fluctuating groundwater levels may have changed the local soil characteristics. Sufficient subsurface data is lacking to conclude that settlement would occur during a large earthquake; however, the data is sufficient to indicate that the potential exists.

Other Hazards

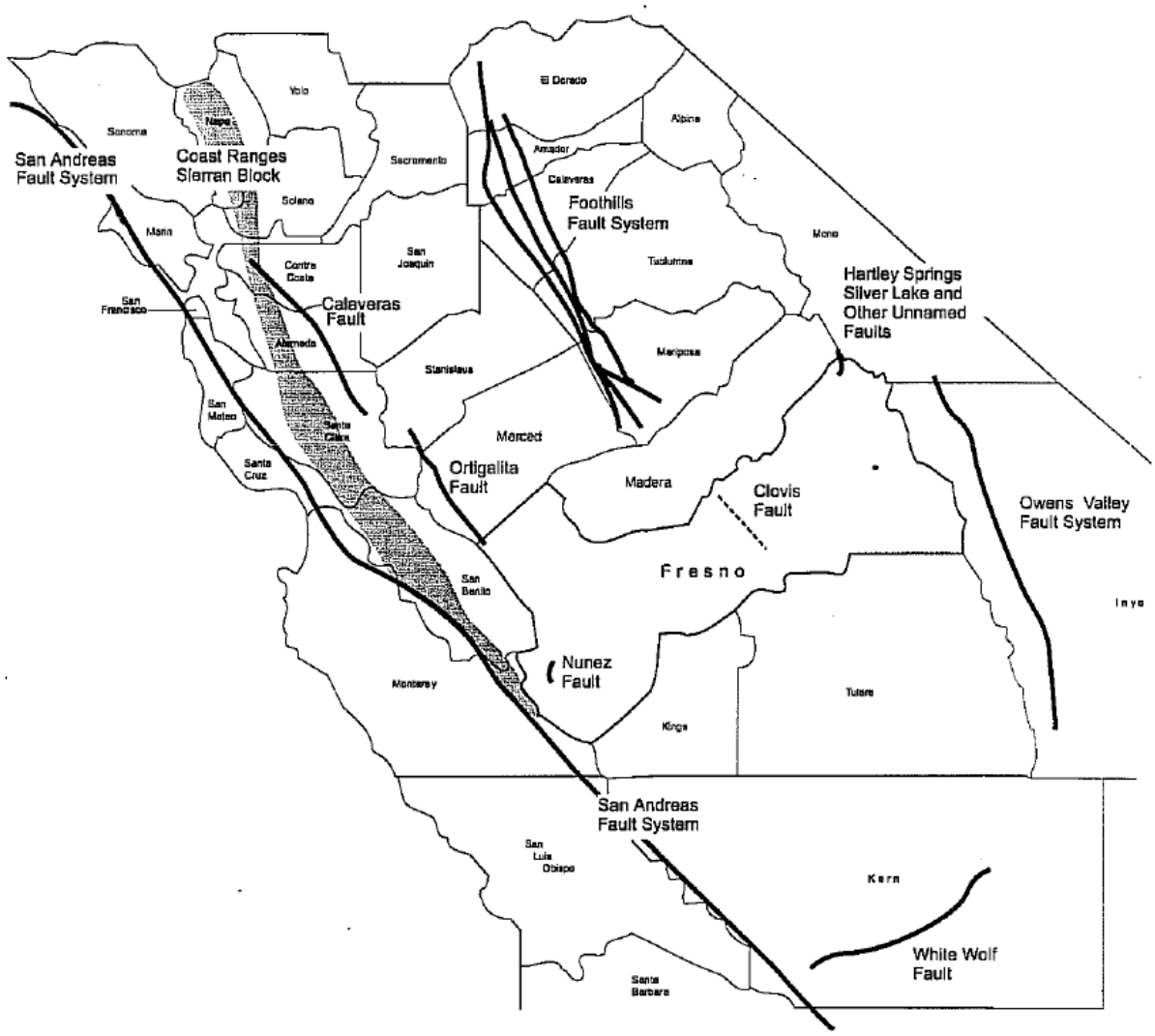
Earthquakes can also cause seiches, landslides, and dam failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other causes that can cause flooding. Earthquake-induced seiches are not considered a risk in Fresno County. Earthquakes may cause landslides, particularly during the wet season, in areas of high water or saturated soils. The most likely areas for earthquake-induced landslides are the same areas of high landslide potential discussed in Section 4.2.15 Landslide. Finally, earthquakes can cause dams to fail (see Section 4.2.9 Dam Failure).

Faults

An active fault is defined by the California Geological Survey as one that has had surface displacement within the last 11,000 years (Holocene). This does not mean, however, that faults having no evidence of surface displacement within the last 11,000 years are necessarily inactive. For example, the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active. Potentially active faults are those that have shown displacement within the last 1.6 million years (Quaternary). An inactive fault shows no evidence of movement in historic (last 200 years) or geologic time, suggesting that these faults are dormant.

There are a number of active and potentially active faults within and adjacent to Fresno County. Faults within Fresno County and major active and potentially active faults in the region are illustrated in Figures 4.20 and 4.21 and described below.

Figure 4.20. Fresno County Regional Faults

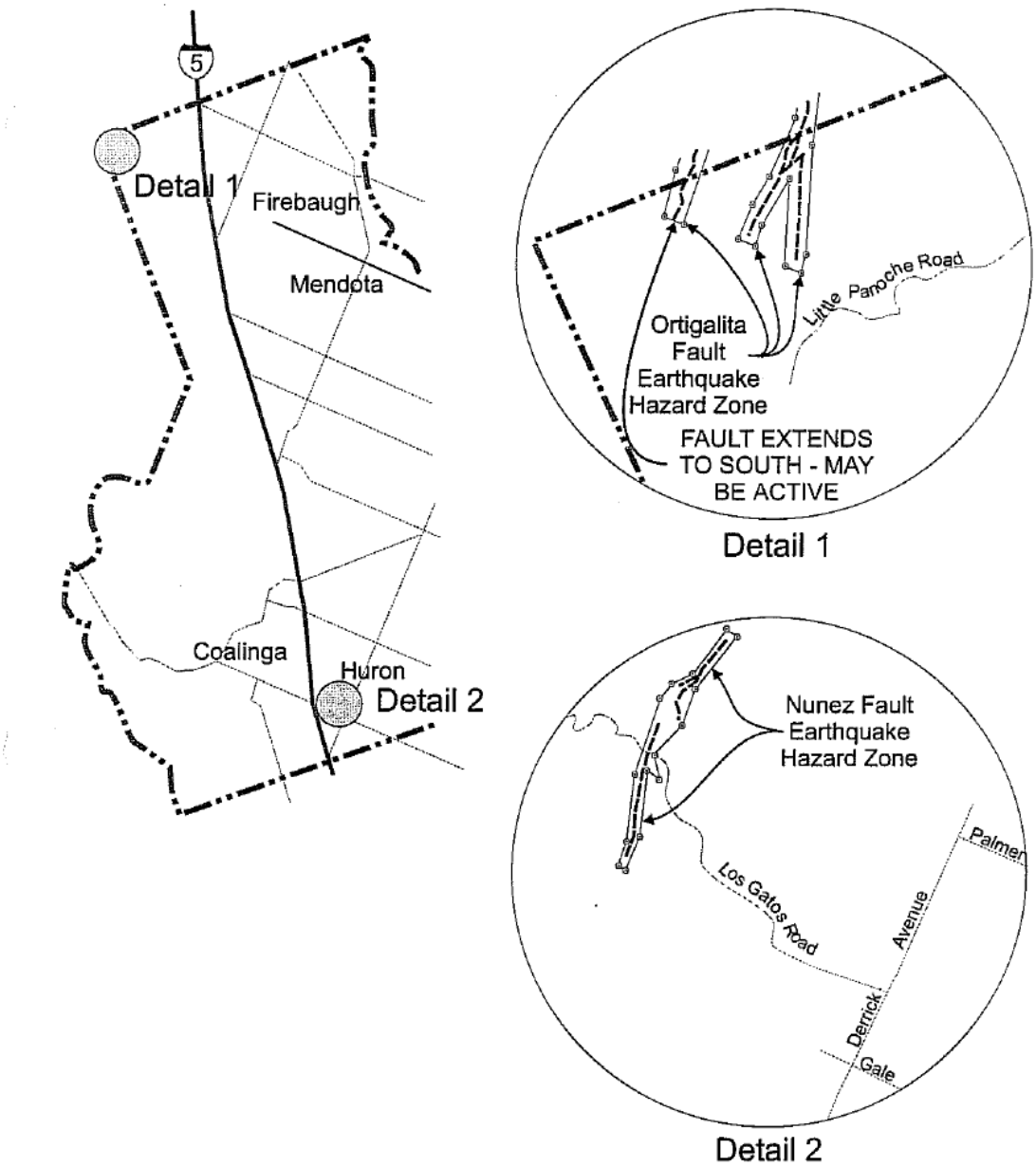


NORTH No Scale	Approximate Fault Location Inferred Fault Location Blind Thrust Fault Zone	Fresno County General Plan Regional Faults Figure 9-2

SOURCE: California Division of Mines and Geology, Fault ctivity Map of California and Adjacent Areas, Scale .750,000 Geologic Data Map No. 6, 1994; EIP Associates, March 1997.

Source: Fresno County General Plan, 2000

Figure 4.21. Alquist-Priolo Earthquake Fault (Hazards) Zones



NORTH No Scale	Fault	Fresno County General Plan **Alquist - Priolo Earthquake Hazards Zone** Figure 9-3

Source: Alquist Priolo Special Studies Zones Fresno Area Plates I and II

Source: Fresno County General Plan, 2000

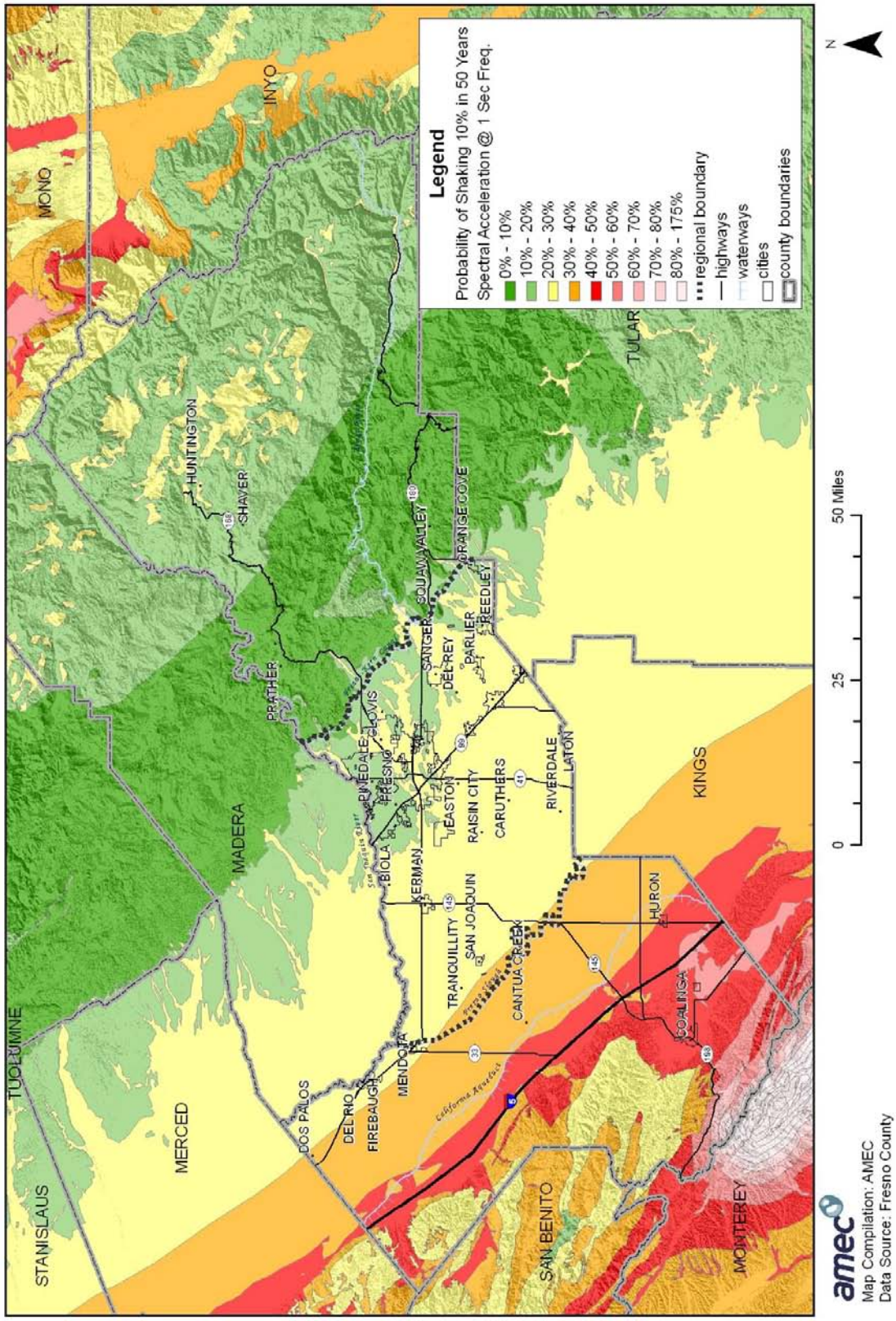
- **Clovis Fault**—The northwest-trending Clovis fault is believed to be approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. The Clovis fault is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.
- **Hartley Springs Fault, Silver Lake Fault (Parker Lake Fault), Unnamed Faults**—Holocene and Quaternary faults are present in the vicinity of Duck Lake in the northeastern part of Fresno County, a few miles south of Mammoth Lakes.
- **Unnamed Inferred Faults**—Relative or apparent upward and downward displacement, which are interpreted as inferred faults, occur in an area located a few miles south of Helm, extending southeast to approximately Lanare (between Fresno Slough and Crescent Ditch). As with the Clovis fault, there is no apparent Quaternary displacement; however, the possibility for fault movement in this area cannot be completely eliminated.
- **Nuñez Fault**—The Nuñez fault is located approximately six to seven miles northwest of Coalinga. The Nuñez fault experienced surface rupture during the 1983 Coalinga earthquake and is designated an earthquake fault zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994. No structure for human occupancy may be built within an earthquake fault zone until geologic investigations demonstrate that the site is free of fault traces that are likely to rupture with surface displacement. Special development standards associated with Alquist-Priolo requirements would be necessary for development in this area.
- **Ortigalita Fault**—The Ortigalita fault zone is approximately 50 miles long, originating near Crow Creek in western Stanislaus County and extending southeast to a few miles north of Panoche in western Fresno County. Most of the fault is considered active due to displacement during Holocene time and is designated an earthquake fault zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994. As illustrated in Figure 4.20, the southernmost extension of the fault lies in Fresno County.
- **The San Andreas Fault**—The San Andreas fault lies to the west and southwest of Fresno County. In the southwestern part of the County, the fault is roughly parallel to and a few miles west of the County line. This fault is considered active and is of primary concern in evaluating seismic hazards throughout western Fresno County, although effects of earthquakes along the San Andreas fault could occur farther east as well.
- **Sierra Nevada Fault Zone (Owens Valley Fault Zone)**—Approximately 12 miles east of the eastern Fresno County boundary lies the Owens Valley fault zone. This northwest-trending fault zone is a lengthy and complex system containing active and potentially active faults. Historically, this fault has been the source of seismic activity in Madera County to the north.
- **Foothills Fault System**—The southern part of the Foothills Fault System, located approximately 70-80 miles north of the City of Fresno, includes the Bear Mountains fault and the Melones fault zone, as well as numerous smaller, but related faults. According to the California Geological Survey data, these faults have not shown any activity during the last 1.6 million years; however, geologic investigations of the seismic safety of the Auburn Dam

site suggest these faults are potentially active. Therefore, the possibility exists that earthquakes could occur on these faults.

- **White Wolf Fault**—The White Wolf fault is located approximately 100 miles south of western Fresno County. The fault was not considered active until 1952, when movement along it generated a series of damaging earthquakes in the Bakersfield (Kern County) area.
- **Coast Range-Sierran Block Boundary**—Recent evidence suggests that faults along the western boundary of the Central Valley may be more active than once believed. According to the California Geological Survey, asymmetrical folds have recently been identified on the eastern slopes of the Coast Range, which includes western Fresno County. Such folds can hide faults that show no surface rupture. These faults and folds, which are part of a large system called the Coast Range-Sierran Block Boundary, are similar to the faults/folds identified as the cause of the 1983 Coalinga earthquake. Therefore, faults beneath the Central Valley once believed to be inactive are now believed to be active and capable of generating large magnitude earthquakes.

Figure 4.22 is an earthquake shaking map of Fresno County that is based on analyses of these faults, soils, topography, groundwater, and the potential for earthquake shaking sufficiently strong to trigger landslide and liquefaction. It supports the conclusion that the Fresno County planning area is at risk to future damaging earthquake hazards, especially in the western and eastern portions of the County.

Figure 4.22. Earthquake Shaking Potential for Fresno County



Seismic risk is not limited to identified faults. A significant fraction of small to moderately large earthquakes occur on faults not previously recognized. Such earthquakes are characterized as "background seismicity" or "floating earthquakes," which mean that the expected sources and locations of such earthquakes are unknown.

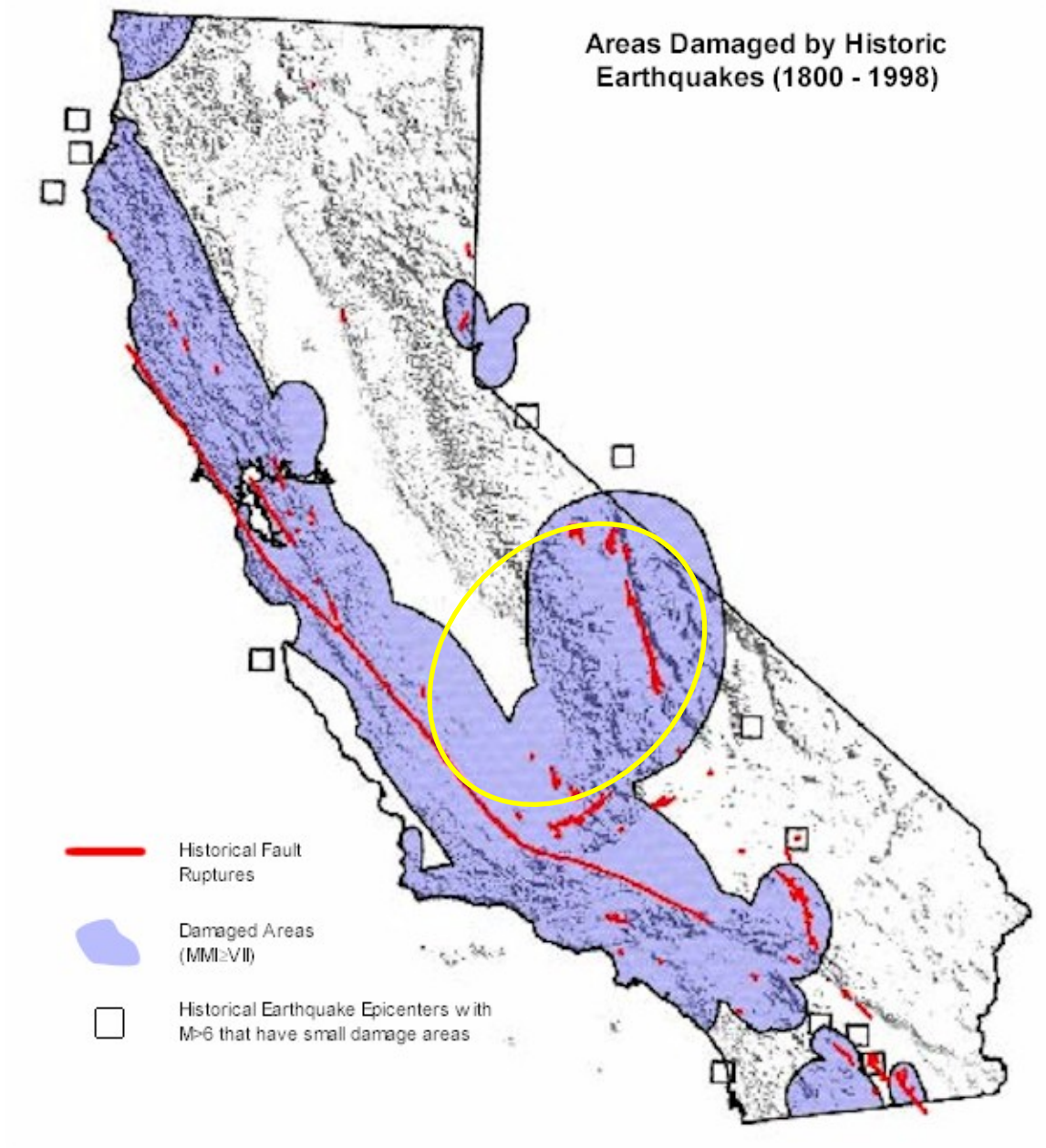
Past Occurrences

Earthquakes have occurred in Fresno County in the past. Figure 4.23 illustrates areas of California damaged by earthquakes between 1800 and 1998. According to the Fresno County Operational Area Master Emergency Services Plan, the California Geological Survey has identified a minimum of four magnitude 5.0 or greater earthquakes that caused damaging shaking in Fresno County between 1800 and 1999. Details on some of these events follow.

- **1983**—In Coalinga, a surface rupture occurred along the Nuñez fault. The main shock was 6.7 on the Richter scale. The surface rupture was determined not to be the cause of the main shock; instead, a blind thrust fault concealed deep within a complex fold-and-thrust belt at the western end of the San Joaquin Valley was identified as the cause. Approximately 800 buildings were destroyed, and 1,000 people were left homeless. No deaths resulted, but 47 people were injured. Private homeowner losses exceeded $25 million. Public agency losses were roughly $6 million. The commercial section of Coalinga was heavily damaged; however, most schools and the hospital received only slight damage. Local, state, and federal declarations resulted.
- **August 4, 1985**—A magnitude 6.0 earthquake occurred, centered about 10.5 kilometers east of Coalinga.

It is unknown to what extent earthquakes occurring outside of the planning area were felt by Fresno County residents.

Figure 4.23. Areas Damaged by Historical Earthquakes, 1800-1998



Source: California Geological Survey, www.consrv.ca.gov/CGS/rghm/psha/ofr9608/index.htm#Faults%20in%20California

Likelihood of Future Occurrences

Occasional—According to the Fresno County Operational Master Emergency Services Plan, the faults and fault systems that lie along the eastern and western boundaries of Fresno County, as well as other regional faults, have the potential to produce high magnitude earthquakes throughout the County. Based on the Alquist-Priolo Earthquake Fault Zone chart, Fresno County would be affected by earthquake activity in the Alcalde Hills and Ortigalita Peak faults. There

are also several faults in the vicinity of Coalinga that could cause problems in the future. These include the Nuñez fault, about ten kilometers northwest of Coalinga, the Coalinga fault, 5 kilometers northeast of Coalinga; and the New Idria fault, approximately 21 kilometers northwest of Coalinga. In addition, there are many faults in neighboring counties that could potentially affect Fresno County. Specifically, the U.S. Geological Survey is predicting an earthquake at the community of Parkfield in Monterey County, approximately 15 miles southwest of Coalinga.

4.2.12 Flood

Hazard/Problem Description

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss and are usually caused by weather events. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Certain health hazards are also common to flood events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When floodwaters contain sewage or decaying animal carcasses, infectious disease becomes a concern. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts.

The area adjacent to a channel is the floodplain. 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 the 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 their floodplains through the National Flood Insurance Program. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which can result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The Fresno County planning area is susceptible primarily to three types of flooding: localized, riverine, and dam failure flooding.

- **Localized flooding—**Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems. The term “flash flood” describes localized floods of great volume and short duration. This

type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour.

- **Riverine flooding—**Riverine flooding, defined as when a watercourse exceeds its "bank-full" capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Fresno County planning area, riverine flooding is largely caused by heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. The warning time associated with slow rise floods assists in life and property protection.
- **Dam failure flooding**—Flooding from failure of one or more upstream dams is also a concern to the Fresno County planning area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result, and there could be associated health concerns as well as problems with the identification and burial of the deceased. Dam failure is further addressed in Section 4.2.9 Dam Failure.

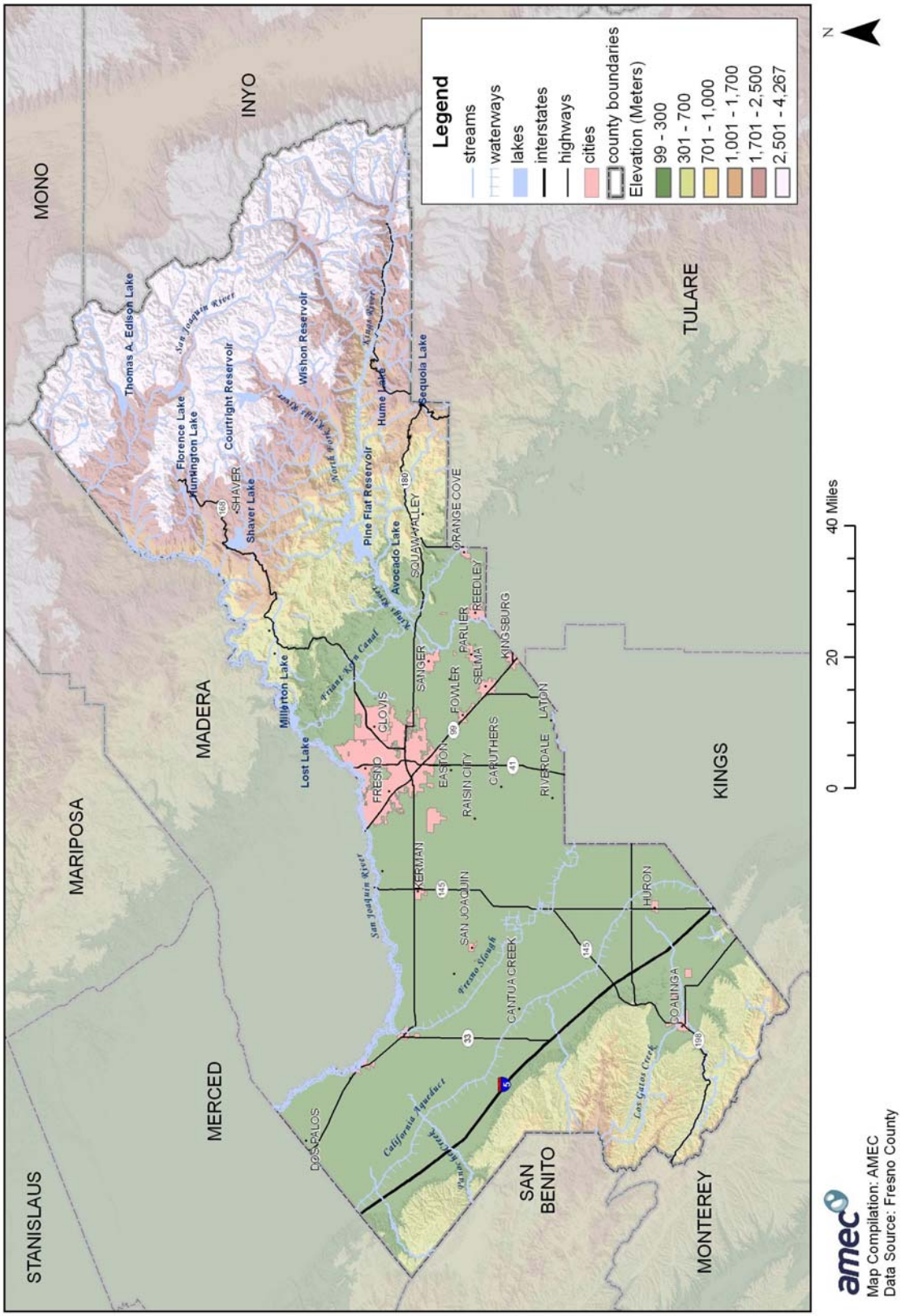
The Fresno County Waterway and Flood Control Systems

Fresno County is large and geographically diverse. Water resources in the Fresno County planning area include a number of rivers and streams, artificial waterways, and groundwater sources located throughout the County. The mountainous eastern portion of Fresno County, located primarily in the Sierra Nevada, contains many small mountain lakes and streams that are tributaries to the San Joaquin and Kings rivers, which flow into the Central Valley. The arid western portion of Fresno County is characterized by larger watersheds in the Coast Range that drain stormwater eastward into the valley and the Fresno Slough.

During winter and spring months, river systems in Fresno County swell with heavy rainfall and snowmelt runoff. To prevent flooding, a wide variety of storm drainage and flood control measures are used throughout the County. These include flood control reservoirs, levee systems, and watershed treatments. In rural areas, the management of reservoir releases, canals, and levee systems reduces the likelihood of flooding and reroutes stormwater around urban areas. In developed areas, storm drainage systems composed of street gutters, inlets, underground storm drains, ponds, pumping stations, and open channels are used to collect and control stormwater runoff. The storm drainage and flood control systems are discussed further in the sections that follow.

Figure 4.24 illustrates natural and manmade waterways in the County. Information on the County's more notable waterways and associated flood control facilities extracted from the Fresno County General Plan Background Report (2000) is included below by region.

Figure 4.24. Waterways in Fresno County



Eastern and Central Fresno County

Eastern Fresno County extends from the Sierra Nevada foothills to the Great Western Divide. It is located primarily in the Sierra Nevada, where precipitation falls mainly as snow. The region is characterized by small local watersheds and draining to the reservoirs upstream of Millerton and Pine Flat reservoirs. Flows originating in the mountains and foothills contribute to the drainage and flooding problems on the valley floor.

Central Fresno County includes the area between the valley floor around Fresno Slough and eastward to the Sierra Nevada foothills, including Millerton Reservoir to Pine Flat Reservoir. The geographic area of central Fresno County runs along the Sierra Nevada foothills at elevations around 500 feet, and slopes down to the Fresno Slough on the valley floor, and drains gently to the north. This area is the population center of the County, thus, most storm drainage and flood control systems are largely designed to protect urban development. Average annual precipitation in the central Fresno County area varies from 6 inches near Mendota to about 70 inches upstream.

The western slope of the Sierra Nevada drains into central Fresno County via the San Joaquin and Kings rivers and small creeks and stream systems. The Fresno Slough, also known as the North Fork of the Kings River, is connected to the San Joaquin River by the James Bypass, a manmade canal. It directs floodwater from the Kings River to the San Joaquin River. Three dams have been constructed to control flows on the rivers. These dams are Friant and Mendota dams on the San Joaquin River and Pine Flat Dam on the Kings River. Pine Flat Dam is operated primarily for flood control purposes. Friant Dam was constructed and is managed by the U.S. Bureau of Reclamation as part of the Central Valley Project. Although Friant Dam does serve to reduce release volumes in the main San Joaquin River channel, it was not sited, designed, or engineered for the purpose of flood control. Mendota Dam is operated primarily for irrigation.

In addition to the flood control facilities on the San Joaquin and Kings rivers, a number of reservoirs and detention basins have been constructed on streams east of the Fresno-Clovis area to prevent urban flooding. These facilities include Redbank Dam and the Redbank-Fancher Creeks Flood Control Project. The Redbank-Fancher Creeks Flood Control Project consists of two dams (Big Dry Creek Dam and Fancher Creek Dam), three detention basins (Redbank Creek, Pup Creek, and Alluvial Drain detention basins), and various canals to convey discharges around developed areas. The Friant-Kern Canal draws water from Millerton Reservoir at Friant Dam and flows south along the foothills toward Bakersfield.

The rivers, streams, and flood control systems of eastern and central Fresno County are described in further detail below. Table 4.12 summarizes the location, capacity, and managing agency for each steam system and flood control facility in eastern and central Fresno County.

San Joaquin River

The San Joaquin River forms the boundary between Fresno and Madera counties. It flows from the Great Western Divide in the Sierra Nevada southwest along the northern border of Fresno

County where it is joined by flows from the North Fork of the Kings River. From there, the river flows northwest up the San Joaquin Valley toward the Delta. Friant Dam, which serves to regulate river flows, is the most significant of the dams on the San Joaquin River. Several dams are located upstream of Friant Dam.

The storage capacity of Millerton Reservoir (formed by Friant Dam) is 520,500 acre-feet. The Central Valley Project Friant Unit consists of Friant Dam and Millerton Reservoir; the Friant-Kern Canal, which runs south to Kern County; and the Madera Canal, which runs northwesterly to Madera County. Releases from Friant Dam to the San Joaquin River and the Friant-Kern Canal provide service to water users within Fresno County.

This storage capacity of Millerton Reservoir is inadequate for full flood protection during wet years, and emergency releases may result in flooding problems downstream. The U.S. Army Corps of Engineers (the Corps) has evaluated the operational plans for all the dams in the San Joaquin River system to determine the possibility of coordinated releases to reduce the likelihood of coincident peak flows downstream with some success. However, in 1997, emergency releases from Friant Dam combined with large storm events and several levee breaks contributed to flooding along the San Joaquin River. Not designed for purposes of flood control, any flood control capability of the Friant Unit is incidental to its function as a diversion facility. The Madera Canal, also part of this unit, also serves to release runoff volumes from the San Joaquin River.

The Friant-Kern Canal carries irrigation water from Millerton Reservoir southeast to Kern County. The average annual delivery from the canal is about one million acre-feet with a design capacity of 5,000 cubic feet per second (cfs). There is a spillway into the Kings River just upstream of a double barrel 24 ½-foot diameter siphon under the river. Although the canal was constructed by the Bureau of Reclamation and is normally managed by the Friant-Kern Water Users Authority, floodwater in the canal is managed by the Corps. During times of flooding, water from the Friant-Kern Canal may not be releasable to the Kings River since the Corps may not want additional flows on the river.

Mendota Pool is a 5,000 acre-foot reservoir created by Mendota Dam located just outside City of Mendota on the San Joaquin River. The primary function of the dam is storage of irrigation water for agriculture; however, the water level in the pool also functions to maintain water levels in the Mendota Wildlife Management Area. Mendota Pool provides little or no flood protection. Mendota Dam contains flow from the San Joaquin River as well as discharge and releases from the Kings River via the Fresno Slough and James Bypass. The Delta-Mendota Canal conveys Delta water to Mendota Pool from the north, and several irrigation channels divert flows from it. The Bureau of Reclamation, in coordination with the Central California Irrigation District, manages this system, which is part of the Central Valley Project, and they have proposed replacing the existing dam with a new dam, which may raise the water level in the pool.

Southern California Edison and Pacific Gas and Electric own and operate a number of dams and reservoirs on the San Joaquin River and its tributaries upstream of Friant Dam. The most notable of these are Edison Lake and Florence Lake. These upstream storage facilities are operated for the production of electric energy and have a combined capacity of about 609,530 acre-feet. Their operation does affect the flow of water into Millerton Reservoir and subsequently the timing and availability of releases to Friant Unit contractors. None of these storage facilities are designed or operated for flood control, and the Corps currently has no jurisdiction over releases from these structures. Cumulative flood releases from the upper San Joaquin River dams could overwhelm Friant Dam.

From Friant to Gravelly Ford, the San Joaquin River is part of the Designated Floodway Program administered by the State Reclamation Board. Land use restrictions and river management practices allow the river to meander, flood the overbanks, and remain in a relatively natural state. Downstream of Gravelly Ford, the river is confined by levees. The design capacity of the San Joaquin River from Friant Dam to Chowchilla Bypass is in excess of 8,000 cfs, while the channel capacity downstream is reduced. The major San Joaquin River "choke point" in Fresno County is the reach near Mendota and Firebaugh, which has a channel capacity of 8,000 cfs. Beyond that point, San Joaquin River channel capacity continues to decrease for some distance due to lack of annual flooding and natural channel clearing since Friant Dam was constructed. Further downstream, the river channel has been deepened and widened by historical flows of the Merced and Tuolumne rivers and other tributaries.

In addition to releases from Friant Dam, two uncontrolled streams, Cottonwood Creek and Little Dry Creek, add significantly to the river flows below Friant during heavy precipitation. Historically, large areas within the Central Valley were within the river's floodplain. Development has encroached on the floodplain and the flow is now confined to a relatively narrow channel constrained by levees, which reduce the carrying capacity of the river. Most of the flow from Friant Dam is diverted to the Chowchilla Bypass, which branches off the San Joaquin River about 11 river miles upstream from Mendota Dam. Over time, encroachment of vegetation, substantial sedimentation, and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Downstream of the Chowchilla Bypass, the river is not confined by levees (within Fresno County) and generally carries no more than 2,500 cfs.

Flood control measures constructed along the main stem of the river have impacted riparian and wetland wildlife habitat areas. Levee construction and sediment and vegetation removal can damage streamside vegetation, divert floodwater from wetlands and riparian areas, and reclaim natural wetlands for other uses.

Kings River

The Kings River originates high in the Sierra Nevada Mountains near the Inyo County line and flows southwest through the central part of Fresno County and into Tulare County at Reedley. It has a large drainage basin, which includes most of Kings Canyon National Park and most of the

area between Shaver and Florence lakes in the north to the Fresno/Tulare County border in the south. North of Hanford, the river branches, and the south fork flows southward to the Tulare Lakebed. The north fork joins Fresno Slough, which conveys flows north to the San Joaquin River at Mendota Pool. Several sloughs and canals branch off of the river and are used for water storage and to convey irrigation water.

The Kings River flows are regulated by Pine Flat Dam, completed in 1954 for flood control purposes. Pine Flat Reservoir has a storage capacity of approximately one million acre-feet. The flood control functions of the facility are managed by the Corps while the releases for irrigation diversion are managed by the Kings River Water Association. There are additional reservoirs upstream of Pine Flat that are owned and operated by Pacific Gas and Electric for the purpose of hydroelectric power generation. These facilities have a combined storage capacity of about 252,000 acre-feet. Two uncontrolled creeks, Hughes Creek and Mill Creek, flow into the Kings River below Pine Flat Dam. Pine Flat Reservoir has adequate storage capacity to avoid emergency releases in most storm events, but these downstream creeks can add significant flow to the river.

Downstream of Pine Flat Dam, the Kings River is managed for flood control by the Kings River Conservation District in cooperation with the Corps, the California Department of Water Resources (DWR), and local irrigation districts. Releases from Pine Flat Dam and flows from Hughes Creek and Mill Creek provide the majority of the river's flow. Numerous sloughs and irrigation canals branch off the Kings River. The capacity of the river is more than 13,000 cfs. The Kings River flood control facilities include many miles of levees in central Fresno County.

There are three weirs on the river: Army Weir, Crescent Weir, and Stinson Weir. Army Weir is located where the north and south forks branch off of the natural river just upstream from State Route 41. Crescent Weir is located at the Crescent Bypass southwest of 22nd and Excelsior Avenues. The Crescent Bypass flows to Fresno Slough. Stinson Weir is located near the confluence of Murphy Slough and Fresno Slough at Elkhorn Avenue. Normal flows are held by these weirs in the main channel. During storm events, as much as 4,750 cfs is diverted to the North Fork and the San Joaquin River. As much as 3,200 cfs can then be diverted to the Crescent Bypass. Any flow above approximately 10,000 cfs is divided equally between the north and south forks.

In practice, the flow of the Kings River is carefully managed using analysis of anticipated weather, upstream flows, and ability of downstream users to receive the water. Significant adjustment may be necessary, and a variety of operations options are considered, including storing or routing water through alternate sloughs or requesting users to accept additional water. Fresno Slough and the James Bypass are normally dry except for groundwater seepage and irrigation returns. Flow is diverted to the South Fork only in very wet years.

Sand and gravel extraction has occurred along both the San Joaquin River and the Kings River in Fresno County, although most of this aggregate mining has occurred outside of the main river

channels. The hydrologic effect of the mining and subsequent reclamation activity has generally been to increase the overall hydraulic capacity of the rivers to accommodate major flood events.

Eastern County Streams

There are many creeks and lakes in the high Sierra Nevada within Fresno County, all of which eventually feed into either the Kings River or the San Joaquin River. In addition, several creeks drain the foothill areas and flow into developed areas in central Fresno County. Most of these streams (i.e., Redbank, Fancher, Dry, and Dog creeks) have been controlled by efforts of the Corps and the Fresno Metropolitan Flood Control District to protect the City of Fresno from damage of flooding from a 200-year storm. Other creeks, such as Wahtoke Creek, are uncontrolled. Some streams in foothill areas of southeastern Fresno County are tributaries to the Orange Cove Stream Group and to Sand Creek, which is a tributary to the Kaweah River.

Flood control efforts along some of these eastern Fresno County streams include the following:

- **Redbank Reservoir**—Redbank Reservoir, formed by Redbank Dam, is located on Redbank Creek north of Shaw Avenue. The reservoir has a gross pool capacity of 1,030 acre-feet, and receives water from the Redbank Creek watershed. The reservoir is operated for flood control by the Fresno Metropolitan Flood Control District.
- **Redbank-Fancher Creeks Flood Control Project**—This project consists of a system of two dams, three detention basins, and canals to protect developed areas in and around the City of Fresno from a 200-year storm. The project was built by the Corps and is managed and operated by the Fresno Metropolitan Flood Control District. Fancher Creek Reservoir has a capacity of 9,712 acre-feet and retains water from Fancher and Hog creeks and some flows from Redbank Creek. Fancher Dam diverts flows via canals around Fresno. Redbank Creek Detention Basin (940 acre-feet) contains local flows from Redbank Creek downstream from Redbank Dam. The Alluvial Drain and Pup Creek detention basins have capacities of 305 and 559 acre-feet, respectively, and can each regulate discharges into Dry Creek at 25 cfs.
- **Big Dry Creek Reservoir**—Big Dry Creek Reservoir, with a capacity of 30,200 acre-feet, retains flows from Big Dry Creek and Dog Creek and diverts flows via Little Dry Creek to the San Joaquin River at a rate of up to 700 cfs. During a flood event, water is not typically released from Big Dry Creek Dam; however, during a severe flood event, it may be necessary to do so.

Table 4.12. Major Flood Control Facilities and Stream Systems in Eastern and Central Fresno County

Facility/Water Body	Location	Capacity	Managing Agency
Millerton Reservoir*	17 miles northeast of Highway 99 on San Joaquin River in north central Fresno County	520,500 acre-ft[1]	Bureau of Reclamation
Pine Flat Reservoir	16 miles northeast of Sanger on the Kings River in the east central part of the County	1,000,000 acre-ft[1]	U.S. Army Corps of Engineers
Mendota Pool	On the San Joaquin River at Mendota where it turns north and Fresno Slough joins the river in the northwestern part of the County	5,000 acre-ft[2]	Bureau of Reclamation
Big Dry Creek Reservoir	West of Friant-Kern Canal and north of Tollhouse Road on Big Dry Creek	30,200 acre-ft[1]	Fresno Metropolitan Flood Control District
Redbank Reservoir	7 miles east of Clovis, 3 miles southwest of the Friant-Kern Canal between Dog Creek and Fancher Creek in central Fresno County	1,030 acre-ft	Fresno Metropolitan Flood Control District
Fancher Creek Reservoir	East of the Friant-Kern Canal at the confluence of Fancher and Hog creeks	9,712 acre-ft[1]	Fresno Metropolitan Flood Control District
Redbank Creek Detention Basin	On Redbank Creek north of McKinley Avenue and west of DeWolf Avenue	940 acre-ft[1]	Fresno Metropolitan Flood Control District
Pup Creek Detention Basin	On Pup Creek south of Herndon Avenue and east of Temperance Avenue	559 acre-ft[1]	Fresno Metropolitan Flood Control District
Alluvial Drain Detention Basin	On Alluvial Drain west of Temperance Avenue and north of Nees Avenue	305 acre-ft[1]	Fresno Metropolitan Flood Control District
San Joaquin River	Flows from the Sierra Nevada southwest along the northern border of the County to Mendota where it turns to flow to the northwest, forms the border between Fresno and Madera counties	8,000 cfs[1,4] (Friant Dam to Chowchilla) 2,500 cfs[1,4] (to Mendota) 4,500 cfs[1,4] (Mendota Dam to Sand Slough)	Bureau of Reclamation, U.S. Army Corps of Engineers, local irrigation districts
Kings River	Flows from the Sierra Nevada to Sanger and Reedley and into Kings County then southwest near the Fresno-Kings County line to Army Weir above Highway 41 where the normal flow is diverted to the north fork. Excess flows are diverted to Tulare Lakebed	13,000 cfs[1,4]	Kings River Conservation District
Fresno Slough and James Bypass	A seasonal waterway system that connects the Kings River near Laton and Lemoore NAS to the San Joaquin River at Mendota Pool during flood events	4,750 cfs[1]	U.S. Army Corps of Engineers
Friant-Kern Canal	Flows southeasterly from Millerton Reservoir through Orange Cove continuing on to Bakersfield. Crosses 5 feet below Kings River via a 24.25 ft diameter 3,000 ft siphon	5,000 cfs[1]	Friant-Kern Water Users' Authority, Bureau of Reclamation, U.S. Army Corps of Engineers

Source: Fresno County General Plan, 2000

Note: The numbers provided in this table are design capacity and actual river capacity may vary significantly

*Friant Dam/Millerton Reservoir is not sited, designed, or operated to function as a flood control facility, and any such capability is incidental to its function as a diversion facility

[1]U.S. Army Corps of Engineers

[2]Central California Irrigation District

[3]Kings River Conservation District

[4]River channel capacity is difficult to define due to significant changes in the river conditions over time, variance in channel conditions and geometry along a given river reach, and assumptions made in developing hydraulic models

Western County Streams

Western Fresno County consists of the Coast Range within which lies the County's western boundary with San Benito and Monterey counties and the San Joaquin Valley area between the Range and the Fresno Slough. Interstate 5 and the California Aqueduct pass in a north-south direction through western Fresno County. A complex system of streams drains the eastern slope of the Coast Range into the valley and the Fresno Slough. Western Fresno County is significantly different from the rest of the County in climate and character.

Western Fresno County is largely unpopulated. The major land uses are agriculture and grazing. The region is quite dry, with an average annual rainfall of only six to eight inches, yet the stream systems are prone to high flows and flooding because they drain very large watersheds. The soils in the Coast Range are subject to erosion. As a result, stormwater runoff typically carries large volumes of sediment and naturally occurring minerals, such as selenium, arsenic, boron, and asbestos, which is undesirable to downstream users.

Western Fresno County contains five major stream systems that flow from the Coast Range as described further below. The location, capacity, and managing agency for each stream system and associated flood control facility is summarized in Table 4.13.

- **Little Panoche Creek**—Little Panoche Creek, located in the northwestern corner of Fresno County, is managed for flood control purposes by the DWR. The DWR operates and maintains a detention dam and reservoir (Little Panoche Reservoir) on the creek. The facility was constructed by the Bureau of Reclamation to provide flood protection for the California Aqueduct. It was designed for a 100-year storm and has a storage capacity of 820 acre-feet. When storage levels in the reservoir exceed 820 acre-feet, the dam's uncontrolled spillway releases water. The creek flows under Interstate 5 and the California Aqueduct. Little Panoche Creek ends at a retention basin on the eastside of the aqueduct. When the retention basin fills with stormwater during high flows, stormwater is pumped into the aqueduct. The reservoir also serves as a wildlife preserve.
- **Panoche Creek**—Panoche Creek is located just south of Little Panoche Creek in northwestern Fresno County. It flows under Interstate 5and across the California Aqueduct. The estimated 100-year peak flow for Panoche Creek is 22,000 cfs. On the east side of the aqueduct, the water is not channelized and flows overland. During high creek flows, stormwater floods vast tracks of agricultural land and portions of the City of Mendota.
- **Tumey Gulch and Arroyo Ciervo**—Tumey Gulch and Arroyo Ciervo are located in central western Fresno County and flow easterly from Ciervo Mountain. The estimated 100-year peak flow is 3,600 cfs for Tumey Gulch and is 900 cfs Arroyo Ciervo. No flood control facilities exist on the streams; however, the California Aqueduct obstructs their eastward flow. During periods of high stream flow, sediment laden floodwater may form ponds on the west side of the aqueduct. These ponds may spill stormwater and sediment into the aqueduct during storm events.

- **Cantua Creek System**—This creek system includes Arroyo Hondo, Cantua Creek, Salt Creek, Martinez Creek, and Domegine Creek in central western Fresno County. These creeks drain the east side of Joaquin Ridge, crossing Interstate 5 between Kamm Road and Fresno-Coalinga Road. The estimated 100-year peak flow from the Cantua Creek system is 8,300 cfs. As with Tumey Gulch and Arroyo Ciervo, stormwater from the Cantua Creek system ponds on the east side of the California Aqueduct during periods of high flow, dumping large quantities of sediment and storm runoff into the aqueduct. Cantua Creek has inundated Interstate 5 during large storm events.
- **Arroyo Pasajero Stream System**—The Arroyo Pasajero stream system encompasses the largest drainage area in the western San Joaquin Valley. The major creeks in the system are Los Gatos, Warthan, Jacalitos, and Zapato-Chino creeks. They flow through the City of Coalinga and under Interstate 5 to a small ponding basin on the west side of the California Aqueduct. Arroyo Pasajero carries large quantities of sediment containing naturally occurring asbestos. During flood events, the system may damage the aqueduct and Interstate 5. Floodwater may also wash asbestos fibers into the aqueduct.

Table 4.13. Major Flood Control Facilities and Stream Systems in Western Fresno County

Facility/Water Body	Location	Capacity[1]	Managing Agency
Little Panoche Reservoir	3 miles west of I-5 in the northwest corner of the County	820 acre-ft	Department of Water Resources
Little Panoche Creek	Flows easterly from the north side of Panoche Mt. in the northwest corner of the County	N/A	Department of Water Resources
Panoche Creek	Flows eastward just north of Panoche Road crossing I-5 approximately one mile north of the Panoche Road interchange	N/A	Department of Water Resources
Tumey Gulch and Arroyo Ciervo	Flows eastward from Ciervo Mt. crossing I-5 between Panoche Road and Harlan Avenue	N/A	Department of Water Resources
Cantua Creek	Flows easterly between Ciervo Hills and Three Sisters crossing I-5 just south of Coalinga-Mendota Road interchange	2,200 cfs[2] (bankfull at approximately 10-year event)	Department of Water Resources
Arroyo Pasajero (including Los Gatos, Warthan, Acalitos, and Zapata-Chino Creeks)	This stream system drains the largest drainage basin in the western San Joaquin Valley, flowing from the hills of the Coastal Range west of Coalinga and Pleasant Valley, through Coalinga and westerly across I-5 and terminating in a constructed ponding basin west of the aqueduct	2,500 cfs (typ. flow) [2] 36,000 cfs 100-year peak flow[2]	Department of Water Resources, U.S. Army Corps of Engineers, Bureau of Reclamation

Source: Fresno County General Plan, 2000
Note: The numbers provided in this table are design capacity and actual river capacity may vary significantly
[1]Department of Water Resources
[2]River channel capacity is difficult to define due to significant changes in the river conditions over time, variance in channel conditions and geometry along a given river reach, and assumptions made in developing hydraulic models

Major Sources of Flooding/Problem Areas

Flooding is a natural occurrence in the Central Valley because it is a natural drainage basin for thousands of watershed acres of Sierra Nevada and Coast Range foothills and mountains.

FEMA's 2005 Flood Insurance Study for the County describes several types of primary flood problems.

General rainfall floods can occur in Fresno County during winter and spring months. This type of flood results from prolonged heavy rainfall over tributary areas and is characterized by high peak flows of moderate duration. Flooding is more severe when antecedent rain has resulted in saturated ground conditions; when the ground is frozen and infiltration is minimal; or when rain on snow in the high elevations on the east side adds snowmelt to rain flood runoff.

Snowmelt floods on the San Joaquin and Kings rivers and their higher elevation tributaries can be expected to occur any time from April through June. Although snowmelt flooding is of much larger volume and longer duration than rain flooding, it does not have the high peak flows characteristic of rain floods. Snowmelt flood runoff is sometimes augmented by late spring rains on the snowfields or lower elevation tributary watersheds.

Cloudburst storms sometimes lasting as long as three hours can occur any time from late spring to early fall and may occur as an extremely severe sequence within a general rainstorm. Cloudbursts are high-intensity storms that can produce floods characterized by high peak flows, short duration of flood flows, and small volume of runoff. In some areas, especially where drainage basins are small, cloudbursts can produce peak flows substantially larger than those of general rainstorms. Cloudburst storms usually cover small areas and would not generally affect flood flows or flood stages on the San Joaquin or Kings rivers. Generally, only the upper reaches of the smaller streams are affected by cloudbursts.

In urban areas, flood problems intensify because open land available to absorb rainfall and runoff is being used for new development, which increases the amount of paved areas (i.e., impervious surfaces). The decrease in the amount of open land increases the volume of water that must be carried away by waterways. Urban development in some areas of Fresno County has been substantial in recent years and is expected to continue.

Eastern and Central Fresno County Flood Problem Areas

Most flood issues in eastern and central Fresno County are associated with the San Joaquin River, Kings River, and several other stream systems.

San Joaquin River System

The San Joaquin River from Gravelly Ford to the Chowchilla Bypass outside Fresno County is confined by a levee system. The design capacity of the river is 5,000 cfs, which is considered a safe carrying capacity with three feet of allowable freeboard. Over time, encroachment of vegetation, substantial sedimentation, and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Levee maintenance is generally under the jurisdiction of local reclamation districts. Uncontrolled flooding from the San Joaquin River between the Chowchilla Bypass and Dos Palos tends to flow into Madera County north of Mendota.

The Mendota Pool area has shown evidence of significant subsidence, possibly affecting levee height, river invert (i.e., bottom of low-flow channel), as well as the pool depth. The flooding hazards in the region are from Panoche Creek to the west into Madera County downstream from Mendota Pool. It was reported in 1997 (Fresno County General Plan Background Report) that the Mendota Dam is of limited usefulness for flood control purposes. Construction of a new dam at Mendota has been contemplated to improve flood control capabilities of the lower reaches of the San Joaquin.

The flooding potential from creeks and streams between the San Joaquin and Kings Rivers in the east has been substantially eliminated within the last few years by the completion of the Redbank-Fancher Creeks Flood Control Project. This has resulted in a decrease in the areas designated in the 100-year floodplain. However, as noted in the Fresno County General Plan Background Report, the 100-year storm event flows have increased from 18,000 cfs to 24,500 cfs in the San Joaquin River over last few decades (due to increasing intensity of storms and statistical analysis of the meteorologic/hydrologic database for the San Joaquin River).

Kings River System

Uncontrolled creeks within the Kings River system, notably Mill Creek, continue to challenge management of Pine Flat Dam and Kings River flood control during consecutive large storm events. In 1997, water was not released form Pine Flat due to large flows in Mill Creek, which pushed the limits of the system. If another large event had occurred before Pine Flat Reservoir releases could provide adequate storage space and the Mill creek watershed was still saturated, rapid runoff in Mill Creek and an emergency spill at Pine Flat would have overwhelmed the system. In the event of a major release from Pine Flat Dam, downstream flooding would occur over agricultural lands near the riverbanks and possibly within the Cities of Reedley and Kingsburg.

Western Fresno County Flood Problem Areas

Flood issues in western Fresno County are varied in scope and unique in nature. Many creeks prone to high flows and significant erosion are found in the area, but most of the region is unpopulated, so flooding in many areas poses little threat to life or personal property. Major facilities that are subject to flooding include Interstate 5 and the California Aqueduct. Urban areas subject to flooding include the communities of Coalinga, Huron, and Mendota. Important wetland habitat in the Mendota Wildlife Management Area is also subject to flooding and may be impacted by sediments carried by flood flows from these creeks.

During large storm events, the California Aqueduct is flooded by high flows from Arroyo Pasajero. Consequently, the Bureau of Reclamation, the Corps, and the DWR are coordinating efforts to relieve the threat of flooding from this stream system. Other stream systems obstructed by the aqueduct may pose a flooding hazard during periods of high flow when ponds form on the west side of the aqueduct. The streams carry large amounts of sediment. When ponds fill with sediment, water and sediment spill into the aqueduct.

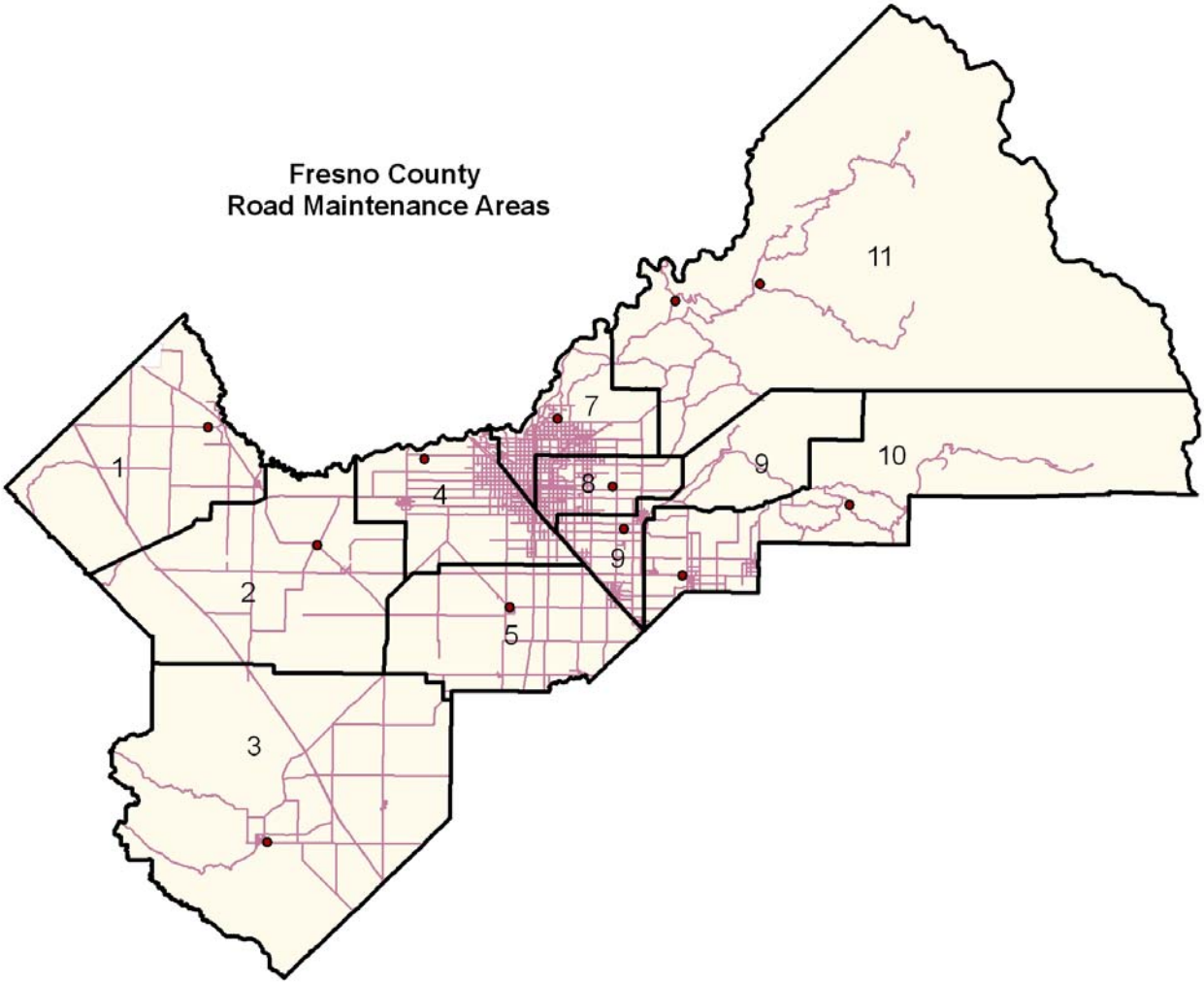
Various stream systems also flood developed areas in western Fresno County during storm events. Creeks that feed into Arroyo Pasajero flow through the City of Coalinga, creating flood hazards and preventing development in impacted areas. Downstream, Arroyo Pasajero is prone to flooding the road into the City of Huron. After crossing the California Aqueduct, Panoche Creek flows overland and floods both agricultural land and portions of the City of Mendota.

The Mendota Wildlife Management Area receives water from Panoche Creek, which drains into Mendota Pool. During storm events, the sediments carried in Panoche Creek contain high levels of selenium and arsenic, which may degrade the water quality in the Mendota Wildlife Management Area.

Localized Flooding Problem Areas

Localized flooding also occurs throughout the County with several areas of primary concern. According to the Fresno County Department of Public Works, numerous roads throughout the County are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. Flooding problems are tracked by road maintenance area (see Figure 4.25) and noted below.

Figure 4.25. Fresno County's Road Maintenance Areas



Source: Fresno County Public Works and Planning

A-1 Firebaugh Area

The following roads in Area #1 are subject to flooding in heavy rains and flooding signs are required.

- Washoe at Delta Mendota Canal southeast of Bridge
- Herndon at Russell
- Belmont from San Diego to Fairfax
- Shaw between Milux and Russell
- Washoe .01 miles north of California
- Shields at Fairfax southwest corner
- Russell 1.9 miles south of Shields
- Little Panoche, numerous areas 1.3 miles west of Interstate 5 to C/L

- Milux at Bullard, west side
- Bullard east of Milux numerous areas to Fairfax
- Althea 1 mile west of Russell
- Hudson at Merrill northeast corner
- Fairfax at Valeria southwest corner
- Fairfax .02 miles south of Valeria
- Oxalis .04 miles west of Ormsby

A-2 Tranquility

Areas that flood east of James Road:

- Butte, American to North
- American, Denver to El Dorado
- El Dorado, American to Colorado
- Marin, Adams South .2 miles
- Sumner, Colorado to Placer
- Yuba, Manning to Colorado
- Parilier, Placer to Yuba
- Springfield, Colorado to Plumas
- Springfield, Colusa to Sutter
- Huntsman, Colorado to El Dorado
- Floral, Colorado to Graham
- Rose, Colorado to Trinity
- Napa, at drain ditch crossing (Nebraska)?
- Kamm, Placer to Yuba

Areas that flood west of James Road:

- San Mateo north of State Route 180
- Sante Fe at San Benteo
- Jefferson Amador to Tuolumne
- Lincoln James Rd. to Calaveras
- Mt. View San Mateo to Montery
- Clarkson San Mateo to Amador
- Amador Clarkson to Elkhorn
- Elkhorn Amador to Sonoma
- Sonoma Elkhorn to Mt. Whitney
- Kamm State Route 33 to Interstate 5
- Manning Aqua Duct to Interstate 5
- Douglas south of Manning .1 mile
- Douglas north of Manning 1 mile
- San Diego Adams to American
- Jensen San Diego to Washoe

A-3 Coalinga

- Mt. Whitney
- Coalinga-Mendota Road
- Parkfield
- Collwell east and west
- Boone
- Alcalde Road

A-4 Biola

- Dickenson Avenue, Herndon to Barstow
- Dickenson Avenue, south of North Avenue, east side
- Belmont Avenue, Grantland to Howard Avenue, various locations
- Shields Avenue, Westlawn to Bishop Avenue, various locations

- Shields Avenue west of State Route 145, various locations
- Shaw Avenue west of State Route 145, various locations
- Dower Avenue, Shields Avenue to Shaw Avenue, various locations
- Henderson north of South Avenue, east side
- Brawley south of Lincoln
- Elm Avenue between Morton and Clayton Avenue.
- Adams-Clovis Avenue to State Route 99
- Central at Blyth to Cornelia
- Grantland south of Shaw, east side
- Grantland south of Belmont to RXR tracks, east side

A-5 Caruthers

- Floral west of Temperance
- Fowler at Davis
- McCall south of Clarkson
- Fowler north of Elkhorn
- Temperance south of Conejo
- Dewolf north of Mt. View
- Clovis north of Nebraska
- Harlan between Maple and Chestnut

A-7 Fresno-Clovis

- Copper between Minnewawa and Fowler
- Copper near Armstrong
- Armstrong between Copper and International
- International between Flower and Armstrong
- Fowler between International and Shepherd
- Behymer between Willow and Minnewawa
- Behymer between Minnewawa and Fowler
- Sunnyside between Teague and Nees
- Teague between Fowler and Armstrong
- Marion between Teague and Nees
- Shaw between McCall and Leonard
- Academy between Herndon and Shaw
- Sierra between Academy and Del Rey
- Herndon between Academy and Madsen
- Madsen between Herndon and Shepherd
- Shepherd between SH 168 and Academy
- Shepherd between Fowler and Armstrong
- Gettysburg between Van Ness and Wishon

- Sierra between Forkner and Van Ness Extension
- College between Swift and Santa Ana

A-8 Fresno-Sanger

This is not a complete list as there are many locations that pool at the shoulder or just onto the road. Large or back to back storms can change all.

- Jensen at Sierra Vista
- Shields/Locan
- National east of Minnewawa
- Monticeto/Rogers
- Fowler at Princeton
- Butler east of Locan
- Gettysburg/Greenwood
- McKinley west of Bethel
- McKinley at Leonard
- Indianola south of Highway 180
- Dewolf/Church
- Bond/Mayfair Drive North
- Griffith east of Clovis
- Dakota east of Highland
- Fowler at Olive
- Walling north of Kings Canyon
- Olive east of Hornet
- Temperance north of Church
- Temperance north of Jensen
- Locan north of Church
- Highland north of Jensen
- Zediker south of Belmont
- Tulare west of Zediker
- Newmark north of Belmont
- Macdonough north of Belmont
- Newmark north of Highway 180
- California east of Dockery
- McCall/Tulare
- Tulare east of McCall
- Indianola at Jensen
- Olive/Zediker
- Thompson north of Dakota
- Rancho at Butler
- Illinois west of Villa
- Madison west of Clovis
- Grant west of Clovis
- Washington west of Clovis
- Easterby Drive South west of Minnewawa
- Easterby Drive North west of Minnewawa
- Brown at Jackson

A-9 Sanger-Del Rey

- American between Academy and Armstrong
- Central between McCall and Willow
- Bethel south of Adams 100-500 feet
- Bethel between Manning and Rose
- Willow between North and Jensen
- Nebraska from Academy to city limits and at intersection of Bethel

A-10 Reedley-Dunlap

- Aita at Manning
- Zediker south of Caruthers

- South at Zediker
- Reed at Floral
- Reed at South
- Adams betwwen Zediker and Smith
- Smith at Dinuba
- Hill between Sumner and Adams
- Monson south of Parlier (this might be the City of Orange Cove)

Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping is provided in the following paragraphs. Details on the NFIP and mapping specific to participating jurisdictions are in the jurisdictional annexes.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of a community that is used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Fresno County FIS is dated September 30, 2005. This study covers both the unincorporated and incorporated areas of the County.

Flood Insurance Rate Map (FIRM)

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. The County FIRMs are in the process of being replaced by new digital flood insurance rate maps as part of FEMA’s Map Modernization program, which is discussed further below.

Letter of Map Revision (LOMR) and Map Amendment (LOMA)

LOMRs and LOMAs represent separate floodplain studies dealing with individual properties or limited stream segments that update the FIS and FIRM data between periodic FEMA publications of the FIS and FIRM.

Digital Flood Insurance Rate Maps (DFIRM)

As part of their Map Modernization program, FEMA is converting paper FIRMS to digital FIRMs (DFIRMS). These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs),
- Utilize community supplied data,
- Verify the currency of the floodplains and refit them to community supplied base maps,
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications, and
- Solicit community participation.

In August of 2005, FEMA headquarters' issued Interim Guidance for Studies Including Levees. This memo recognizes the risk and vulnerability of communities with levees. The memo mandates the inclusion of levee evaluations for those communities that are undergoing map changes, such as the conversion to DFIRMs. No maps could become effective without an evaluation of all levees within a community against the criteria set forth in 44 CFR 65.10 Mapping of Areas Protected by Levee Systems. Generally, these levee certification requirements include evaluations of freeboard, geotechnical stability and seepage, bank erosion potential due to currents and waves, closure structures, operations and maintenance, and wind wet and wave run-up. In short, these guidelines require certification of levees before crediting any levee with providing protection from the 1 percent annual event (e.g., the 100-year flood).

In Fresno, similar to other locations in California, levees and flood control facilities have been built and are maintained variously by public and private entities, including water, irrigation, and flood control districts; other state and local agencies; and private interests. Some of these facilities were constructed with flood control as secondary or incidental to their primary purpose. With the exception of certain limited responsibilities related to the County's participation in the East Side Stream Group Agreement, Fresno County does not own, operate, maintain, or have responsibility to maintain any levees or flood control facilities within the planning area. Nevertheless, Fresno County, as administrator of the NFIP for the County, is required to participate in the levee certification process. Currently, there is no comprehensive system of flood management or inventory of levee condition and needs within the planning area. This creates unique challenges in the levee certification process.

On September 28, 2007, FEMA issued draft DFIRMs for the entire Fresno County planning area. While in draft form, they are subject to change based on input from Fresno County and affected jurisdictions. The DFIRMs are expected to be finalized by September 2008. Most of the levees in the County could not be certified in accordance with the requirements of 44 CFR 65.10 for the 100-year flood event. As a result, substantial areas formerly designated as "X" zones, or protected from a 100-year flood event by levees, have been remapped into flood hazard "A" zones. Preliminary estimates show that over 7,200 parcels in the Fresno County planning area are being remapped. This remapping will affect construction and development standards within these

areas as well as the cost and requirements for maintaining flood insurance. It is important to note that this redesignation does not change the actual level of flood protection that these levees provide. It just acts to shift liability for living in these areas to the affected individuals and local governments.

The areas redesignated as part of the DFIRM process are predominantly north of the Kings River between Highway 99 and the Fresno Slough, along the Fresno Slough Corridor, and west of the San Joaquin River between Mendota Pool and Firebaugh. Although the majority of the remapped areas are agricultural lands, the communities of Laton, Lanare, Riverdale, and the City of San Joaquin are now entirely within flood hazard zone A.

Past Occurrences

Fresno County has a long history of flooding, but according to the Fresno County General Plan Background Report, little definitive data is available for specific floods, particularly on the smaller streams. Historical records indicate that nine significant flood events occurred in Fresno County between the 1840s and 1900. A series of river floods during the 1980s and 1990s prompted FEMA to drastically revise its estimate of the 100-year flood flows in the San Joaquin River channel and to develop a new FIRM for the area. Construction of major detention structures in the eastern part of the County along the Fresno County Stream Group enabled FIRMs to be revised in the early 1990s to show a reduced 100-year flood risk from the San Joaquin River to the metropolitan area. The HMPC provided information on more recent flood events, which are detailed below.

- **December 1955**—A rain on snow event caused local and downstream flooding in eastern Fresno County, ultimately affecting the entire valley region. Homes were lost and roads and bridges were damaged or destroyed. Damage to some dam facilities also resulted.
- **1995**—Beginning in January and continuing through the end of March 1995, a series of strong storms caused flooding that resulted in multiple road closures, destroyed a bridge on Interstate 5, displaced 300 to 400 people, damaged crops, and caused the deaths of seven people. Most flooding occurred in the western portion of the County. A local, state, and federal disaster was declared for the County. Twenty homes were damaged; 150 acres submerged. Losses to public facilities were estimated at $5 million. Agricultural damage and crop losses exceeded $8.6 million. There was an estimated $9 million in economic and other damage to businesses. Additionally, Huntington Lake Road and Highway 168 were closed due to snowfall, Highway 180 was closed due to a rock slide, an Interstate 5 bridge over Arroyo Pasajero drainage was washed out (causing the seven deaths), 15 to 20 other County roads were closed at least temporarily, 20 to 40 water systems were unable to serve potable water for various periods of time, and an estimated 300 to 400 people were displaced by flooding (the American Red Cross shelter was open from March 11-18, providing shelter for 57 to 70 people).
- **1997**—A regionwide rain on snow event in high elevations caused local flooding and flooding downstream in the valley. Homes, bridges, roads, and other infrastructure near

waterways were damaged. A bridge on Interstate 5 over the Kings River was washed out. Losses to infrastructure were estimated in the hundreds of millions. Other impacts included damage to fisheries and wildlife.

- **1998 (El Niño rain event)**—Starting February 1, 1998, and continuing until June of 1998, Fresno County experienced extreme amounts of rain, resulting in local, state, and federal emergency declarations. Thirty-three days within a 42-day period experienced significant rainfall. Flooding damaged buildings and crops in the area. Property damage included major damage to five buildings and minor damage to six buildings for a cost of $378,000 and $80,000 in damage to public facilities. There was an estimated loss of $17 million to the farming industry. The primary damage was to tree fruit and row crops. Estimated economic impacts to the community were $38-48 million. An estimated 15,000 to 20,000 agricultural workers were out of work or on limited work schedules.
- **April 28, 2005 (Parlier Flood)**—A cell of severe weather passed over the City of Parlier dropping up to three inches of rain in 20 minutes. The drainage system could not handle the flow, and approximately 25 homes and businesses were flooded. The City of Parlier declared a local disaster, as did Fresno County. Damage was estimated at $700,000. Home owners had little or no insurance coverage. In addition, J Street was closed for one day.
- **2005-2006**—Above average rainfall occurred between December 19, 2005, and January 1, 2006. This resulted in flooding of low lying areas throughout the County. Flood control basins were overflowing in several areas, including the Cities of Fresno and Clovis. Property damage included damage to approximately 180 businesses and homes estimated at $1.4 million within the unincorporated County. Damage to other jurisdictions was estimated at $611,307. Damage to crops was minimal due to the time of year. Flooding further resulted in a number of road closures, which were one to two weeks in duration.
- **April 5, 2006**—Above average rainfall and snowmelt created excessive run off into the San Joaquin and Kings river drainages on the west side of the County. Levees and river channels were in jeopardy of failing, but held. The DWR sent a flood fight team to coordinate the effort to shore up the system. Construction crews and hand crews were used to shore up the system, make sandbags, and repair leaks. Property and crop damage was minimal due to limited flooding. The most notable damage to cropland was to 200 acres affected by a levee break in the Tranquillity Irrigation District. There was, however, extensive damage to the levee system, canal system, and river channel. Local and state disasters were declared for the County based on the potential damage if the levees, canals, or river channel failed. Extensive work was done on the system during the event by locals and the DWR.
- **July 2006**—Flash floods from thunderstorms in drainages above the north end of Huntington Lake resulted in a variety of damage. This included an estimated $250,000 in damage to private boats and an estimated $200,000 in damage to local infrastructure (roads, boat docks, etc.). Other impacts included loss of power for three weeks in some areas, closure of a primary summer road for one week, and closure of Huntington Lake to recreational use for one week. Cleanup costs exceeded $150,000, and search and rescue costs were estimated at $25,000.

Localized Flooding

In addition to the major historical flood events described above, as previously described, the Fresno County planning area remains at risk to annual localized flooding.

Likelihood of Future Occurrences

100-Year Flood

Occasional—The 100-year flood is the flood that has a one percent chance in any given year of being equaled or exceeded.

<100-Year Flood/Outside the 100-Year Floodplain

Highly Likely—Based on historical data, flooding events less severe than a 100-year flood and those outside of the 100-year floodplain occur frequently during periods of heavy rains.

4.2.13 Human Health Hazards: Epidemic/Pandemic

Hazard/Problem Description

Epidemics occur when an infectious disease spreads beyond a local population, lasting longer and reaching people in a wider geographical area. When that disease reaches global proportions, it is considered a pandemic. Several factors determine whether an outbreak will explode into an epidemic or pandemic: the ease with which a microbe moves from person-to-person and the behavior of individuals and societies.

A pandemic flu occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

Most recently, health professionals are concerned by the possibility of an avian (or bird) flu pandemic associated with a highly pathogenic avian H5N1 virus. Since 2003, avian influenza has been spreading through Asia. A growing number of human H5N1 cases contracted directly from handling infected poultry have been reported in Asia, Europe, and Africa, and more than half the infected people have died. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the

interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Past Occurrences

There were three acknowledged pandemics in the twentieth century:

- **1918-19 Spanish flu (H1N1)**—This flu is estimated to have sickened 20-40 percent of the world's population. Over 20 million people lost their lives. Between September 1918 and April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain.

  By late September 1918, over 35,000 people throughout California had contracted influenza. According to state officials, influenza was most prevalent in the southern part of California, but the death toll was high across the state.
- **1957-58 Asian flu (H2N2)**—This virus was quickly identified due to advances in technology, and a vaccine was produced. Infection rates were highest among school children, young adults, and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States. Worldwide deaths were estimated between 1 and 2 million.
- **1968-69 Hong Kong flu (H3N2)**—This strain caused approximately 34,000 deaths in the United States and more than 700,000 deaths worldwide. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were most likely to die. This virus returned in 1970 and 1972 and still circulates today.

Likelihood of Future Occurrences

Occasional—According to historical data, three influenza pandemics have occurred since 1918. This averages out to a pandemic every 30 years or a 3.33 percent chance of a pandemic outbreak in any given year. Although scientists cannot predict when the next influenza or other type of pandemic will occur or how severe it will be, wherever and whenever it starts, everyone around the world will be at risk. If an influenza pandemic does occur, it is likely that many age groups would be seriously affected. The greatest risks of hospitalization and death—as seen during the last two pandemics in 1957 and 1968 as well as during annual outbreaks of influenza—will be to infants, the elderly, and those with underlying health conditions. However, in the 1918 pandemic, most deaths occurred in young adults. Few people, if any, would have immunity to a new virus.

4.2.14 Human Health Hazards: West Nile Virus

Hazard/Problem Description

The impact to human health that wildlife, and more notably, insects, can have on an area can be substantial. Mosquitoes transmit the potentially deadly West Nile virus to livestock and humans alike. West Nile virus first struck the western hemisphere in Queens, New York, in 1999 and killed four people. Since then, the disease has spread across the United States. In 2003, West Nile virus activity occurred in 46 states and caused illness in over 9,800 people.

Most humans infected by the virus have no symptoms. A small proportion develops mild symptoms that include fever, headache, body aches, skin rash, and swollen lymph glands. Less than 1 percent of those infected develop more severe illness such as meningitis or encephalitis, symptoms of which include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. Of the few people who develop encephalitis, fewer than 1 out of 1,000 infected die as a result.

There is no specific treatment for the infection or a vaccine to prevent it. Treatment of severe illness includes hospitalization, use of intravenous fluids and nutrition, respiratory support, prevention of secondary infections, and good nursing care. Medical care should be sought as soon as possible for persons who have symptoms suggesting severe illness. People over 50 years of age appear to be at high risk for the severe aspects of the disease.

West Nile virus is a concern in the Fresno County planning area in part because of the agricultural nature of the County and the large areas of standing water created through farming operations. Excess standing water provides a breeding area for mosquitoes. Also contributing to the mosquito population in the County are the beaver dams and ponds, which are large pools of standing water.

Within the Fresno County planning area, several mosquito abatement and control districts operate to prevent the spread of the virus through focused efforts on reducing the mosquito population and educating the public. Several types of preventive methods lower mosquito populations to levels that reduce chances for the spread of disease. The County also has an active surveillance program and maintains records for all identified cases of the virus.

Past Occurrences

The virus first appeared in California in 2002 with the identification of one human case. In 2003, three human cases occurred in California, and the virus was detected in six southern California counties. By 2004, the virus was in all 58 counties in California; 830 human infections were identified. According to the California West Nile Virus Surveillance Information Center sponsored by the California Department of Health Services, 28 California residents died from the virus in 2004. Most of these deaths were in Southern California.

In 2005, 54 of the 58 California counties reported some West Nile virus activity and 935 human cases were reported, which included 19 deaths from 12 counties (at least 1 death was in Fresno County). In 2006, the number of human cases in California was 278, including 7 deaths (1 in Fresno County), which was significantly down from 2005. In 2007, there were 380 human cases in California, including 18 deaths (at least 1 in Fresno County). Table 4.14 summarizes reported West Nile virus cases in Fresno County for the years 2004 through 2007.

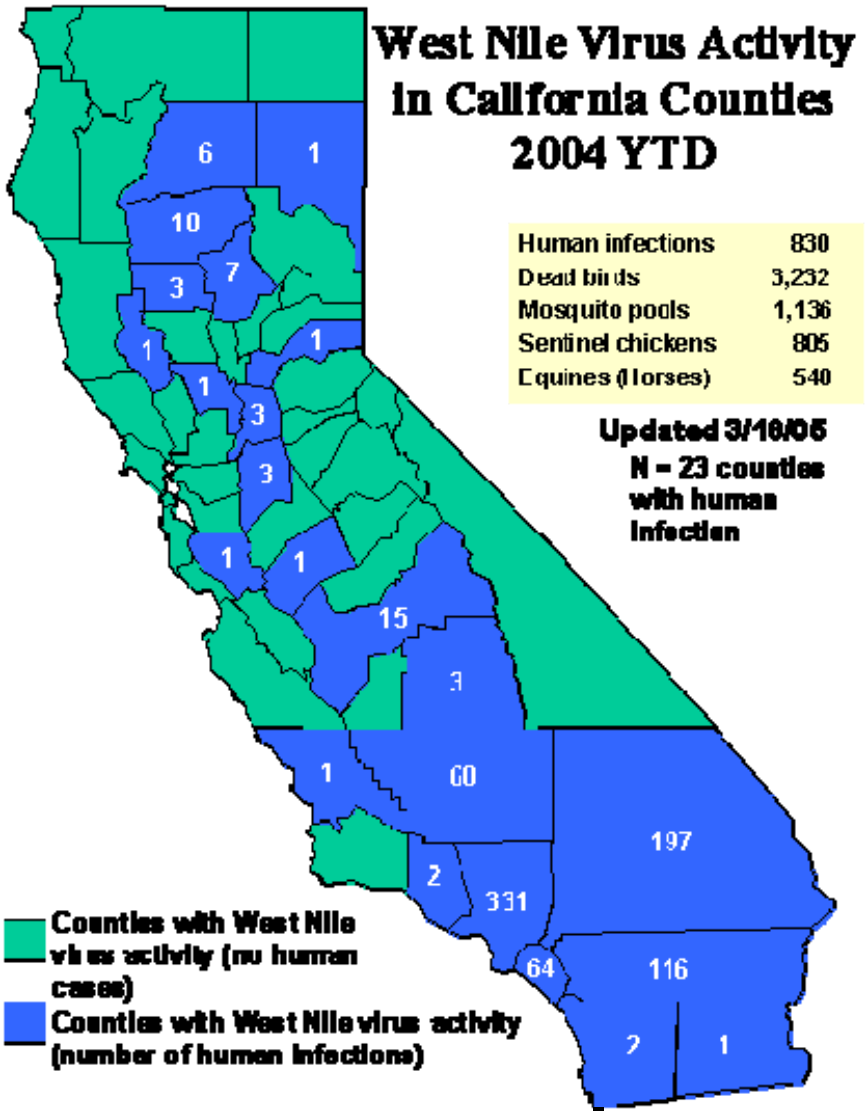
Table 4.14. Summary of West Nile Virus in California and Fresno County, 2004-2007*

	Humans		Birds		Mosquitoes		Horses		Sentinel Flock	
Year	CA	Fresno County	CA	Fresno County	CA	Fresno County	CA	Fresno County	CA	Fresno County
2004	830	15	3,232	116	1,136	14	540	21	805	25
2005	935	68	3,046	97	1,242	71	456	33	1,053	85
2006	278	11	1,446	2	832	40	58	5	640	37
2007*	380	17	1,395	114	1,007	61	28	1	510	46

Source: California West Nile Virus Web Site, www.westnile.ca.gov/
*As of March 13, 2008

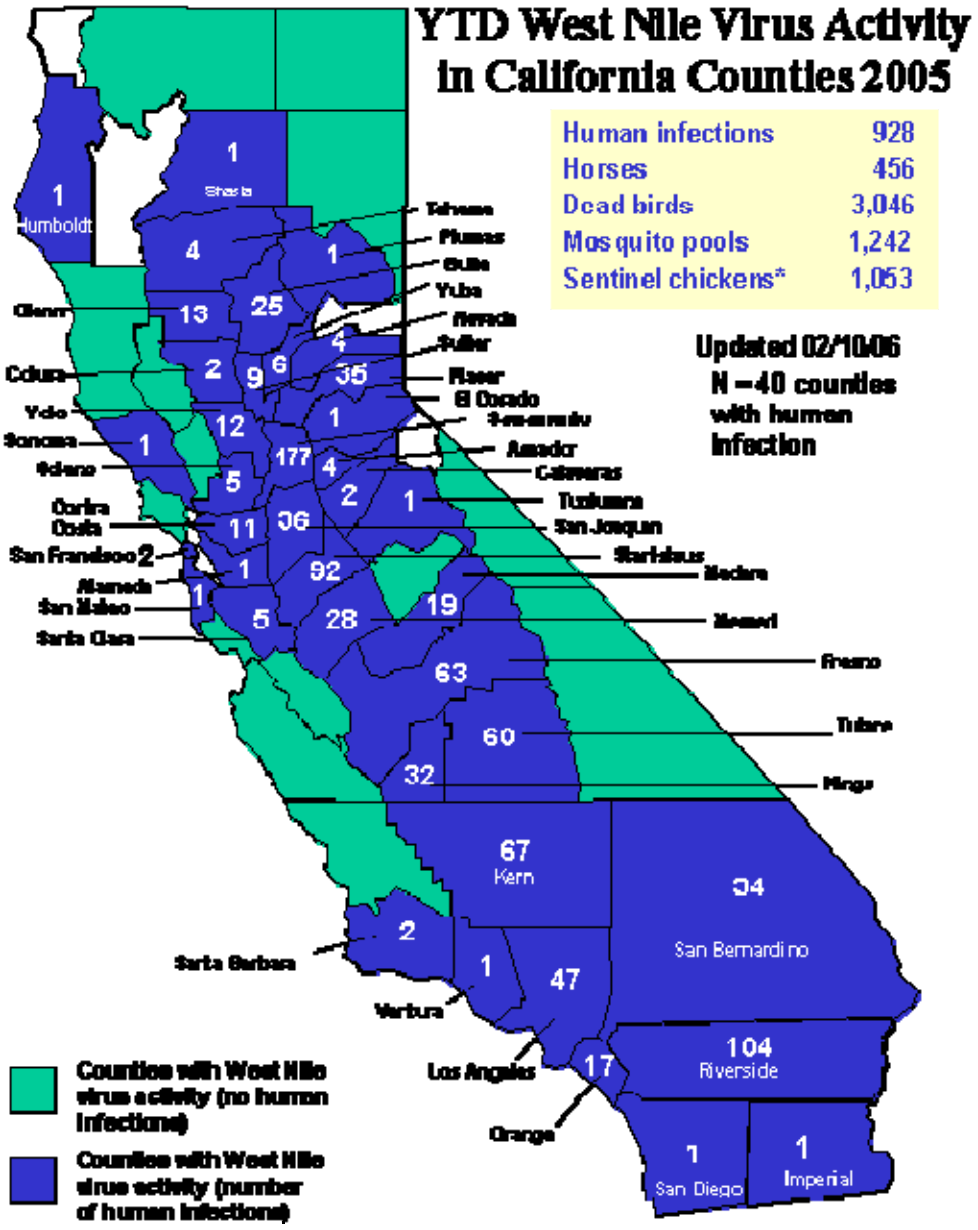
West Nile virus activity in California (and Fresno County) for 2004, 2005, 2006, and 2007 is illustrated in Figures 4.26-4.29.

Figure 4.26. West Nile Virus Activity in California Counties, 2004



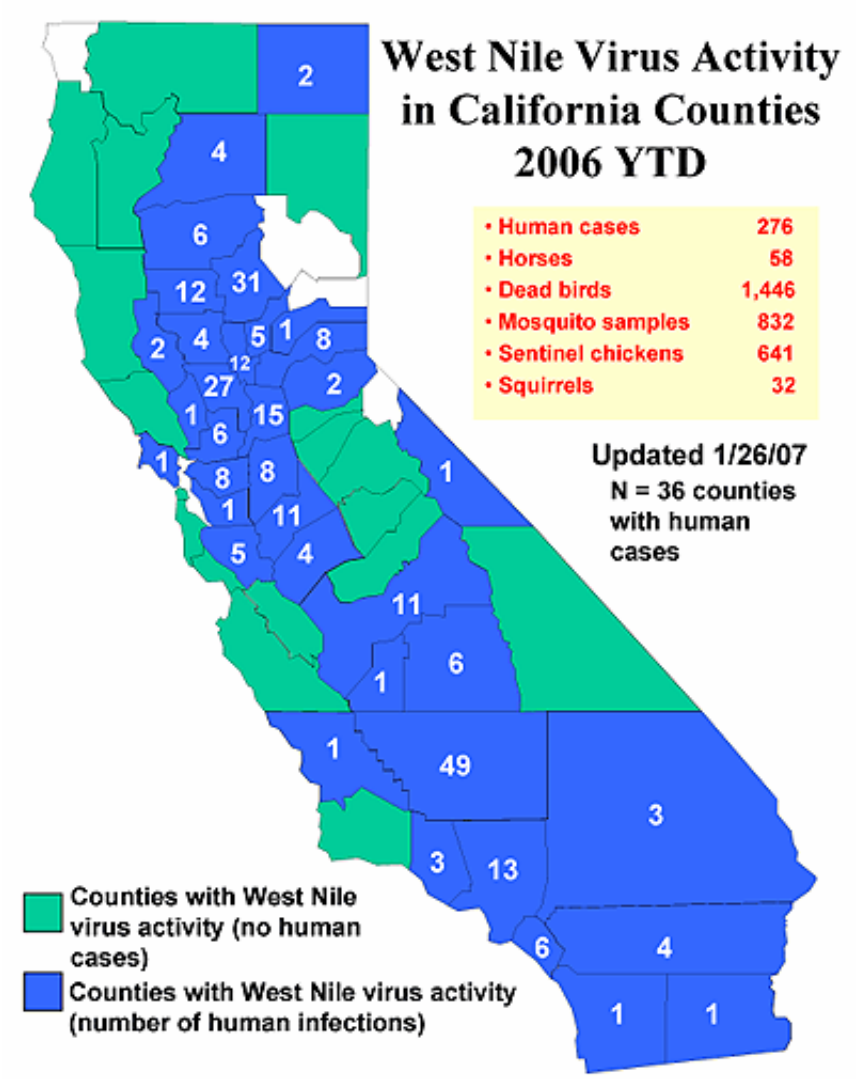
Source: California Department of Public Health, www.westnile.ca.gov/

Figure 4.27. West Nile Virus Activity in California Counties, 2005



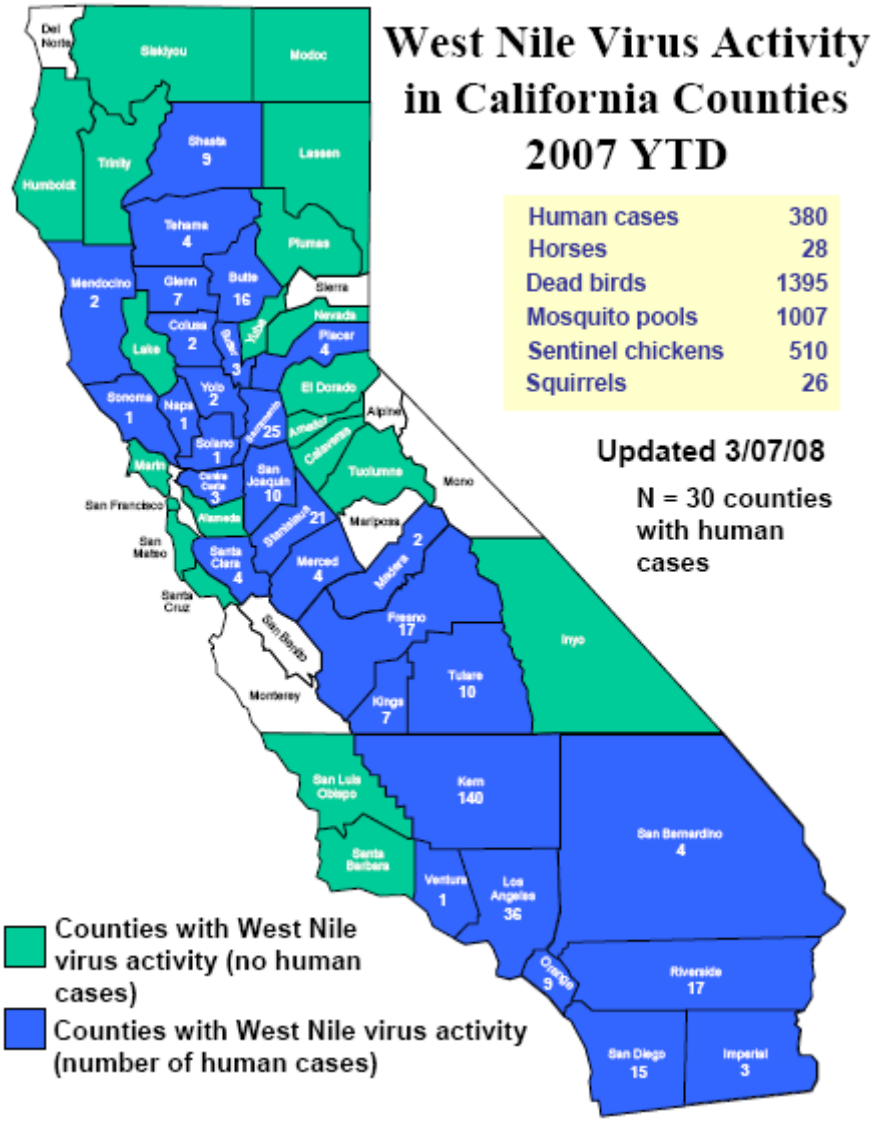
Source: California Department of Public Health, www.westnile.ca.gov/

Figure 4.28. West Nile Virus Activity in California Counties, 2006



Source: California Department of Public Health, www.westnile.ca.gov/

Figure 4.29. West Nile Virus Activity in California Counties, 2007



Source: California Department of Public Health, www.westnile.ca.gov/

In response to the increased activity of the virus in California, in August of 2007, Governor Schwarzenegger signed an emergency proclamation and commitment of more than $10 million in emergency funding to fight the virus.

Likelihood of Future Occurrences

Highly Likely—Based on historical data, the Fresno County planning area has experienced 111 human cases of West Nile virus since its discovery in California in 2003. This is an average of 22 cases per year. The agricultural nature of much of the planning area combined with the great potential for standing water to be present throughout the County puts the planning area at future risk of West Nile virus.

4.2.15 Landslide

Hazard/Problem Description

Landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

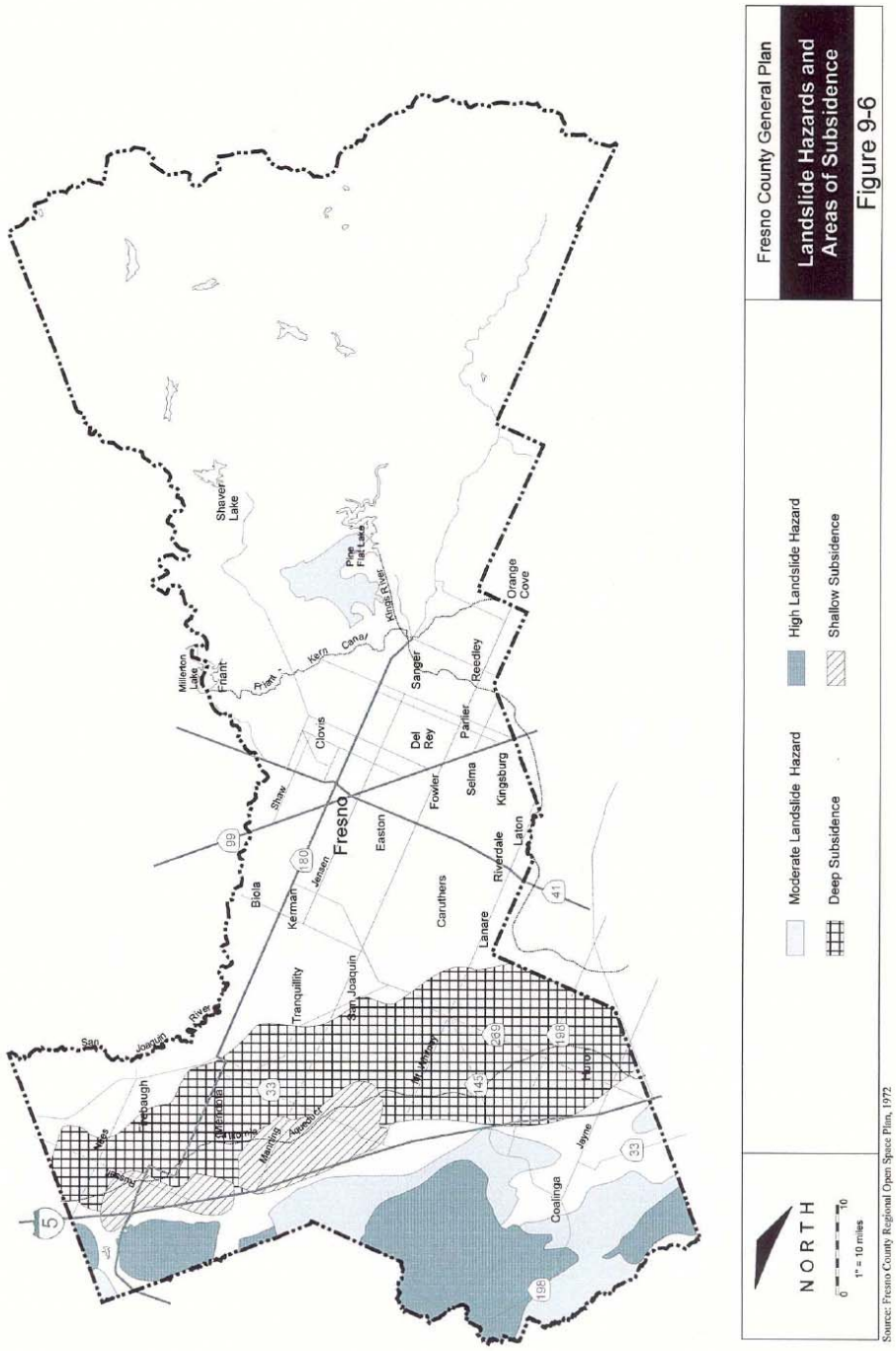
The susceptibility of an area to landslides depends on many variables, including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas and cause injuries and death.

The Fresno County General Plan Background Report describes areas in Fresno County that are particularly prone to landslides. Landslide hazard areas include foothill and mountain areas where fractured and steep slopes are present (i.e., the Sierra Nevada), areas where less consolidated or weathered soils overlie bedrock (e.g., the Coast Range), and areas where inadequate ground cover accelerates erosion (e.g., along the San Joaquin River). According to the background report, areas where steep slopes are present are not generally heavily populated and most are located in federal or state lands. The report further identified State Route 168 in eastern Fresno County and State Route 198 in western Fresno County as areas that could be affected by landslides caused by earthquakes or heavy rains. It also concludes that there is no risk of large landslides in the valley area of the County due to its relatively flat topography. However, there is the potential for small slides and slumping along the steep banks of rivers and creeks.

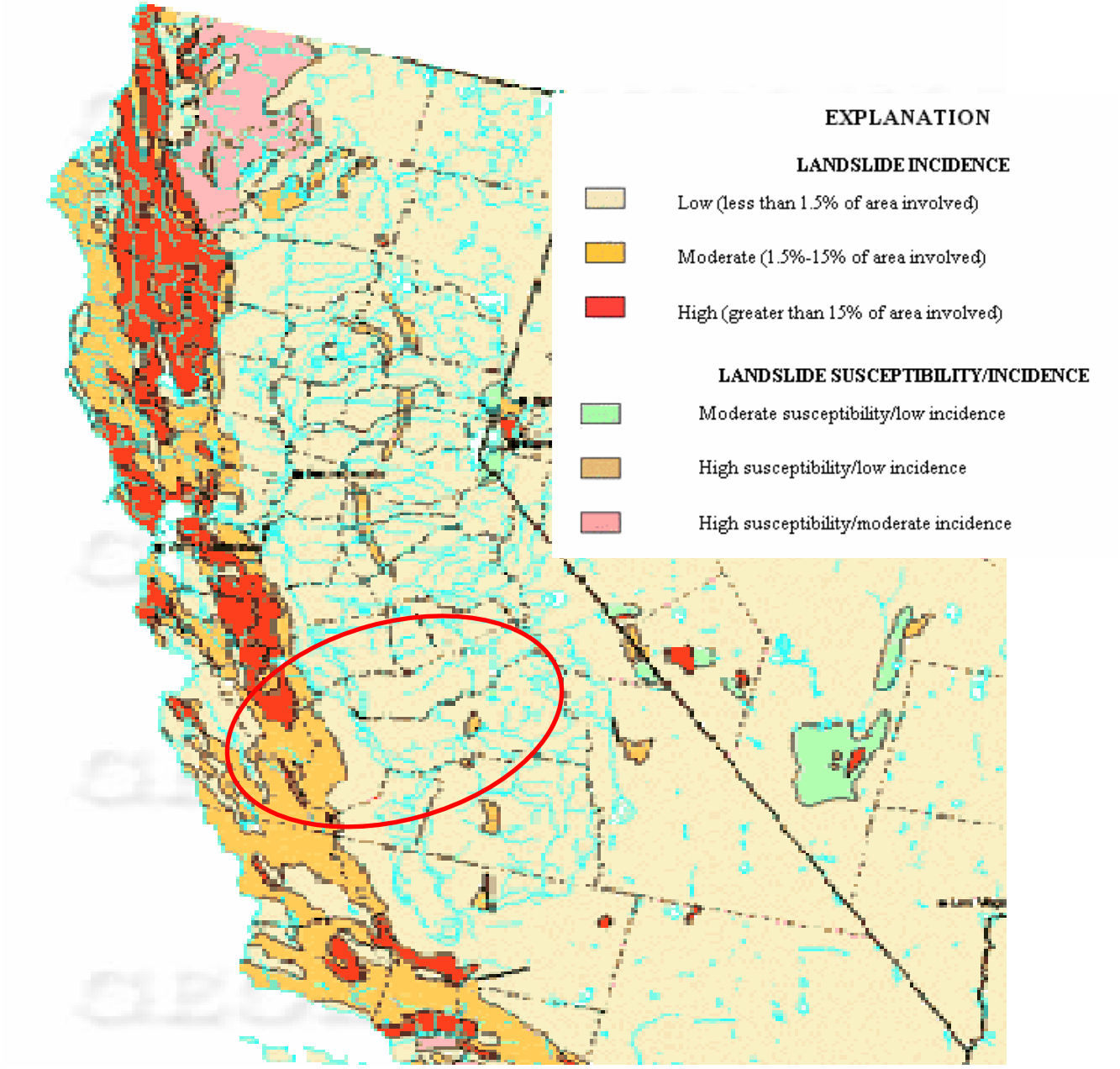
Figure 4.30 is a landslide hazard map from the background report. Figure 4.31 was developed for the State of California Multi-Hazard Mitigation Plan. It indicates that the central and eastern portions of Fresno County are at low risk for landslides and the far west side of the County along the Coast Range is at moderate risk for landslides.

Figure 4.30. Landslide Hazards and Areas of Subsidence in Fresno County



Source: Fresno County General Plan, 2000

Figure 4.31. California's Landslide Risk Zones



Source: State of California Multi-Hazard Mitigation Plan, www.hazardmitigation.oes.ca.gov/

Past Occurrences

There have been no disaster declarations associated with landslides in Fresno County. Notable landslides of record include the following:

- **1995**—Following a large storm event, a fairly large landslide occurred on Los Gatos Road, a significant local access road west of Coalinga. State geologists determined that catastrophic

failure was unlikely, but long-term road maintenance could be compromised due to undercutting of the slope by the creek below the road.

Likelihood of Future Occurrences

Occasional—Based on data provided by the HMPC, minor landslides have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely within the identified landslide hazard areas. Given the nature of localized problems identified within the County, minor landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

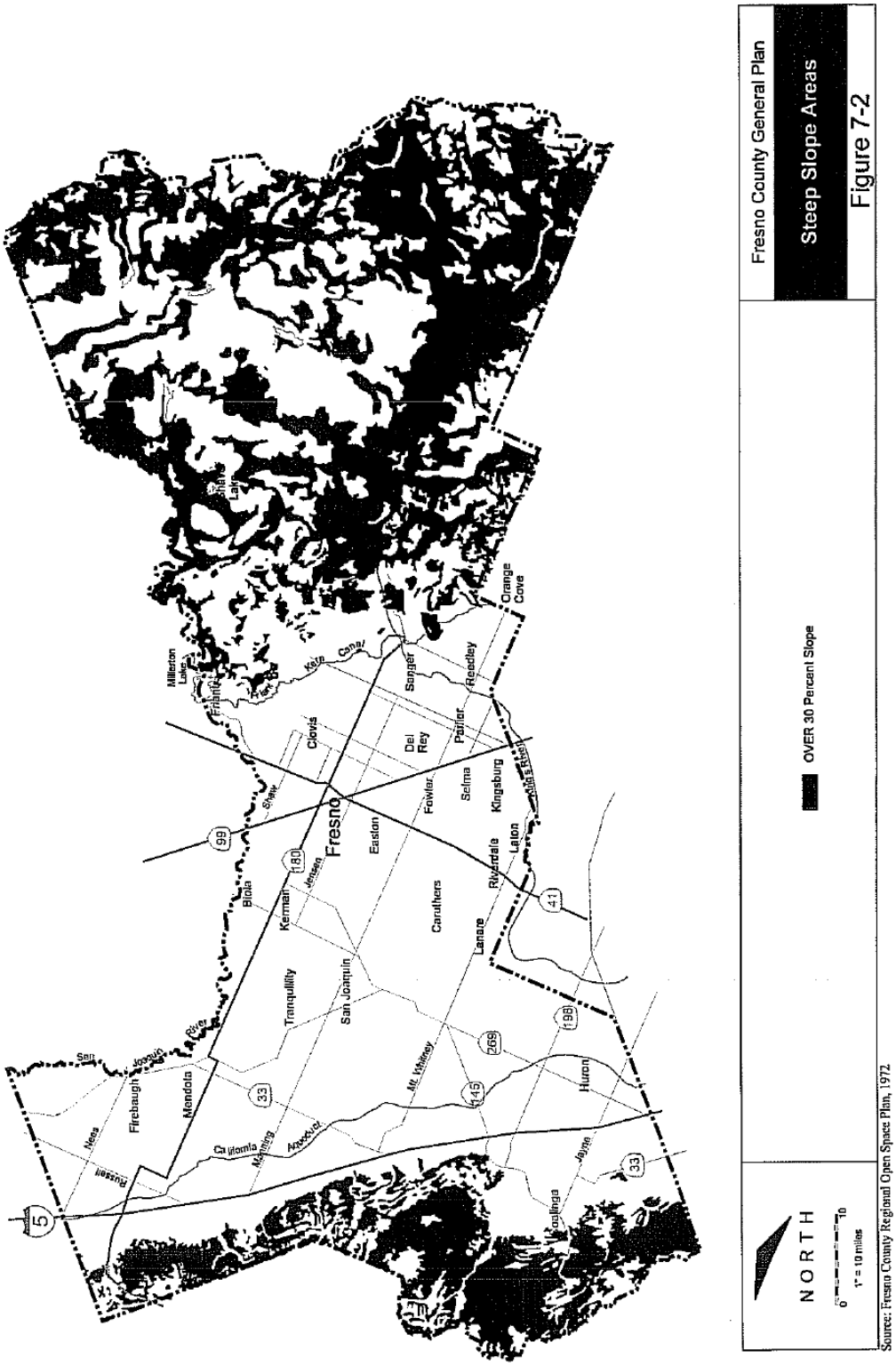
4.2.16 Soil Hazards: Erosion

Hazard/Problem Description

Erosion is the general process whereby rocks and soils are broken down, removed by weathering, or fragmented and then deposited in other places by water or air. The rate of erosion depends on many variables, including the soil or rock texture and composition, soil permeability, slope, extent of vegetative cover, and precipitation amounts and patterns. Erosion increases with increasing slope and precipitation and with decreasing vegetative cover, which includes areas where protective vegetation has been removed by fire, construction, or cultivation. Significant erosion can cause degradation and loss of agricultural land, degradation of streams and other water habitats, and rapid silting of reservoirs.

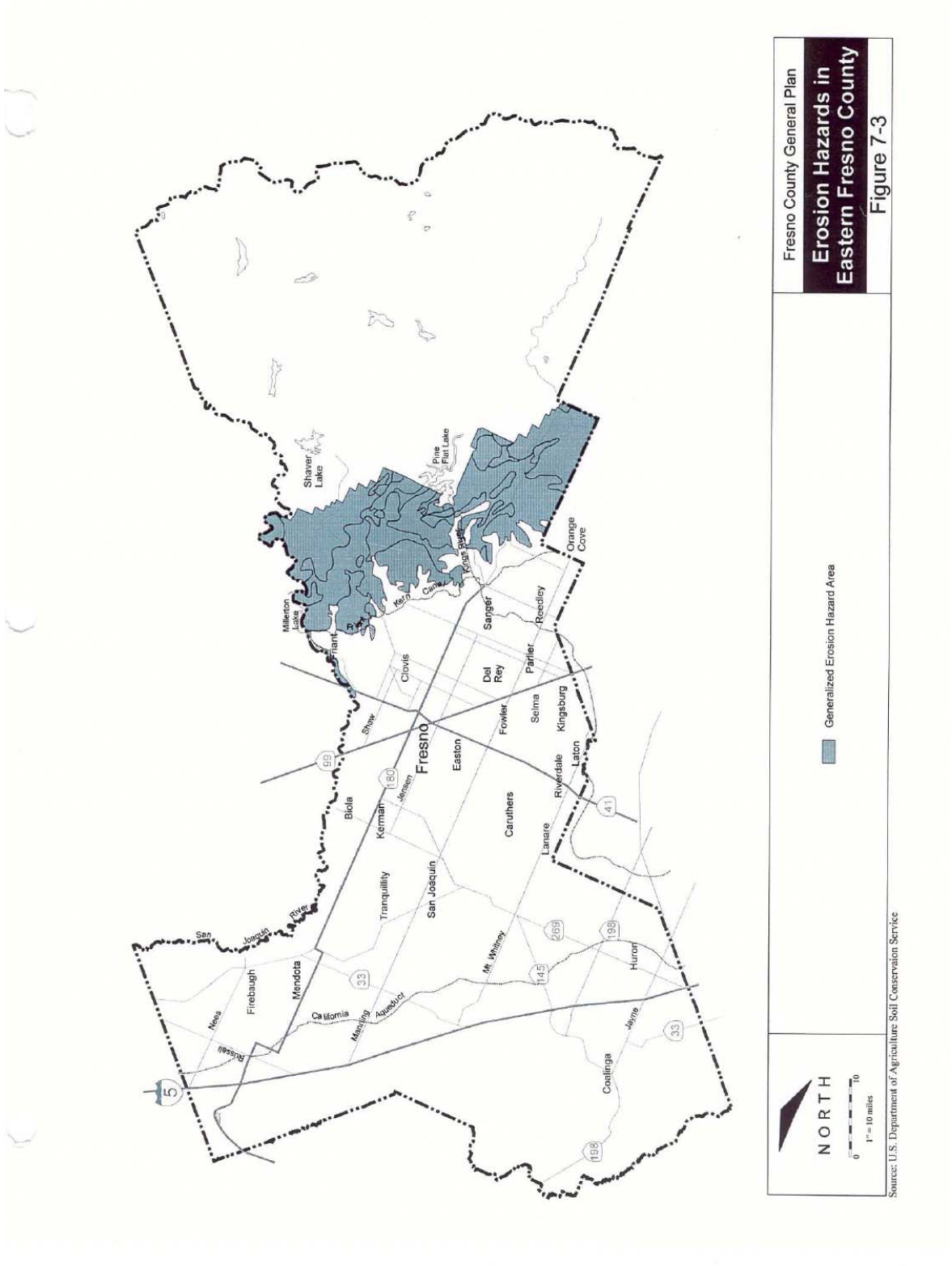
The Fresno County General Plan Background Report identifies those areas with moderately high to high erosion potential. These include areas of certain soil types in the Sierra Nevada and the foothills that generally coincide with slopes that exceed 30 percent (see Figures 4.32 and 4.33). However, many of these identified areas are located within the boundaries of the Sierra National Forest, Sequoia National Forest, or Kings Canyon National Park, which limits their availability for intensive development.

Figure 4.32. Steep Slope Areas in Fresno County



Source: Fresno County General Plan, 2000

Figure 4.33. Erosion Hazards in Eastern Fresno County

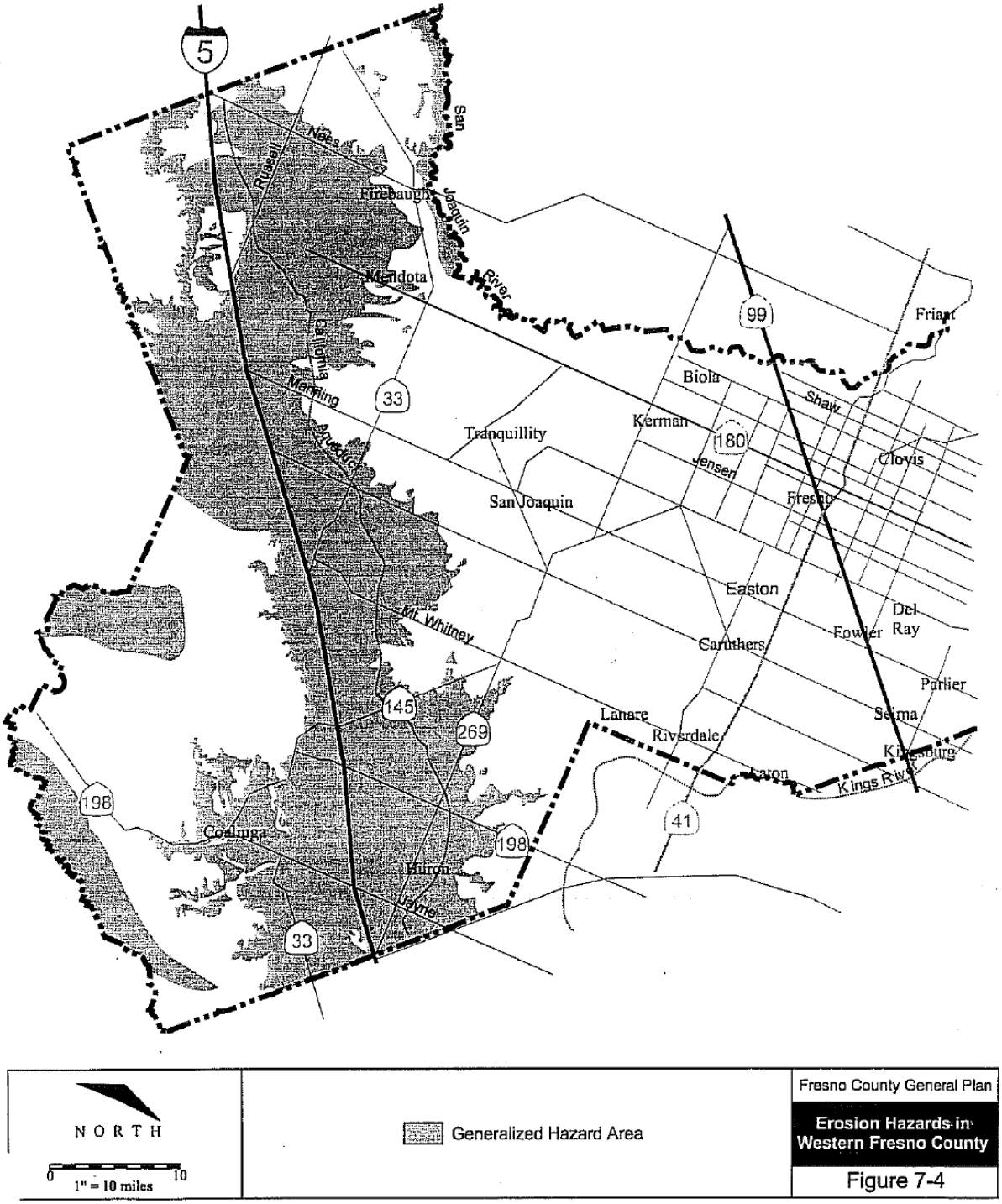


Source: Fresno County General Plan, 2000

Erosion within the valley area is generally not problematic, with the exception of areas containing Rossi soil east of the Fresno Slough from approximately Mendota to Fish Slough near Helm. Severe erosion potential has also been identified along the San Joaquin River Bluff. Also, along the main bypass floodway of the Fresno Slough, widely spaced gullies in a trellis pattern have eroded the soils where subsiding floodwaters drain back into the deeper main flood channel.

In western Fresno County, most soils associated with the Kettleman series appear to be subject to moderate to severe sheet and gully erosion potential. These include areas located primarily west of Interstate 5 in the Coast Range foothills. Also in the western portion of the County, Panoche and Panhill soils, which under natural conditions do not exhibit erosion potential, are susceptible to erosion as a result of human activity. These soils are located extensively throughout the western part of the County and are prevalent in areas on recent alluvial fans in the central part of the region (see Figure 4.34).

Figure 4.34. Erosion Hazards in Western Fresno County



Source: U.S. Department of Agricultrue, Soil Conservation Service, *Soil Survey Western Fresno Area, California*, 1950

Source: Fresno County General Plan, 2000

Past Occurrences

According to the HMPC and the County geologist, there have been no significant erosion events within the County.

Likelihood of Future Occurrences

Likely—Based on input from the HMPC, erosion does occur in the planning area. Given the nature of erosion problems identified within the County, erosion will continue to be an issue.

4.2.17 Soil Hazards: Expansive Soils

Hazard/Problem Description

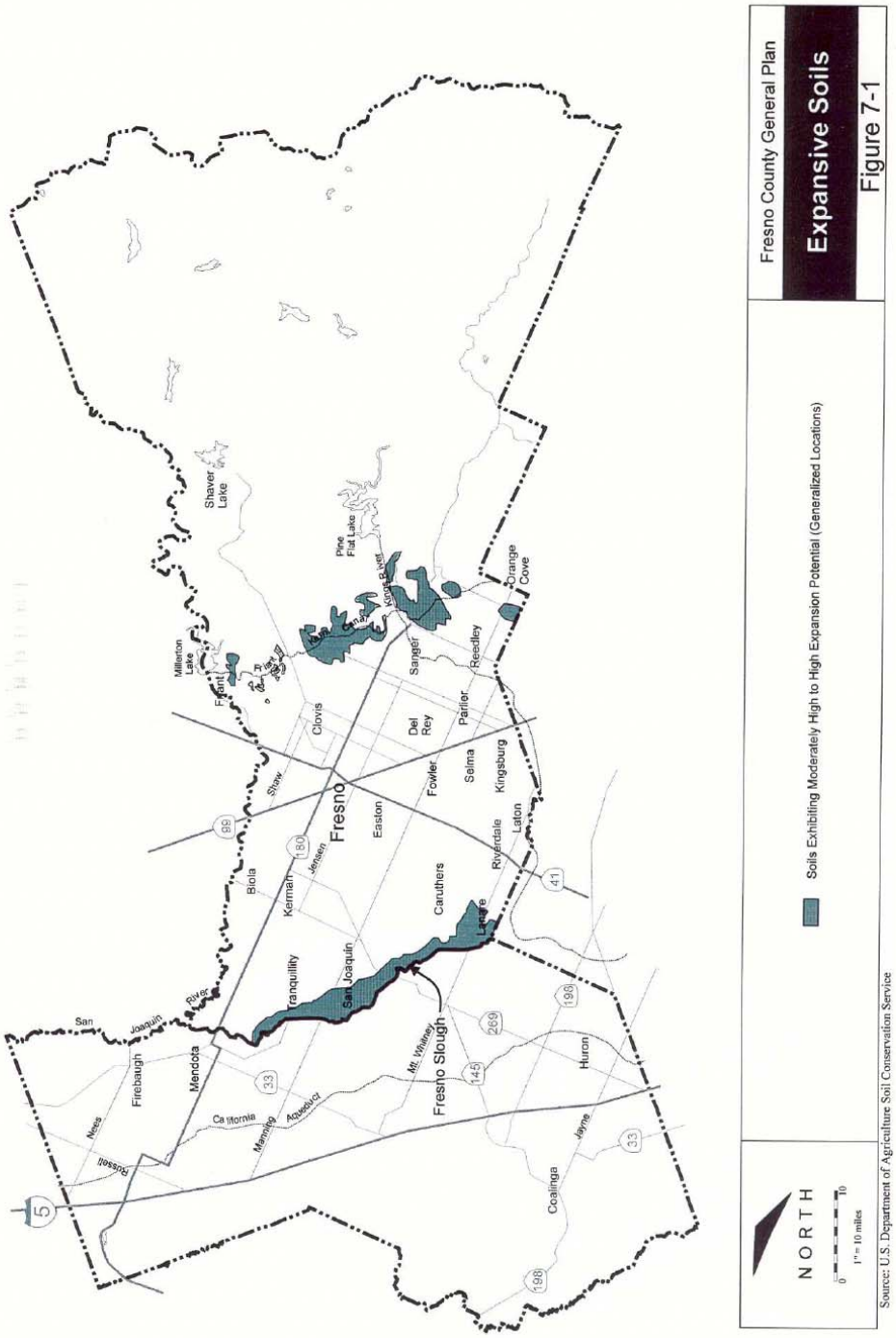
Expansive (swelling) soils or soft bedrock are those that increase in volume as they get wet and shrink as they dry. They are known as shrink-swell, bentonite, expansive, or montmorillinitic soils. Swelling soils contain high percentages of certain kinds of clay particles that are capable of absorbing large quantities of water, expanding up to 10 percent or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 20,000 pounds per square foot or greater on foundations, slabs, and other confining structures. Soils composed only of sand and gravel have no potential for volume changes. Soils are generally classified into three expansive soils classes with low, moderate, and high potential for volume changes:

- **Low**—This soils class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential, if the clay is kaolinite. Kaolinite is a common clay mineral.
- **Moderate**—This class includes silty clay and clay textured soils, if the clay is kaolinite, and also includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.
- **High**—This class includes clays and clay with mixed montmorillonite, a clay mineral which expands and contracts more than kaolinite.

Damage can include severe structural damage, cracked driveways and sidewalks, heaving of roads and highway structures, and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Building in and on swelling soils can be done successfully, although more expensively, as long as appropriate construction design and mitigation measures are followed.

According to the Fresno County General Plan Background Report, expansive soils within Fresno County generally occur in a northwest-trending belt approximately parallel to the Friant-Kern Canal foothills in Kings Canyon National Park in the Sierra Nevada, along the Fresno Slough from Madera County to Kings County, and roughly parallel to the San Luis Drain west of Tranquillity and San Joaquin. Figure 4.35 from the Fresno County General Plan Background Report illustrates the areas most susceptible to expansive soils.

Figure 4.35. Expansive Soils in Fresno County



Source: Fresno County General Plan, 2000

Past Occurrences

Expansive soils are present in the County. However, due to the ability to successfully mitigate the hazard by adhering to sound design and construction practices, the HMPC was unable to find examples of historical expansive soil problems in the planning area.

Likelihood of Future Occurrences

Occasional—Based on the soil types found in Fresno County, the potential exists for expansive soils to be a future issue in the Fresno County planning area.

4.2.18 Soil Hazards: Land Subsidence

Hazard/Problem Description

Land subsidence is defined as the vertical sinking of the land over manmade or natural underground voids. Subsidence, usually as a direct result of groundwater withdrawal or oil and gas withdrawal is common in several areas of California, including parts of the Central Valley. Weight, including surface developments such as roads, reservoirs, and buildings, and manmade vibrations from such activities as blasting and heavy truck or train traffic can accelerate the natural processes of subsidence. According to the Fresno County General Plan Background Report, some areas of the Central Valley have subsided more than 20 feet during the past 50 years.

Subsidence can result in serious structural damage to buildings, roads, irrigation ditches, canals, streams, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Improper use of land subject to subsidence can result in excessive economic losses: direct economic losses as well as indirect losses (e.g., increased taxes and decreased property values).

According to the background report, in some areas along the valley trough and in parts of western Fresno County, groundwater pumping has caused subsidence of the land surface. Historically, this has occurred in areas where the groundwater basin has been subject to overdraft and long-term recharge is inadequate to maintain the water table elevation, leaving underground voids. As of 2000, subsidence in the County has stabilized, except during periods of drought. Specific areas where subsidence has been a problem include the Westlands Water District and the Pleasant Valley Water District. Figure 4.30 in Section 4.2.15 Landslide shows the areas of subsidence in Fresno County.

Past Occurrences

According to the HMPC and County geologist, there have not been any notable occurrences of subsidence within the County.

Likelihood of Future Occurrences

Occasional—Historically, land subsidence issues in the County have been limited. However, given historical problems and the nature of the area, the potential exists for subsidence to be an issue in the future.

4.2.19 Volcano

The State of California Multi-Hazard Mitigation Plan identifies volcanoes as one of the hazards that can adversely impact the state. However, there have been few losses in California from volcanic eruptions. Of the approximately 20 volcanoes in the state, only a few are active and pose a threat. The Fresno County General Plan Background Report identifies the Mono Lake-Long Valley area located adjacent to the north and east of the northernmost areas of Fresno County as the only known volcanic hazard to Fresno County. The Long Valley area is considered to be an active volcanic region of California and includes features such as the Mono-Inyo Craters, Long Valley Caldera, and numerous active and potential faults. Figure 4.36 shows volcanoes in or near California and the location of the Long Valley area relative to the Fresno County planning area.

Figure 4.36. Volcanoes In or Near California

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. Based on information in the background report, the Fresno County planning area is susceptible to various hazards associated with its proximity to the Long Valley area as further described below.

Volcanic Flows

Two mildly explosive volcanic vents are located three to four miles from northernmost Fresno County, northwest of Duck Lake. In the event of an eruption, flows or debris from the vents would likely flow predominantly southwest approximately parallel to the North Fork of the San Joaquin River in Madera County. Lava flows, steam blasts, or base surges could occur in the northernmost tip of Fresno County. The northern portions of the Silver Divide (including Duck Lake and Fish Creek) could be subject to lava flows. However, this area of the County is mostly unpopulated and not easily developable as it is situated in the high peaks of the Sierra Nevada. Thus, potential safety hazards would be limited to backcountry visitors.

Ash

With most volcanic eruptions, a significant amount of ash is released into the atmosphere. The location and thickness of ash in any given area is generally a function of the volume erupted and wind speed and direction. Based on historical wind directions and wind speeds, most volcanic ash from a volcanic eruption of Long Valley would be deposited east of the volcano. Looking at historical data from past ash falls, the majority of ash beds from volcanic eruptions in California lie east of their source vents. Other studies of Mount Rainier and Mount St. Helens show that more than 90 percent of the ash beds deposited from volcanic eruptions during the last 10,000 years lie to the east of those volcanoes. This data suggest that most ashfall from future eruptions, including those from Long Valley, would also be deposited to the east of the source.

According to a worst-case scenario provided in the background report, geologists estimate that the South Fork of the San Joaquin River, Mono Creek, Margaret Lakes, Duck Lake, Fish Creek, Lake Thomas A. Edison, Bear Creek, Lake Italy, and the town of Mono Hot Springs could be subject to eight inches or more of compacted ash from an eruption at Long Valley. It only takes up to five inches of ash to stop an automobile engine. These areas, in addition to Kaiser Creek and Three Island Lake, could also be affected by hot pyroclastic flows. It is further estimated that up to two inches of ash could fall within a 50-mile radius of the eruption, potentially affecting the areas of Auberry, Prather, Meadow Lakes, Pine Ridge, Tollhouse, Dinkey Creek, Humphreys Station, Courtright Reservoir, Pine Flat Reservoir, and numerous small lakes, creeks, and streams.

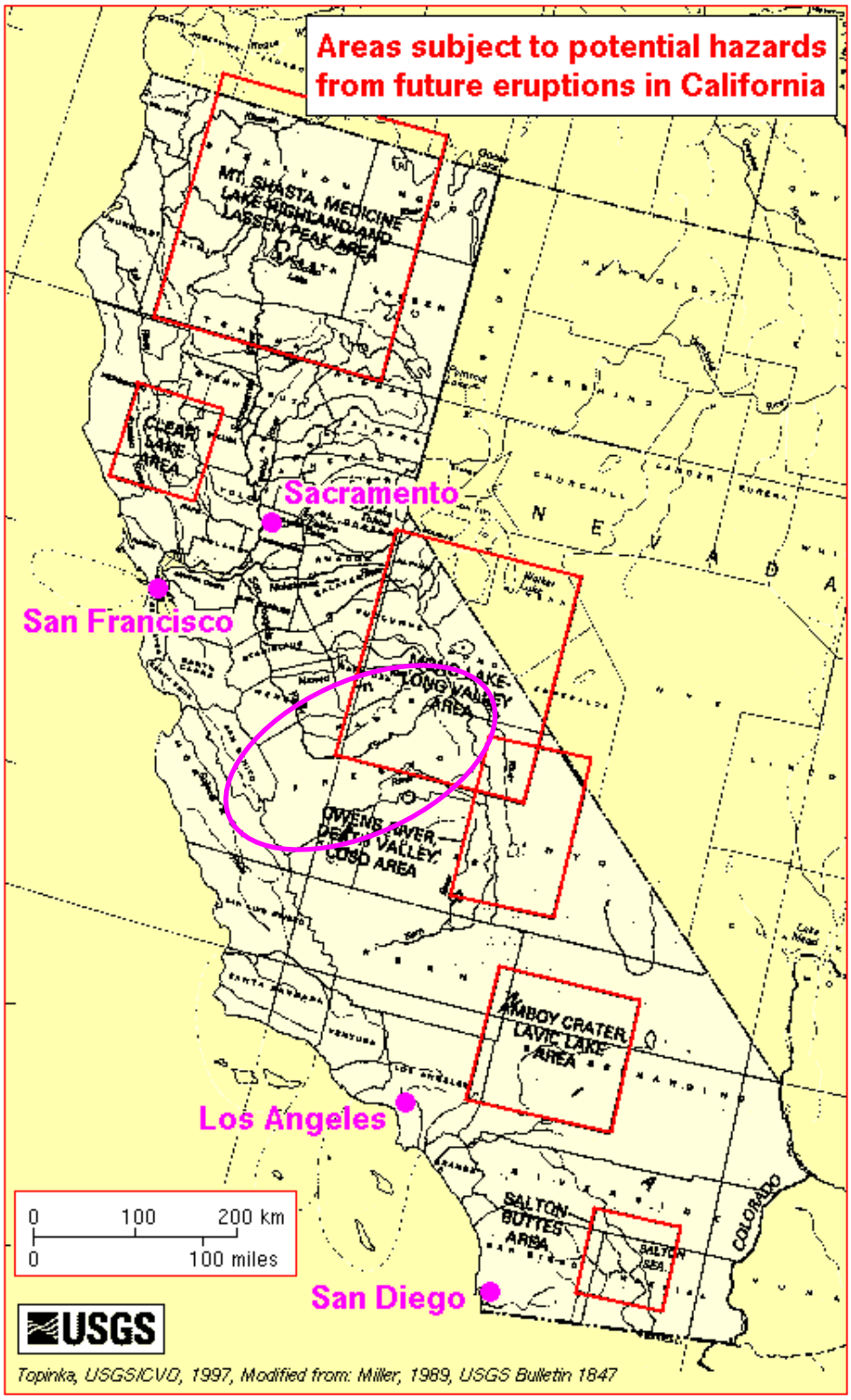
Resulting Floods and Mudflows

An eruption on the western slope of Mammoth Mountain (on the rim of the Long Valley Caldera) in the winter could also cause hot mudflows to mix with melting snow and rock debris,

creating the possibility of severe flood conditions in the San Joaquin River drainage system, endangering people, dams, and other property as it moves downstream.

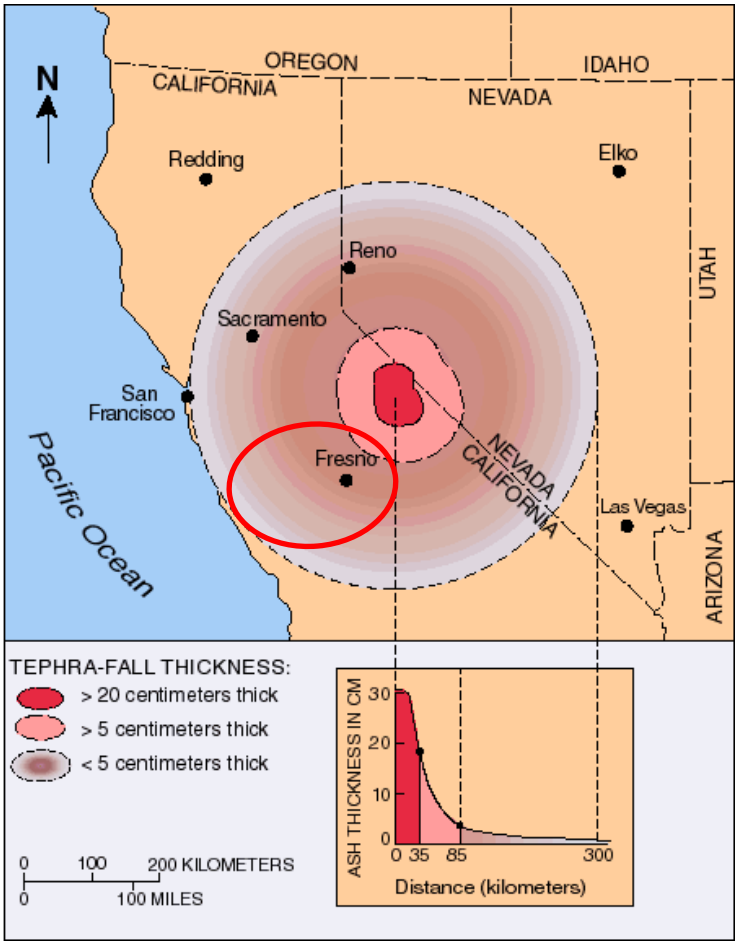
Figure 4.37 illustrates areas subject to potential volcanic hazards from future eruptions in California and supports the conclusion that the planning area is potentially at risk to volcanic activity from the Long Valley area. The ash dispersion map that follows (Figure 4.38) also illustrates the extent to which the planning area may be affected by ash fallout in the event of renewed volcanic activity in the area.

Figure 4.37. Areas Subject to Potential Volcanic Hazards from Future Eruptions in California



Source: U.S. Geological Survey, Cascades Volcano Observatory, http://vulcan.wr.usgs.gov/Volcanoes/California/

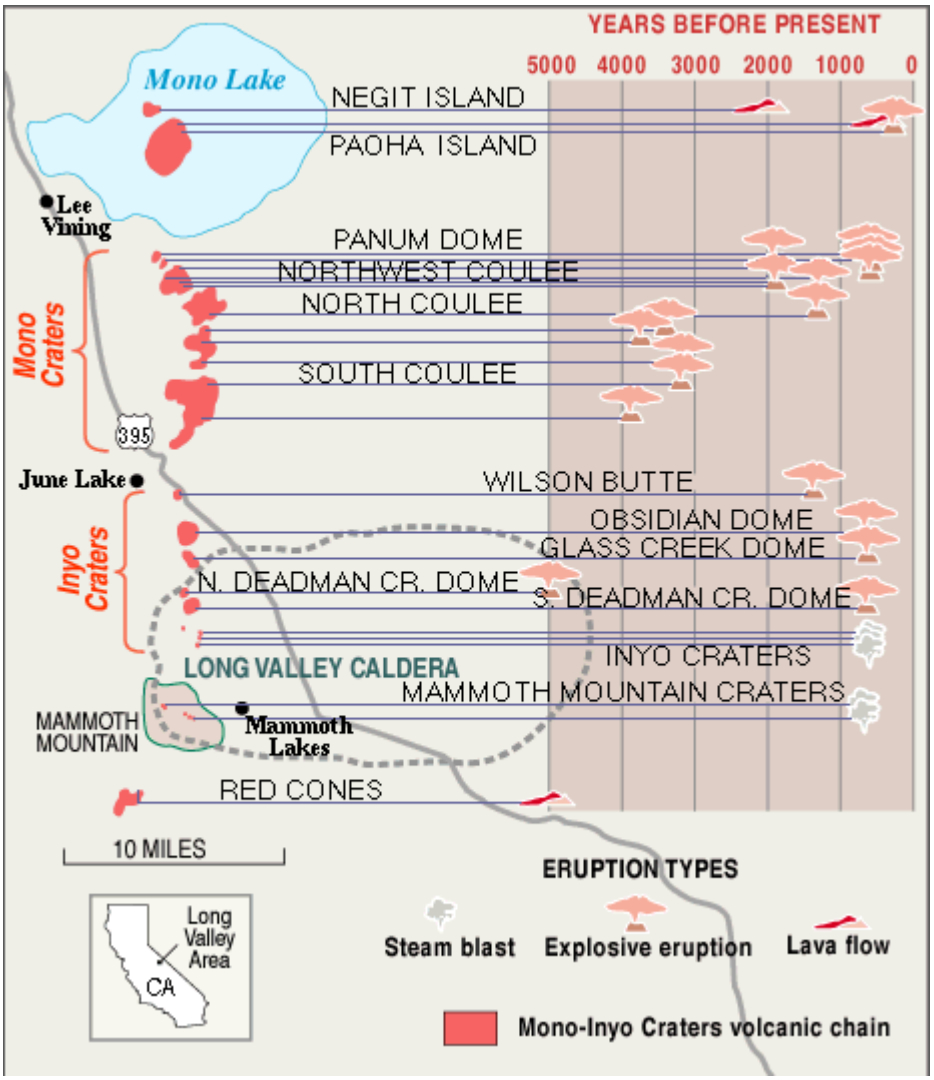
Figure 4.38. Volcanic Hazards Ash Dispersion Map for the Long Valley Caldera



Past Occurrences

During the past 1,000 years there have been at least 12 volcanic eruptions in the Long Valley area. Volcanoes in the Mono-Inyo Craters volcanic chain, which extends from just south of Mammoth Mountain to the north shore of Mono Lake, have erupted often over the past 40,000 years. Over the past 5,000 years, small to moderate eruptions have occurred at various sites along the Mono-Inyo Craters volcanic chain at intervals ranging from 250 to 700 years (see Figure 4.39).

Figure 4.39. Volcanic Activity in the Mono-Inyo Craters Volcanic Chain of the Past 5,000 Years



Source: U.S. Geological Survey, http://pubs.usgs.gov/fs/fs073-97/eruptions.html

As recently as 1980, four large earthquakes (greater than magnitude 6 on the Richter Scale) and numerous relatively shallow earthquakes occurred in the area. Since then, earthquakes and associated uplift and deformation in the Mammoth Lakes Caldera have continued. Because such activities are common precursors of volcanic eruptions, the U.S. Geological Survey closely monitors the unrest in the region.

Likelihood of Future Occurrences

Unlikely—According to the U.S. Geological Survey, the pattern of volcanic activity over the past 5,000 years suggests that the next eruption in the Long Valley area will most likely happen somewhere along the Mono-Inyo volcanic chain. However, the probability of such an eruption

occurring in any given year is less than 1 percent. Most likely, the next eruption will be small and similar to previous eruptions along the Mono-Inyo volcanic chain during the past 5,000 years (see Figure 4.39 above). Based on available data and the location of the County relative to the Long Valley area, there is a potential for volcanic activity of sufficient magnitude to adversely impact the Fresno County planning area.

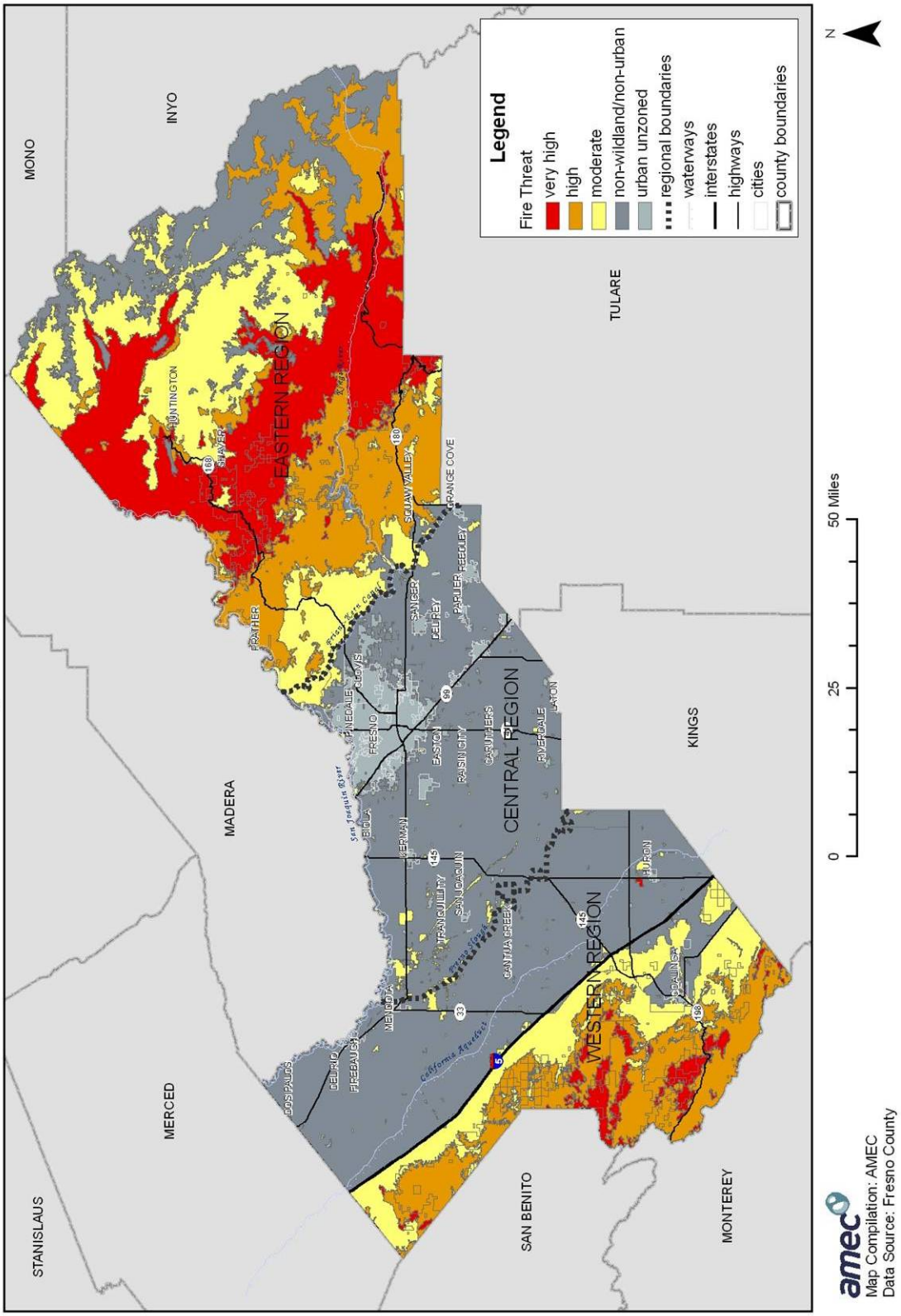
4.2.20 Wildfire

Hazard/Problem Description

Wildfire is an ongoing concern for the Fresno County planning area. Generally, the fire season extends from June through October of each year during the hot, dry months. Fire conditions arise from a combination of high temperatures, intense sunlight, low rainfall and humidity, an accumulation of vegetation, and high winds.

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland-urban interface areas, significant wildfires can also occur in heavily populated areas. The wildland-urban interface is a general term that applies to development adjacent to landscapes that support wildfire. Wildfires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas, such as the Sierra Nevada and Coast Range foothills, the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Within the County, the San Joaquin River Bluff area in northern Fresno is prone to wildfire due to its steep terrain and vegetation. In other areas, large concentrations of highly flammable brush located in flat open spaces are also quite susceptible to wildfire. Figure 4.40 illustrates Fresno County's wildfire threat.

Figure 4.40. Fresno County's Wildfire Threat



Map Compilation: AMEC
Data Source: Fresno County

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses could also result. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

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

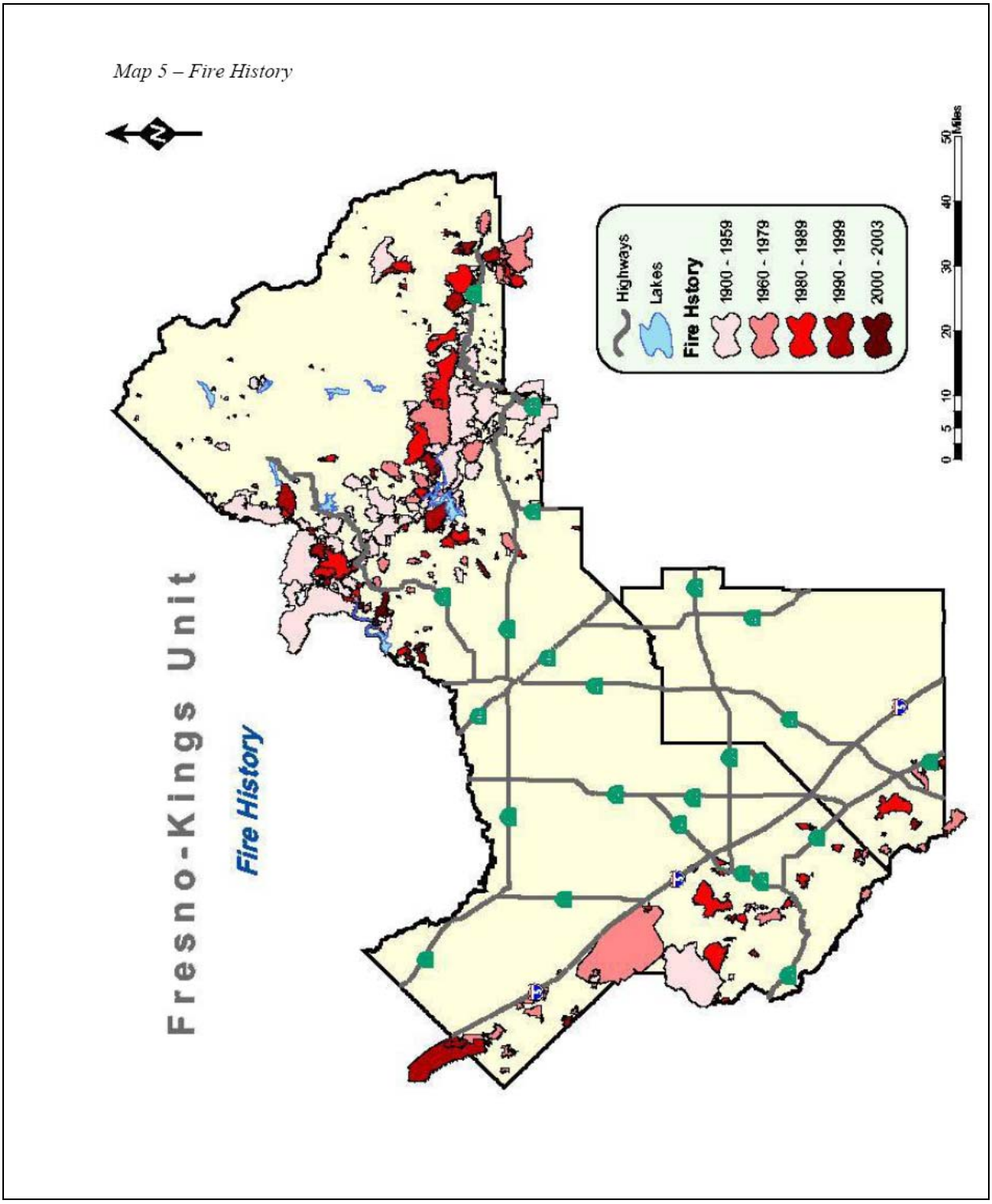
- **Fuel—**Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. Fuel types within the Fresno County planning area include seasonal grasses, deciduous oaks, and heavy brush in the Coast Range of western Fresno County; seasonal grasses, deciduous and evergreen oaks, and grass in the lower and mid-elevations of central and eastern Fresno County, and conifers in the higher elevations of eastern Fresno County.
- **Topography—**An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather**—Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will more readily ignite and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread and the more intense it will be. Winds can be significant at times in the Fresno County planning area during the summer fire season. Lightning also ignites wildfires, often in difficult-to reach terrain for firefighters.

Past Occurrences

Wildfires are of significant concern throughout California. According to the California Department of Forestry and Fire Protection (CAL FIRE), vegetation fires occur within their jurisdiction on a regular basis; most are controlled and contained early with limited damage. For those ignitions that are not readily contained and become wildfires, damage can be extensive. There are many causes of wildfire, from naturally caused lightning fires to human-caused fires linked to activities such as smoking, campfires, debris burning, equipment use, and arson. Recent studies conclude that the greater the population density in an area, the greater the chance of an ignition. With population continuing to grow throughout California and the Fresno County planning area, the risk posed by wildfire also continues to grow.

According to the 2005 Prefire Management Plan for CAL FIRE's Fresno-Kings Unit, an ignition analysis for 2004 was determined to be very similar to that of years past. The four primary ignition sources continue to be other and undetermined (535 fires), arson (311 fires), equipment use (315 fires), and debris burning (158 fires). The remaining causes, which are almost insignificant in number, are lightning, campfires, smoking, vehicles, electrical power, and playing with fire. The unit, which encompasses all of Fresno and Kings counties, experiences 120 to 200 fires a year in the state responsibility area and 1,400 to 1,600 fires in the local responsibility areas (LRA). Figure 4.41 is a fire history map for the Fresno-Kings Unit.

Figure 4.41. Fresno-Kings Unit Fire History Map



Source Fresno-Kings Unit Prefire Management Plan, California Department of Forestry and Fire Protection, 2005

The HMPC identified the following as notable wildfires in the Fresno County planning area.

- **1933 Tollhouse fire**—The Tollhouse fire started when a local resident was burning brush in late August. The fire got out of hand and burned across fields and grazing lands and encircled the Town of Tollhouse, a large hub for the timber industry in eastern Fresno County. It burned portions of the flume that carried logs and boards from Shaver Lake to the valley floor. The fire raced up the hill and burned into Jose Basin and over Burrough Mountain into Blue Canyon. The fire burned very hot, destroying conifers in the area, which never grew back. Tollhouse was evacuated for safety, but no losses were incurred.
- **1987**—The state declared a disaster for Fresno County and 32 other counties during the 1987 wildfires. Collectively, the fires resulted in 3 deaths, 76 injuries, and $18 million in damage. The eastern side of Fresno County was primarily affected. Property damage was estimated at $1 million. Damage to roads, bridges, and power distribution also occurred. Timber production in the area was also impacted.
- **August 2-21, 1989, Powerhouse fire**—The Powerhouse fire started near the Fresno and Madera county line on the Fresno side of the San Joaquin River. Arson was suspected as the cause. The fire raced up the canyon skirting Powerhouse road in Auberry, traveling mid-slope behind the settlement of Jose Basin. Fingers of the fire touched New Auberry and Auberry. It burned across the front of Bald Mountain in to Mile High and it threatened Meadow Lakes and all homes in its path. An assault by air and ground stopped the fire at Sugarloaf Road at the 3,800 foot elevation. It took a multi-agency effort to put out the fire, which burned an estimated 21,000 acres. No deaths were reported, and only minor injuries were experienced by firefighters. No homes were burned, but several out buildings were lost. Other losses included damage to power poles, fences, and automobiles. Overall, the fire was devastating to the watershed, wildlife, and residents.
- **August 24, 1994, Big Creek Wildland fire**—This wildfire occurred in eastern Fresno County in the area of Big Creek, between Shaver and Huntington Lakes, which is used extensively for recreation and has numerous summer homes. The Big Creek area is part of an extensive hydroelectric project (Southern California Edison) that produces electricity for the area. 9,000 acres of national forest land burned. Although 300-500 homes were threatened, no structures burned. Highway 168 and Huntington Lake Road were temporarily closed. The local school closed and the community of Big Creek was evacuated for 1 ½ weeks. Estimated cost of infrastructure damage included $2 million to roads and miscellaneous improvements on national forest land and $500,000 to power distribution. An estimated cost to recover forest land was $2 million. Twelve firefighters were injured. Fighting the fire cost more than $50 million. A post-fire mudslide caused an estimated $50,000 in damage.
- **September 21, 2000**, **Millwood fire**—This fire burned 283 acres; 363 personnel responded. Highway 180 was closed until 8:00 p.m. that evening. A shelter was prepared in the City of Orange Cove, but was not used.
- **August 17, 2001**, **Highway fire**—This fire, located near the community of Dunlap, burned 4,152 acres and destroyed five out buildings, a cabin, two travel trailers, and a miscellaneous number of cars.

- **August 17, 2001**, **Musick fire**—The Musick fire, located between Shaver Lake and Big Creek, burned 193 acres. No structures were damaged in this fire caused by downed power lines. The cost was estimated at $800,000.

Likelihood of Future Occurrences

Highly Likely—Within the Fresno-Kings Unit, fire occurrences range from 120 to 200 fires a year in the SRA and 1,400 to 1,600 fires in the LRAs. Fires will continue to occur on an annual basis in the Fresno County planning area.

4.2.21 Natural Hazards Summary

Table 4.15 summarizes the results of the hazard identification and hazard profile for the Fresno County planning area based on the hazard identification data and input from the HMPC. For each hazard profiled in Section 4.2, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for the Fresno County planning area.

Table 4.15. Hazard Identification/Profile Summary and Determination of Priority Hazard

Hazard	Likelihood of Future Occurrence	Priority Hazard
Agricultural Hazards	Highly Likely	Yes
Avalanche	Likely	No
Dam Failure	Likely	Yes
Drought	Occasional	Yes
Earthquake	Occasional	Yes
Flood	100-Year Flood: Occasional <100-Year Flood: Highly Likely	Yes
Human Health Hazards:		
Epidemic/Pandemic	Occasional	Yes
West Nile Virus	Highly Likely	Yes
Landslide	Occasional	No
Severe Weather		
Extreme Cold/Freeze	Highly Likely	Yes
Extreme Heat	Highly Likely	Yes
Fog	Likely	Yes
Heavy Rain/Thunderstorm/ Hail/Lightning/Wind	Highly Likely	Yes
Snow	Highly Likely	No
Tornado	Occasional	No
Soil Hazards:		
Erosion	Likely	No
Expansive Soils	Occasional	No
Land Subsidence	Occasional	No
Volcano	Unlikely	No
Wildfire	Highly Likely	Yes

Source: HMPC, 2007

The HMPC determined that flood, wildfire, and drought are the most significant hazards in the planning area. The assets at risk and estimated potential losses associated with these hazards are discussed in Section 4.3 Vulnerability Assessment. Only those hazards determined to be priority hazards are discussed further in this plan.

4.3 Vulnerability Assessment

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

With Fresno County's hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. This section focuses on the risks to the County as a whole. Data from the individual participating jurisdictions was also evaluated and is integrated here and in the jurisdictional annexes and noted where the risk differs for a particular jurisdiction within the planning area.

This vulnerability assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data)
- Statewide GIS datasets compiled by the California Governor's Office of Emergency Services to support mitigation planning
- California Department of Forestry and Fire Protection GIS datasets

- FEMA's HAZUS-MH MR3 GIS-based inventory data (January 2005)
- Written descriptions of inventory and risks provided by participating jurisdictions
- Existing plans and studies
- Personal interviews with planning team members and staff from the County and participating jurisdictions

4.3.1 Fresno County Vulnerability and Assets at Risk

As a starting point for analyzing the planning area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. This section describes significant assets at risk in the planning area. Data used in this baseline assessment included:

- Total values at risk
- Critical facility inventory
- Historic, cultural, and natural resources
- Growth and development trends
- Social vulnerability

Total Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties within the County. It is also important to note, in regard to 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 loss. Table 4.16 shows the 2007 roll values for the entire Fresno County planning area (e.g., the total values at risk) by jurisdiction. The roll values for unincorporated Fresno County are provided in Table 4.17 by property type.

Table 4.16. 2007 Total Roll Values for Fresno County Planning Area

Jurisdiction	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Clovis	25,774	5,425,767,090	1,849,303,079	2,199	209,237,386	27,973	7,484,307,555
Coalinga	3,104	357,689,968	104,650,862	426	27,147,627	3,530	489,488,457
Firebaugh	1,360	166,422,231	40,139,384	168	12,858,495	1,528	219,420,110
Fowler	1,458	232,676,642	65,459,670	385	18,607,767	1,843	316,744,079
Fresno	52,688	7,382,472,468	2,171,539,465	5,130	309,526,262	57,818	9,863,538,195
Huron	763	74,463,338	20,088,540	224	7,262,701	987	101,814,579
Kerman	2,768	404,677,255	130,961,562	474	30,855,637	3,242	566,494,454
Kingsburg	3,388	480,261,824	168,243,394	171	18,632,711	3,559	667,137,929
Mendota	1,444	158,096,423	39,981,415	197	5,362,598	1,641	203,440,436
Orange Cove	1,388	132,896,877	36,291,641	183	3,503,295	1,571	172,691,813
Parlier	2,188	246,464,506	63,720,801	104	6,004,257	2,292	316,189,564
Reedley	5,233	696,644,320	229,773,291	574	20,926,059	5,807	947,343,670
San Joaquin	621	61,484,159	18,662,920	68	4,617,028	689	84,764,107
Sanger	5,818	750,497,859	246,384,977	745	40,622,153	6,563	1,037,504,989
Selma	5,448	665,210,164	229,914,962	469	19,527,818	5,917	914,652,944
Unincorporated	123,073	22,644,365,319	8,987,703,429	20,806	1,693,156,208	143,879	33,325,224,956
Total	**236,516**	**39,880,090,443**	**14,402,819,392**	**32,323**	**2,427,848,002**	**268,839**	**56,710,757,837**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Table 4.17. 2007 Roll Values for Unincorporated Fresno County

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	6,426	868,832,266	919,942,452	4,925	232,046,826	11,351	2,020,821,544
Commercial	3,093	3,324,436,685	1,191,502,925	690	196,377,405	3,783	4,712,317,015
Industrial	1,496	1,068,800,017	239,991,854	313	42,988,643	1,809	1,351,780,514
Open Space	10,092	1,651,550,753	1,141,221,930	4,642	331,717,618	14,734	3,124,490,301
Residential	101,919	15,693,073,377	5,489,574,282	10,196	878,716,252	112,115	22,061,363,911
Other	47	37,672,221	5,469,986	40	11,309,464	87	54,451,671
Total	**123,073**	**22,644,365,319**	**8,987,703,429**	**20,806**	**1,693,156,208**	**143,879**	**33,325,224,956**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those services and facilities essential during a major emergency and that, if damaged, would result in severe consequences to public health and safety or facilities that, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities include, but are not limited to:

- Schools and other publicly owned facilities;
- Hospitals, nursing homes, and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a major disaster;
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for response activities before, during, and after an event;
- Public and private utility facilities that are vital to maintaining or restoring normal services to damaged areas before, during, and after an event; and
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials.

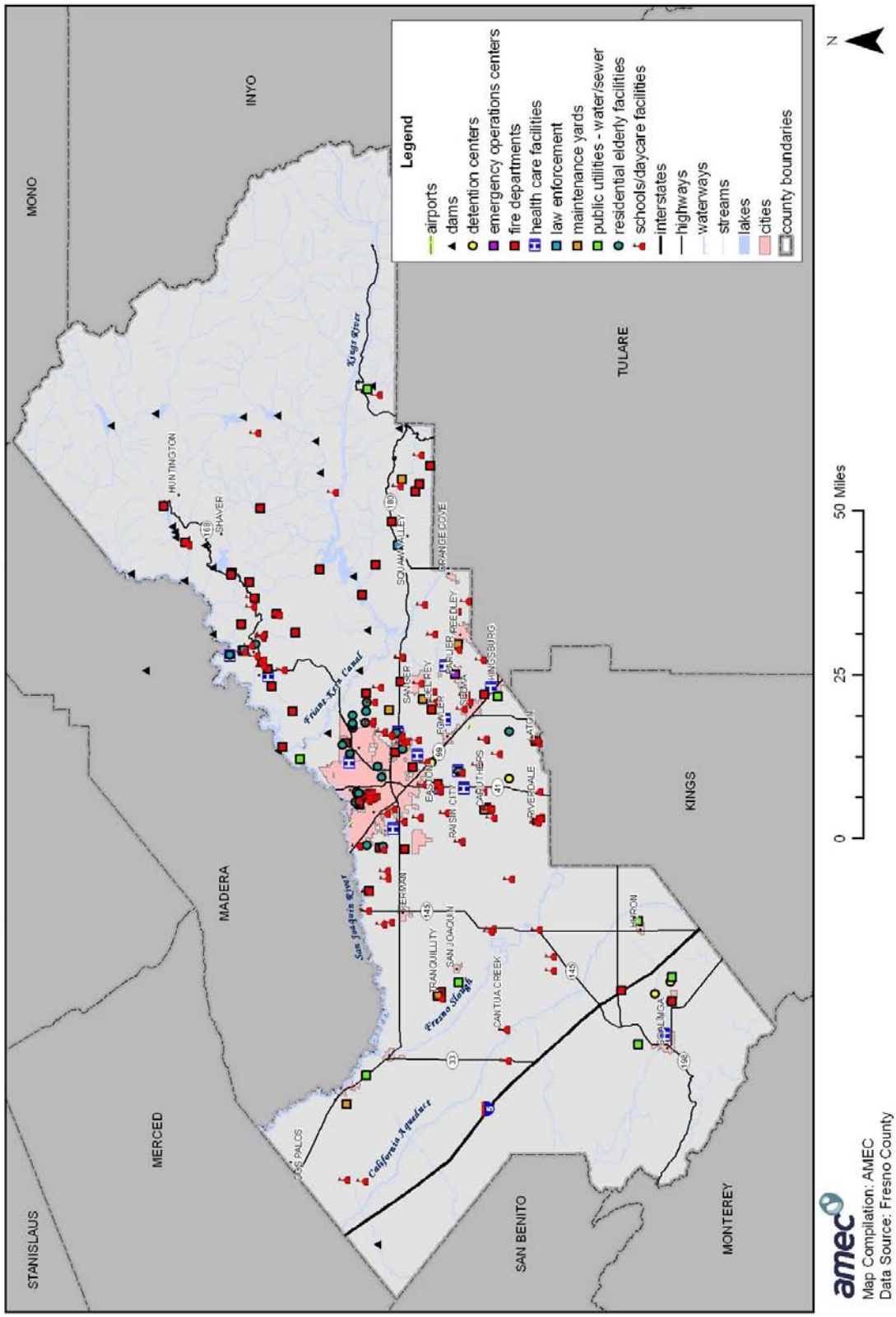
An inventory of critical facilities in the planning area based on data from Fresno County GIS is provided in Table 4.18. Critical facilities in the unincorporated areas of the County are illustrated in Figure 4.42. More information on critical facilities in the participating jurisdictions can be found in the jurisdictional annexes.

Table 4.18. Fresno County Planning Area's Critical Facilities

Critical Facilities Type	Unincorporated	All Cities	County Totals
Airports	2	5	7
Communications Centers	0	10	10
Detention Centers	5	5	10
Emergency Command Centers	0	1	1
Emergency Operations Centers	1	24	25
Fire Departments	46	42	88
Health Care Facilities	14	109	123
Law Enforcement Facilities	2	26	28
Maintenance Yards	10	18	28
Residential Elderly Facilities	28	102	130
Schools and Day Care Facilities	130	528	658
Public Utilities—Water/Sewer/Power*	38	10	48
Total	**301**	**880**	**1,181**

Source: Fresno County GIS
*Power utilities are not mapped

Figure 4.42. Critical Facilities in Unincorporated Fresno County



Historic, Cultural, and Natural Resources

Assessing the vulnerability of Fresno County to disaster also involves inventorying the historic, cultural, and natural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat help absorb and attenuate floodwaters.

Historic and Cultural Resources

Fresno County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. The OHP is responsible for the administration of federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of California's irreplaceable archaeological, and historical resources. OHP administers the National Register of Historic Places, the California Register of Historical Resources, the California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements.

- The **National Register of Historic Places** is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The **California Register of Historical Resources** program encourages public recognition and protection of resources of architectural, historical, archeological and cultural significance; identifies historical resources for state and local planning purposes; determines eligibility for state historic preservation grant funding; and affords certain protections under the California Environmental Quality Act. The register is the authoritative guide to the state's significant historical and archeological resources.
- **California Historical Landmarks** are sites, buildings, features, or events that are of **statewide** significance and have anthropological, cultural, military, political, architectural,

economic, scientific, technical, religious, experimental, or other value. Landmarks #770 and above are automatically listed in the California Register of Historical Resources.

- **California Points of Historical Interest** are sites, buildings, features, or events that are of **local (city or county)** significance and have anthropological, cultural, military, political, architectural, economic, scientific, technical, religious, experimental, or other value. Points designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the California Register.

Historical resources included in the programs above are identified in Table 4.19.

Table 4.19. Fresno County's Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	Point of Interest	Date Listed	City
Arroyo De Cantua (344)		X		8/8/1939	Coalinga
Bank Of Italy (N1140)	X			10/29/1982	Fresno
Birdwell Rock Petroglyph Site (N2193)	X			3/12/2003	Coalinga
Brix, H.H., Mansion (N1235, P438)	X		X	9/15/1983 (N) 10/1/1975 (P)	Fresno
Coaling Station A (P7)			X	12/16/1966	Coalinga
Coalinga Polk Street School (N1099)	X			5/6/1982	Coalinga
Dinkey Creek Bridge (N1957)	X			9/5/1996	Dinkey Creek
Einstein House (N554, P440)	X		X	1/31/1978 (N) 10/1/1975 (P)	Fresno
Fig Garden Woman's Club (P799)			X	7/18/1994	Fresno
Forestiere Underground Gardens (N524, 916)	X	X		10/28/1977 (N) 1/31/1978	Fresno
Fort Miller (584)		X		5/22/1957	Friant
Fowler's Switch (P299)			X	5/2/1973	Fowler
Fresno Bee Building (N1158)	X			11/1/1982	Fresno
Fresno Brewing Company Office and Warehouse (N1260)	X			1/5/1984	Fresno
Fresno City (488)		X		8/7/1951	Tranquillity
Fresno Memorial Auditorium (N1867)	X			5/10/1994	Fresno
Fresno Republican Printery Building (N738)	X			1/2/1979	Fresno
Fresno Sanitary Landfill (N2140)	X			8/7/2001	Fresno
Gamlin Cabin (N471)	X			3/8/1977	Wilsonia
Holy Trinity Armenian Apostolic Church (N1450)	X			7/31/1986	Fresno
Hotel Californian (N2235)	X			4/21/2004	Fresno
Kearney, M. Theo, Park and Mansion (N335, P5)	X		X	3/13/1975 (N) 8/5/1966 (P)	Fresno
Kindler, Paul, House (N1141)	X			10/29/1982	Fresno
Kingsburg Railroad Depot (P694)			X	3/30/1988	Kingsburg
Knapp Cabin (N727)	X			12/20/1978	Cedar Grove
Maulbridge Apartments (N1100)	X			5/6/1982	Fresno
Meux House (N324, P437)	X		X	1/13/1975 (N) 10/1/1975 (P)	Fresno
Milwood Townsite (P4)			X	8/5/1966	Miramonte

Name (Landmark Plaque Number)	National Register	State Landmark	Point of Interest	Date Listed	City
Old Administration Building, Fresno City College (N282)	X			5/1/1974	Fresno
Old Fresno Water Tower (N114)	X			10/14/1971	Fresno
Orange Cove Santa Fe Railway Depot (N658)	X			8/29/1978	Orange Cove
Pantages, Alexander, Theater (N559)	X			2/23/1978	Fresno
Physicians Building (N701)	X			11/20/1978	Fresno
Reedley National Bank (N1344)	X			2/28/1985	Reedley
Reedley Opera House Complex (N1276)	X			4/5/1984	Reedley
Rehorn House (N982)	X			1/8/1982	Fresno
Romain, Frank, House (N986)	X			1/11/1982	Fresno
San Joaquin Light & Power Corporation Building (N2310)	X			1/3/2006	Fresno
Santa Fe Hotel (N1673)	X			3/14/1991	Fresno
Santa Fe Passenger Depot (N443)	X			11/7/1976	Fresno
Settlement of Academy (P45)			X	9/22/1967	Toll House
Shorty Lovelace Historic District (N555)*	X			1/31/1978	Pinehurst
Site of First Junior College in California (803)		X		6/28/1965	Fresno
Site of the Fresno Free Speech Fight of the Industrial Workers of the World (873)		X		7/19/1974	Fresno
Southern Pacific Passenger Depot (N561)	X			3/21/1978	Fresno
Stoner House (N1390)	X			10/17/1985	Sanger
Sycamore Point (P226)			X	10/5/1971	Friant
Temporary Detention Camps for Japanese Americans-Fresno Assembly Center (934)		X		5/13/1980	Fresno
Temporary Detention Camps for Japanese Americans-Pinedale Assembly Center (934)		X		5/13/1980	Pinedale
Tollhouse (P145)			X	11/3/1969	Toll House
Tower Theatre (N1795)	X			9/24/1992	Fresno
Twining Laboratories (N1681)	X			3/26/1991	Fresno
Warehouse Row (N564)*	X			3/24/1978	Fresno
YWCA Building (N673, P439)	X		X	9/21/1978(N) 10/1/1975 (P)	Fresno

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/
*Historic district

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. Note: Since these structures are not protected, it is possible that they no longer exist.

- The **Historic American Buildings Survey** (HABS) documents America's architectural heritage. The following are the HABS structures in Fresno County:
  - Burnett Nurse's Home, 120 North Howard Street, Fresno
  - Camp Barbour Blockhouse, Millerton vicinity
  - Fort Miller Bakery, Lake Millerton, Millerton
  - Fort Miller Ford, Lake Millerton, Millerton
  - Fort Miller Hospital, Lake Millerton, Millerton

- Fort Miller Mess Hall, Lake Millerton, Millerton
- Fort Miller Officer's Quarters, Lake Millerton, Millerton
- Fort Miller, Lake Millerton, Millerton
- Ira H. Brooks House, 350 North Fulton Avenue, Fresno
- Shelter Cabin, Muir Pass, Big Pine vicinity

- The **Historic American Engineering Record** documents historic sites and structures related to engineering and industry. The following are the HAER structures in Fresno County:
  - Big Creek Hydroelectric System, Big Creek Town, Operator House Garage, Orchard Avenue south of Huntington Lake Road, Big Creek vicinity
  - Big Creek Hydroelectric System, Big Creek Town, Operator House, Orchard Avenue south of Huntington Lake Road, Big Creek vicinity
  - Big Creek Hydroelectric System, Powerhouse 3 Penstock Standpipes, Big Creek, Big Creek vicinity
  - Big Creek Hydroelectric System, Powerhouse 8, Operator Cottage, Big Creek, Big Creek vicinity
  - Hume Lake Dam, Sequoia National Forest, Hume

The Fresno County General Plan Background Report identifies the following, some of which are already mentioned above, as historic properties in Fresno County:

1.O.O.F. Hall
Academy
Alamo/Helm House
Alexander Home
American Self Storage (denied by city)
Anderson Home
Arioto, Thomas; Home
Armenian Presbyterian Church (demolished)
Arroyo De Cantua
Aten Residence
Back (Beck) Home
Baker Valley Historic District
Bank of America Building
Bank of Italy (Fresno)
Bank of Italy (Reedley)
Barkdale Home
Barton Opera House (non extent)
Basque Hotel
Bauder Home
Bean Home
Beeler/Thorton Shop (denied by City)
Bekins Van & Storage
Bernhauer House
Berry Home
Berven Rug Mills
Besaw Home
Bethel Lutheran Church
Bing Kong Tong Asso. Building
Black Market (denied by city)
Bonsel/Rush/Hunt Home (relocated)
Booker House
Boole Tree
Bow On Ton Asso. Building
Brix Apartments (removed from city list)
Brix Home
Burks, Drs.; Home
Caldwell Home
California Products Company
Camp Barbour Blockhouse
Campbell's Store
Cardwell Home
Carlson Home
Carmel Saddlery
Carnegie Library
Centennial Stump
Centerville
Central Packaging/Supply
Chicago Stump
Chorbajian Home (demolished)
City Fire Alarm Station
City Fire Alarm Station
Clements Service Station
Clovis Carnegie Library
Clovis Cole Home
Cobb Home
Collins Residence
Converse Basin Grove
Converse Hoist Site
Cowdrey Home
Craycroft Home
Davidson Home
Einstein Home
El Camino Viejo
Elkhorn Springs
Euless Home (denied by city)
Evinger Home
Ewing Home (denied by city)
Eymann, A.C. Home
Eymann, J.J. Home
Farr Residence
Fassett Home (demolished)
Fig Garden Women's Club
Firebaugh's Ferry
First Church of Christian Science
First Congressional Church
First Fresno Store
First Mexican Baptist Church
First Presbyterian Church (proposed)
First Store in Fresno

First Store, James Pager 1872
First United Methodist Church (proposed)
Forestiere Underground Gardens
Forkner Home
Fort Miller Blockhouse
Fort Miller Site
Fort Washington Site
Forthcamp Home
Fowler's Switch
Frank Dusy Home Site
Frankenau Home (proposed)
Free Speech Fight Site
Freemont, John C.; Kearney Park
Fresno Bee Building
Fresno Brewery Company
Fresno Buddhist Temple
Fresno City College Library
Fresno City Hall
Fresno Copper Mine
Fresno County Hall of Records
Fresno County Seat
Fresno Fire Alarm Station
Fresno Irrigation District/Moses J. Church
Fresno Junior College
Fresno Memorial Auditorium
Fresno Planning Mill
Fresno Republican/Print Building
Fresno Temple Church of God
Fresno Traction Company
Fresno Trolley Cars
Gamlin Cabin
Gemer Home
Gerlitz Home
Gibbs Home
Giffen Home (denied by city)
Gilbert Residence (denied by city)
Goodman Residence
Graff Home
Grant House
Grant Tree/Nations Christmas Tree
Green Bush Spring Plaque
Gregory Home
Griffen Home; Blackstone Ave
Groundwater Irrigation Plaque
Guarantee Savings Building
Gundelfinger, Henry, Home
Gundelfinger, Herbert, Home
Gundelfinger, Louis, Home
Hanger Home
Hansen House
Hansen, Jens; House
Hare, Drs., Home
Hayhurst Home
Hays Home
Helm Building
Hero Home
Hewitt Residence
Hines Home
Hines Home; Blackstone Ave
Hobbs Parsons Produce Co.
Holt Lumber Company
Holy Trinity Armenian Apostolic Church
Hoover Residence
Hotel California
Hotel Fresno
Hotel Virginia
Howard, Dr. Oliver, Home
Hughes Home
Hume Lake Dam
Hunt/Bonsel Home (relocated)
Huntington/Douglas Stump
Ingmire, Ovid; Home
J.C. Penny Store
Jamieson Home
Japanese American Detention Site
Jensen Home
Johnson Home
Johnson Home; Illinois Ave
Johnson, N.M., Home
Kearney Boulevard
Kearney Mansion
Kerman Union High School
Kern Kay Hotel
Kindler, Paul House
King Solomon Lodge
Kings River Irrigation Plaque
Kingsburg Railroad Depot
Knapp Cabin; Cedar Grove
Kutner Home
La Libertad
Laguna de Tache Land Office (burned)
Laton Library Building
Legler Residence
Leslie House
Letcher
Liberty Theatre/Hardys
Long/Black Home
Main Home
Main Post Office
Maracci, Joseph, Home
Mason Building
Masonic Hall
Mattel Building
Maubridge Apartments
McAlpine Home
McCollum Home
McKay Home
Mclndoo/Phillips Home
Meux Home, Museum
Meux, John, Home (burned)
Mill Ditch
Miller Home
Millerton Site
Millwood Site
Mink Home
Mosgrove Home
Mundroff Home
National Warehouse
Nestel Home
Neverman Home
Newman Home
Nye, Judge, Home
Ohannesian Home
Oil City
Okamoto's Dept. Store
Okonogi Home
Old Administration Building
Old Barn "M" Street
Old Clovis Courthouse
Old Fresno City Site
Old Fresno Unified School Building
Old Fresno Water Tower
Old St. Agnes Hospital
Orangedale Odd Fellow's Lodge 211 (proposed)
Owen Home
P.G.kE. Building
Pantages, Alexander; Theater
Parret Home
Patterson, T.W., Building
Pattison House
Peden Home
Peterson Home
Phelan, James, Building
Physicians Building
Pine Flat Dann Plaque
Pinedale Elementary Plaque
Pollasky Railroad
Poole's Ferry
Porteous Home
Posa de China Site
Post Office Substation; Inyo
Prescott, F.K. Home
Post Office; Tulare
Prescott, F.K. Home
Pueblo de las Juntas
Radin-Kamp Dept. Store

Railroad Anniversary Plaque; 100 Anniversary
Rainbow Ballroom
Ramona Apartments (demolished)
Reedley National Bank
Reedley Opera House
Rehorn Residence
Reyburn Home
Rheingans Home
Riverview Ranch House
Robinson Home
Roessler Home
Roessler Winery
Romain Home
Rowell Building
Rowell Home
Rustigan Building
Rutherford Home (not extant)
Saddler Office Supply
San Joaquin Grocers Wholesale
San Joaquin Valley Coal Mine
San Joaquin Valley Railroad
Sanger Depot Museum
Sanger Lodge #316 (proposed)
Sanger Womens Club
Santa Fe Depot, Fresno
Santa Fe Depot; Orange Cove
Santa Fe Motel
Saroyan Home; El Monte Way
Saroyan Home; Griffith Way
Schmidt Home
Schutz Residence (non extant)
Scottish Rite Temple
Scottsburg Site
Security Bank Building
Selma Flouring Mill
Selma, Townsite
Sharer Home
Shipp Home
Shorty Lovelace Hist. District
Shuttera Home
Solorio Residence
Southern Pacific Depot
Spencer Home
Squaw Leap Archeological Dit.
St. Alphonsus Catholic Church
St. Ansgar's Lutheran Church
St. Genevieve's Catholic
St. John's Cathedral
St. John's Hall School
St. John's Rectory
St. Paul's Armenian Church
Staley House
Station "A" Postal Service
Steinwand Home
Stone Home
Stoner House
Sun Maid Raisin Growers (demolished)
Sun Stereo Warehouse
Swedish Methodist Church
Swift Home
Sycamore Bend
Teilrnan Home
Temple Beth Israel
Theatre 3
Thomas, Montgomery; Home
Thompson Residence
Tinkler Mission Chapel
Tollhouse Grade
Towne Apartments
Tranquillity Site
Traveler's Hotel
Turner Building
Turpin Home
Twin Sisters/McVey House
Twining Laboratories
Van Ness Gate
Van Volkenburgh Home
Vartanian Home
Vincent Home
Vincent Home; San Pablo Ave
Warehouse Row
Warehouse Row Packing
Warehouse Row Storehouse
Warrior's/Pantages Theater
Water Works Assoc.
Webb House
Weems House
Welsh Home
Wilson Theater Building
Wishon Home
Wishon, A.G.; Home
Wishon, A.G.; Home, Fulton St
Woolfolk Home
YWCA Residence Hall
Yost & Webb Mortuary
Yost Sr Webb Mortuary/Martin
Young Home
Zacky Farm Grain Elevator

A 1988 publication from the state's Office of Historical Preservation identified 16 "ethnic historic sites" in Fresno County. *Five Views: An Ethnic Historic Site Survey for California* was originally conceived to broaden the spectrum of ethnic community participation in historic preservation activities and to provide better information on ethnic history and associated sites. The 16 sites are as follows:

- Burr Ranch/Smith Brothers Ranch (Black American)
- Fowler City Park (Black American)
- Gabriel Moore Ranch (Black American)
- Young's Place (Black American)
- First Mexican Baptist Church (Mexican American)
- Fresno Buddhist Church (Japanese American)
- Fresno Nihonmachi (Japanese American)
- H. Sumida Company (Japanese American)
- Iseki Labor Camp (Japanese American)
- Kamikawa Brothers (Japanese American)
- Nihin Byoin-Hashiba Sanitarium (Japanese American)
- Okonogi Hospital Site (Japanese American)
- Reedley Kyogi-Kai Hall (Japanese American)
- Bowles (Japanese American)
- Selma Japanese Mission Church (Japanese American)
- KGST (Mexican American)

The Fresno County General Plan Background Report also identifies 13 museums in Fresno County, most of which are located in the City of Fresno. They are all privately owned and operated nonprofit organizations.

- African-American Museum, Fresno (city)
- Centro Bellas Artes, Fresno (city)
- Clovis-Big Creek Historical Museum, Clovis
- Discovery Center, Fresno (city)
- Forestiere Underground Gardens, Fresno (city)
- Fresno Art Museum, Fresno (city)
- Fresno Metropolitan Museum, Fresno (city)
- German Museum, Fresno (city)
- Kearney Mansion Museum, Fresno (city)
- Meux Home Museum, Fresno (city)
- R.C. Baker Memorial Museum, Coalinga
- Reedley Museum, Reedley
- Sanger Depot Museum, Sanger

It should be noted that these lists may not be complete, as they may not include those properties currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as stores and reduces the force of floodwaters.

Fresno County is unique among California counties. It cuts an east/west cross section across central California that incorporates four biotic regions (see Figure 4.43):

Central Coast Range Region

Only a small portion of the far western edge of Fresno County lies in the central Coast Range region. This area supports a mosaic of summer dry grassland, blue oak and blue oak-foothill pine woodland, and chaparral habitat types. Western Fresno County transitions from the grasslands and agriculture of the Central Valley to the inner coast region. Mostly intermittent streams flow from the inner Coast Range to the valley floor. Some can support riparian habitat that provides additional value to both resident and migratory wildlife.

San Joaquin Valley Floor Region

More than 50 percent of Fresno County lies in the southern San Joaquin Valley subregion of the Central Valley. This southern subregion is generally hotter and drier than the subregion to the north and supports some desert elements. The valley floor region has undergone extensive conversion of native habitats that existed before European settlement of the state. Presently, this region supports extensive amounts of agriculture and urban development around the Fresno, Clovis, and Sanger areas.

In the few remaining areas not converted to urban or agriculture use, unique biological features persist. Mixed in with areas of grassland habitat are freshwater and alkaline vernal pools that support unique native flora and fauna. A few small isolated areas of sodic vernal pools occur in the northwestern part of the County, primarily at the Kerman reserve. Concentrations of freshwater vernal pools occur in a belt along the northeast edge of the valley floor region north of the Kings River. In the highly modified Central Valley, vernal pool areas are often grazed but remain a unique biological relic of native California species in the natural landscape.

The rivers and streams that flow from the mountains in the east historically meandered through broad floodplain. Because of urbanization and agriculture, these broad floodplains have been restricted to narrower belts along the rivers and streams or otherwise modified for flood control. In the upper San Joaquin River, the floodplains are naturally constrained by high bluffs bordering the river. Within this modified landscape, the remaining riparian habitat provides corridors and linkages to and from the biotic regions of the County and is of great value to resident and migratory wildlife. The San Joaquin and Kings river systems and the Fresno Slough are the major waterways in the County.

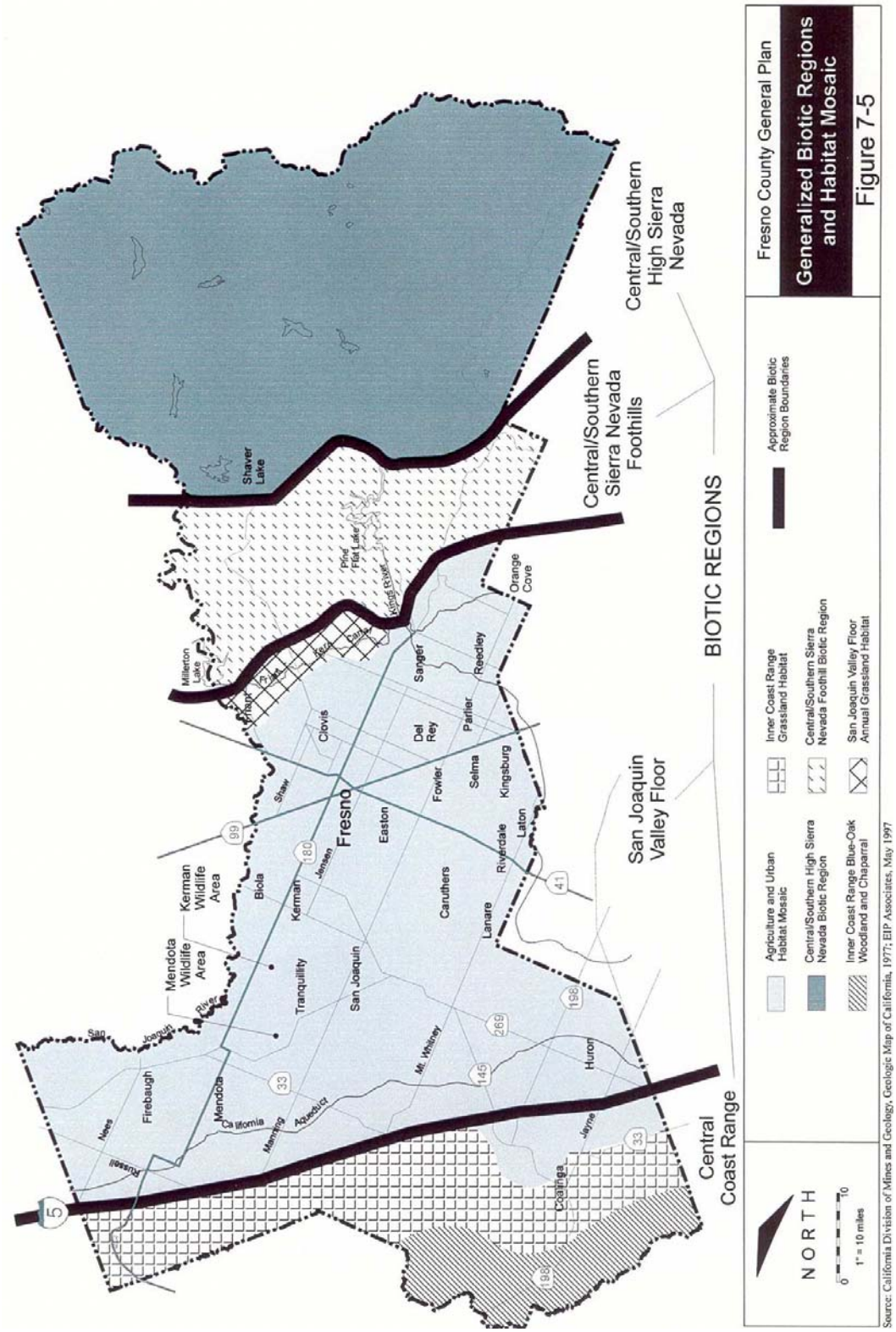
Central Southern Sierra Nevada Foothills

Fresno County includes a portion of the central and southern subregions of the Sierra Nevada Mountains that can be further divided into a central/southern Sierra Nevada foothill and central/southern high Sierra Nevada district. The foothill district is best differentiated from the high Sierra and the San Joaquin Valley areas by habitat types that change with topography. The foothills that are the transition from the valley floor to the high Sierra can be characterized by blue oak and blue oak-foothill pine woodlands and chaparral habitats dotted with areas of serpentine soils. Density and canopy coverage of tree species is highly variable depending on natural conditions such as soils, topography, slope and aspect, and human influences from grazing, hardwood harvesting, and other land clearing activities. Moderate gradient perennial and intermittent streams and rivers support a varied amount of riparian habitat that provide valuable habitat for wildlife.

Central/Southern High Sierra Nevada

The transition from the foothills to the high Sierra Nevada can be characterized by the addition of ponderosa pine at the low elevations into the dominant plant species composition (from around 2,000 feet). The foothills to high Sierra biotic regions make a transition through a mixed hardwood conifer habitat to those habitats dominated by conifers, such as ponderosa pine, white fir, and giant sequoia. In the higher elevations, Jeffrey pine, lodgepole pine, and treeless alpine communities dominate. Rivers and streams are at a higher gradient than their foothill or valley floor reaches and support a montane riparian habitat that, like the others, provides valuable habitat for resident and migratory wildlife. The majority of the high Sierra region in Fresno County is included in the Sequoia and Sierra National Forests and Kings Canyon National Park and managed by their respective federal agencies for recreational, timber, tourism, and wilderness values.

Figure 4.43. Fresno County's Generalized Biotic Regions and Habitat Mosaic



Source: Fresno County General Plan, 2000

Each region hosts specific habitats that together support a wide variety of vegetation and wildlife (see Table 4.20), and each region has different susceptibilities to hazards such as wildfire, flood, and drought. Fresno County recognizes the importance of protecting, preserving, conserving, and restoring this biodiversity.

Table 4.20. Fresno County Habitat Types by Biotic Region

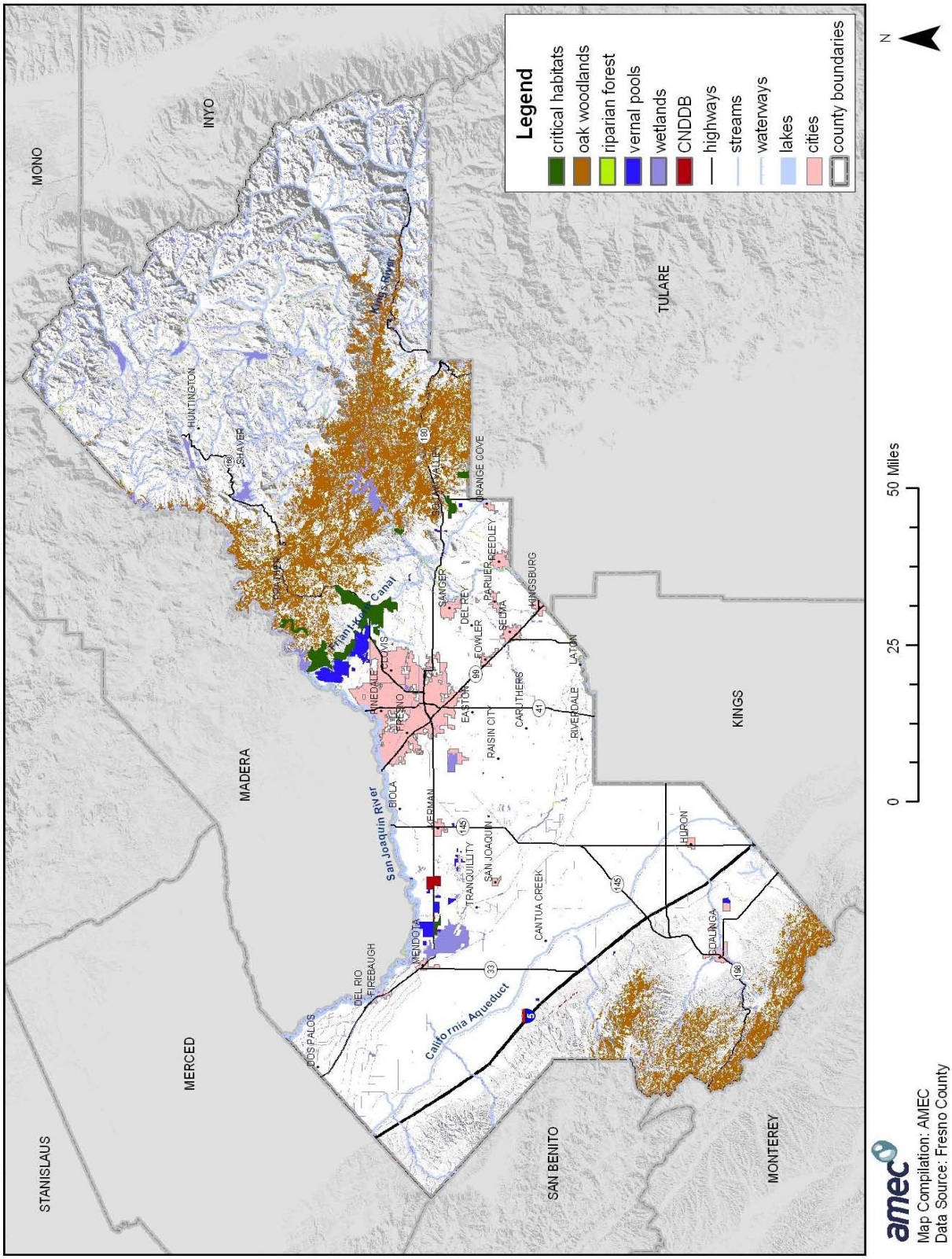
Central Coast Range	San Joaquin Valley Floor	Central/Southern Sierra Nevada Foothills	Central/Southern High Sierra Nevada
• Annual/Ruderal Grassland • Valley Oak Woodland • Pasture • Cropland • Valley-Foothill Riparian/Riverine • Fresh Emergent Wetland • Larustrine • Blue Oak Woodland • Blue Oak-Foothill Pine Woodland • Mixed Chaparral • Chamise-Redshank Chaparral	• Annual/Ruderal Grassland • Vernal Pool • Alkali Scrub • Pasture • Cropland • Orchard-Vineyard • Urban • Valley-Foothill Riparian • Fresh Emergent Wetland • Lacustrine	• Annual/Ruderal Grassland • Pasture • Cropland • Orchard-Vineyard • Urban • Valley-Foothill Riparian • Fresh Emergent Wetland • Larustrine • Blue Oak Woodland • Blue Oak Foothill Fine Woodland • Mixed Chaparral • Chamise-Redshank Chaparral	• Montane Chaparal • Montane Hardwood-Conifer • Montane Riparian • Sierran Mixed Conifer • Ponderosa Pine • Jeffrey Pine • White Fir • Red Fir • Lodgepole Pine • Subalpine Conifer • Alpine Dwarf Scrub • Wet Meadow • Bitterbrush • Juniper

Source: Fresno County General Plan, 2000

Approximately one third of the County lies within land under federal jurisdiction. The USDA Forest Service and National Parks Service manage these lands for recreation, biology, wilderness, tourism, timber, and mining under federal guidelines, policies, and laws. The biotic regions that are outside of federal ownership and, therefore, most subject to development are the Central Coast Range, San Joaquin Valley Floor, and the lower Sierra Nevada foothills.

For purposes of this plan, natural resources include special-status species, sensitive habitats, wetlands, and other natural resources identified by the HMPC. Figure 4.44 further illustrates Fresno County's environmental features.

Figure 4.44. Fresno County's Environmental Features



Special-Status Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

Information from the U.S. Fish and Wildlife Service and the California Natural Diversity Data Base, a program that inventories the status and locations of rare plants and animals in California, was combined to create an inventory of special-status species in Fresno County. The full inventory, along with information about habitat requirements and distribution where available from the Fresno County General Plan Background Report, is available in Appendix B: Special-Status Species in Fresno County. Table 4.21 lists national and state endangered, threatened, rare, and candidate species in Fresno County by species type.

Table 4.21. Endangered, Threatened, Rare, and Candidate Species in Fresno County

Common Name	Scientific Name	Federal Status	California Status
Amphibians			
California red-legged frog	*Rana aurora draytonii*	Threatened	None
California tiger salamander*	*Ambystoma californiense*	Threatened	None
Sierra Madre (=mountain) yellow-legged frog	*Rana muscosa*	Endangered	None
Sierra Nevada yellow-legged frog	*Rana sierrae*	Candidate	None
Yosemite toad	*Bufo canorus*	Candidate	None
Birds			
Bald eagle	*Haliaeetus leucocephalus*	Delisted	Endangered
Bank swallow	*Riparia riparia*	None	Threatened
California condor	*Gymnogyps californianus*	Endangered	Endangered
Great gray owl	*Strix nebulosa*	None	Endangered
Swainson's hawk	*Buteo swainsoni*	None	Threatened
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Candidate	Endangered
Willow flycatcher	*Empidonax traillii*	None	Endangered
Fish			
Central Valley steelhead	*Oncorhynchus mykiss*	Threatened	None
Lahontan cutthroat trout	*Oncorhynchus (=Salmo) clarkii henshawi*	Threatened	None
Paiute cutthroat trout	*Oncorhynchus (=Salmo) clarkii seleniris*	Threatened	None
Invertebrates			
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened	None
Vernal pool fairy shrimp*	*Branchinecta lynchi*	Threatened	None

Common Name	Scientific Name	Federal Status	California Status
Vernal pool tadpole shrimp*	*Lepidurus packardi*	Endangered	None
Mammals			
California wolverine	*Gulo gulo*	None	Threatened
Fresno kangaroo rat*	*Dipodomys nitratoides exilis*	Endangered	Endangered
Giant kangaroo rat	*Dipodomys ingens*	Endangered	Endangered
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	None	Threatened
Pacific fisher	*Martes pennanti (pacifica) DPS*	Candidate	None
San Joaquin kit fox	*Vulpes macrotis mutica*	Endangered	Threatened
Sierra Nevada (=California) bighorn sheep	*Ovis canadensis sierrae (=californiana)*	Endangered	Endangered
Sierra Nevada red fox	*Vulpes vulpes necator*	None	Threatened
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	Endangered	Endangered
Plants			
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	None	Endangered
California jewel-flower	*Caulanthus californicus*	Endangered	Endangered
Congdon's lewisia	*Lewisia congdonii*	None	Rare
Greene's tuctoria	*Tuctoria greenei*	Endangered	Rare
Hairy Orcutt grass*	*Orcuttia pilosa*	Endangered	Endangered
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	Endangered	Endangered
Hoover's eriastrum	*Eriastrum hooveri*	Delisted	None
Keck's checkerbloom (=checker-mallow)*	*Sidalcea keckii*	Endangered	None
Mariposa pussypaws	*Calyptridium pulchellum*	Threatened	None
Palmate-bracted bird's-beak	*Cordylanthus palmatus*	Endangered	Endangered
San Benito evening-primrose	*Camissonia benitensis*	Threatened	None
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	Threatened	Endangered
San Joaquin Valley Orcutt grass*	*Orcuttia inaequalis*	Threatened	Endangered
San Joaquin woollythreads	*Monolopia congdonii (=Lembertia congdonii)*	Endangered	None
Slender moonwort	*Botrychium lineare*	Candidate	None
Succulent (=fleshy) owl's-clover	*Castilleja campestris ssp. succulenta*	Threatened	Endangered
Tompkins' sedge	*Carex tompkinsii*	None	Rare
Tree-anemone	*Carpenteria californica*	None	Threatened
Reptiles			
Blunt-nosed leopard lizard	*Gambelia (=Croataphytus) sila*	Endangered	Endangered
Giant garter snake	*Thamnophis gigas*	Threatened	Threatened

Sources: U.S. Fish and Wildlife Service Sacramento Office, www.fws.gov/sacramento/; California Natural Diversity Data Base, www.dfg.ca.gov/biogeodata/cnddb/

*According to the U.S. Fish and Wildlife Service, critical habitat is designated for this species

Sensitive Habitats

The California Department of Fish and Game Natural Diversity Data Base identifies 12 sensitive habitat types in Fresno County:

- Big tree forest
- Coastal and valley freshwater marsh
- Great Valley mesquite scrub

- Great valley mixed riparian forest
- Monvero residual dunes
- Northern basalt flow vernal pool
- Northern claypan vernal pool
- Northern hardpan vernal pool
- Northern vernal pool
- Sycamore alluvial woodland
- Valley needlegrass grassland
- Valley sink scrub

Wetlands

Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools, and riparian woodlands. Wetlands are considered to be waters of the United States and are subject to the jurisdiction of the U.S. Army Corps of Engineers as well as the California Department of Fish and Game (CDF&G). Where the waters provide habitat for federally endangered species, the U.S. Fish and Wildlife Service may also have authority.

Wetlands are a valuable natural resource for communities due to their benefits to water quality, wildlife protection, recreation, and education and play an important role in hazard mitigation. Wetlands provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital and reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water.

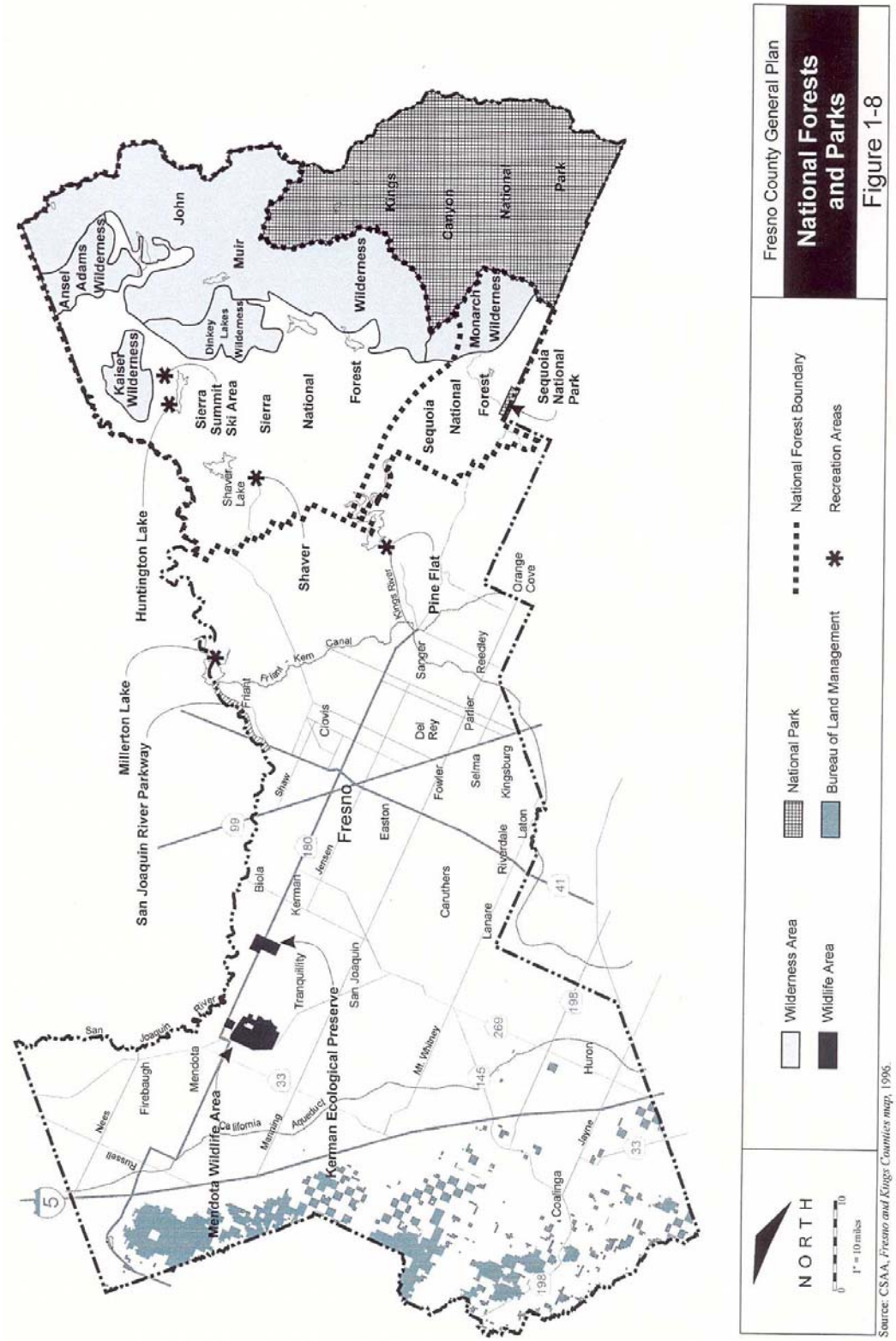
Notable categories of wetlands found in Fresno County include wet meadows in the mountainous region, vernal pools in the foothills, marshes in the valley trough, and reclaimed agricultural lands in western Fresno County. The CDF&G manages several of the major identified wetlands in Fresno County, including the Mendota Wildlife Management Area, Kerman Ecological Reserve, Alkali Sink Ecological Reserve, and smaller wetlands management units along the San Joaquin River. While these lands are currently being adequately protected, environmental concern is primarily focused on wetlands that are not yet identified and protection of remaining vernal pools. Several vernal pool complexes are located near Friant between Friant Road and the Friant-Kern Canal and in the area south of Academy and east of Red Mountain. A large concentration of very high quality vernal pools is found in these areas, and they are considered to be some of the best examples of vernal pools in the state. The County’s vernal pools are threatened by urban development and conversion to intensive agriculture.

Other Natural Resources

While some of these resources are not owned or managed by the County, they are important assets for the County (see Figure 4.45).

- **Sierra National Forest**—Managed by the USDA Forest Service, makes up much of the eastern portion of the County north of the Kings River
- **Sequoia National Forest**—Managed by the USDA Forest Service, makes up a small portion of the County south of the Kings River
- **Kings Canyon National Park**—Managed by the National Park Service, encompasses a portion of southeastern Fresno County
- **John Muir, Ansel Adams, Monarch, Kaiser, and Dinkey Lake Wilderness Areas**—Managed by the Bureau of Land Management, located in the eastern portion of the County
- **Mendota Wildlife Area**—Operated by the California Department of Fish and Game, located three miles south of Mendota
- **Kerman Ecological Preserve**—Operated by the California Department of Fish and Game
- **Alkali Sink Ecological Reserve**—Operated by the California Department of Fish and Game
- **Allen Ranch**—640 acres operated by the California Department of Fish and Game
- **Millerton Lake State Recreational Area**—Administered by the California Department of Parks and Recreation

Figure 4.45. National Forests and Parks in Fresno County



Source: Fresno County General Plan, 2000

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability. Information from the Fresno County General Plan Housing Element, the draft 2007 Fresno County Regional Housing Needs Allocation Plan, and the California Department of Finance form the basis of this discussion.

More specific information on growth and development for each participating jurisdiction can be found in the jurisdictional annexes.

Current Status and Past Development

The 2007 estimated population of Fresno County was 917,515. This was an increase of 14.77 percent from the 2000 census population of 799,407. For the year January 1, 2006, to January 1, 2007, Fresno County ranked 13th in percent of growth and 9th in numerical growth among California counties. Fresno County was the 10th largest county in California (and the 53rd largest in the United States). Tables 4.22-4.25 illustrate past growth in Fresno County in terms of population, housing units, and density. Figure 4.46 illustrates the population by census block based on 2000 census data.

Table 4.22. Fresno County's Population Growth 1960-2007

	1960's	1970	1980	1990	2000	2007*
Total	365,945	413,329	514,621	667,490	799,407	917,515
Change	--	47,384	101,292	152,869	131,917	118,108
Percent Change (%)	--	12.95	24.51	29.71	19.76	14.77

Sources: Social Science Data Analysis Network (Census 2000 data), www.censusscope.org/; California Department of Finance, www.dof.ca.gov/Research/
*Estimate

Table 4.23. Population Growth for Jurisdictions in Fresno County, 2000-2007

Jurisdiction	2000	2007*	Percent Change (%)	# Change	Percent of County (%)	Percent of Total Growth (%)
Clovis	68,516	92,269	34.67	23,753	10.06	20.11
Coalinga	15,798	18,061	14.32	2,263	1.97	1.92
Firebaugh	5,743	6,692	16.52	949	0.73	0.80
Fowler	4,046	5,293	30.82	1,247	0.58	1.06
Fresno	427,652	481,035	12.48	53,383	52.43	45.20
Huron	6,310	7,493	18.75	1,183	0.82	1.00
Kerman	8,548	13,591	59.00	5,043	1.48	4.27
Kingsburg	9,231	11,234	21.70	2,003	1.22	1.70
Mendota	7,890	9,426	19.47	1,536	1.03	1.30
Orange Cove	7,722	10,544	36.54	2,822	1.15	2.39
Parlier	11,145	13,080	17.36	1,935	1.43	1.64
Reedley	20,756	24,909	20.01	4,153	2.71	3.52
San Joaquin	3,270	3,870	18.35	600	0.42	0.51
Sanger	18,931	23,289	23.02	4,358	2.54	3.69
Selma	19,444	23,194	19.29	3,750	2.53	3.18
All Cities	635,002	743,980	17.16	108,978	81.09	92.27
Unincorporated	164,405	173,535	5.55	9,130	18.91	7.73
County Totals	**799,407**	**917,515**	**14.77**	**118,108**	**100.00**	**100.00**

Source: California Department of Finance, www.dof.ca.gov/Research/ *Estimate

Table 4.24. Growth in Housing Units for Jurisdictions in Fresno County, 2000-2007

Jurisdiction	2000	2007*	Percent Change (%)	# Change	Percent of County (%)	Percent of Total Growth (%)
Clovis	25,265	33,353	32.01	8,088	10.98	24.60
Coalinga	3,714	4,040	8.78	326	1.33	0.99
Firebaugh	1,581	1,803	14.04	222	0.59	0.68
Fowler	1,305	1,668	27.82	363	0.55	1.10
Fresno	149,025	164,190	10.18	15,165	54.07	46.13
Huron	1,415	1,650	16.61	235	0.54	0.71
Kerman	2,461	3,830	55.63	1,369	1.26	4.16
Kingsburg	3,377	4,024	19.16	647	1.33	1.97
Mendota	1,878	2,193	16.77	315	0.72	0.96
Orange Cove	1,767	2,371	34.18	604	0.78	1.84
Parlier	2,644	3,037	14.86	393	1.00	1.20
Reedley	5,972	7,028	17.68	1,056	2.31	3.21
San Joaquin	735	850	15.65	115	0.28	0.35
Sanger	5,420	6,527	20.42	1,107	2.15	3.37
Selma	5,815	6,787	16.72	972	2.24	2.96
All Cities	212,374	243,351	14.59	30,977	80.14	94.23
Unincorporated	58,393	60,289	3.25	1,896	19.86	5.77
County Totals	**270,767**	**303,640**	**12.14**	**32,873**	**100.00**	**100.00**

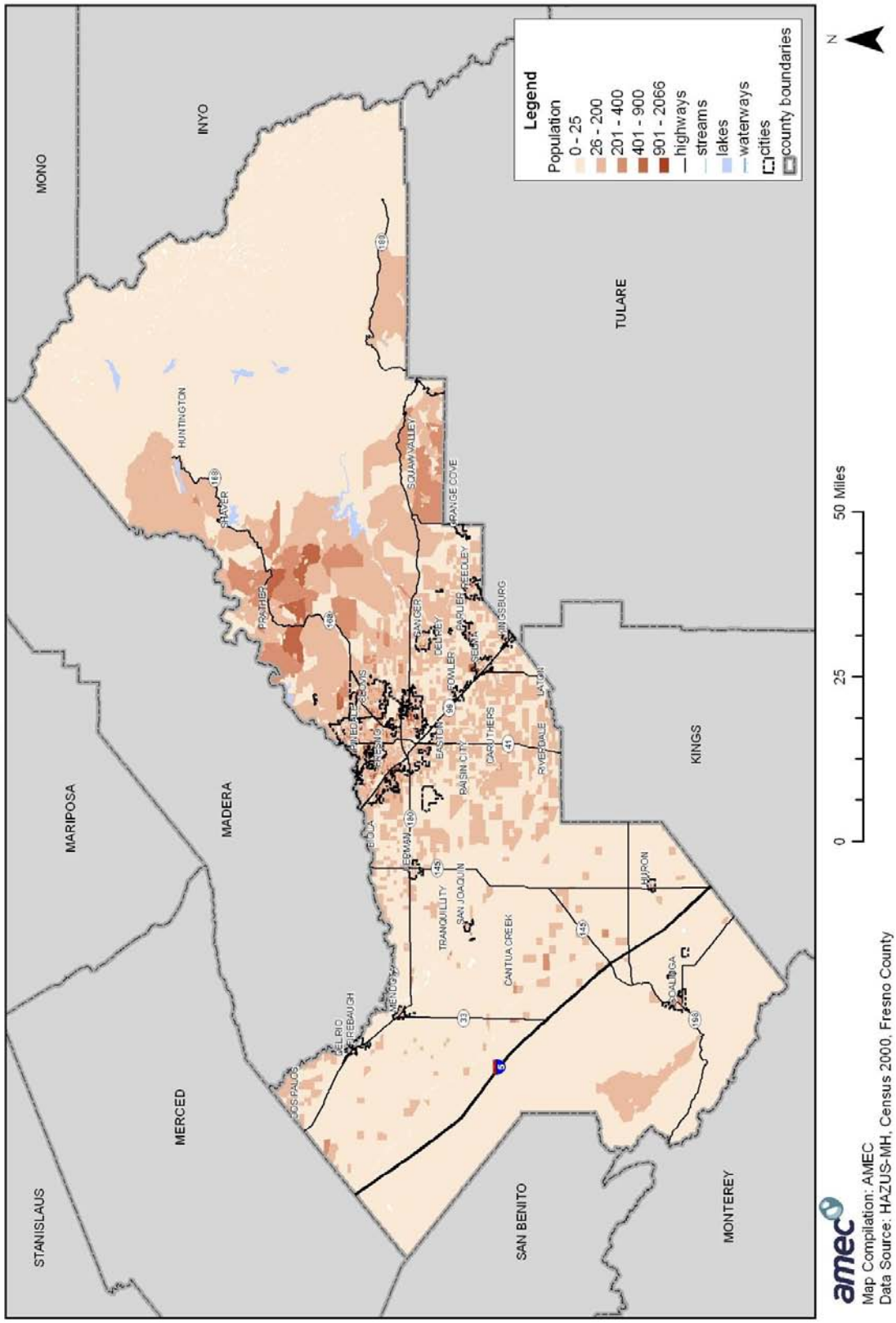
Source: California Department of Finance, www.dof.ca.gov/Research/ *Estimate

Table 4.25. Population and Housing Unit Density for Jurisdictions in Fresno County, 2000-2007

Jurisdiction	Area in Square Miles	2000 Population Density	2000 Housing Unit Density	2007 Population Density*	2007 Housing Unit Density*
Clovis	17.12	4,002.10	1,475.76	5,389.54	1,948.19
Coalinga	5.96	2,650.67	623.15	3,030.37	677.85
Firebaugh	2.91	1,973.54	543.30	2,299.66	619.59
Fowler	2.03	1,993.10	642.86	2,607.39	821.67
Fresno	104.8	4,080.65	1,421.99	4,590.03	1,566.70
Huron	1.34	4,708.96	1,055.97	5,591.79	1,231.34
Kerman	2.16	3,957.41	1,139.35	6,292.13	1,773.15
Kingsburg	2.34	3,944.87	1,443.16	4,800.85	1,719.66
Mendota	1.87	4,219.25	1,004.28	5,040.64	1,172.73
Orange Cove	1.54	5,014.29	1,147.40	6,846.75	1,539.61
Parlier	1.62	6,879.63	1,632.10	8,074.07	1,874.69
Reedley	4.49	4,622.72	1,330.07	5,547.66	1,565.26
San Joaquin	0.99	3,303.03	742.42	3,909.09	858.59
Sanger	4.75	3,985.47	1,141.05	4,902.95	1,374.11
Selma	4.34	4,480.18	1,339.86	5,344.24	1,563.82
All Cities	158.26	4,012.40	1,341.93	4,701.00	1,537.67
Unincorporated	5,859.16	28.06	9.97	29.62	10.29
County Totals	**6,017.42**	**132.85**	**45.00**	**152.48**	**50.46**

Sources: California Department of Finance, www.dof.ca.gov/Research/, U.S. Census Bureau, www.census.gov/
*Estimate

Figure 4.46. Fresno County's Population by Census Block



Current Status and Past Development Summary

- 173,535 individuals (18.91) percent, of Fresno County's residents live in the unincorporated portion of the County.
- 743,980 individuals (81.09) percent, of Fresno County's residents live within the County's incorporated areas.
- Population growth between 2000 and 2007 was greatest in the incorporated areas of Kerman (59 percent), Orange Cove (36.54 percent), and Clovis (34.67 percent).
- Numerically, the greatest population growth occurred in the Cities of Fresno (53,383) and Clovis (23,753). The combined population of the contiguous cities is 573,304, 62.5 percent of the County's total population.
- Population growth between 2000 and 2007 was slowest in unincorporated Fresno County, which only grew by 5.5 percent. Among the incorporated areas, growth was slowest in the City of Fresno (12.48 percent), Coalinga (14.32 percent), and Firebaugh (16.52 percent).
- Growth in using units tracked with population growth.
- Population growth in the City of Fresno was 45.20 percent of the County's total population growth. The City's housing unit growth was 46.13 percent of the County's total housing unit growth.
- Fresno County's population growth outstripped the increase in housing units by 2.6 percent, suggesting an increasing unmet housing need, larger households sizes (with potential overcrowding), or both.
- With 8,074 people per square mile, Parlier has the highest population density in the County, followed by Orange Cove (6,847) and Kerman (6,292). (Kerman displaced six other cities between 2000 and 2007.)
- With 1,948 housing units per square mile, Clovis has the highest housing unit density in the County, followed by Parlier (1,875) and Kerman (1,773). (Clovis displaced Parlier, and Kerman displaced six other cities between 2000 and 2007.)

Future Development

As indicated in the previous section, Fresno County has been steadily growing over the last four decades, and this growth is projected to continue through the middle of the century. Table 4.26 shows the population projections for the County as a whole through 2050.

Table 4.26. Population Projections for Fresno County, 2000-2050

	2000	2010	2020	2030	2040	2050
Population	804,508	983,478	1,201,792	1,429,228	1,670,542	1,928,411
Percent Change (%)		22.25	22.20	18.92	16.88	15.44

Source: California Department of Finance, www.dof.ca.gov/Research/

Housing Needs

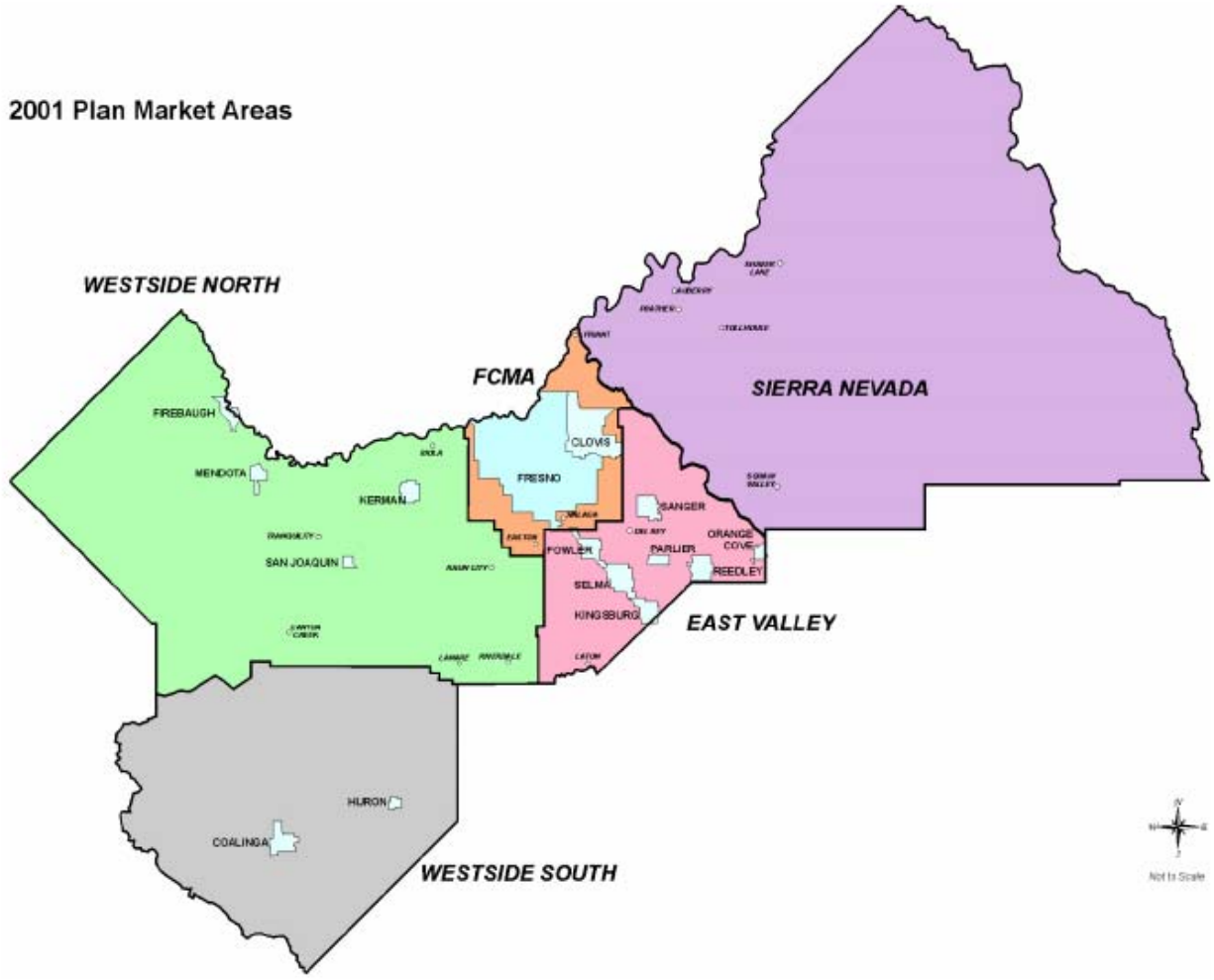
The draft 2007 Fresno County Regional Housing Needs Allocation Plan (RHNA) determines housing needs in Fresno County for the planning period January 1, 2006, to June 30, 2013, and

provides a general measure of each local jurisdiction's responsibility for the provision of housing to meet those needs. Among the objectives of the plan, which are required by California state law, are promoting infill development, protection of environmental and agricultural resources, and encouragement of efficient development patterns.

Housing market areas were used in the plan to gather, analyze, and present data. These areas were considered to be subregionally significant areas within the County (see Figure 4.47). Two concepts were considered in defining market areas: not dividing developed areas and defining subregions in which there is an interaction between employment opportunities and housing opportunities. The following market areas were established in the 2001 plan and used again in the 2007 plan:

- **Fresno-Clovis Metropolitan Area (FCMA)**—The FCMA market area is comprised of the Cities of Fresno and Clovis; the unincorporated communities of Easton and Friant; several unincorporated neighborhoods including Fig Garden, Malaga, and Sunnyside; and, remaining unincorporated area. The geographic boundary of the FCMA generally extends from the San Joaquin River on the north, Grantland Avenue on the west, McCall Avenue on the east, and South Avenue on the south. As the largest metropolitan area in the San Joaquin Valley, the FCMA is a significant center of employment and residential opportunities.
- **Westside North**—The Westside North market area is comprised of the Cities of Kerman, Firebaugh, Mendota, and San Joaquin; the unincorporated communities of Tranquillity, Biola, Caruthers, Lanare, Laton, and Riverdale; and remaining unincorporated area. The area extends from the eastern slope of the Coast Range to the western boundary of the FCMA, and south of the FCMA to a point just east of and parallel to State Route 41. The valley portion is largely agricultural, while the Coast Range portion is used for cattle grazing, mining, recreation, and wildlife habitat.
- **Westside South**—The Westside South market area is comprised of the Cities of Coalinga and Huron and unincorporated area. The area extends from the eastern slope of the Coast Range to the Fresno and Kings counties boundary. The primary economic activities of this market area are similar to those in the Westside North market area.
- **East Valley**—The East Valley market area is comprised of the Cities of Orange Cove, Parlier, Reedley, Sanger, Fowler, Kingsburg, and Selma; the unincorporated community of Del Rey; and remaining unincorporated area. The area extends southeastwardly from the FCMA between a point just east of and parallel to State Route 41 and the Friant-Kern Canal. The economic base of this market area is agriculture, although commercial and industrial activities have become increasingly important.
- **Sierra Nevada**—The Sierra Nevada market area is comprised of the unincorporated communities of Auberry, Big Creek, and Shaver Lake and the remaining unincorporated area. There are no cities in this market area. The area extends easterly of the Friant-Kern Canal and comprises the western slope of the Sierra Nevada Mountain Range. The unincorporated communities function as service centers for the various recreational sites in the area and the farming, cattle grazing, and lumbering activities that occur.

Figure 4.47. Fresno County Market Areas



Source: 2001 Fresno County Regional Housing Needs Allocation Plan, www.fresnocog.org/

For this RHNA cycle, the estimated regional housing need number is 52,142 units. This determination projects the minimum housing need to be accommodated in the region over the planning period. But, in light of the rate of population growth in the region, it is recommended that jurisdictions consider planning for housing needs above the minimum determination. Table 4.27 provides the estimated basic construction need for the region for the 7½ year planning period. Basic construction need is the number of new housing units that must be constructed to provide housing for the anticipated population.

Table 4.27. Fresno County's Basic Construction Needs, January 1, 2006, to June 30, 2013

Jurisdiction	2006 Units	Projected 2013 Units	Growth	Normal Market Removals	Total Units Needed
Fresno-Clovis Metropolitan Area (FCMA)					
Clovis	32,458	48,155	15,697	141	15,838
Fresno	160,446	181,560	21,114	190	21,304
Unincorporated	28,138	29,010	872	8	880
FCMA Totals	221,042	258,724	37,682	339	38,021
East Valley					
Fowler	1,519	2,228	709	6	716
Kingsburg	4,023	5,498	1,475	13	1,489
Orange Cove	2,153	2,961	808	7	815
Parlier	2,990	3,535	545	5	550
Reedley	6,570	7,985	1,415	13	1,428
Sanger	6,527	8,764	2,237	21	2,258
Selma	6,701	8,575	1,874	17	1,891
Unincorporated	11,561	11,919	358	3	361
East Valley Totals	42,044	51,466	9,422	86	9,507
Westside North					
Firebaugh	18,806	2,228	422	4	425
Kerman	3,555	6,016	2,461	22	2,483
Mendota	2,039	2,413	374	3	377
San Joaquin	822	1,019	197	2	199
Unincorporated	9,812	10,116	304	3	307
Westside North Totals	18,034	21,791	3,758	34	3,791
Westside South					
Coalinga	3,988	4,066	78	1	79
Huron	1,614	2,020	406	4	409
Unincorporated	9,812	10,116	27	0	27
Westside South Totals	6,466	6,976	511	5	515
Sierra Nevada					
Unincorporated	9,823	10,127	304	3	307
Sierra Nevada Totals	9,823	10,127	304	3	307
County Totals					
Incorporated Totals	237,211	287,022	49,811	449	50,260
Unincorporated Totals	60,197	62,062	1,865	17	1,882
County Totals	**297,408**	**349,084**	**51,676**	**466**	**52,142**

Source: 2007 Fresno County Regional Housing Needs Allocation Plan (draft), www.fresnocog.org/

Holding Capacity and Buildout

Collectively, the land use designations of the Fresno County General Plan work together to determine the plan's holding capacity. Holding capacity is normally expressed as the number of people that could theoretically be accommodated in a planning area if all of the land were developed to the maximum potential allowed by the land use designations of the plan. Buildout is the point at which the land in the planning area is being used to the maximum extent allowed

by the plan. Since buildout will never occur for a number of reasons discussed further in the plan, the plan considers holding capacity at buildout of the plan to be 80 percent of the theoretical maximum holding capacity. Table 4.28 shows the existing population (2007 estimates) of each of the cities and the future population (holding capacity) that could be accommodated in each city based on buildout of each jurisdiction's general plan and applying the 80 percent factor to the holding capacities.

Table 4.28. Population Holding Capacities for Jurisdictions in Fresno County

Jurisdiction	2007 Population*	Holding Capacity**	Percent Built Out (%)	Remaining Population Capacity at 80% of Holding Capacity***
Clovis	92,269	176,680	52.22	49,075
Coalinga	18,061	16,000	112.88	0
Firebaugh	6,692	880,000	99.88	0
Fowler	5,293	6,700	167.50	0
Fresno	481,035	3,160	54.66	222,965
Huron	7,493	5,530	135.50	0
Kerman	13,591	15,000	90.61	0
Kingsburg	11,234	13,800	81.41	0
Mendota	9,426	12,000	78.55	174
Orange Cove	10,544	7,000	150.63	0
Parlier	13,080	14,000	93.43	0
Reedley	24,909	35,000	71.17	3,091
San Joaquin	3,870	7,000	55.29	1,730
Sanger	23,289	19,800	117.62	0
Selma	23,194	37,630	61.64	6,910
All Cities	743,980	1,249,300	59.55	255,460
Unincorporated	173,535	316,521	54.83	79,682
County Totals	**917,515**	**1,565,821**	**52.22**	**335,142**

Sources: Fresno County General Plan, 2000; California Department of Finance, www.dof.ca.gov/Research/
*Estimate
**May be out of date and no longer valid
***This number is 80 percent of the holding capacity minus the 2007 population

Future Development Summary

- According to the projections in Table 4.26, all areas of the County will continue to grow, but the percentage of growth will decrease over time, through 2050.
- The Fresno County General Plan assumes that 92.6 percent of the population growth experienced in Fresno County through the year 2020 will be directed to incorporated cities and 7.4 percent will be absorbed in the unincorporated area.
- In evaluating the residential growth potential based on development on vacant sites in the unincorporated areas, Fresno County recognizes the governmental, environmental, and economic influences that may impact the provision of new housing or maintenance of existing housing.

- Coalinga, Firebaugh, Fowler, Huron, Kerman, Kingsburg, Orange Cove, Parlier, and Sanger are already built out according to the data in Table 4.28, yet there are still housing needs projected out through 2013. After the Cities of Fresno and Clovis, which are not near buildout, Kerman and Sanger have the greatest housing needs. All of these built out jurisdictions in particular should be careful about where and how future development takes place, taking care to avoid hazard-prone areas in the face of development pressures.
- The Land Resources Inventory verifies that there is no shortage of potentially developable land in Fresno County. Consistent with the County's urban development policy, intensive housing development will be directed to residentially zoned urban areas and established communities where infrastructure and services are available. This policy reflects the commitment to conserve natural and managed resources and to minimize the loss of valuable agriculture land and open space.

Land Use

The Fresno County General Plan includes 30 resource, residential, commercial, industrial, and other land use designations that depict the types of land uses that will be allowed throughout the unincorporated County (see Table 4.29). Allowable uses for each land use designation and intensity standards for the various land use designations are available in the general plan's Agriculture and Land Use Element.

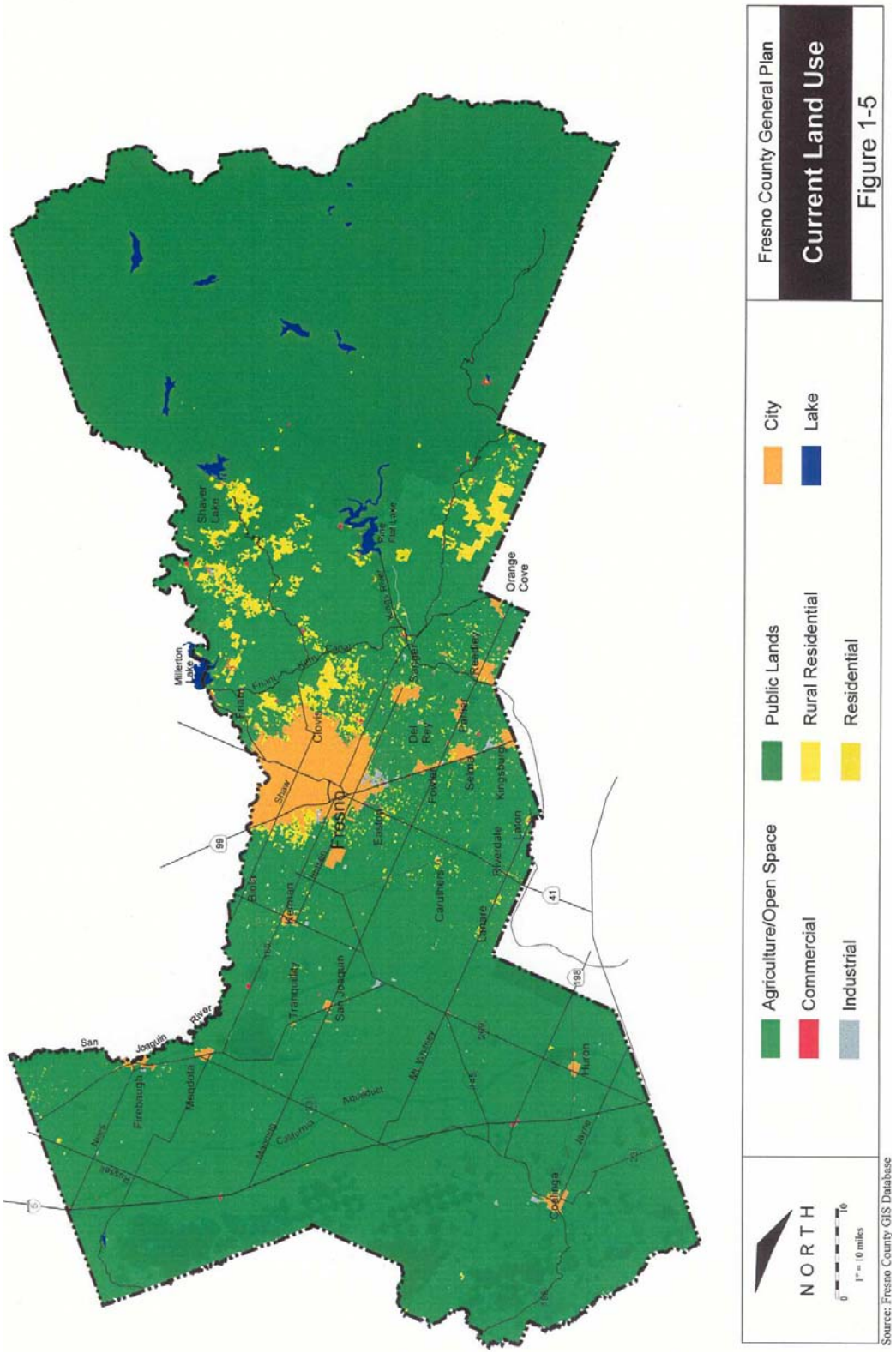
Table 4.29. Fresno County's Land Use by Generalized Land Use Categories, 1997

Generalized Land Use Category	Square Miles*	Percent (%)
Residential	152	2.50
Commercial	7	0.12
Industrial	11	0.18
Agriculture	2,911	48.00
Resource Conservation (including national forests and parks, timber preserves)	2,691	44.80
Unclassified (includes streets and highways, rivers, etc.)	11	0.18
Incorporated Cities	154	2.60
County Totals	**6,005**	**100.00**

Source: Fresno County General Plan, 2000; Fresno County Assessor's Office, 1997
*Individual figures do not exactly total 6,005 square miles because of the assessor's classification system

The residential land use designation encompasses a number of uses that have distinctly different densities, which is important to consider in development and hazard mitigation activities. Figure 4.48 illustrates the County's land use, and Table 4.30 shows the breakdown of residential uses by acre in Fresno County in 1997.

Figure 4.48. Fresno County's Land Use



Source: Fresno County General Plan, 2000

Table 4.30. Fresno County's Acreage for Residential Land Uses, 1997

General Description	Acres
Single family residential	84,071
Multi-family residential	178
Planned unit development and condominiums	17
Single family and mobile home together on the same lot	2,806
Mobile home only	9,332
Mobile home on permanent foundation	505
Mobile home park	305
County Totals	**97,214**

Source: Fresno County General Plan, 2000; Fresno County Assessor, 1997

The western rangelands of Fresno County's coastal foothills possess unique physiographic features and are relatively isolated from major population concentrations. This area is sensitive to human activity and is best suited for continuation of open space uses that protect important watershed areas, decrease flood hazards, and prevent loss of wildlife habitat, grazing land, and other desirable open space uses. At the same time, various nonintensive uses are suitable for this land, including grazing and other agricultural operations, mining, oil and gas development, and various recreational activities such as hiking, hunting, and rock hounding.

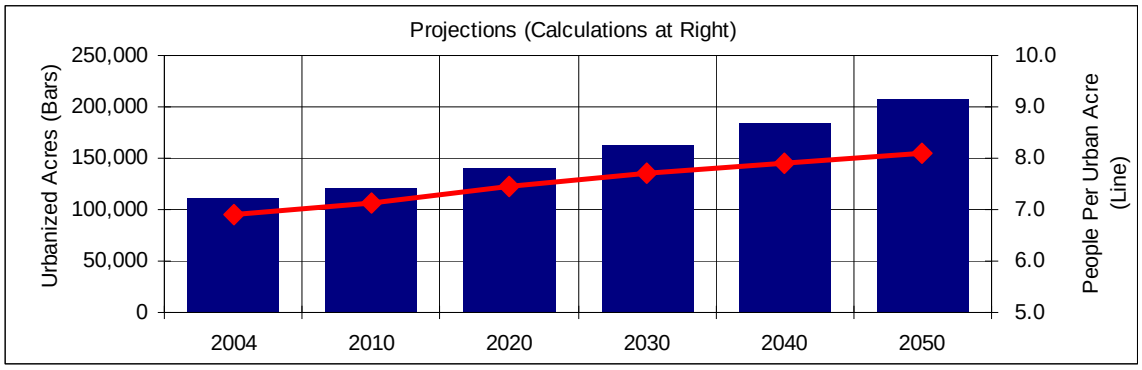
The San Joaquin and Kings river valleys have unique features such as topography, wildlife, vegetation, microclimate, and openness that make them attractive for multiple uses, including agriculture, sand and gravel mining, recreation, and homesite development. At the same time, these river valleys are subject to natural constraints to development, such as periodic flooding and soils with a high water table and poor filtration capacity for domestic sewage.

Urbanization

According to a recent report from the American Farmland Trust, urban development is proceeding at a rapid pace in California, and it is disproportionately targeting the state's agricultural regions. Rapid population growth is driving this trend, but the inefficiency of development in terms of the number of acres developed per person is a strong contributing factor.

In 2004, the County had 110,897 urbanized acres, 21,525 of which were urbanized between 1990 and 2004. This rapid urbanization places the County 7th among California counties in terms of number of acres urbanized in this time period. Should this trend continue, an estimated 97,605 more acres will be urbanized by 2050. Figure 4.49 illustrates this potential growth along with that of people per urban acre (efficiency).

Figure 4.49. Fresno County Urbanization Projections, 2004-2050



Source: American Farmland Trust, www.farmland.org/

Social Vulnerability

Certain demographic and housing characteristics may amplify or reduce overall vulnerability to hazards. These characteristics, such as age, race/ethnicity, income levels, gender, building quality, and public infrastructure, all contribute to social vulnerability.

A Social Vulnerability Index compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina measures the social vulnerability of U.S. counties to environmental hazards for the purpose of examining the differences in social vulnerability among counties. Based on national data sources, primarily the 2000 census, it synthesizes 42 socioeconomic and built environment variables that research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards (i.e., social vulnerability). Eleven composite factors were identified that differentiate counties according to their relative level of social vulnerability: personal wealth, age, density of the built environment, single-sector economic dependence, housing stock and tenancy, race (African American and Asian), ethnicity (Hispanic and Native American), occupation, and infrastructure dependence. Fresno County ranks in the top 20 percent in the nation and in the state on the vulnerability index, which indicates highest social vulnerability.

Fresno County is the 8th most socially vulnerable County (out of 58 counties) in California. To better understand the characteristics behind this ranking, the HMPC researched information from the 2000 census on four factors of social vulnerability: gender, age, language spoken in home, and wealth/poverty. These factors were analyzed for Fresno County as a whole and individually for each of the incorporated and unincorporated communities. One characteristic of social vulnerability is differential access to resources and greater susceptibility to hazards. All factors considered here are related to this characteristic. Table 4.31 displays these variables and compares them to the same variables for California and the United States. These factors of social vulnerability hold many implications for disaster response and recovery and are important

considerations when identifying and prioritizing mitigation actions and overall goals and objectives of the plan.

Gender

Women may have a more difficult time recovering from disaster than men because of sector-specific employment, lower wages, and family care responsibilities. The percentage of men and women in the County is approximately equal: Fresno County is 49.9 percent female. A few of the communities have a higher proportion of men to women: the percentage of females is 42.6 in Cantua Creek, 43.4 in Mendota, 44.3 in Huron, and 46.6 in Tranquillity. The data indicates that in Fresno County, gender is not a factor that increases the social vulnerability of the planning area.

Age

Age can affect the ability of individuals to move out of harm's way and take care of themselves. The HMPC analyzed two variables for age, percentage of population age 65 and over and percentage under age 18. Overall, Fresno County has a younger population than California or the United States with approximately one-third of the population under the age of 18. Although the low proportion of elderly residents in many areas lowers vulnerability; some of these areas have a high percentage of children, which heightens vulnerability. A few of the cities have approximately 40 percent of their population under the age of 18 (San Joaquin, Orange Cove, Firebaugh, and Huron). The percent of the population age 65 and over is particularly high in Bowles (33.5 percent) and also notable in Auberry (18.9 percent).

Language Spoken at Home

Language barriers can affect communication of warning information and access to post-disaster funding. In California, 39.5 percent of the population speaks a language other than English in the home. This is much higher than for the United States as a whole, which is 17.9 percent. Fresno County has a slightly higher percentage than the state: 40.8 percent. In more than half of Fresno County's cities and census-designated places, more than half of the populations speak languages other than English at home. In a number of communities, this percentage exceeds 75 percent: San Joaquin (89.8 percent), Huron (86.9 percent), Cantua Creek (83.3 percent), Parlier (82.9 percent), Mendota (82 percent), Calwa (81.8 percent), Orange Cove (77.9 percent), Firebaugh (77.1 percent), and Biola (76.8 percent). While this does not mean these populations do not speak English (20.7 percent of the County's population speaks English less than "very well"), these figures are indicative of cultural differences that may affect receipt of and response to disaster information.

Wealth and Poverty

Wealth and poverty are also indicators of social vulnerability. Low income and impoverished populations have fewer resources available for recovery and are more likely to live in structures of greater physical vulnerability. Wealthier communities often have greater capabilities to mitigate hazards and greater access to funds for recovery.

To compare wealth and poverty, the HMPC analyzed the percentage of individuals below the poverty level and the median home value in each city and census-designated place in Fresno County. Fresno County overall has a higher percentage of people living below the poverty level, 22.9 percent, than California (14.2 percent) or the nation (12.4 percent). Poverty is highest in the unincorporated areas of Orange Cove (44.5 percent) and Mendota (41.9 percent). The median value of single-family, owner-occupied homes in Fresno County in 2000 was $104,900 compared to $211,500 in California. Home values are lowest (below $80,000) in Cantua Creek, Lanare, Biola, Del Rey, Calwa, Tranquillity, Huron, and Laton.

Table 4.31. Measures of Fresno County's Social Vulnerability from 2000 U.S. Census

	Total Population	Total Housing Units	% Females	% Under Age 18	% Age 65 and Over	% Speak Language Other than English in Home**	% Individuals Below Poverty Level**	Median Value ($), Single-Family Owner-Occupied Homes**
United States	281,421,906	115,904,641	50.9	25.7	12.4	17.9	12.4	119,600
California	33,871,648	12,214,549	50.2	27.3	10.6	39.5	12.2	211,500
Fresno County	799,407	270,767	49.9	32.9	9.9	40.8	22.9	104,900
Clovis	68,468	25,250	52	30.7	9.4	17.1	10.6	125,200
Coalinga*	16,213	3,848	48	33.2	8.5	42.2	20.3	86,900
Firebaugh	5,743	1,581	48	39.3	6.4	77.1	22.5	80,900
Fowler	3,979	1,277	51.1	32.9	11.9	53.7	21.5	93,300
Fresno	427,652	149,025	50.9	32.9	9.3	39.5	26.2	97,300
Huron	6,306	1,414	44.3	39.1	4.2	86.9	39.4	75,800
Kerman	8,551	2,462	50.5	35.3	8.1	62.4	20.2	97,900
Kingsburg	9,199	3,358	52.2	30.0	13.2	23.7	11.5	117,300
Mendota	7,890	1,878	43.4	33.9	5.2	82	41.9	82,700
Orange Cove	7,722	1,767	48.1	40.4	5	77.9	44.5	80,200
Parlier	11,145	2,644	47.9	37.9	4.9	82.9	36	81,400
Reedley	20,756	5,972	48.6	32.1	11.3	58.8	23.8	104,200
San Joaquin	3,270	735	46.8	41.2	4	89.8	34.6	82.900
Sanger	18,931	5,420	49.8	34.1	10.1	65	23.7	92,200
Selma	19,444	5,815	49.9	33.1	10.3	55.6	22.7	97,000
Auberry	2,053	791	51.5	26.3	18.9	6.1	13.8	136,400
Biola	1,037	241	48	36.5	9.7	76.8	25.9	65,700
Bowles	182	35	56	23.6	33.5	26.8	34.9	122,700
Calwa	762	227	51.2	30.8	12.7	81.8	28	72,500
Cantua Creek	655	154	42.6	37.5	3.2	83.3	38.1	57,200
Caruthers	2,103	602	51.3	36.0	9.9	41.1	17.6	90,600
Del Rey	950	257	50.9	35.9	9.3	73.1	34.2	69,700
Easton	1,966	648	49.4	30.2	13.3	37.4	24	91,200
Friant	519	236	49.9	18.7	25	2.9	12.6	92,700
Lanare	540	132	48.9	33.9	9.6	66.7	29.1	59,100
Laton	1,236	340	50	35.9	7	53	17.4	76,500
Raisin City	165	46	52.1	32.1	13.3	42.9	21.3	87,500
Riverdale	2,416	773	50	35.6	10.6	47.8	26.5	81,900
Shaver Lake	705	1,845	48.8	18.7	17.4	11.3	10.3	223,300
Squaw Valley	2,691	1,160	50.9	25.7	12.4	17.9	12.4	142,000
Tranquillity	813	249	46.6	33.5	9.3	57.1	7.9	75,500

Source: U.S. Census Bureau, 2000, www.census.gov
*Population count revised
**Based on sample data

4.3.2 Vulnerability of Fresno County to Specific Hazards

The Disaster Mitigation Act regulations require the HMPC to evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the hazards identified as a priority hazard in Section 4.2.21 Natural Hazards Summary. Where specific hazards vary across the County, additional information can be found in the jurisdictional annexes. The hazards evaluated further as part of this vulnerability assessment include, in alphabetical order:

- Agricultural Hazards
- Dam Failure
- Drought
- Earthquake
- Flood
- Human Health Hazards
  - Epidemic/Pandemic
  - West Nile Virus
- Severe Weather
  - Extreme Temperatures
    - Extreme Cold/Freeze
    - Extreme Heat
  - Fog
  - Heavy Rain/Thunderstorm/Hail/Lightning/Wind
- Wildfire

An estimate of the vulnerability of the County to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. The potential damage is more isolated and less costly than a more widespread disaster.

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

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Further, other information can be collected in regard to the hazard area, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information portrays the impact, or vulnerability, of that area to that hazard.

The HMPC identified three 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. These three hazards are flood, wildfire, and earthquake. Because these hazards have discrete hazard risk areas, their risk varies by jurisdiction. For flood and wildfire, the HMPC inventoried the following for each community, to the extent possible, to quantify vulnerability in identified hazard areas:

- General hazard-related impacts, including impacts to life, safety, and health
- Insurance coverage, claims paid, and repetitive losses
- Values at risk (i.e., types, numbers, and value of improvements)
- Identification of critical facilities at risk
- Identification of cultural and natural resources at risk
- Overall community impact
- Development trends within the identified hazard area

The HMPC used FEMA's loss estimation software, HAZUS-MH, to analyze the County's vulnerability to earthquakes.

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

Hazards with Geographical Limits

Vulnerability to Flood

100-Year Flood:

Likelihood of Future Occurrence—Occasional
Vulnerability—High

<100-Year Flood/Localized Flooding:

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Medium

Flooding is a natural occurrence in the Central Valley because it is a natural drainage basin for thousands of watershed acres of Sierra Nevada and Coast Range foothills and mountains. Historically, the Fresno County planning area has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. But, occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

Flooding has occurred in the past: within the 100-year floodplain and in other localized areas. Recent draft digital flood insurance rate maps (DFIRMs) dated September 2007 placed additional areas within the 100-year or greater floodplain. This is primarily due to the inability of the old and inadequate levees to be certified in accordance with current FEMA standards. As such, these levees no longer provide protection from the 100-year flood. It should be noted, however, that all levees, whether certified or not, provide some level of protection to the planning area and remain a critical factor in floodplain management for the communities.

The continued need to rely on these flood control structures is an ongoing concern. The history of the area, beginning with hydraulic gold mining techniques and through the continuing conversion of agricultural lands to commercial and residential uses, makes it impossible to reverse the planning area's dependence on structural flood control protection. Levee maintenance is a continuous effort due to erosion and scour brought on by the channelization itself.

Additional improvements to strengthen the levees and make them less susceptible to seepage induced failures are a priority of local and state agencies. Once these improvements are made, certification may be possible. Nevertheless, while these improvements may mitigate the impacts of flooding due to levee failure, the levees will remain subject to overtopping by flood events larger than their design capacity.

The likelihood of flooding increases with the heavy rains that occur annually between November and May. In addition to damage to area infrastructure, other problems associated with flooding include erosion, sedimentation, degradation of water quality, loss of environmental resources, and certain health hazards.

Methodology

The unincorporated County and incorporated communities have mapped flood hazard areas. GIS was used to determine the possible impacts of flooding within the County and where the flood risk varies across the planning area. Once the flood hazard areas were mapped, the next step was to quantify the flood vulnerability by jurisdiction. The following methodology was followed in creating these flood vulnerability maps and determining values at risk to the 100-year and 500-year flood events.

The 2007 draft DFIRMs were used as the floodplain layer. This data set, even in draft form, was the most comprehensive, electronic representation of the 100- and 500-year floodplains for the entire planning area. Table 4.32 summarizes the flood zones included on these maps.

Table 4.32. Fresno County's Flood Zones

Flood Zone	Definition
Special Flood Hazard Areas (SFHA) Subject to Inundation by 100-Year Flood	
Zone A	No base flood elevations determined
Zone AE	Base flood elevations determined
Zone AH	Flood depths of 1-3 feet (usually areas of ponding); base flood elevations determined
Zone AO	Flood depths of 1-3 feet (usually sheet flow on sloping terrain); average depths determined; for areas of alluvial fan flooding, velocities also determined
Zone AR	SFHA formerly protected from the 1 percent annual chance flood by a flood control system that was subsequently decertified; zone AR indicates that the former flood control system is being restored to provide protection from the 1 percent annual chance or greater flood
Zone A99	Area to be protected from 1 percent annual chance flood by a federal flood protection system under construction; no base flood elevations determined
Other Flood Areas	
Zone X (with color coding)	Areas of 0.2 percent annual chance flood (i.e., 500-year flood); areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood
Other Areas	
Zone X (with no shading)	Areas determined to be outside the 0.2 percent annual chance floodplain
Zone D	Areas in which flood hazards are undetermined, but possible

Source: 2007 Draft Digital Flood Insurance Rate Maps, Fresno County

The County's parcel layer was used as the basis for the inventory of developed parcels. In some cases, there are parcels in multiple flood zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon. The layer was then overlaid on the floodplain layer. For the purposes of this analysis, the flood zone in which the centroid was located was assigned as the flood zone for the entire parcel. This model assumed that every parcel with an improved value greater than zero was developed in some way. Only improved parcels and the value of their improvements were analyzed. In order to assess the land use type by flood zone, a land use code table was joined to the parcel layer. The codes were simplified into the five categories shown in Table 4.33.

Table 4.33. Fresno County's Land Use Code Zones

Code	Description	Use Summary
S	Single Family Residential Properties	Residential
M	Multi-Family Residential Properties	Residential
P	Planned Unit Development & Condos	Residential
A	Agricultural Properties	Agriculture
Z	Farmland Security Zone Properties	Agriculture
C	Commercial Properties	Commercial
I	Industrial Properties	Industrial
O	Open Space Properties	Open Space

Source: Fresno County Assessor's Office

The parcels were segregated and analyzed for the entire County, unincorporated areas only, and for the following incorporated cities: Clovis, Coalinga, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, San Joaquin, Sanger, and Selma. The results for the County as a whole and the unincorporated areas are reported in this section. The results for the participating incorporated cities can be found in their respective jurisdictional annexes.

Two main limitations to this methodology were identified:

- The DFIRM flood layer and the parcel boundary layer did not match up perfectly. There were 99 parcels whose centroids did not intersect the flood layer; those points were located around the perimeter of the County. These parcels may or may not be inundated with a 100- or 500-year flood. The combined assessed improved value of these parcels did not exceed $4.5 million. This flood analysis does not include these outlying parcels.
- A parcel layer from the Fresno County Department of Public Works and Planning was used. It was joined to a land use table and a valuation table, both from the Assessor's Office, based on assessor's parcel numbers (APN). There were 5,941 parcel APNs that did not match up between the parcel layer and the assessor's tables. This was because the land use and valuation tables were from 2006 and the parcel layer had been amended since then. The assumption is that these 5,941 parcels were not developed, so they were not included in the analysis. Furthermore, 8,231 parcels did not have assessor's land use or valuation data. Of these, 3,163 fell in either a 100- or 500-year flood zone. These are also assumed to be undeveloped and were not included in the analysis. As a result of these limitations, of the 285,579 total parcels in Fresno County, 14,172 (approximately 5 percent) were not analyzed.

Following this methodology, flood maps were created that illustrate where flooding is most likely to happen in unincorporated Fresno County (see Figures 4.50-4.52).

Figure 4.50. Eastern Unincorporated Fresno County: 100- and 500-Year Floods

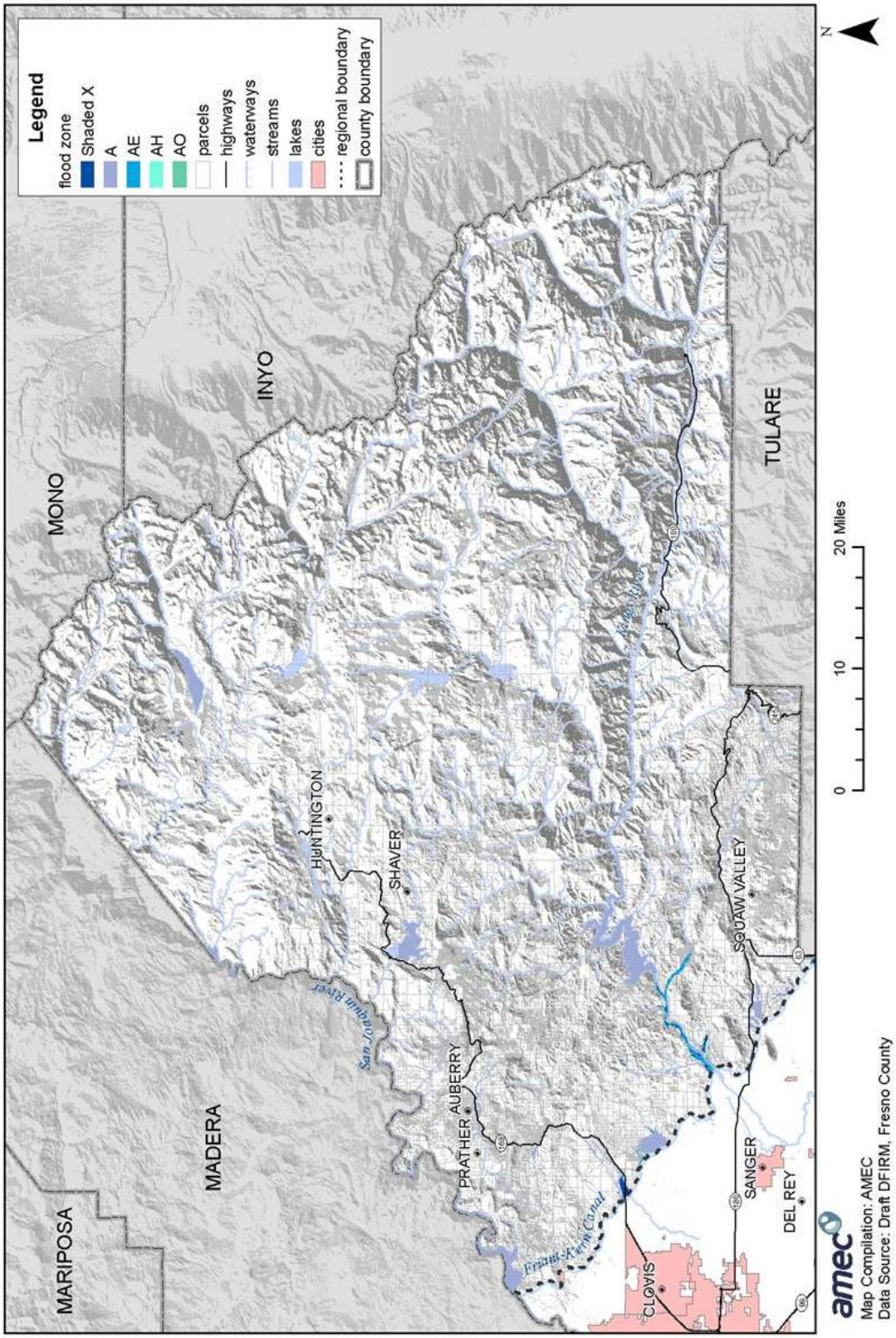


Figure 4.51. Central Unincorporated Fresno County: 100- and 500-Year Floods

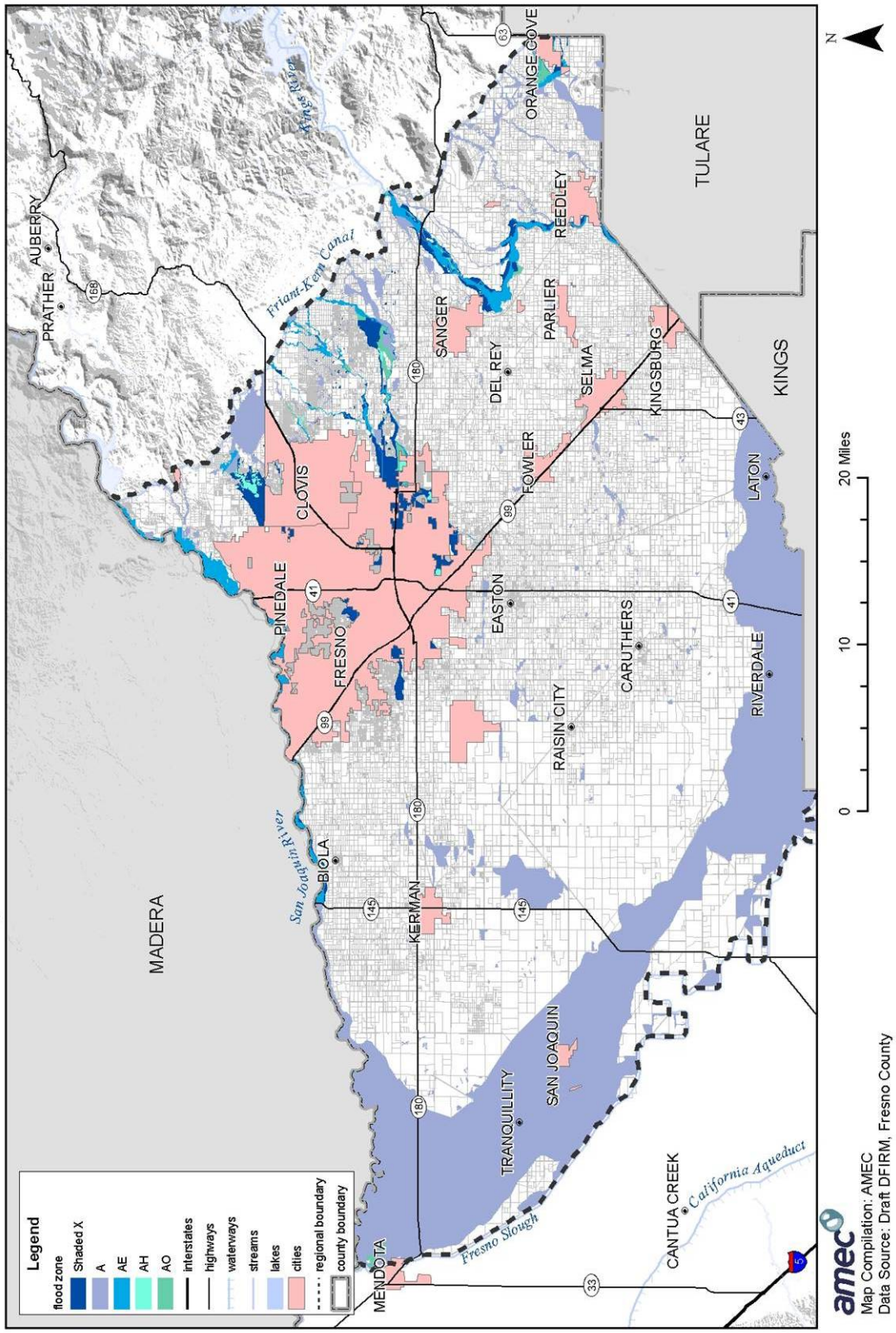
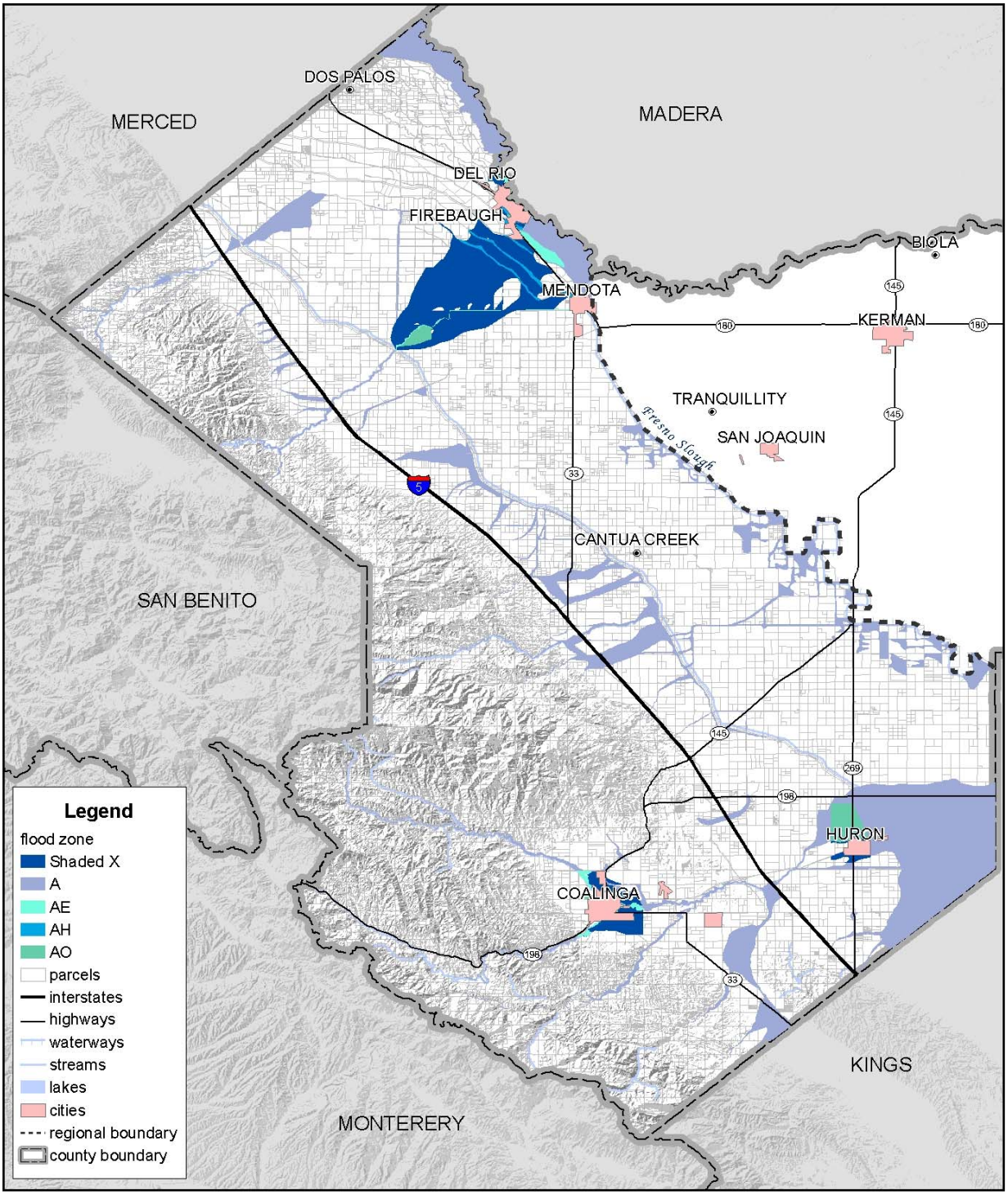


Figure 4.52. Western Unincorporated Fresno County: 100- and 500-Year Floods



amec

Map Compilation: AMEC
Data Source: Draft DFIRM, Fresno County

0 10 20 Miles

N

Values at Risk

Tables 4.34-4.39 summarize the values at risk in Fresno County's floodplain. The data is presented here in two parts. First it looks at the entire Fresno County planning area, and then it focuses in on the unincorporated areas. Similar data is available for the other participating jurisdictions in the jurisdictional annexes. Three tables are used to depict the flood hazard.

- The first table is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type.
- The second table summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined).
- The third table shows loss estimates by flood based on guidance from FEMA. Based on this guidance, contents value is estimated at 50 percent of the improved value. Estimated losses assume that a flood is unlikely to cause total destruction. Losses are related to a variety of factors, including flood depth, flood velocity, building type, and construction. Using FEMA's recommendations, average damage is estimated to be 20 percent of the total building value.

While there are several limitations to this model, it does allow for potential loss estimation. It should be noted that the model may have included structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, it is important to remember that the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Fresno County Planning Area

Tables 4.34-4.36 contain information for the entire Fresno County planning area. This includes unincorporated Fresno County and the 15 incorporated communities. Tables 4.34 and 4.35 show the number of parcels and values at risk to the 100-year and greater flood for the entire Fresno County planning area. Table 4.36 shows the potential losses.

Table 4.34. Count and Improved Value of Parcels in Floodplain by Zone—Fresno County Planning Area

Property Type	Zone A		Zone AE		Zone AH	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	993	68,329,310	131	7,912,931	9	243,976
Commercial	312	32,841,811	55	17,512,372	50	3,740,381
Industrial	101	41,143,028	24	4,029,310	146	47,187,430
Open Space	2,240	257,754,278	106	5,399,080	11	361,396
Residential	3,787	314,242,112	722	82,459,291	746	74,366,950
Totals	**7,433**	**714,310,539**	**1,038**	**117,312,984**	**962**	**125,900,133**
Property Type	**Zone AO**		**Shaded Zone X**		**Zone X**	
	# of Parcels	**Improved Value ($)**	**# of Parcels**	**Improved Value ($)**	**# of Parcels**	**Improved Value ($)**
Agriculture	31	3,242,568	182	11,729,490	10,556	773,147,003
Commercial	30	3,024,853	3,577	1,533,036,768	7,632	4,133,014,816
Industrial	21	7,159,325	1,276	332,575,198	3,709	2,010,208,506
Open Space	33	2,893,435	226	13,349,067	13,054	1,440,139,298
Residential	558	64,813,119	46,047	5,146,300,535	175,042	23,093,874,164
Totals	**673**	**81,133,300**	**51,308**	**7,036,991,058**	**209,993**	**31,450,383,787**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table 4.35. Count and Improved Value of Parcels in Floodplain by Type of Flood—Fresno County Planning Area

Property Type	Total 100-Year Flood*		Total 500-Year Flood		Total Flood**	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	1,164	79,728,785	182	11,729,490	1,346	91,458,275
Commercial	447	57,119,417	3,577	1,533,036,768	4,024	1,590,156,185
Industrial	292	99,519,093	1,276	332,575,198	1,568	432,094,291
Open Space	2,390	266,408,189	226	13,349,067	2,616	279,757,256
Residential	5,813	535,881,472	46,047	5,146,300,535	51,860	5,682,182,007
Totals	**10,106**	**1,038,656,956**	**51,308**	**7,036,991,058**	**61,414**	**8,075,648,014**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table 4.36. Fresno County Flood Loss Estimates—Fresno County Planning Area

Flood Event	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	10,106	1,038,656,956	519,328,478	1,557,985,434	311,597,087
500-Year Flood	51,308	7,036,991,058	3,518,495,529	10,555,486,587	2,111,097,317
Total Flood*	**61,414**	**8,075,648,014**	**4,037,824,007**	**12,113,472,021**	**2,422,694,404**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data

According to this information, the Fresno County planning area has 10,106 improved parcels valued at roughly $1 billion in the 100-year floodplain. An additional 51,308 improved parcels valued at roughly $7 billion fall within the 500-year floodplain for a combined total of approximately $8 billion.

Applying the 20 percent damage factor as previously described, there is a 1 percent chance in any given year of a 100-year flood causing roughly $311 million in damage in the Fresno County planning area and a .2 percent chance in any given year of a 500-year flood causing roughly $2.4 billion in damage (combined damage from both floods).

Looking at the flood risk for the entire Fresno County planning area, in general, Clovis, Firebaugh, Coalinga, Fresno, and Reedley are predominantly inundated by the 500-year flood. Orange Cove, San Joaquin, and Sanger are predominantly inundated by the 100-year flood. Fowler, Huron, Mendota, Parlier, and Selma are just barely affected by the floodplain. Kerman and Kingsburg are not in floodplains. This analysis does not take localized flooding into account.

Unincorporated Fresno County

Tables 4.37-4.39 contain information for unincorporated Fresno County only. Tables 4.37 and 4.38 show the number of parcels and values at risk to the 100-year and greater flood in the unincorporated areas, and Table 4.39 shows the potential losses.

Table 4.37. Count and Improved Value of Parcels in Floodplain by Zone—Unincorporated Fresno County

Property Type	Zone A		Zone AE		Zone AH	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	983	68,329,310	121	7,722,748	5	0
Commercial	151	11,279,579	20	5,802,243	1	0
Industrial	57	25,187,325	14	3,553,655	3	2,573,460
Open Space	2,237	257,738,220	106	5,399,080	11	361,396
Residential	2,741	208,176,359	351	45,262,713	127	21,543,200
Total	**6,169**	**570,710,793**	**612**	**67,740,439**	**147**	**24,478,056**
Property Type	**Zone AO**		**Shaded Zone X**		**Zone X**	
	# of Parcels	**Improved Value ($)**	**# of Parcels**	**Improved Value ($)**	**# of Parcels**	**Improved Value ($)**
Agriculture	29	3,138,797	168	11,424,222	10,470	768,448,257
Commercial	4	212,585	542	530,894,171	3,157	2,730,525,540
Industrial	6	48,713	263	74,186,875	1,496	984,506,209
Open Space	32	2,891,746	223	13,349,067	13,038	1,437,734,528
Residential	324	42,006,302	14,367	1,793,520,783	95,012	13,606,903,029
Total	**395**	**48,298,143**	**15,563**	**2,423,375,118**	**123,173**	**19,528,117,563**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table 4.38. Count and Improved Value of Parcels in Floodplain by Type of Flood—Unincorporated Fresno County

Property Type	Total 100-Year Flood*		Total 500-Year Flood		Total Flood**	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	1,138	79,190,855	168	11,424,222	1,306	90,615,077
Commercial	176	17,294,407	542	530,894,171	718	548,188,578
Industrial	80	31,363,153	263	74,186,875	343	105,550,028
Open Space	2,386	266,390,442	223	13,349,067	2,609	279,739,509
Residential	3,543	316,988,574	14,367	1,793,520,783	17,910	2,110,509,357
Total	**7,323**	**711,227,431**	**15,563**	**2,423,375,118**	**22,886**	**3,134,602,549**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table 4.39. Fresno County Flood Loss Estimates—Unincorporated Fresno County

Flood Event	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	7,323	711,227,431	355,613,716	1,066,841,147	213,368,229
500-Year Flood	15,563	2,423,375,118	1,211,687,559	3,635,062,677	727,012,535
Total Flood*	**22,886**	**3,134,602,549**	**1,567,301,275**	**4,701,903,824**	**940,380,765**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data

According to this information, the unincorporated Fresno County has 7,323 improved parcels valued at roughly $711 million in the 100-year floodplain. An additional 15,563 improved parcels valued at roughly $2.4 billion fall within the 500-year floodplain for a combined total of approximately $3.1 billion.

Applying the 20 percent damage factor as previously described, there is a 1 percent chance in any given year of a 100-year flood causing roughly $213 million in damage in the unincorporated areas of Fresno County and a .2 percent chance in any given year of a 500-year flood causing roughly $940 million in damage (combined damage from both floods).

Insurance Coverage, Claims Paid, and Repetitive Losses

Unincorporated Fresno County joined the National Flood Insurance Program (NFIP) on December 12, 1982, and the Community Rating System (CRS) on October 1, 1991. According to the CRS listing of eligible communities dated October 1, 2007, the County is currently a Class 8, which provides a 10 percent discount on flood insurance for those located within the special flood hazard area (SFHA) and a 5 percent discount for those located in non-SFHA areas.

NFIP insurance data indicates that as of November 30, 2007, there were 728 policies in force in the unincorporated County, resulting in $155,510,800 of insurance in force. Of these, 705 were for residential properties; 23 were nonresidential. 460 of these were in A zones; 268 policies were for parcels in the B, C, and X zones.

There have been 38 historical claims for flood losses totaling $530,163; 36 of these were for residential properties and 2 were nonresidential. Of these losses, 16 were parcels in A zones and 18 parcels were in the B, C, and X zones. Information was not provided on the other four4 claims. Of the 34 claims with available data, 28 claims were associated with pre-FIRM structures and 6 with post-FIRM structures. Five of these claims were for substantial damage losses. There is only one repetitive loss parcel in the unincorporated County with two paid losses totaling $12,267.

Based on this analysis of insurance coverage, unincorporated Fresno County has significant assets at risk to the 100-year and greater floods. Of the 7,323 improved parcels within the 100-year floodplain, only 460 (or 6.3 percent) of those parcels maintain flood insurance. This number, however, is somewhat misleading, since many of the 7,323 improved parcels were just recently remapped into the 100-year floodplain as part of the recent map modernization/DFIRM effort.

Populations at Risk

Of greatest concern in the event of a flood is the potential for loss of life. Using 2000 population data aggregated by census block data from HAZUS-MH and GIS, an estimate was made of populations within the 100- and 500-year floodplains. To account for parcels that were split by flood boundaries, a proportional division was performed to better reflect population counts in the floodplain. For example, a census block that was split by a floodplain (40 percent in, 60 percent

out) had its population attributes multiplied by .40. Population counts were then sorted by jurisdiction. Results are provided in Table 4.40.

Table 4.40. Fresno County Planning Area: Population by Flood Event

Jurisdiction	100-Year Flood	500-Year Flood	Total
Clovis	1,091	14,794	15,885
Coalinga	1,308	1,682	2,990
Firebaugh	2,121	2,126	4,247
Fowler	172	17	189
Fresno	4,835	156,780	161,615
Huron	290	3,890	4,180
Mendota	240	81	321
Orange Cove	1,583	616	2,199
Parlier	187	0	187
Reedley	201	381	582
San Joaquin	3,008	0	3,008
Sanger	759	290	1,049
Selma	3	0	3
All Cities	15,798	180,657	196,455
Unincorporated	15,553	13,368	28,921
Total	**31,351**	**194,025**	**225,376**

Sources: HAZUS-MH MR3 (Census 2000); Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. An analysis was performed using GIS software to determine critical facilities in Fresno County's floodplain. The DFIRM flood layer previously discussed was used to identify the 100- and 500-year floodplains. Figures 4.53-4.55 illustrate the locations of critical facilities relative to the floodplain in the unincorporated areas of the County. Table 4.41 provides an inventory of these facilities. The impact to the community could be great if these critical facilities were damaged or destroyed during a flood event. Similar data is available for the other participating jurisdictions in the jurisdictional annexes.

Figure 4.53. Critical Facilities in the 100- and 500-Year Floodplains: Eastern Unincorporated Fresno County

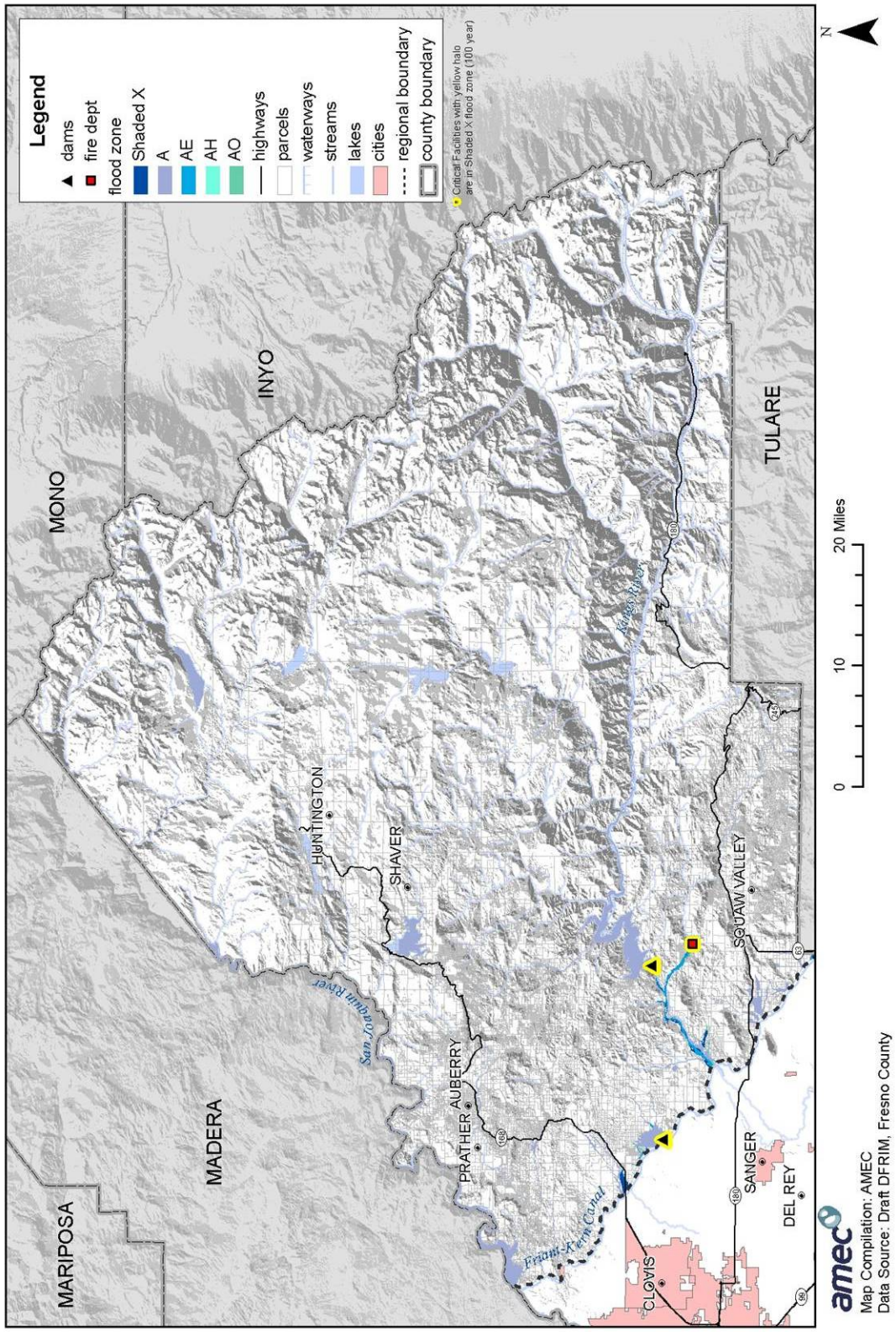


Figure 4.54. Critical Facilities in the 100- and 500-Year Floodplains: Central Unincorporated Fresno County

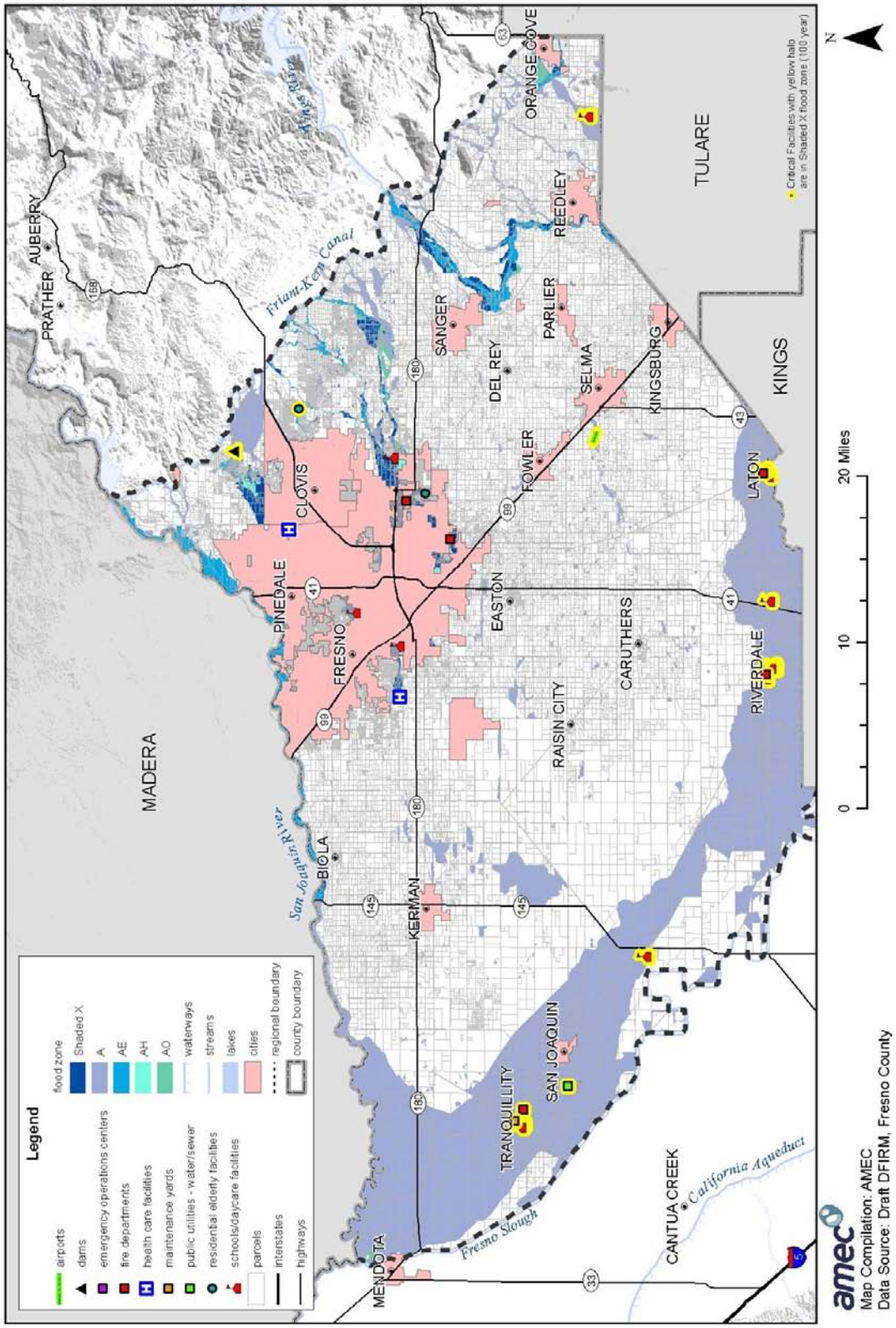
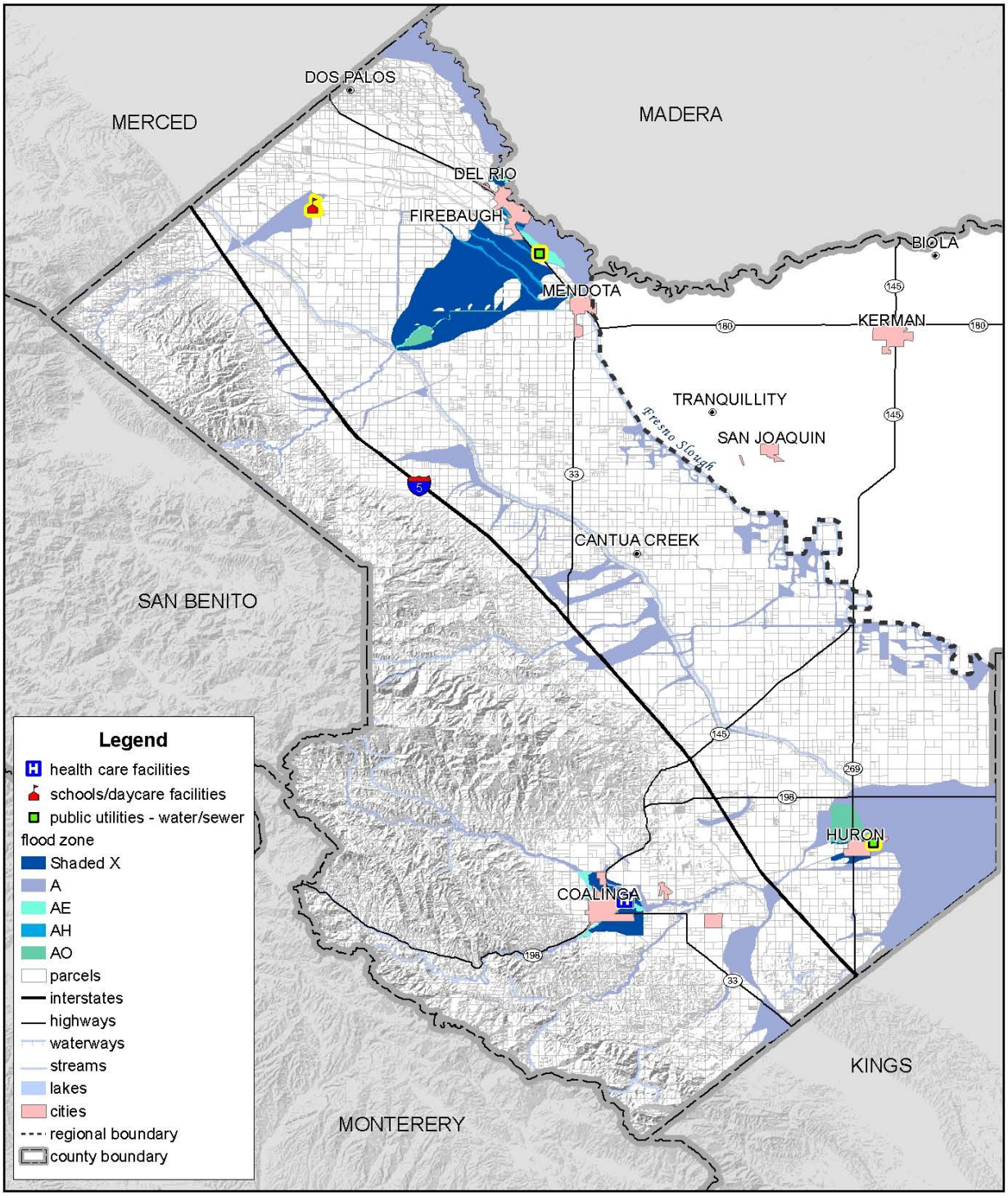


Figure 4.55. Critical Facilities in the 100- and 500-Year Floodplains: Western Unincorporated Fresno County



Map Compilation: AMEC
Data Source: Draft DFIRM, Fresno County

Historic, Cultural, and Natural Resources at Risk

The Fresno County planning area has significant historic, cultural, and natural resources located throughout the County as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

Table 4.41. Critical Facilities in the 100- and 500-Year Floodplains: Unincorporated Fresno County

Critical Facilities Type	100-Year Flood	500-Year Flood	Total Unincorporated
Eastern Region			
Dams	2	-	2
Fire Departments	1	-	1
Region Totals	**3**	**-**	**3**
Central Region			
Airports	1	-	1
Dams	1	-	1
Fire Departments	3	2	5
Health Care Centers	-	2	2
Maintenance Yards	1	-	1
Residential Elderly Facilities	1	1	2
Schools and Day Care Centers	16	2	20
Public Utilities - Water/Sewer	1	-	1
Region Totals	**24**	**9**	**33**
Western Region			
Health Care Centers	-	2	2
Schools and Day Care Centers	1	-	1
Public Utilities - Water/Sewer	2	-	2
Region Totals	**4**	**2**	**6**

Source: Fresno County GIS

Development Trends

The development trend in the Fresno County planning area is steady, significant growth. Much of this growth is occurring in the urban areas, which causes a significant increase in peak flow and stormwater runoff.

Census projections from the California Department of Finance expect the County's population to grow to 1,201,792 by 2020. This is an increase of 397,284 people from the 2000 census estimate of 804,508. Such growth will consume previously undeveloped acres, and the impacts may overwhelm existing drainage and flood control facilities.

The potential for flooding may increase as stormwater is channelized due to land development. Such changes can create localized flooding problems inside and outside of natural floodplains by

altering or confining natural drainage channels. Floodplain modeling and master planning should be based on buildout land use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative affects can have a negative impact on the floodplain.

Local floodplain management ordinances require that new construction be built with the lowest floor elevated a minimum of 12 inches above the base flood (100-year) elevation. New development that adheres to the elevation requirements in addition to other requirements for maintaining elevation certificates and implementing stormwater program elements and erosion or sediment controls for all new development in the floodplain should help protect development from 100-year floods.

The amount of growth in the County and nearby communities can also strain the limits of the entire water management system, which includes water supply in addition to water control. When flood control structures are overwhelmed, the result is not only severe flooding. Significant losses to the water supply system may also occur.

Overall Community Impact

Floods and their impacts will vary by location and severity and will likely only affect certain areas of the County at any one time. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Health hazards associated with mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) upon the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Vulnerability to Wildfire

Likelihood of Future Occurrence—Highly Likely
Vulnerability—High

Fresno County planning area's wildfire risk and vulnerability is of significant concern, with some areas of the planning area being at greater risk than others as described further in this

section. High fuel loads in the planning area, along with geographical and topographical features create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. Even the relatively flat and more urbanized area of central Fresno is not immune from fire. During the May to October fire season, the dry vegetation and hot and sometimes windy weather combined with a more dense population results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire.

Fresno County's wildfire vulnerability is the result of increased development encroaching into forested and dry grassland areas, typically referred to as the wildland-urban interface. As development continues throughout the planning area, especially in the interface, the risk and vulnerability to wildfires will likely increase. Two fire safe councils have been created to address this increased wildfire threat in the wildland-urban interface: Highway 168 and Oak to Timberline fire safe councils.

Fresno County Communities at Risk to Wildfire

For purposes of the National Fire Plan, the California Department of Forestry and Fire Protection (CAL FIRE) generated a list of California communities at risk for wildfire. The intent of this assessment was to evaluate the risk to a given area from fire escaping off federal lands. Three main factors were used to determine the wildfire threat in the wildland-urban interface areas of California: fuel hazards, probability of fire, and areas of suitable housing density that could create wildland-urban interface fire protection strategy situations. The preliminary criteria and methodology for evaluating wildfire risk to communities is published in the *Federal Register*, January 4, 2001. The following communities in the Fresno County planning area have been identified by the state as at risk to wildfire: Auberry, Big Creek, Big Sandy, Coalinga, Dinkey Creek, Dunlap, Friant, Hume, Lakeshore, Meadow Lakes, Miramonte, Piedra, Pinehurst, Prather, Shaver Lake, Squaw Valley, and Tollhouse.

Methodology

In 2007, CAL FIRE updated its fire hazard severity zone maps for California. The fire hazard model considers wildland fuels, topography, weather, crown fire potential, and ember production and movement. This model does not consider risk. The end product is the identification of fire hazard severity zones rated moderate, high, or very high fire hazard. Specifically, "wildfire hazard zones represent areas of variable size ranging from 20 acres in urbanized areas to at least 200 acres in wildland areas, with relatively homogeneous characteristics regarding expected burn probability and potential fire behavior attributes based on climax fuel conditions over a 30-50 year time horizon."

Using CAL FIRE's 2007 fire hazard severity zones, an initial assessment of wildfire risk in the Fresno County planning area was made following the methodology detailed below. The results are summarized in the tables and maps that follow.

The wildfire data was acquired from the CAL FIRE Fire and Resource Assessment Program; the layer used was the Fire Hazard Severity Zones DRAFT, 9-2007, Very High zones in LRA. The County's parcel layer was used as the basis for the inventory of developed parcels. In some cases, there were parcels in multiple wildfire hazard zones. GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the wildfire layer. For the purposes of this analysis, the wildfire hazard zone that intersected the centroid was assigned as the hazard zone for the entire parcel. For purposes of this analysis, it was assumed that every parcel with an improved value greater than zero was developed in some way. Only improved parcels and the value of their improvements were analyzed.

The parcels were segregated and analyzed for three areas or groups: entire County (unincorporated and cities combined), unincorporated only, and all cities. To further segregate by property type, a land use code table was joined to the parcel layer. The codes were simplified into the five categories that are shown in Table 4.42.

Table 4.42. Fresno County's Land Use Code Table

Code	Description	Use Summary
S	Single Family Residential Properties	Residential
M	Multi-Family Residential Properties	Residential
P	Planned Unit Development & Condos	Residential
A	Agricultural Properties	Agriculture
Z	Farmland Security Zone Properties	Agriculture
C	Commercial Properties	Commercial
I	Industrial Properties	Industrial
O	Open Space Properties	Open Space

Source: Fresno County Assessor's Office

Two main limitations to this method were identified:

- A parcel layer from the Department of Public Works and Planning at the County of Fresno was used. It was joined to a land use table and a valuation table, both from the Assessor's Office, based on assessor's parcel numbers (APN). There were 5,941 parcel APNs that did not match up between the parcel layer and the assessor's tables. This was because the land use and valuation tables are from 2006 and the parcel layer had been amended since then. The assumption is that these 5,941 parcels were not developed, so they were not included in the analysis. Furthermore, 8,231 parcels did not have assessor's land use or valuation data. These were also assumed to be undeveloped and were not included in the analysis. As a result of these limitations, of the 285,579 total parcels in Fresno County, 14,172 (approximately 5 percent) were not analyzed.

- Of the 271,407 parcels analyzed, 33,804 do not have improved values, thus they are assumed to be undeveloped. This group is still included in the analysis tables. They will be represented in the parcel counts, but not in the valuation.

As Figure 4.40 in Section 4.2.20 Wildfire illustrates, there is a significant fire hazard in the eastern and far western portions of the County. The central area, while predominantly zoned as nonwildfire/nonurban, is still at risk to smaller grassfires, especially during the dry, hot summers. The topography and fuel type in this area cannot be modeled using the fire hazard severity zone methodology previously described.

Values at Risk

Once the number of parcels and their values were determined, contents values were estimated (based on 50 percent of the assessed value) to determine total values at risk by hazard zone. Overlaying the fire hazard severity zone map with the County parcel layer, it is evident that the Fresno County planning area has significant assets at risk to wildfire as detailed in Tables 4.43-4.45.

Table 4.43. Values at Risk from Wildfire—Fresno County Planning Area

Property Type	Parcels	Improved Value ($)	Contents Value ($)	Total Value ($)
Moderate				
Agriculture	2,780	156,696,731	78,348,366	235,045,097
Commercial	153	27,562,184	13,781,092	41,343,276
Industrial	58	4,686,845	2,343,423	7,030,268
Open Space	1,454	90,457,884	45,228,942	135,686,826
Residential	4,650	563,856,439	281,928,220	845,784,659
Totals	**9,095**	**843,260,083**	**421,630,042**	**1,264,890,125**
High				
Agriculture	996	26,865,781	13,432,891	40,298,672
Commercial	137	40,827,827	20,413,914	61,241,741
Industrial	14	1,531,871	765,936	2,297,807
Open Space	1,462	28,564,081	14,282,041	42,846,122
Residential	6,345	408,987,033	204,493,517	613,480,550
Totals	**8,954**	**506,776,593**	**253,388,297**	**760,164,890**
Very High				
Agriculture	265	3,091,309	1,545,655	4,636,964
Commercial	91	29,325,955	14,662,978	43,988,933
Industrial	2	0	0	0
Open Space	141	2,848,091	1,424,046	4,272,137
Residential	4,885	470,903,213	235,451,607	706,354,820
Totals	**5,384**	**506,168,568**	**253,084,284**	**759,252,852**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Table 4.44. Values at Risk from Wildfire—Unincorporated Fresno County

Property Type	Parcels	Improved Value ($)	Contents Value ($)	Total Value ($)
Moderate				
Agriculture	2,777	156,607,549	78,303,775	234,911,324
Commercial	147	25,649,523	12,824,762	38,474,285
Industrial	35	2,742,171	1,371,086	4,113,257
Open Space	1,454	90,457,884	45,228,942	135,686,826
Residential	3,852	484,525,160	242,262,580	726,787,740
Totals	**8,265**	**759,982,287**	**379,991,144**	1,139,973,431
High				
Agriculture	994	26,808,204	13,404,102	40,212,306
Commercial	129	38,035,462	19,017,731	57,053,193
Industrial	14	1,531,871	765,936	2,297,807
Open Space	1,462	28,564,081	14,282,041	42,846,122
Residential	6,092	378,850,785	189,425,393	568,276,178
Totals	**8,691**	**473,790,403**	**236,895,202**	710,685,605
Very High				
Agriculture	265	3,091,309	1,545,655	4,636,964
Commercial	91	29,325,955	14,662,978	43,988,933
Industrial	2	0	0	0
Open Space	141	2,848,091	1,424,046	4,272,137
Residential	4,885	470,903,213	235,451,607	706,354,820
Totals	**5,384**	**506,168,568**	**253,084,284**	**759,252,852**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Table 4.45. Values at Risk from Wildfire—Fresno County Incorporated Cities

Property Type	Parcels	Improved Value ($)	Contents Value ($)	Total Value ($)
Moderate				
Agriculture	3	89,182	44,591	133,773
Commercial	6	1,912,661	956,331	2,868,992
Industrial	23	1,944,674	972,337	2,917,011
Open Space	-	-	-	-
Residential	798	79,331,279	39,665,640	118,996,919
Total	830	83,277,796	41,638,898	124,916,694
High				
Agriculture	2	57,577	28,789	86,366
Commercial	8	2,792,365	1,396,183	4,188,548
Industrial	-	-	-	-
Open Space	-	-	-	-
Residential	253	30,136,248	15,068,124	45,204,372
Total	263	32,986,190	16,493,095	49,479,285
Very High				
Agriculture	-	-	-	-
Commercial	-	-	-	-
Industrial	-	-	-	-
Open Space	-	-	-	-
Residential	-	-	-	-
Totals	-	-	-	-

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Populations at Risk

Wildfire risk is of greatest concern to populations residing in the moderate, high, and very high wildfire hazard zones. Fresno County Census 2000 population data from HAZUS-MH, aggregated by census block, and GIS was used to estimate populations within the hazard zones. A proportional division was performed to account for parcels that were split by wildfire hazard class boundaries and to better model population counts in the hazard classes. For example, a census block that was split by a hazard class boundary (40 percent in high, 60 percent in moderate) had its "high" population attribute multiplied by .40 and its "moderate" population attribute multiplied by .60. Population counts were then sorted by jurisdiction as shown in Table 4.46.

Table 4.46. Populations at Risk to Wildfire: Fresno County Planning Area

Jurisdiction	Very High	High	Moderate	Nonwildland/ Nonurban	Urban Unzoned	Total
Clovis	0	0	29	795	68,332	69,156
Coalinga	0	1,094	1,593	512	8,115	11,314
Firebaugh	0	0	668	190	5,439	6,297
Fowler	0	0	0	136	3,639	3,775
Fresno	0	0	1,232	2,732	426,043	430,007
Huron	0	0	21	129	6,091	6,241
Kerman	0	0	0	113	8,421	8,534
Kingsburg	0	0	0	63	9,114	9,177
Mendota	0	0	0	4	7,834	7,838
Orange Cove	0	0	0	102	7,595	7,697
Parlier	0	0	0	466	10,702	11,168
Reedley	0	0	0	232	20,517	20,749
San Joaquin	0	0	0	204	2,743	2,947
Sanger	0	0	0	205	18,822	19,027
Selma	0	0	0	369	18,993	19,362
All Cities	0	1,094	3,543	6,252	622,400	633,289
Unincorporated	2,700	10,708	10,349	70,456	72,028	166,241
County Totals	**2,700**	**11,802**	**13,892**	**76,708**	**694,428**	**799,530**

Sources: HAZUS-MH MR3 (Census 2000); California Department of Forestry and Fire Protection

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. An analysis was performed using GIS software to determine where critical facilities are located within wildfire threat zones. Figure 4.56 shows the critical facilities located in the unincorporated areas of the County. Table 4.47 lists the critical facilities in the different wildfire hazard zones for the entire Fresno County planning area.

Historic, Cultural, and Natural Resources at Risk

The Fresno County planning area has substantial cultural and natural resources located throughout the County as previously described. Wildfires also cause watershed and ecosystem losses. These losses include impacts to water supplies and water quality as well as air quality. Another loss is to the aesthetic value of the area. Major fires that result in visible damage detract from that value. Other natural resources at risk from wildfire include wildland recreation areas, wildlife and habitat areas, rangeland, and timber resources. The loss to these natural resources would be significant.

Figure 4.56. Critical Facilities at Risk to Wildfire: Unincorporated Fresno County

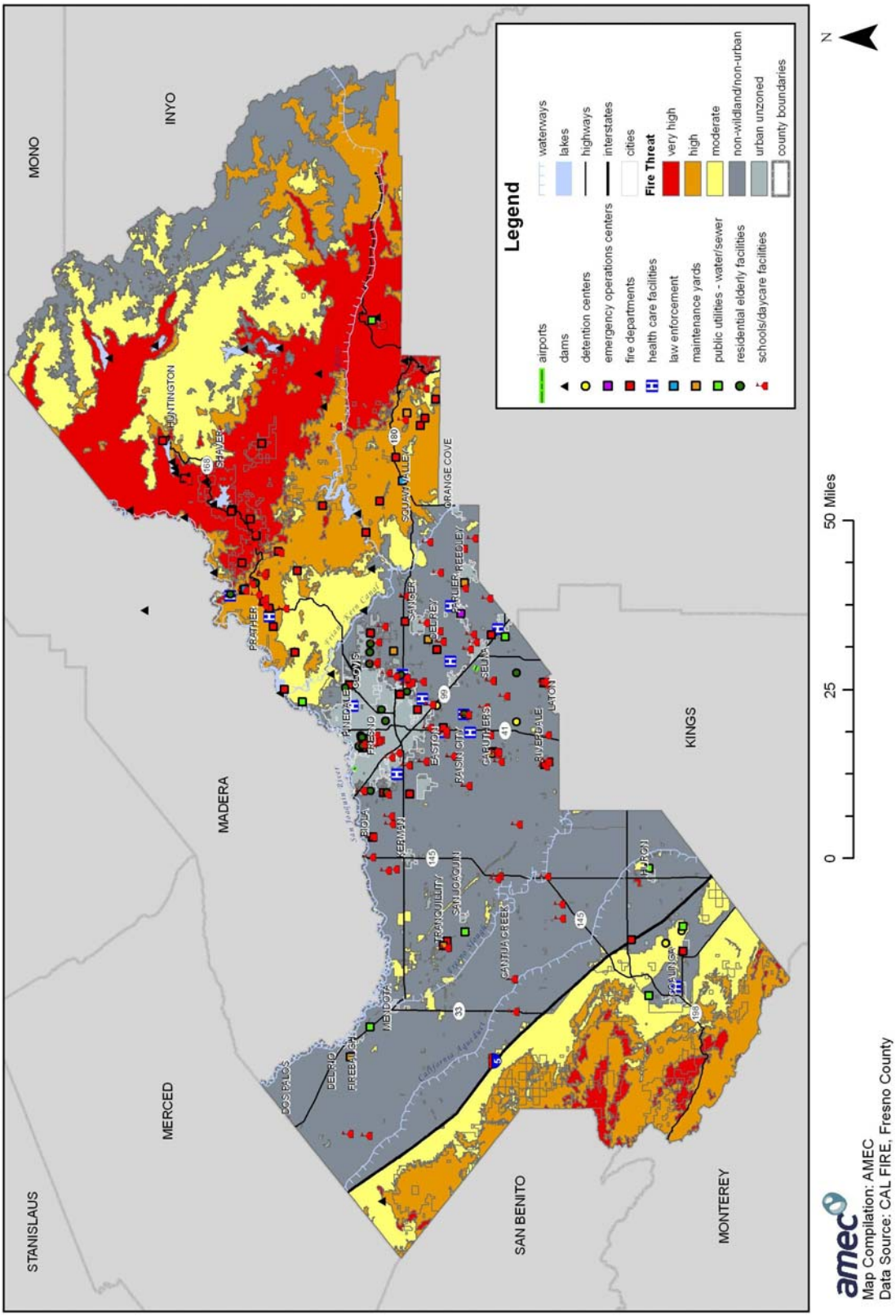


Table 4.47. Critical Facilities at Risk to Wildfire by Hazard Class: Fresno County Planning Area

Facility Type	Cities	Unincorporated	County Total
Very High			
Dams	0	8	8
Fire Departments	0	9	9
Maintenance Yards	0	1	1
Schools and Day Care Centers	0	6	6
Public Utilities - Water/Sewer	0	1	1
Totals	**0**	**25**	**25**
High			
Dams	0	3	3
Fire Departments	0	10	10
Health Care Facilities	0	2	2
Law Enforcement Facilities	0	1	1
Maintenance Yards	1	1	2
Residential Elderly Facilities	0	2	2
Schools and Daycare Centers	0	13	13
Totals	**1**	**32**	**33**
Moderate			
Dams	0	4	4
Detention Centers	0	1	1
Emergency Operations Centers	1	0	1
Fire Departments	0	7	7
Health Care Facilities	1	0	1
Law Enforcement Facilities	0	1	1
Maintenance Yards	2	1	3
Schools and Day Care Centers	0	2	2
Public Utilities - Water/Sewer	0	2	2
Totals	**4**	**18**	**22**
Nonwildland/Nonurban			
Airports	1	1	2
Dams	0	7	7
Detention Centers	0	4	4
Emergency Operations Centers	1	0	1
Fire Departments	0	9	9
Health Care Facilities	0	7	7
Maintenance Yards	1	3	4
Residential Elderly Facilities	0	6	6
Schools and Day Care Centers	12	33	45
Public Utilities - Water/Sewer	3	4	7
Totals	**18**	**74**	**92**
Urban Unzoned			
Airports	4	1	5
Communications Centers	10	0	10
Detention Centers	5	0	5

Facility Type	Cities	Unincorporated	County Total
Emergency Operations Centers	23	1	24
Fire Departments	42	11	53
Health Care Facilities	108	5	113
Law Enforcement Facilities	26	0	26
Maintenance Yards	14	4	18
Residential Elderly Facilities	102	20	122
Schools and Day Care Centers	516	76	592
Public Utilities - Water/Sewer	7	1	8
Totals	**857**	**119**	**976**

Sources: Fresno County GIS, California Department of Forestry and Fire Protection

Development Trends

Population growth and development in Fresno County is on the rise. Additional growth and development within the wildland-urban interface will continue to increase the risk and vulnerability of the planning area to damaging wildfires.

Overall Community Impact

The overall impact to the community from a severe wildfire includes:

- Injury and loss of life;
- Commercial and residential structural damage;
- Decreased water quality in area watersheds;
- Increase in post-fire hazards such as flooding, sedimentation, and mudslides;
- Damage to natural resource habitats and other resources, such as timber and rangeland;
- Loss of water, power, roads, phones, and transportation, which could impact, strand, and/or impair mobility for emergency responders and/or area residents;
- Economic losses (jobs, sales, tax revenue) associated with loss of commercial structures;
- Negative impact on commercial and residential property values;
- Loss of churches, which could severely impact the social fabric of the community;
- Loss of schools, which could severely impact the entire school system and disrupt families and teachers, as temporary facilities and relocations would likely be needed; and
- Impact on the overall mental health of the community.

Vulnerability to Earthquake

Likelihood of Future Occurrence—Occasional
Vulnerability—Medium

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

The California Geological Survey and U.S. Geological Survey have done considerable work using GIS to identify populations in high seismic hazard zones in every California county.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Fault rupture itself contributes very little to damage unless the structure or system element crosses the active fault. In general, newer construction is more earthquake resistant than older construction because of improved building codes and their enforcement. Manufactured housing is very susceptible to damage because rarely are their foundation systems braced for earthquake motions. Locally generated earthquake motions, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry, as was seen in the Oroville, Coalinga, Santa Cruz, and Paso Robles earthquakes.

Common impacts from earthquakes include damage to infrastructure and buildings (e.g., crumbling of unreinforced masonry, failure of architectural facades, rupturing of underground utilities, and road closures). Earthquakes also frequently trigger secondary hazards, such as dam failures, landslides and rock falls, explosions, and fires that can become disasters themselves.

Estimating Potential Losses

Earthquake losses will vary across the Fresno County planning area depending on the source and magnitude of the event. The Coalinga earthquake provides a good estimate of loss to the planning area based on a realistic earthquake scenario. To further evaluate potential losses associated with earthquake activity in the planning area, a HAZUS-MH probabilistic earthquake scenario was run with the latest version of HAZUS-MH (MR3 released in October 2007).

The methodology used probabilistic seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2002 update of the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500 year return period analyzes ground shaking estimates from the various seismic sources in the area with a 2 percent probability of being exceeded in 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas and is more of a worst case scenario.

The results of the scenario are captured in Table 4.48. Key losses included the following:

- Total economic loss estimated for the earthquake was $5.6 billion, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses, totaled $4.8 billion.
- Over 20 percent of the buildings in the County were at least moderately damaged. 2,276 buildings were completely destroyed.
- Over 55 percent of the building- and income-related losses were residential structures.
- 12 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake caused the most casualties: 2,159.
- 88 percent of the households experienced a loss of potable water the first day after the earthquake.

Table 4.48. HAZUS-MH Earthquake Loss Estimation: 2,500-Year Scenario Results

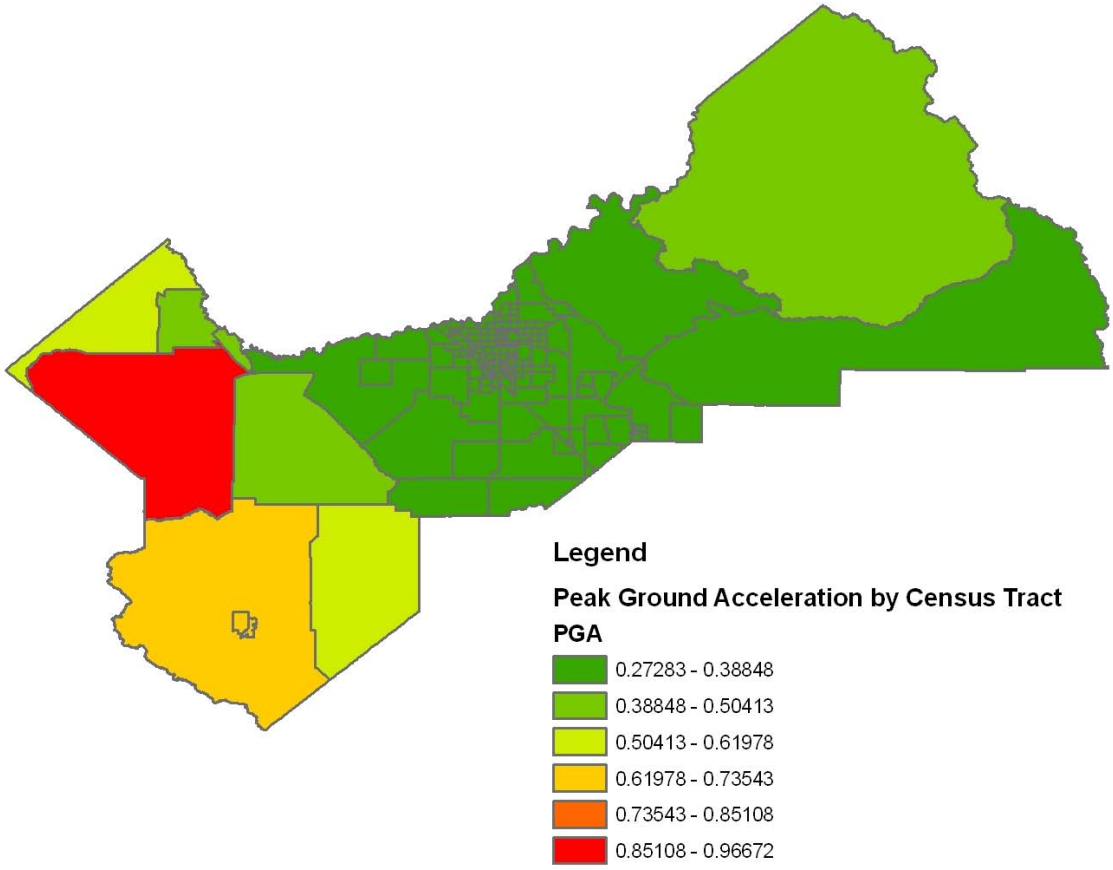
Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 77,017 Moderate: 33,708 Extensive: 7,502 Complete: 2,276
Building and Income Related Losses	$4.82 billion 55 percent of damage related to residential structures 12 percent of loss due to business interruption
Total Economic Losses (Includes building, income and lifeline losses)	$5.66 billion
Casualties (Based on 2 a.m. time of occurrence)	Without requiring hospitalization: 1,234 Requiring hospitalization: 220 Life threatening: 19 Fatalities: 34
Casualties (Based on 2 p.m. time of occurrence)	Without requiring hospitalization: 1,621 Requiring hospitalization: 379 Life threatening: 57 Fatalities: 102
Casualties (Based on 5 p.m. time of occurrence)	Without requiring hospitalization: 1,358 Requiring hospitalization: 344 Life threatening: 130 Fatalities: 89
Damage to Transportation Systems	15 highway bridges, complete damage 111 highway bridges, moderate damage 10 airport facilities, moderate damage 1 bus facility, moderate damage $145 million in economic losses
Damage to Essential Facilities	2 schools, 2 police stations, 1 fire station at least moderately damaged
Damage to Utility Systems	1 wastewater system, moderate damage 1 Oil system, moderate damage 8 electrical power system, moderate damage 25 communication systems, moderate damage Potable water breaks: 5,956 Waste water breaks: 4,710 Natural gas breaks: 5,035 $697.5 million economic losses
Households without Power/Water Service (Based on 252,940 total households)	Power loss, Day 1: 13,199 Power loss, Day 3: 8,620

Type of Impact	Impacts to County
	Power loss, Day 7: 3,988 Power loss, Day 30: 923 Power loss, Day 90: 18 Water loss, Day 1: 225,091 Water loss, Day 3: 224,614 Water loss, Day 7: 223,631 Water loss, Day 30: 217,097 Water loss, Day 90: 189,584
Displaced Households	3,829
Shelter Requirements	4,090
Debris Generation	1.5 million tons

Source: HAZUS-MH MR3

A map showing the peak ground accelerations by census tract is shown in Figure 4.57. The warm color tones indicate damaging levels of shaking. The western portion of the County would experience the greatest shaking levels and damage due to its proximity to the San Andreas fault and other faults.

Figure 4.57. Fresno County's Peak Ground Acceleration from a 2,500-Year Earthquake



Source: HAZUS-MH MR3

Other Hazards

For the other hazards identified as significant in Section 4.2, information is provided here where the potential impacts could be developed or inferred. Losses and impacts cannot be tied to specific locations based on available information. To some extent, most of the planning hazard area is subject to these hazards. The following sections describe the vulnerability of the Fresno County planning area to agricultural hazards, dam failure, drought, severe weather (extreme temperatures and heavy rain/thunderstorm/hail/lightning/wind), and West Nile virus.

Vulnerability to Agricultural Hazards

Likelihood of Future Occurrence—Highly Likely
Vulnerability—High

Given the importance of agriculture to Fresno County, agricultural hazards continue to be an ongoing concern. The primary causes of agricultural losses are severe weather events, such as drought and freeze and, to a limited extent, insect infestations. According to the HMPC, agricultural losses occur on an annual basis throughout the County and are usually associated with these severe weather events.

Vulnerability to Dam Failure

Likelihood of Future Occurrence—Likely
Vulnerability—Extremely High

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam.

A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions.

According to the Fresno County Operational Area Dam Failure Evacuation Plan, of the 23 dams with a potential to impact the planning area (see Table 4.49), four of them pose the greatest threat should a failure occur: Big Dry, Fancher Creek, Friant, and Pine Flat. According to the plan, a catastrophic failure of any of these dams could have a significant impact on Fresno County. The failure of any of these dams would cause downstream flooding and would likely result in loss of life and property. The potential magnitude of a dam failure depends on the time of year and the base flow of the river when the failure occurs. During the winter months, when the river flows are higher, the impact to the area would be much greater and evacuation times much less.

Table 4.49. Major Dams with Potential to Impact the Fresno County Planning Area

Dam	Stream	Capacity (Acre-Feet)	Population Threatened
Balch Afterbay	North Fork Kings River	318	20
Balch Diversion	North Fork Kings River	1,295	20
Balsam Meadow	West Fork Balsam Creek	2,040	319
Big Creek No. 4	Big Creek	100	244
Big Creek No. 6	San Joaquin River	993	104
Big Creek No. 7	San Joaquin River	35,000	713
Big Dry 1017	Big Dry Creek/ Dog Creek	30,200	266,502
Courtright	Helms Creek	123,300	20
Crane Valley	North Fork Willow Creek	45,410	142
Fancher Creek	Fancher Creek & Hog Creek	9,600	134,775
Florence Lake	South Fork San Joaquin River	64,406	822
Friant	San Joaquin River	520,500	75,184
Giffen Reservoir	Tributary Holland Creek	900	98
Hume Lake	Ten Mile Creek	1,410	57
Huntington Lake	Big Creek	88,834	1,018
Little Panoche	Little Panoche Creek	5,580	459
Mammoth Pool	San Joaquin River	123,000	817
Pine Flat	Kings River	1,000,000	143,678
Redbank	Redbank Creek	1,100	947
Sequoia Lake	Mill Flat Creek	1,370	27
Shaver Lake	Stevenson Creek	135,283	863
Vermilion Valley	Mono Creek	125,000	822
Wishon	North Fork Kings River	118,000	20

Source: Fresno County Operational Area Dam Failure Evacuation Plan, 2003

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact on the planning area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Vulnerability to Drought

Likelihood of Future Occurrence—Occasional
Vulnerability—High

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agricultural, manufacturing, tourism,

recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Based on historical information, the occurrence of drought in California, including Fresno County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of Fresno County to drought is countywide, but impacts may vary and include reduction in water supply, agricultural losses, and an increase in dry fuels.

Vulnerability to Human Health: Epidemic/Pandemic

Likelihood of Future Occurrence—Occasional
Vulnerability—Medium

Based on historical occurrences, the risk to the Fresno County planning area is occasional, but the vulnerability is medium. According to the Centers for Disease Control and Prevention, the risk from avian influenza is generally low to most people, because the viruses do not usually affect humans. However, H5N1 is one of the few avian influenza viruses to have crossed the species barrier to infect humans, and it is the most deadly of those that have crossed the barrier. Most cases of H5N1 influenza infection in humans have resulted from contact with infected poultry. So far, the spread of H5N1 from person to person has been limited and has not continued beyond one person. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned that the H5N1 virus, or another influenza virus, could one day be able to infect humans and spread easily from one person to another. If this were to happen, a pandemic could begin and everyone would be at risk. Other communicable diseases of this nature could result in a similar type of epidemic/pandemic and become a significant concern for the Fresno County planning area.

Vulnerability to Human Health: West Nile Virus

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Low

While the likelihood of occurrence of West Nile virus in the Fresno County planning area is likely, the County's vulnerability is low, based on the percentage of total population that actually comes down with the disease. Since the discovery of West Nile virus in California in 2003, Fresno County has had 111 confirmed human cases.

Although the potential for exposure does exist in Fresno County, the vulnerability should be considered in terms of adverse effects due to exposure. The County already has an active vector control program in place for mosquitoes, and protective measures to prevent exposure are relatively simple and cost-effective. Given the nature of protective measures, such as wearing long-sleeved clothing and using bug spray, the responsibility for protection can and should be an

individual responsibility. Fresno County's current public education program should give the community the knowledge as well as access to resources to effectively counter the risk and impact from the virus.

Vulnerability to Severe Weather: Extreme Temperatures (Extreme Cold/Freeze and Extreme Heat)

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Medium

Extreme temperature events happen in Fresno County each year. The varying elevations in the County, in part, determine the extent to which a given area is affected by temperature extremes. Given its significance to the community, the agricultural industry is most vulnerable to extreme temperatures. Freezing temperatures can cause significant loss to crops, especially to the citrus industry, and excessive heat can cause high levels of mortality among livestock such as poultry, which cause economic losses and create a significant carcass disposal issues. Historically, extreme temperatures have caused large losses to agricultural crops and have resulted in several USDA disaster declarations.

Also of concern are impacts to sensitive populations such as the elderly and the young. Historically, severe heat has had the greatest impact to these sensitive populations, necessitating the use of cooling centers during extended periods of high temperatures.

Vulnerability to Severe Weather: Fog

Likelihood of Future Occurrence—Likely
Vulnerability—Medium

Fog issues are well documented in the Fresno County planning area. In recent years, there have been several large scale accidents during periods of heavy fog. However, it should be noted that while fog is present, usually driver error is a significant contributory factor to these accidents. Fog is driven by weather patterns in the Central Valley that will continue to occur annually. As such, until people can learn to take appropriate precautions during fog events, fog-related accidents will also continue to occur.

Vulnerability to Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind

Likelihood of Future Occurrence—Highly Likely
Vulnerability—Medium

According to historical hazard data, severe weather is an annual occurrence in Fresno County. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the County. Wind and lightning often accompany these storms and have caused damage in the past. However, actual damage associated with the primary effects of severe weather have been limited. It is the secondary hazards caused by weather, such as floods, fire,

and agricultural losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in other sections.

4.4 Human-Caused Hazards

This risk assessment differs from the risk assessment for natural hazards in that it does not include an assessment of potential losses from human-caused hazards. Such an assessment is very difficult, primarily because of how unpredictable and complex such events are. Human-caused hazard events are often measured in terms such as human lives and economic disruption as well as the value of the facilities actually impacted. The value of impacted facilities is often negligible as compared to the emotional value and the economic impact of affected local, regional, national, and world markets. The unpredictability of human-caused hazard events creates a level of complexity in modeling potential losses which is often covered in other planning mechanisms and is well beyond the scope of this DMA planning effort.

The risk assessment process for human-caused hazards identifies the areas most susceptible to potential hazard events by evaluating which populations and facilities are most vulnerable to human-caused hazards. It is presented in two sections: Hazard Identification and Profiles: Human Caused-Hazards and Asset Inventory and Vulnerability Assessment.

4.4.1 Hazard Identification and Profiles: Human-Caused Hazards

Natural hazards, while essentially uncontrollable events, do follow the fundamental laws of earth science and physics. Therefore, the types, frequencies, and locations of many natural hazards can be identified and often predicted with a certain level of confidence. For example, within floodplains, it can be stated that in any given year there is a 1 percent chance of a flood event at a given discharge and flood depth that will be equaled or exceeded. These predictions are based on historical flood records combined with hydrologic and hydraulic modeling. In many cases, warning systems are in place to notify the public of a pending natural event. The same is not usually true for human-caused hazards.

With human-caused hazards, the recurrence interval cannot be predicted and human behaviors, such as incompetence and carelessness, cannot be forecast with any level of accuracy. While some warning systems have been established to notify at risk populations of impending threats from human-caused hazards, these types of hazards usually do not follow a predictable pattern. The potential exists for most types of human-caused hazards to occur anywhere at anytime. Due to their unpredictability, human-caused hazards can pose great danger to public health and safety. Education, warning, and response capability are particularly important in preparing for human-caused incidents.

Human-caused hazards are hazards that directly result from human activity. These hazards can be accidental or intentional. FEMA guidance generally separates human-caused hazards into two broad categories: technological hazards (accidental) and terrorism hazards (intentional). The

HMPC chose to only address technological hazards associated with a hazardous materials release in this plan.

Technological Hazards

Technological hazard events usually result from accidents or system failures. Technological hazards are largely unforeseen and therefore are difficult to predict with any level of accuracy. Technological hazards of concern in Fresno County include fixed facility incidents and transportation incidents (these are discussed further below); in other words, facilities and operations that produce, transport, store, and/or use hazardous materials. Failure of a supervisory control and data acquisition system is also a concern and can often result in a fixed facility or transportation incident.

Hazardous materials are substances that are flammable or combustible, explosive, toxic, noxious, corrosive, reactive, an oxidizer, an irritant, carcinogenic, or radioactive. These materials can harm people through skin contact, inhalation, ingestion, or pharmaceutical action. Hazardous materials have the potential to be released into the environment during use, processing, storage, and transport or when improperly disposed. A release of a hazardous material can pose a risk to life safety, public health, and property and can result in the evacuation of a few people, a portion of a facility, or an entire area. Other concerns include impacts to air quality, water quality, and other short- and long-term impacts to the natural environment. As a result of these risks, the use, storage, transport, and disposal of hazardous materials is highly regulated at the federal, state, and local levels.

Hazardous materials are everywhere, and spills or releases occur in this nation on a daily basis. According to FEMA, the impact to life and property from any given release depends on a number of factors:

- **Application Mode** describes the human act(s) or unintended event(s) necessary to cause the hazard to occur.
- **Duration** is the length of time the hazard is present on the target.
- The **dynamic/static characteristic** of a hazard describes its tendency, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- **Mitigating conditions** are characteristics of the target and its physical environment that can reduce the effects of a hazard.
- **Exacerbating conditions** are characteristics that can enhance or magnify the effects of a hazard.

These factors are summarized here in regard to hazardous materials releases from a fixed facility or transportation incident:

- Solid, liquid, and/or gaseous hazardous materials can be released from fixed or mobile containers either accidentally or on purpose (see Table 4.50).

- The resulting release can last for hours or for days.
- The substances released may be corrosive or otherwise damaging over time, and they may cause an explosion and/or fire.
- Contamination may be carried out of the incident area by people, vehicles, water, and/or wind.
- Weather conditions will directly affect how the hazard develops.
- The micrometeorological effects of buildings and terrain can alter travel and duration of agents.
- Shielding in the form of sheltering in place can protect people and property from harmful effects.
- Noncompliance with fire and building codes as well as failure to maintain existing fire protection and containment features can substantially increase the damage from a hazardous materials release.

Table 4.50. Potential Human-Caused Actions Resulting in Technological Hazard Events

Industrial (Fixed Facility)	Industrial (Transportation Accidents)	Supervisory Control and Data Acquisition
Failure to adhere to procedures	Tanker truck spills	Failure of automated systems
Leaks	Truck accidents	
Failure of equipment	Railway accidents	
Failure of safety systems		

Source: Integrating Manmade Hazards into Mitigation Planning, FEMA 386-7, 2003; HMPC

Fixed Facility Incidents

Industrial accidents occur due to inadequate human oversight or the failure of systems used to move or store materials, such as pipes and storage tanks. Numerous facilities in the Fresno County region have been identified as sites that store hazardous materials as part of their daily operations. The threat that these sites pose to the region depends on the type of material present and the proximity of these facilities to populations and whether or not these materials are transported.

In order to identify those facilities with the greatest potential for a hazardous materials release that could adversely impact communities within the Fresno County planning area, the HMPC took an initial inventory of potential sites. This inventory, provided by Fresno County, included a database table of 13,063 sites that produce, transport, store, and/or use hazardous materials; sites that generate hazardous wastes; and contaminated sites that have been cleaned up and closed or are still under active cleanup.

The table was geocoded into a spatial format (GIS layer) so that each record in the table could be mapped and spatially analyzed. ESRI's StreetMap USA was used as the reference (location) data. 1,604 (12 percent) of the records were not geocoded because the addresses did not match. This may have been because of spelling errors or differences in spelling between the address table and StreetMap USA, or there just may not have been a street address. Of the original

13,063 records, only 12, 459 were mapped. However, all of the 13,063 records were included in the associated tables.

Once the sites were geocoded, the original 88 facility types (Type 1) from the database were simplified into 30 facility types (Type II) that were similar in nature. See Table 4.51 below.

Table 4.51. Types of Fixed Facilities in Fresno County: Consolidated from Type I to Type II

Type I	Count	Type II	Count
Aboveground Storage Tank(s) (AST)	191	AST Facility	192
CUPA Fine—Above Ground Petroleum Storage	1		
Auto Repair/Maintenance Model Plan	771	Auto Repair / Maintenance Facility	771
CalARP Risk Management Plan (RMP) Inspection/Audit	1	CalARP RMP Facility	113
CalARP RMP Facility	112		
Closed CalARP/RMP Process	3	CalARP RMP Facility Closed	3
Conditionally Exempt Small Quantity Generator (CESQG)	1,297	CESQG	1,297
Drug Lab Contaminated Site – EHS Lead	12	Contaminated Site	12
Former Contaminated Site/Cleanup Complete	568	Contaminated Site Closed	1,276
Former Drug Lab Site/Cleanup Complete	3		
Haz Mat Disclosure/Closed Site	705		
Contaminated Site - Misc/DTSC Lead	49	Contaminated Site Open	463
Contaminated Site - Misc/EHS Lead	7		
Contaminated Site - Misc/RWQCB Lead	116		
Contaminated Site - Misc/USEPA Lead	13		
Contaminated Ust Site/EHS Lead Agency	85		
Contaminated Ust Site/RWQCB Lead Agency	193		
Extremely Hazardous Substance Handler (EPCRA)	275	EPCRA Site	275
Formerly Used Defense Site	14	Formally Used Defense Site	14
Hazardous Materials Disclosure-Below Reporting Quantity	1,585	Hazardous Materials Facility - below reportable quantity	1,585
Hazardous Materials Handler Farm Exemption	459	Hazardous Materials Handler Exempt Agriculture	459
Hazardous Waste Site	4	Hazardous Waste Site	8
Hazardous Waste Facility - Commercial Laundry	4		
Hazardous Waste Treatment - Conditionally Auth	2	Hazardous Waste, Treatment Facility	27
Hazardous Waste Treatment- Permit By Rule	17		
Hazardous Waste Treatment - Conditionally Exempt	8		
Closed Hazardous Waste Treatment Unit	92	Hazardous Waste Treatment Facility Closed	92
Industrial Waste Discharger	42	Industrial Waste Discharger	42
Large Hazardous Materials Handler	279	Large Hazardous Materials Handler	279
Large Quantity Generator (LQG)	145	LQG	145
Medium Hazardous Materials Handler	238	Medium Hazardous Materials Handler	238
Radioactive Materials Only Handler	1	Radioactive Materials Handler	1
Miscellaneous Site Assessment	131	Site Assessment Site	131
Small Hazardous Materials Handler	300	Small Hazardous Materials Handler	300

Type I	Count	Type II	Count
Solid Waste Facility - Abandoned Site	1	Solid Waste Facility	227
Solid Waste Facility - Closed Site	120		
Solid Waste Facility - Eliminated Site	19		
Solid Waste Facility - Full Permit	13		
Solid Waste Facility - Illegal Site	12		
Solid Waste Facility - Registration Permit	2		
Solid Waste Facility - Standardized Permit	1		
Solid Waste Non-Facility/Non-Operation	27		
Solid Waste Operation - Notification	29		
Solid Waste Facility - Performance Standards/Mining Projects	2		
Unclassified Disposal Site (Inert Material)	1		
Small Quantity Generator (SQG)	445	SQG	445
Universal/Electronic/CRT Waste Collection Facility	4	Universal Waste Facility	6
Universal/Electronic/CRT Waste Generator Only	2		
Unstaffed Facility Model Plan	228	Unstaffed Facility Model Plan	228
Closed Underground Storage Tank (UST) Facility/Data Vault	110	UST Closed	2,827
Closed UST Facility/File Purge Project	70		
Closed UST Facility/No Closure Report	106		
UST File: Confirmed No UST	30		
UST Removal/Closure W/1 Tank	1,188		
UST Removal/Closure W/10 Tanks	3		
UST Removal/Closure W/11 Tanks	3		
UST Removal/Closure W/13 Tanks	2		
UST Removal/Closure W/14 Tanks	1		
UST Removal/Closure W/15 Tanks	1		
UST Removal/Closure W/2 Tanks	589		
UST Removal/Closure W/20 Tanks	1		
UST Removal/Closure W/23 Tanks	1		
UST Removal/Closure W/3 Tanks	369		
UST Removal/Closure W/4 Tanks	201		
UST Removal/Closure W/5 Tanks	84		
UST Removal/Closure W/6 Tanks	39		
UST Removal/Closure W/7 Tanks	16		
UST Removal/Closure W/8 Tanks	6		
UST Removal/Closure W/9 Tanks	7		
MY Fuel/Oil/Propane Only In AGST/UST Model Pl	611	UST Facility	1,113
Underground Tank Facility/Existing W/1 Tank	8		
Underground Tank Facility/Existing W/2 Tanks	8		
Underground Tank Facility/Existing W/3 Tanks	7		
Underground Tank Facility/Existing W/4 Tanks	4		
Underground Tank Facility/Unconfirmed	23		
UST Facility With Five Tanks	4		
UST Facility With Four Tanks	54		
UST Facility With One Tank	76		
UST Facility With Seven Or More Tanks	5		
UST Facility With Six Tanks	3		

Type I	Count	Type II	Count
UST Facility With Three Tanks	180		
Ust Facility With Two Tanks	126		
Vaulted Tank(s)	4		
Underground Tank Facility/Ag Exempt	24	UST Facility Exempt Agriculture	24
Waste Tire Generator	354	Waste Tire Facility	470
Waste Tire Hauler	65		
Waste Tire Program	1		
Waste Tire Program/End-Use Facility	50		
Totals	**13,063**		**13,063**

Source: Fresno County Office of Emergency Services

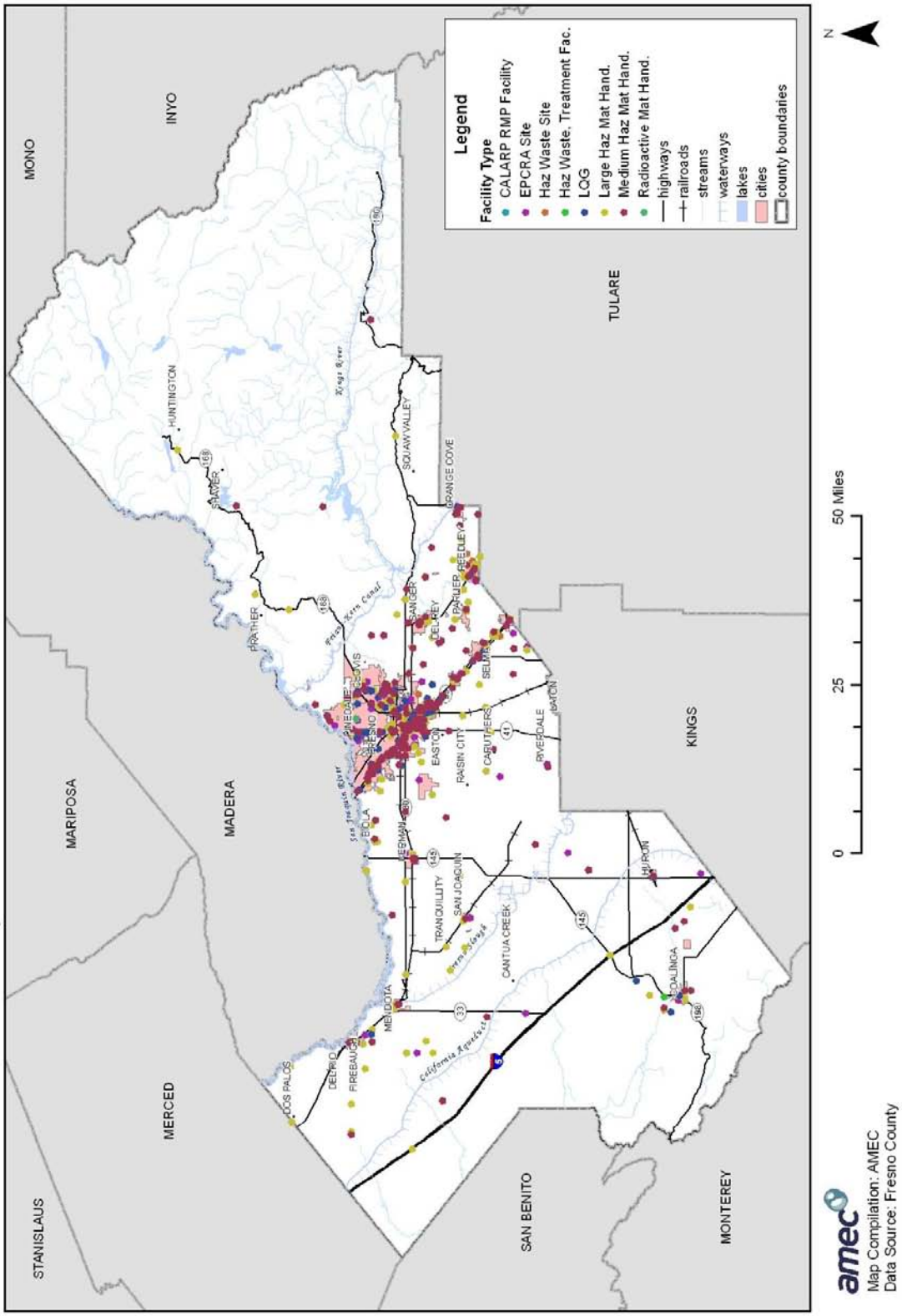
After this consolidation of facility types, the fixed facilities were further sorted by threat level (i.e., the potential to cause a significant hazardous materials release). The following facilities were determined to present the greatest potential threat to the planning area: CalARP RMP facilities, Emergency Planning and Community Right-to-Know Act (EPCRA) sites, hazardous waste sites, hazardous waste and treatment facilities, large hazardous materials handlers, large quantity generators, medium hazardous material handlers, and radioactive material handlers. Table 4.52 lists the number of hazardous material sites in the Fresno County planning area. Figure 4.58 (overview map) and Figure 4.59 (inset map) illustrate the locations of these 941 sites. The inset map provides a zoomed in view of the area where most of the sites are concentrated. These sites pose a threat to both the community in which they are located as well as to surrounding communities. These sites are regulated and most have emergency action plans in place.

Table 4.52. Number of Fixed-Facilities with the Greatest Potential of a Hazardous Materials Release in Fresno County by Facility Type

Facility Type	Cities	Unincorporated	County Total
CalARP RMP Facilities	47	51	98
EPCRA Sites	139	101	240
Hazardous Waste Sites	4	4	8
Hazardous Waste Treatment Facilities	20	5	25
Large Hazardous Materials Handlers	144	104	248
LQG	93	27	120
Medium Hazardous Materials Handlers	141	60	201
Radioactive Materials Handlers	1	0	1
County Totals	**589**	**352**	**941**

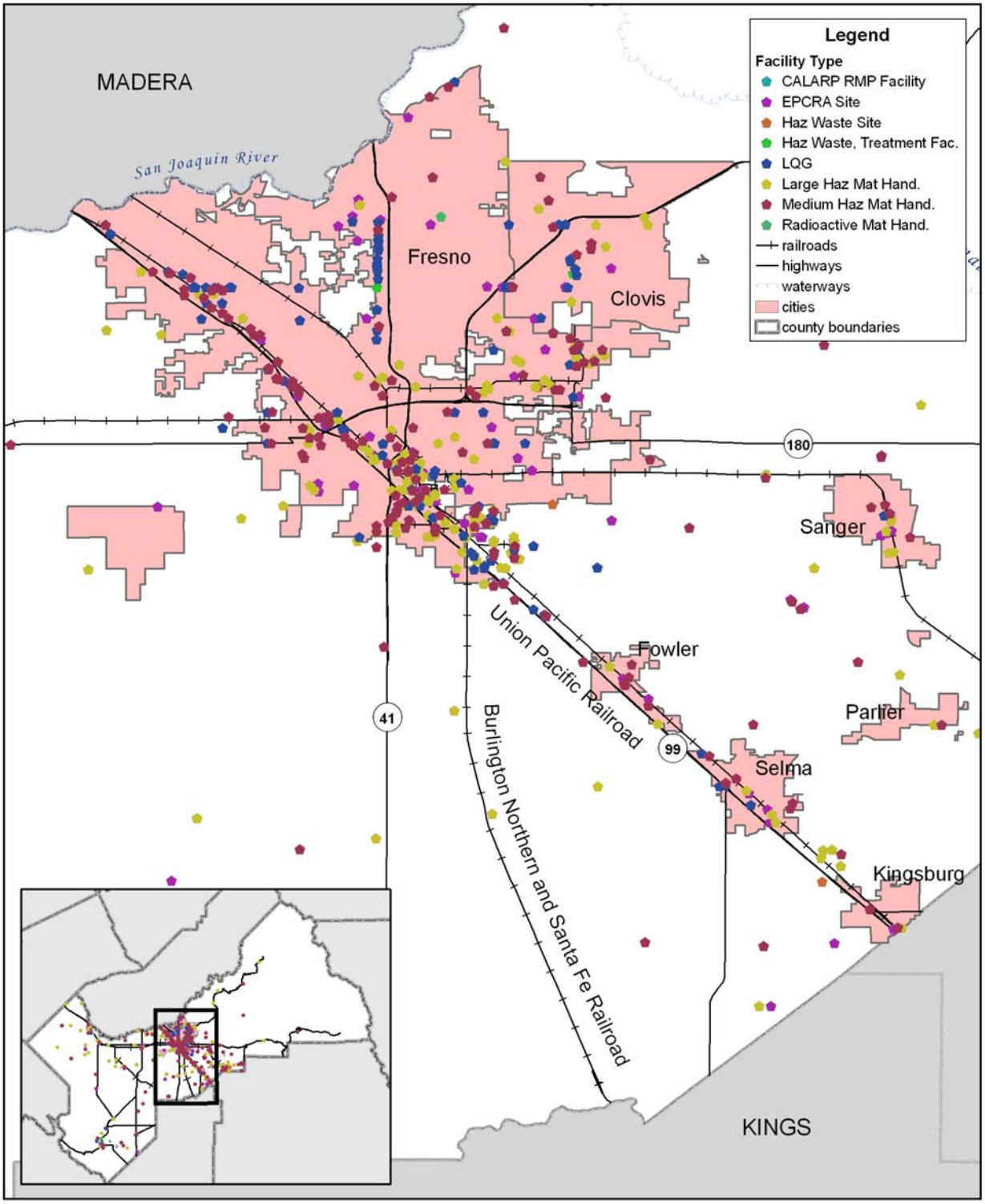
Source: Fresno County Office of Emergency Services/AMEC

Figure 4.58. Hazardous Materials Release—Fixed Facilities (Overview): Fresno County Planning Area



amec
Map Compilation: AMEC
Data Source: Fresno County

Figure 4.59. Hazardous Materials Release—Fixed Facilities (Inset): Fresno County Planning Area



Map Compilation: AMEC
Data Source: Fresno County

Transportation Incidents (e.g., Rail, Highway)

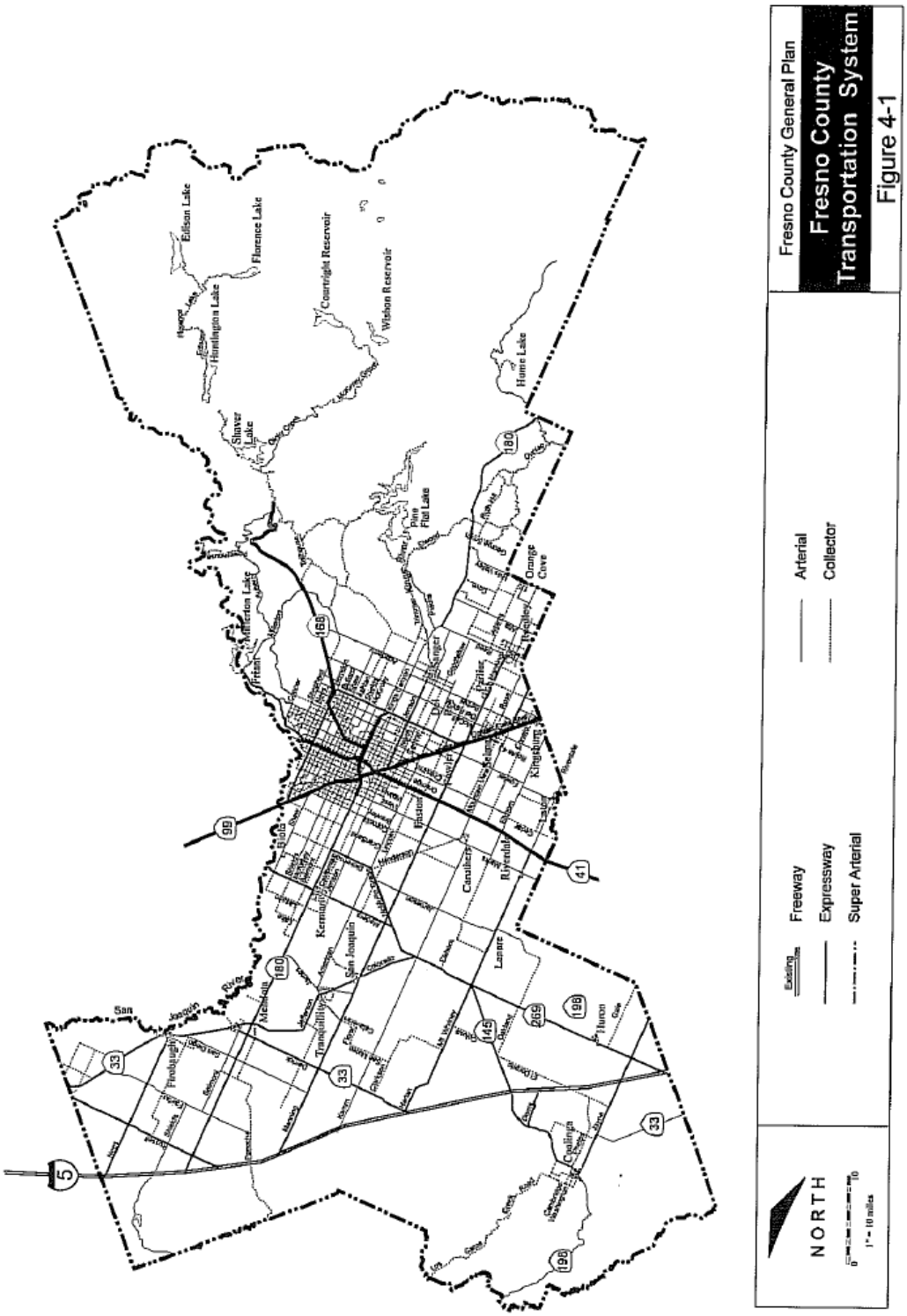
Transportation incidents can occur during the transportation of hazardous materials to and from storage facilities. The most likely routes for the transportation of hazardous materials are major roadways and railroads. Two major north-south roadways are located in Fresno County. Highway 99 runs through the central part of the County and provides a north-south corridor through several counties. Most of the County's industrial and residential activity is positioned along Highway 99. In western Fresno County, Interstate 5 traverses the County at the base of the Coast Range foothills. State Routes 33, 41, 43, 63, 145, 168, 180, 198, and 269 provide local service to urban and rural areas in the County. A network of County roads connects the various communities to these major arteries. Major rail lines include Union Pacific, Burlington Northern and Santa Fe Company, Port Railroads, Inc., and San Joaquin Valley Railroad. The major transportation corridors and rail lines are listed in Table 4.53 and illustrated in Figures 4.60 and 4.61.

Table 4.53. Major Fresno County Transportation Corridors

Major Roadways	Rail Lines/Operators
Highway 99 *	Union Pacific Railways
Interstate 5*	Burlington Northern and Santa Fe Company
State Route 33	Port Railroads Inc.
State Route 41	San Joaquin Valley Railroad
State Route 43	
State Route 63	
State Route 145	
State Route 168	
State Route 180	
State Route 198	
State Route 269	
Golden State Boulevard*	
Manning Avenue	
Jensen Avenue*	

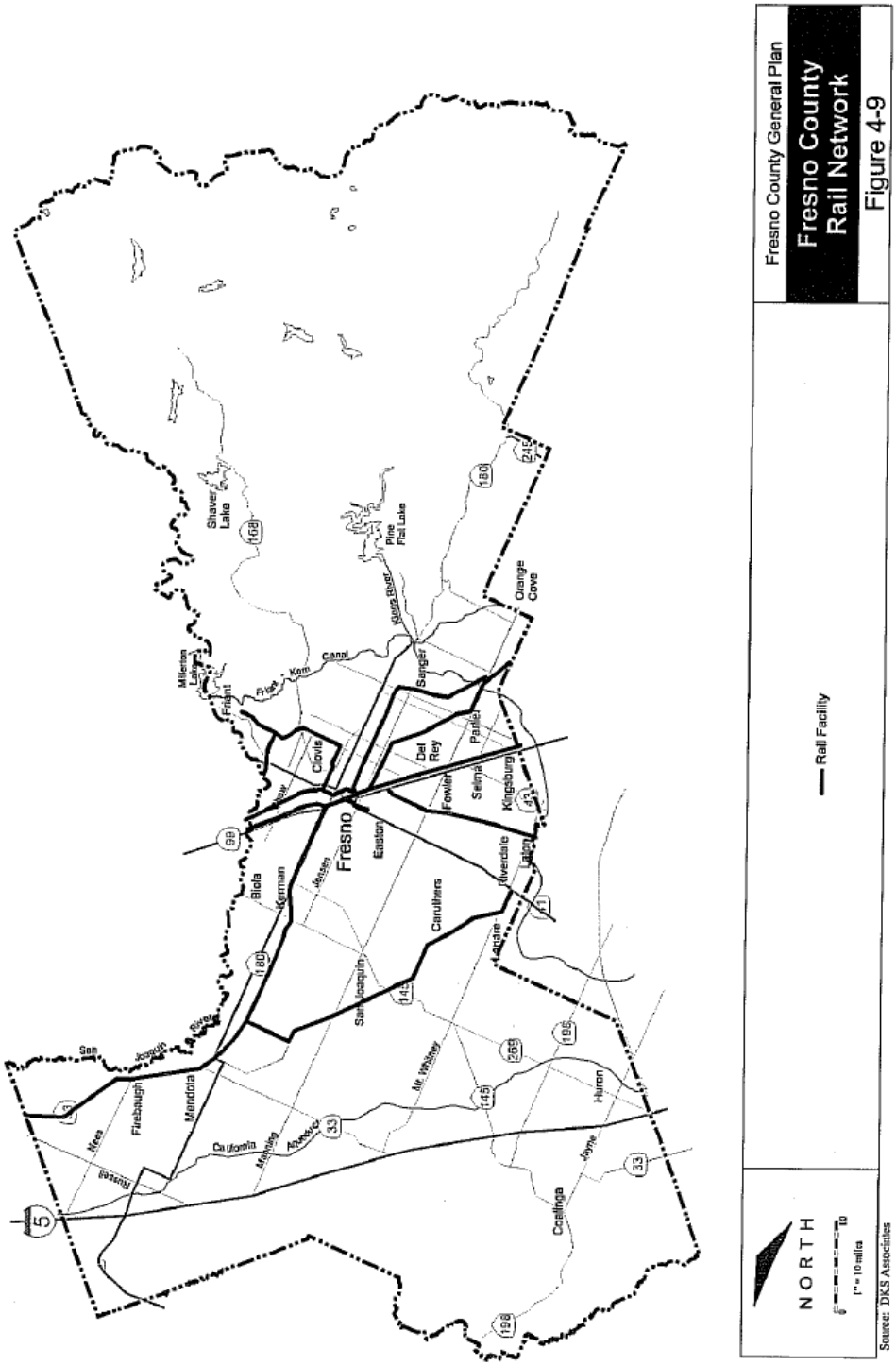
Source: Fresno County General Plan, 2000
*Indicates corridor experiences truck traffic in excess of 2,000 vehicles per day

Figure 4.60. Fresno County's Transportation System



Source: Fresno County General Plan, 2000

Figure 4.61. Fresno County's Rail Network



Source: Fresno County General Plan, 2000

Of the County's transportation corridors, Interstate 5, Highway 99, and State Route 41 are the most significant because they provide direct links between the County transportation system, the surrounding regions, and beyond. The other corridors identified in Table 4.53 connect cities and communities in Fresno County with each other.

According to the Fresno County General Plan Background Report, truck transportation, followed by rail, air, and pipeline, provides the majority of goods movement in Fresno County, including the transportation of hazardous materials. Fresno County has considerable long-distance trucking activity due to the presence of Interstate 5 and Highway 99. According to the background report, Highway 99 carries the greatest volume of truck traffic in Fresno County (between 7,800 and 22,100 vehicles per day); Interstate 5 also experiences large volumes of truck traffic (between 5,500 and 6,500 vehicles per day). Other routes with significant truck traffic (i.e., more than 2,000 vehicles per day) include Golden State Boulevard and Jensen Avenue.

There are two mainline rail lines that run north-south through Fresno County. The first, owned by the Burlington Northern and Santa Fe Company, connects the County to Sacramento and the San Francisco Bay Area to the north and Bakersfield to the south. The second, owned by Union Pacific Railways, parallels the Highway 99 corridor and also connects the County to Sacramento and the Bay Area to the north and Bakersfield to the south. Both lines service the City of Fresno. Other lines provide rail service primarily to communities within the County and to adjacent counties. According to the HMPC, approximately 40 trains travel through the City of Fresno each day, and sometimes the trains carry hazardous materials very close to schools and residential areas.

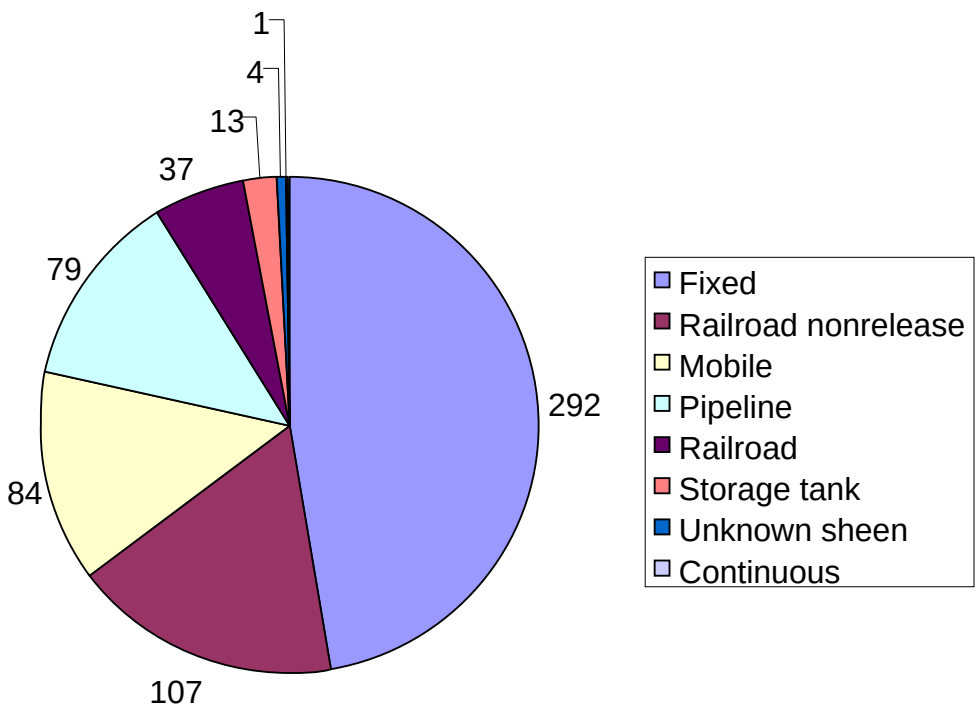
Failure of Supervisory Control and Data Acquisition

These systems control the automated switching of various utility and environmental systems from remote locations, such as electrical power distribution grids, environmental control systems, traffic signals, water management systems, and mass transit systems. Failure of these systems can result in a variety of human-caused hazards.

Past Occurrences

Hazardous materials incidents in Fresno County are frequent events. Statistics from the National Response Center, which serves as the sole national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories, indicate that between 1990 and the end of 2007, 617 incidents were reported in Fresno County. Figure 4.62 shows the breakdown of the types of incidents that occurred in Fresno County in this time period. Of the incidents, 47.3 percent were fixed, 17.3 percent were railroad nonrelease, 13.6 percent were mobile (transportation on land), and 6 percent were railroad.

Figure 4.62. Reports of Hazardous Materials Incidents in Fresno County, 1990–2007



Source: National Response Center, www.nrc.uscg.mil/

The County's emergency response team receives numerous calls each year related to hazardous materials releases. Since 2004, the team has received over 1,000 reports. The majority of incidents in Fresno County were fuel spills and characterized as relatively minor. As such, it is just a response/cleanup issue that generally does not pose a significant impact to the community. However, other incidents can and have occurred in the County. The HMPC provided details about some of the hazardous materials incidents that have occurred in Fresno County (see Tables 4.54 and 4.55).

Table 4.54 Hazardous Materials Fixed Facility Incidents in Fresno County

Date	Location	Incident Type	Damage/Exposures
7/7/2004	Sun West Fruit Company, 755 E. Manning Avenue, Parlier	Anhydrous ammonia (approximately 50 pounds) leaked	86 people were employees, 28 were taken to the hospital

Source: Fresno County HMPC

Table 4.55. Hazardous Materials Transportation Incidents in Fresno County

Date	Location	Incident Type	Damage/Exposures
6/5/2000	Interstate 5 in Fresno County	Pressurized anhydrous ammonia released (truck was hauling 19,500 pounds) in accident	Employees of nearby business affected, one person hospitalized, Interstate 5 was closed for 29 hours
4/28/2006	Southbound Freeway 41 at Highway 99	Automotive fluid released (20 gallons) onto the roadway and into a culvert as a result of an overturned big rig	Spill contained and cleaned up
1/22/2007	Northbound Highway 99 North of Ashlan Avenue	Sodium hydroxide (up to 5 gallons) Methanol, Alkanolamine, and Tolad resulting from a motor vehicle accident	Spill contained and cleaned up, northbound Highway 99 was closed for 9 ½ hours
6/19/2007	Blackstone and McKinley Avenue	Suspected propane resulting from train derailment	Due to potential danger, Fresno City College campus was closed for the evening; no actual release occurred
6/28/2007	Southbound State Route 41 below the Jensen Avenue overpass	Diazinon 50W (insecticide, 10 gallons) occurring when products shifted in a truck and containers fell onto the freeway and were struck by an oncoming truck	Two people exposed and decontaminated; Spill contained and cleaned up
11/3/2007	Highway 99 and Clovis Avenue	Small amount of diesel fuel spilled due to numerous car accidents	Spill contained and cleaned up

Source: Fresno County HMPC

4.4.2 Asset Inventory and Vulnerability Assessment

The probability and potential losses of human-caused technological hazards are difficult to quantify due to the "human" element. These hazards can occur at any time and virtually any place with little or no warning. However, they can often be inventoried because they typically occur in conjunction with a particular facility/business that produces, transports, stores, or uses substances that present a specific hazard to the local community or environment, or the hazard is present due to the shipment of potentially harmful substances from outside the region across various transportation arteries that bisect Fresno County communities.

The facilities and transportation corridors identified in Table 4.53 and Figures 4.60 and 4.61 are those that the HMPC has identified as potential sites for hazardous materials releases that may adversely affect the Fresno County planning area.

Asset Inventory

Section 4.3 Vulnerability Assessment and the jurisdictional annexes identify the total assets at risk in the Fresno County planning area to both natural and human-caused hazards. Also included in those sections are inventories of critical facilities. These critical facilities, as previously defined, are considered vital to the daily continuity of life, unobstructed flow of commerce, and the continued health and welfare of the planning area as a whole.

Vulnerability Assessment

As previously stated, it is often quite difficult to quantify the potential losses from human-caused hazards. While the facilities themselves have a tangible dollar value, loss from a human-caused hazard often inflicts an even greater toll on a community, both economically and emotionally. The impact to identified assets will vary from event to event and depend on the type, location, and nature of a specific technological hazard event.

Given the difficulty in quantifying the losses associated with technological hazards, this section focuses on analyzing key assets and populations relative to the hazardous materials sites and transportation corridors identified above.

Fixed Facility Incidents

As discussed above, there are over 900 fixed facilities identified in the Fresno County planning area with the potential to cause a hazardous materials release of sufficient type and magnitude to adversely impact surrounding areas. These sites are regulated and most have emergency action plans in place. Because of the number and dispersed nature of these fixed facilities, additional analysis on vulnerable assets and populations was not feasible. The impact to surrounding areas would depend on the nature and quantity of any release as well as the time of the event and prevailing weather conditions.

Transportation Incidents

To assess the vulnerability of the Fresno County planning area to a hazardous materials release within a transportation corridor, a buffer zone was established around each of the major transportation routes previously identified. The buffer distance was based on guidelines in the U.S. Department of Transportation's Emergency Response Guidebook that suggest distances useful to protect people from vapors resulting from spills involving dangerous goods considered toxic if inhaled. The recommended buffer distance referred to in the guide as the "protective action distance" is the area surrounding the incident in which people are at risk of harmful exposure. For purposes of this plan, an average buffer distance of one mile was used on either side of the transportation corridor. Actual buffer distances will vary depending on the nature and quantity of the release, whether the release occurred during the night or daytime, and prevailing weather conditions.

Populations at Risk

To determine the populations at risk from a transportation-related hazardous materials release within identified transportation corridors, an analysis was performed using GIS. A one-mile buffer was applied to both sides of Highways 41 and 99, Interstate 5, and the Burlington Northern and Santa Fe and Union Pacific Railroads, creating two-mile buffer zones around each corridor. Fresno County Census 2000 population data, aggregated by census block, was acquired from HAZUS-MH. An intersect was performed between the census data and the transportation buffers. If any part of the census block touched the transportation buffer zone, the entire block

was included in the buffer zone. Table 4.56 shows populations within each transportation corridor that are at greatest risk to transportation-related hazardous materials releases. Figure 4.63 (overview) and Figure 4.64 (inset) illustrate these corridors and their corresponding population densities. The inset map provides a zoomed in view of the area where most of the sites were concentrated.

Table 4.56. Populations in Transportation Corridor

Transportation Corridor	Corridor Length (miles)	Population		
		Cities	Unincorporated	County Totals
Highway 41	33.3	132,089	15,974	148,063
Highway 99	32.0	120,233	12,668	132,901
Interstate 5	66.5	0	601	601
Burlington Northern and Santa Fe Railroad	38.1	143,766	16,151	159,917
Union Pacific Railroad	36.6	154,656	11,278	165,934
Totals		**550,744**	**56,672**	**607,416**

Source: U.S. Census Bureau, 2000; Fresno County

Figure 4.63. Population along Transportation Corridors (Overview): Fresno County Planning Area

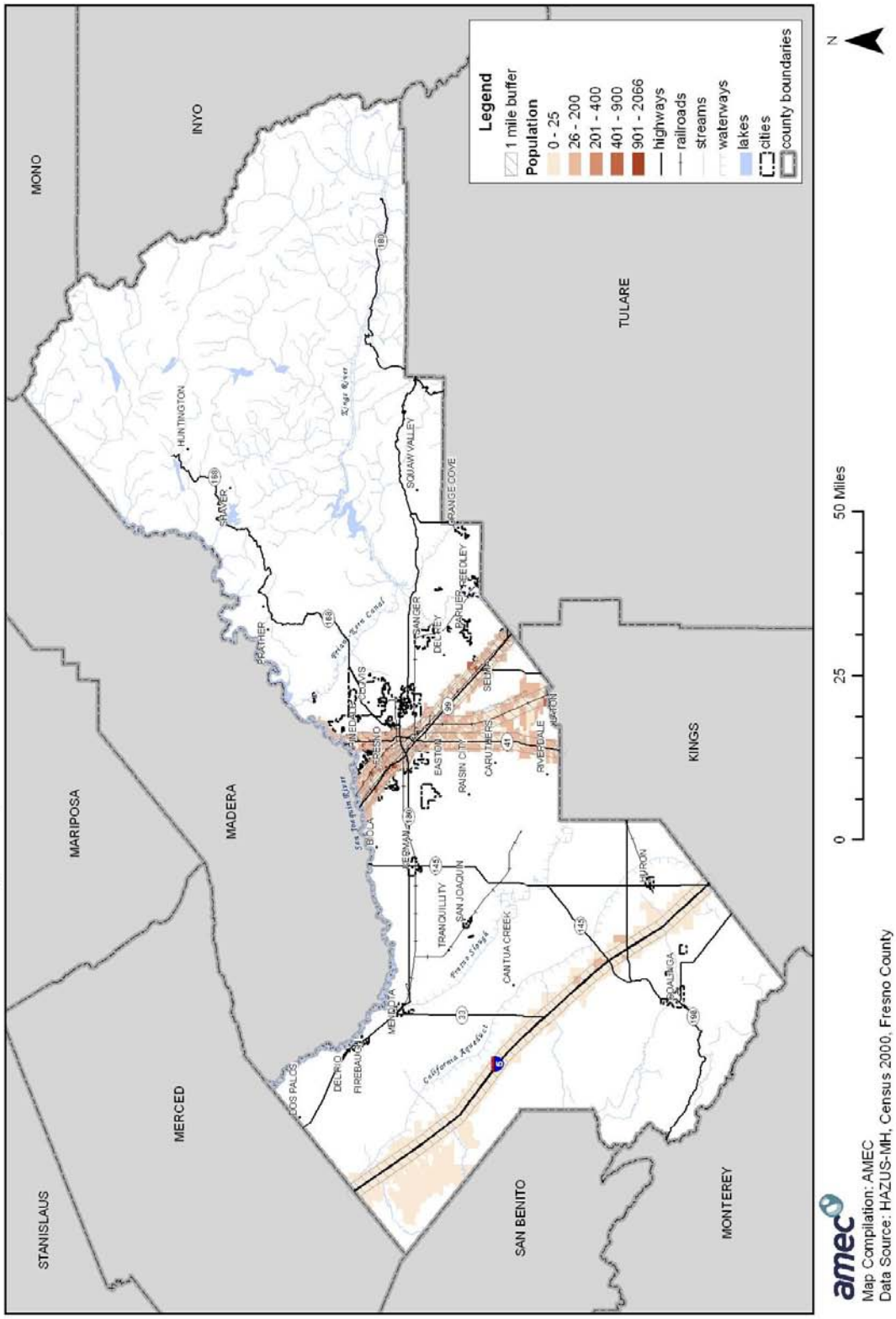
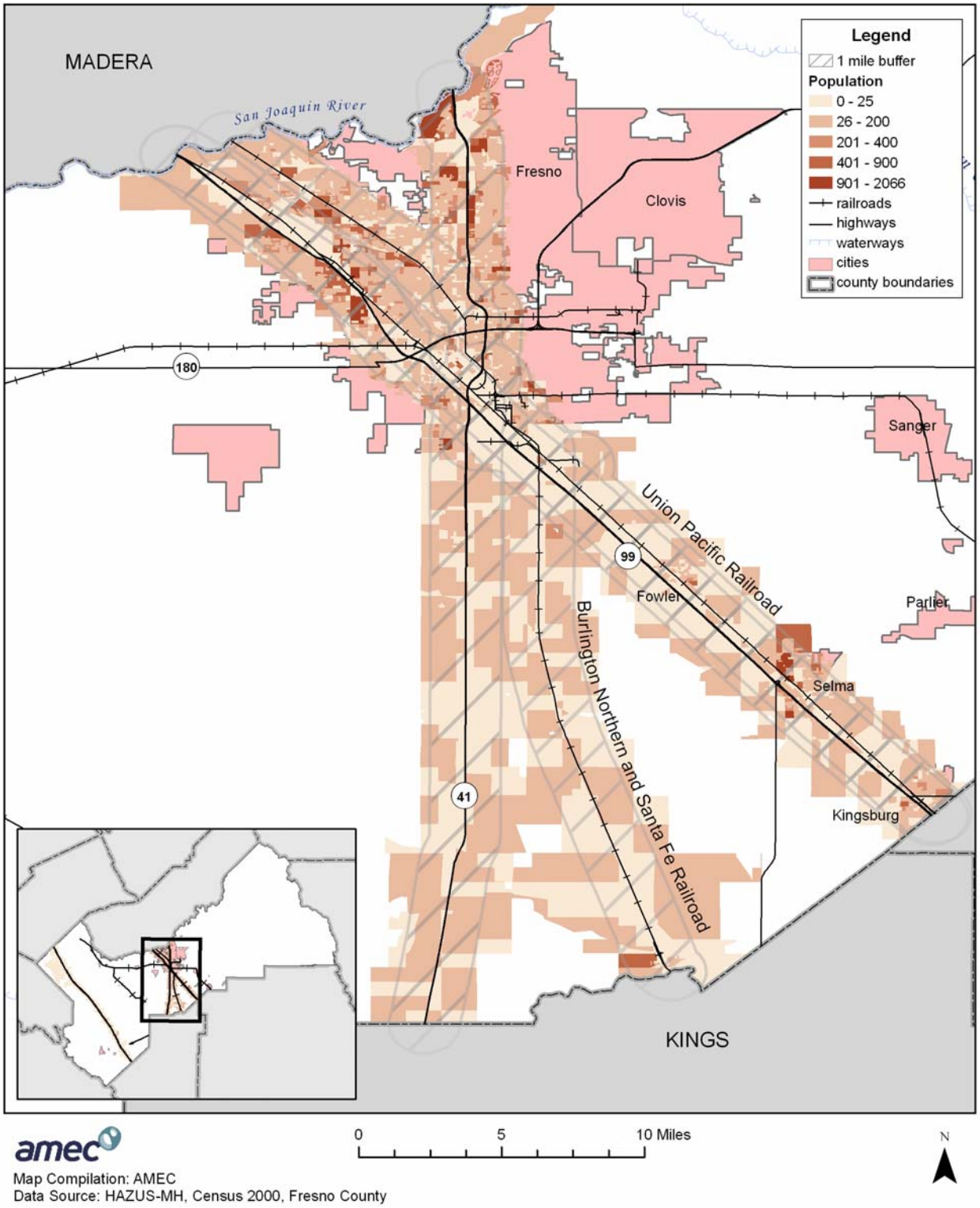


Figure 4.64. Population along Transportation Corridors (Inset): Fresno County Planning Area



Critical Facilities at Risk

In order to identify those critical facilities at risk to a hazardous materials release within identified corridors, an analysis was performed using GIS software. A one-mile buffer was applied to both sides of Highways 41 and 99, Interstate 5, as well as the Burlington Northern and Santa Fe and Union Pacific Railroads, creating two-mile buffer zones around each corridor. An intersect was performed between critical facilities and the transportation buffers. Table 4.57 lists critical facilities located within each transportation corridor that are at risk to transportation-related hazardous materials releases. Figure 4.65 (overview) and Figure 4.66 (inset) illustrate these corridors and locations of critical facilities. The inset map provides a zoomed in view of the area where most of the sites were concentrated.

Table 4.57. Critical Facilities in Transportation Corridor by Corridor

Facility Type	Cities	Unincorporated	County Totals
Highway 41			
Communications Facilities	1	0	1
Detention Centers	4	0	4
Emergency Operations Centers	2	0	2
Fire Departments	7	2	9
Health Care Facilities	39	3	42
Law Enforcement Facilities	3	0	3
Residential Elderly Facilities	19	6	25
Schools and Day Care Centers	102	10	112
Totals	**177**	**21**	**198**
Highway 99			
Airports	1	1	2
Communications Facilities	3	0	3
Detention Centers	4	1	5
Emergency Operations Centers	6	0	6
Fire Departments	11	1	12
Health Care Facilities	10	1	11
Law Enforcement Facilities	10	0	10
Maintenance Yards	4	0	4
Residential Elderly Facilities	13	0	13
Schools and Day Care Centers	95	7	102
Totals	**157**	**11**	**168**
Interstate 5			
Fire Departments	0	1	1
Totals	**0**	**1**	**1**
Burlington Northern and Santa Fe Railroad			
Airports	0	1	1
Communications Facilities	1	0	1
Detention Centers	5	1	6
Emergency Operations Centers	2	0	2
Fire Departments	9	3	12

Facility Type	Cities	Unincorporated	County Totals
Burlington Northern and Santa Fe Railroad (continued)			
Health Care Facilities	15	1	16
Law Enforcement Facilities	5	0	5
Residential Elderly Facilities	18	1	19
Schools and Day Care Centers	87	19	106
Totals	**142**	**26**	**168**
Union Pacific Railroad			
Communications Facilities	3	0	3
Detention Centers	4	1	5
Emergency Operations Centers	6	0	6
Fire Departments	13	2	15
Health Care Facilities	16	2	18
Law Enforcement Facilities	12	0	12
Maintenance Yards	4	0	4
Residential Elderly Facilities	17	0	17
Schools and Day Care Centers	107	7	114
Totals	**182**	**12**	**194**

Source: Fresno County

Figure 4.65. Critical Facilities along Transportation Corridors (Overview): Fresno County Planning Area

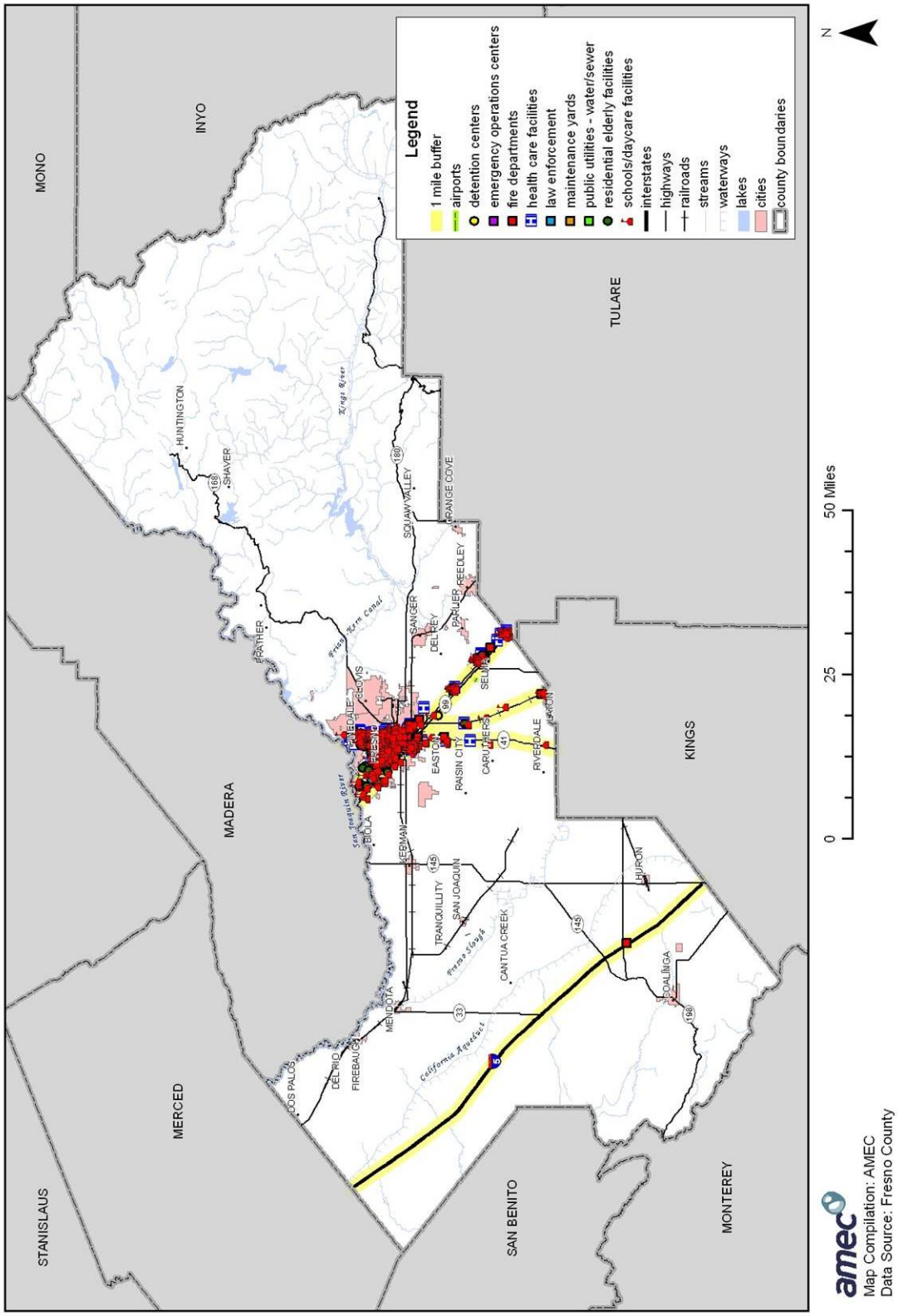
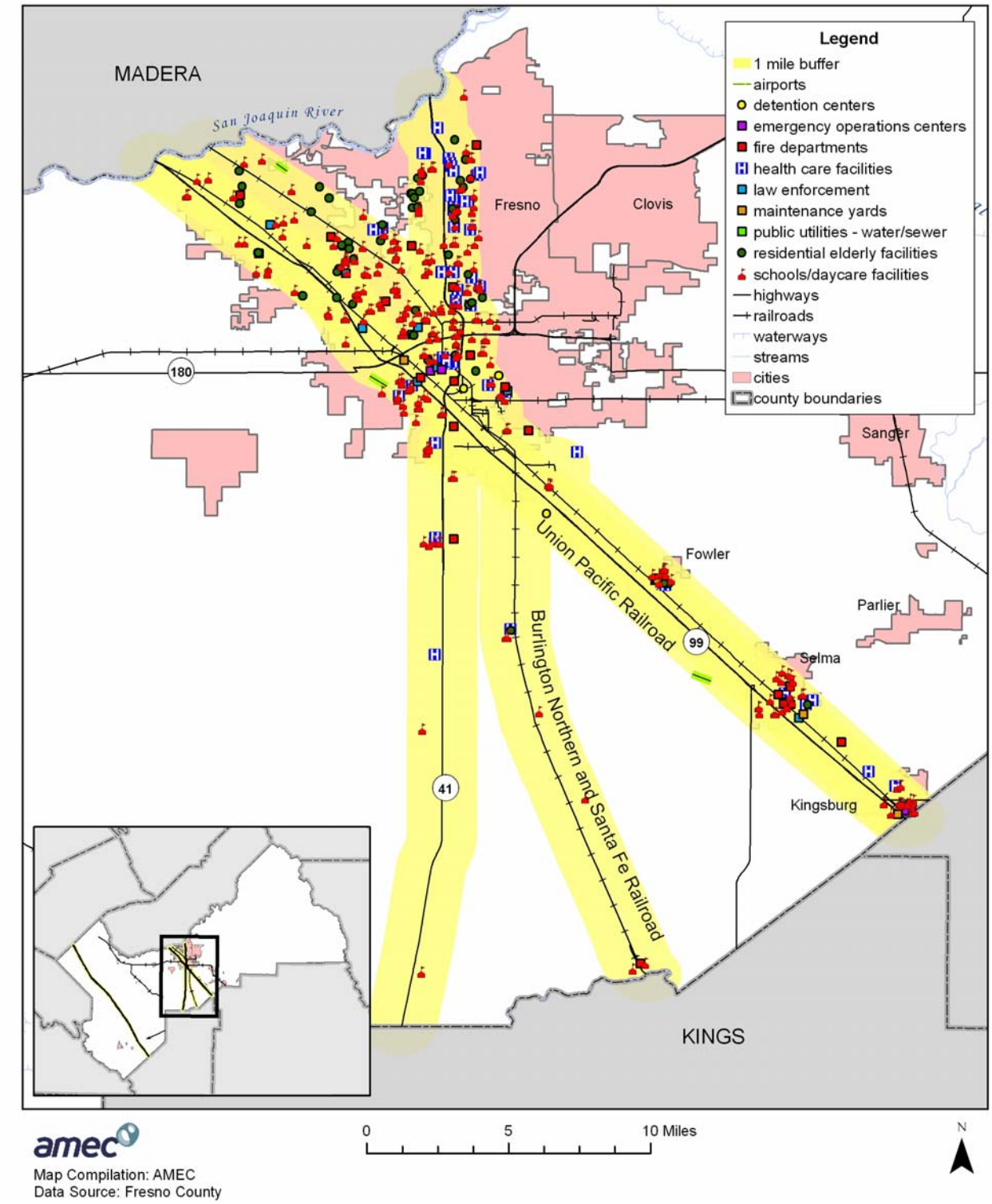


Figure 4.66. Critical Facilities in Transportation Corridors (Inset): Fresno County Planning Area



4.5 Fresno County's Mitigation Capabilities

Thus far, the planning process has identified the hazards posing a threat to Fresno County and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's "net vulnerability" to disasters and more accurately focuses the goals, objectives. and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken, if deemed appropriate. Second, the HMPC reviewed existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents Fresno County's mitigation capabilities: programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. It also identifies select state and federal departments/agencies that can supplement the County's mitigation capabilities. This assessment is divided into three sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities. Information about capabilities specific to the other participating jurisdictions can be found in the jurisdictional annexes.

4.5.1 Fresno County's Regulatory Mitigation Capabilities

Table 4.58 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fresno County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.58. Fresno County's Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	Yes	October 2000 (Housing element dated March 2003)
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (e.g., stormwater, steep slope, wildfire)	Yes	See ordinance discussion that follows
Building code	Yes	2001 California Building Code
Fire department ISO rating	No	
Erosion or sediment control program	Yes	Via grading permits
Stormwater management program	No	See Fresno Metropolitan Flood Control District/Drainage of Land Ordinance
Capital improvements plan	Yes	
Economic development plan	Yes	Policies in County's documents
Local emergency operations plan	Yes	Fresno County Operational Area Master Emergency Services Plan
Other special plans	Yes	
Flood insurance study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005, via floodplain administrator
Elevation certificates	Yes	

As indicated in the table above, Fresno County has several plans and programs that guide the County's development in hazard-prone areas. Starting with the Fresno County General Plan, which is the most comprehensive of the County's plans when it comes to mitigation, some of these are described in more detail below.

Fresno County General Plan

The Fresno County General Plan consists of multiple documents: the countywide General Plan Background Report, the countywide General Plan Policy Document, and over 40 regional, community, and specific plans. This discussion is derived primarily from the Fresno County General Plan Policy Document, from which the text that follows is largely extracted.

The Fresno County General Plan is a comprehensive, long-term framework for the protection of the County's agricultural, natural, and cultural resources and for development in the County. Designed to meet state general plan requirements, it outlines policies, standards, and programs and sets out plan proposals to guide day-to-day decisions concerning Fresno County's future. It is a legal document that serves as the County's "blue print" or "constitution" for land use and development.

Health and Safety Element

Planning for growth and development requires the consideration of a wide range of public safety issues. Many of the health and safety risks associated with development can be avoided through siting decisions made at the planning stages of development, while others may be lessened through the use of mitigation measures in the planning and land use regulation process. This element outlines Fresno County's strategy for ensuring the maintenance of a healthy and safe physical environment. Applicable goals and policies are presented below.

Emergency Management and Response

Policies in this section seek to create an effective emergency response and management system by ensuring that vital public infrastructure is designed to remain operational during and after a major disaster event, by siting critical emergency response facilities as far from potential disaster impact areas as is practical, and through continuing public education and outreach on emergency preparedness and disaster response programs.

Goal HS-A:	**To protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters.**
Policy HS-A.2:	The County shall, within its authority and to the best of its ability, ensure that emergency dispatch centers, emergency operations centers, communications systems, vital utilities, and other essential public facilities necessary for the continuity of government are designed in a manner that will allow them to remain operational during and following an earthquake or other disaster.
Policy HS-A.3:	The County shall ensure that the siting of critical emergency response facilities such as hospitals, fire stations, sheriffs' offices and substations, dispatch centers, emergency operations centers, and other emergency service facilities and utilities are sited and designed to minimize their exposure and susceptibility to flooding, seismic and geological effects, fire, avalanche, and explosions as required by state regulations.
Policy HS-A.4:	The County shall continue to conduct programs to inform the general public of emergency preparedness and disaster response procedures.

Fire Hazards

Policies in this section are designed to ensure that new development is constructed to minimize potential fire hazards, minimize the risk of fire in already developed areas, and to provide public education concerning fire prevention.

Goal HS-B:	**To minimize the risk of loss of life, injury, and damage to property and natural resources resulting from fire hazards.**
Policy HS-B.1:	The County shall review project proposals to identify potential fire hazards and to evaluate the effectiveness of preventive measures to reduce the risk to life and property.
Policy HS-B.2:	The County shall ensure that development in high fire hazard areas is designed and constructed in a manner that minimizes the risk from fire hazards and meets all applicable state and County fire standards. Special consideration shall be given to the use of fire-resistant construction in the underside of eaves, balconies, unenclosed roofs and floors, and other similar horizontal surfaces in areas of steep slopes.
Policy HS-B.3:	The County shall require that development in high fire hazard areas have fire- resistant vegetation, cleared fire breaks separating communities or clusters of structures from native vegetation, or a long-term comprehensive vegetation and fuel management program. Fire hazard reduction measures shall be incorporated into the design of development projects in fire hazard areas.

Goal HS-B:	To minimize the risk of loss of life, injury, and damage to property and natural resources resulting from fire hazards.
Policy HS-B.4:	The County shall require that foothill and mountain subdivisions of more than four parcels provide for safe and ready access for fire and other emergency equipment, for routes of escape that will safely handle evacuations, and for roads and streets designed to be compatible with topography while meeting fire safety needs.
Policy HS-B.5:	The County shall require development to have adequate access for fire and emergency vehicles and equipment. All major subdivisions shall have a minimum of two points of ingress and egress.
Policy HS-B.6:	The County shall work with local fire protection agencies, the California Department of Forestry and Fire Protection, and the U.S. Forest Service to promote the maintenance of existing fuel breaks and emergency access routes for effective fire suppression and in managing wildland fire hazards.
Policy HS-B.7:	The County shall require that community fire breaks be coordinated with overall fire break plans developed by the foothill and mountain fire agencies. Firebreak easements in subdivisions of more than four parcels or in built-up areas shall include access for firefighting personnel and motorized equipment. Easements shall be dedicated for this purpose.
Policy HS-B.8:	The County shall refer development proposals in the unincorporated County to the appropriate local fire agencies for review of compliance with fire safety standards. If dual responsibility exists, both agencies shall review and comment relative to their area of responsibility. If standards are different or conflicting, the more stringent standards shall apply.
Policy HS-B.9:	The County shall require that provisions for establishing year-round fire protection in foothill and mountain areas are developed where concentrations of population are such that structural fire protection is needed.
Policy HS-B.10:	The County shall ensure that existing and new buildings of public assembly incorporate adequate fire protection measures to reduce potential loss of life and property in accordance with state and local codes and ordinances.
Policy HS-B.11:	The County shall require new development to have water systems that meet County fire flow requirements. Where minimum fire flow is not available to meet County standards, alternate fire protection measures, including sprinkler systems, shall be identified and may be incorporated into development if approved by the appropriate fire protection agency.
Policy HS-B.12:	The County shall promote installation and maintenance of smoke detectors in existing residences and commercial facilities that were constructed prior to the requirement for their installation.
Policy HS-B.13:	The County shall work with local fire agencies to develop high-visibility fire prevention programs, including education programs and voluntary home inspections.

Flood Hazards

Policies in this section are designed to minimize flood hazards by restricting development in flood-prone areas, requiring development that does occur in floodplains to be designed to avoid flood damage, and through public education about flood hazards.

Goal HS-C:	To minimize the risk of loss of life, injury, and damage resulting from flood hazards.
Policy HS-C.1:	The County shall encourage the Fresno Metropolitan Flood Control District to control stormwater flows originating in the streams of the Fresno County Stream Group, generally located east and north of the Fresno-Clovis urban area, by dams or other storage means prior to entering the Fresno-Clovis Metropolitan area.
Policy HS-C.2:	The County shall require that the design and location of dams and levees be in accordance with applicable design standards and specifications and accepted design and construction practices.
Policy HS-C.3:	The County shall promote a floodplain management approach in flood hazard areas that are presently undeveloped by giving priority to regulation of land uses over development of structural controls as a method of reducing flood damage.

Goal HS-C:	To minimize the risk of loss of life, injury, and damage resulting from flood hazards.
Policy HS-C.4:	The County shall encourage the performance of appropriate investigations to determine the 100-year water surface elevations for the San Joaquin River, taking into account recent storm events and existing channel conditions, to identify the potential extent and risk of flooding. New development, including public infrastructure projects, shall not be allowed along the river until the risk of flooding at the site has been determined and appropriate flood risk reduction measures identified.
Policy HS-C.5:	Where existing development is located in a flood hazard area, the County shall require that construction of flood control facilities proceed only after a complete review of the environmental effects and a project cost benefit analysis.
Policy HS-C.6:	The County shall promote flood control measures that maintain natural conditions within the 100-year floodplain of rivers and streams and, to the extent possible, combine flood control, recreation, water quality, and open space functions. Existing irrigation canals shall be used to the extent possible to remove excess stormwater. Retention-recharge basins should be located to best utilize natural drainage patterns.
Policy HS-C.7:	The County shall continue to participate in the Federal Flood Insurance Program by ensuring compliance with applicable requirements.
Policy HS-C.8:	During the building permit review process, the County shall ensure project compliance with applicable Federal Emergency Management Agency (FEMA) standards pertaining to residential and non-residential development in the floodplain, floodway, or floodway fringe.
Policy HS-C.9:	The County shall prohibit the construction of essential facilities in the 100- year floodplain, unless it can be demonstrated that the facility can be safely operated and accessed during flood events.
Policy HS-C.10:	The County shall require that all placements of structures and/or flood proofing be done in a manner that will not cause floodwaters to be diverted onto adjacent property, increase flood hazards to other property, or otherwise adversely affect other property.
Policy HS-C.11:	The County shall encourage open space uses in all flood hazard areas. Land Conservation contracts and open space and scenic easements should be made available to property owners.
Policy HS-C.12:	The County shall consider dam failure inundation maps of all reservoirs in making land use and related decisions.
Policy HS-C.13:	The County shall continue public awareness programs to inform the general public and potentially affected property owners of flood hazards and potential dam failure inundation.

Seismic and Geological Hazards

Policies in this section seek to ensure that new buildings and facilities are designed to withstand seismic and geologic hazards.

Goal HS-D:	To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.
Policy HS-D.1:	The County shall continue to support scientific geologic investigations that refine, enlarge, and improve the body of knowledge on active fault zones, unstable areas, severe groundshaking, avalanche potential, and other hazardous geologic conditions in Fresno County.
Policy HS-D.2:	The County shall ensure that the General Plan and/or County Ordinance Code is revised, as necessary, to incorporate geologic hazard areas formally designated by the state geologist (e.g., earthquake fault zones and seismic hazard zones). Development in such areas, including public infrastructure projects, shall not be allowed until compliance with the investigation and mitigation requirements established by the state geologist can be demonstrated.
Policy HS-D.3:	The County shall require that a soils engineering and geologic-seismic analysis be prepared by a California-registered engineer or engineering geologist prior to permitting development, including public infrastructure projects, in areas prone to geologic or seismic hazards (i.e., fault rupture, ground shaking, lateral spreading, lurchcracking, fault creep, liquefaction, subsidence, settlement, landslides, mudslides, unstable slopes, or avalanche).

Goal HS-D:	To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.
Policy HS-D.4:	The County shall require all proposed structures, additions to structures, utilities, or public facilities situated within areas subject to geologic-seismic hazards as identified in the soils engineering and geologic-seismic analysis to be sited, designed, and constructed in accordance with applicable provisions of the Uniform Building Code (Title 24 of the California Code of Regulations) and other relevant professional standards to minimize or prevent damage or loss and to minimize the risk to public safety.
Policy HS-D.5:	Pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code, Chapter 7.5), the County shall not permit any structure for human occupancy to be placed within designated earthquake fault zones unless the specific provisions of the act and Title 14 of the California Code of Regulations have been satisfied.
Policy HS-D.6:	The County shall inventory unreinforced masonry structures, including emergency facilities and other critical facilities constructed prior to 1948, used for human occupancy (excluding single-family residential structures), and evaluate the facilities for seismic safety. If found below acceptable standards, the County shall implement a program to mitigate potential hazards.
Policy HS-D.7:	The County shall ensure compliance with state seismic and building standards in the evaluation, design, and siting of critical facilities, including police and fire stations, school facilities, hospitals, hazardous material manufacture and storage facilities, bridges, large public assembly halls, and other structures subject to special seismic safety design requirements.
Policy HS-D.8:	The County shall require a soils report by a California-registered engineer or engineering geologist for any proposed development, including public infrastructure projects, that requires a County permit and is located in an area containing soils with high “expansive” or “shrink-swell” properties. Development in such areas shall be prohibited unless suitable design and construction measures are incorporated to reduce the potential risks associated with these conditions.
Policy HS-D.9:	The County shall seek to minimize soil erosion by maintaining compatible land uses, suitable building designs, and appropriate construction techniques. Contour grading, where feasible, and revegetation shall be required to mitigate the appearance of engineered slopes and to control erosion.
Policy HS-D.10:	The County shall require the preparation of drainage plans for development or public infrastructure projects in hillside areas to direct runoff and drainage away from unstable slopes.
Policy HS-D.11:	The County shall not approve a County permit for new development, including public infrastructure projects where slopes are over 30 percent unless it can be demonstrated by a California-registered civil engineer or engineering geologist that hazards to public safety will be reduced to acceptable levels.
Policy HS-D.12:	In known or potential landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems, undercutting the bases of slopes, removal of vegetative cover, and steepening of slopes.
Policy HS-D.13:	The County shall not approve a County permit for new development, including public infrastructure projects, in known or potential avalanche hazard areas unless it can be demonstrated by a California-registered engineer or engineering geologist that the structures will be safe under anticipated snow loads and avalanche conditions.
Policy HS-D.14:	Whenever zoning is employed to restrict the use of land subject to severe geologic hazards (e.g., landslides), the County shall designate parcels so restricted for open space uses.
Policy HS-D.15:	The County Board of Review or other subsequently-appointed body shall serve as the review body on appeals from seismic and geologic hazard requirements.

Hazardous Materials

Policies in this section are designed to ensure that development projects minimize public risks associated with both intended and unintended exposure to hazardous materials and wastes.

Goal HS-F:	To minimize the risk of loss of life, injury, serious illness, and damage to property resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous wastes.
Policy HS-F.1:	The County shall require that facilities that handle hazardous materials or hazardous wastes be designed, constructed, and operated in accordance with applicable hazardous materials and waste management laws and regulations.
Policy HS-F.2:	The County shall require that applications for discretionary development projects that will use hazardous materials or generate hazardous waste in large quantities include detailed information concerning hazardous waste reduction, recycling, and storage.

Agriculture and Land Use Element

Applicable goals and policies from the Agriculture and Land Use Element are presented below.

Resource Lands

This section addresses land that will remain primarily open in character. The goals, policies, and implementation programs for these topics reflect a basic commitment to preserve the existing open rural character of the County and its natural and managed resources. While necessarily protective and restrictive, the policies also recognize the need to maintain economic productivity and allow for urban growth. The intent of the policies is not to preclude intensive development but to direct it to minimize loss of valuable open space.

Agriculture

Policies in this section seek to sustain agriculture by protecting agricultural activities from incompatible land uses, promoting agricultural land preservation programs, developing programs to preserve or maintain soil conditions or improve soil productivity, facilitating agricultural production by supplying adequate land for support services, and controlling expansion of nonagricultural development onto productive agricultural lands.

Goal LU-A:	To promote the long-term conservation of productive and potentially- productive agricultural lands and to accommodate agricultural-support services and agriculturally-related activities that support the viability of agriculture and further the County's economic development goals.
Policy LU-A.3:	The County may allow by discretionary permit in areas designated Agriculture, special agricultural uses and agriculturally-related activities and certain non-agricultural uses. Approval of these and similar uses in areas designated Agriculture shall be subject to criteria, including: c. The operational or physical characteristics of the use shall not have a detrimental impact on water resources or the use or management of surrounding properties within at least one-quarter mile radius.
Policy LU-A.19:	The County shall encourage landowners to participate in programs that reduce soil erosion and increase soil productivity. To this end, the County shall promote coordination between the Natural Resources Conservation Service, Resource Conservation Districts, University of California Cooperative Extension, and other agencies and organizations.
Policy LU-A.20:	The County shall adopt and support policies and programs that seek to protect and enhance surface water and groundwater resources critical to agriculture.

Westside Rangelands

Policies in this section seek to preserve rangelands by maintaining their open space character, minimizing grading and erosion, maintaining grazing and agricultural operations, accommodating mineral resource recovery, and protecting biological resources from development.

Goal LU-B:	**To preserve the unique character of the Westside Rangelands, which includes distinctive geologic and topographic landforms, watersheds, important agricultural activities, and significant biological resources, while accommodating agriculture, grazing, recreation, resource recovery, and other limited uses that recognize the sensitive character of the area.**
Policy LU-B.12:	The County shall require a preliminary soils report for discretionary development projects when the project site is subject to moderate or high risk landslide potential and has slopes in excess of 15 percent. If the preliminary soil report indicates soil conditions could be unstable, a detailed geologic report by a registered geologist and registered civil engineer, or a registered engineering geologist, shall be required indicating the suitability of any proposed or additional development.

River Influence Areas

Policies in this section seek to preserve and enhance the County's river influence areas by avoiding adverse impacts from development and encouraging environmentally friendly recreational and agricultural activities.

Goal LU-C:	**To preserve and enhance the value of the river environment as a multiple use, open space resource; maintain the environmental and aesthetic qualities of the area; protect the quality and quantity of the surface and groundwater resources; provide for long term preservation of productive agricultural land; conserve and enhance natural wildlife habitat; and maintain the flood-carrying capacity of the channel at a level equal to the 1 percent flood event (100-year flood).**
Policy LU-C.8:	Fresno County shall take into consideration the presence of the regulatory floodway or other designated floodway, the FEMA-designated 100-year floodplain, estimated 250-year floodplain, the Standard Project Flood, and the Fresno Metropolitan Flood Control District (FMFCD) Riverine Floodplain Policy in determining the location of future development within the San Joaquin River Parkway area. Any development sited in a designated 100-year floodplain shall comply with regulatory requirements at a minimum and with the FMFCD Riverine Floodplain Policy criteria, or requirements of other agencies having jurisdiction, where applicable.

Rural Development

This section guides development in areas designated Rural Residential, Rural Settlement Area, and Planned Rural Community. The policies provide for the continued development of areas within these designations in a manner that minimizes environmental impacts and public infrastructure investments, but generally limits expansion of these designations.

Nonagricultural Rural Development

Policies in this section provide for appropriate development in rural areas by directing development away from productive and potentially productive agricultural areas, limiting expansion of existing designated rural residential areas, and minimizing the environmental and service impacts of continued development within areas already designated for rural development.

Goal LU-E:	To provide for the continued development of areas already designated for nonagricultural rural-residential development in a manner that minimizes environmental impacts and public infrastructure and service costs while restricting designation of new areas for such development.
Policy LU-E.6:	The County shall allow planned residential developments consisting of a minimum two-acre lot in areas designated for rural residential development subject to the following conditions: e. The size and configuration of the buildable portion of the lot shall be based on sufficient geological and hydrological investigations.
Policy LU-E.8	The County shall not allow further parcelization of uncommitted rural residential areas lying northeast of the Enterprise Canal due to potential groundwater supply problems. These areas shall be zoned to a limited agricultural zone district. However, rezoning and development for rural residential use may be permitted subject to established criteria.
Policy LU-E.10	The County shall require new subdivisions within areas designated rural residential be designed to utilize individual on-site sewer and water systems. All proposals shall be reviewed by the County geologist and the County health officer to determine the appropriate minimum lot size based on local hydrogeological conditions.
Policy LU-E.11	The County shall require subdividers of rural residential lots to install, provide, or participate in an effective means for utilization of available surface water entitlements for the area included in the subdivision.
Policy LU-E.12	The County shall ensure through discretionary permit approvals and other development regulations that development within areas designated rural residential does not encroach upon natural water channels or restrict natural water channels in such a way as to increase potential flooding damage. Land divisions shall not render inoperative any existing canal.
Policy LU-E.27	The County shall allow development within the designated Quail Lakes Planned Rural Community to proceed in accordance with the Specific Plan adopted at the time the designation was granted by the County. The County may grant amendments to the Specific Plan provided the overall density of development is not increased and the plan continues to demonstrate the following: a. The development will have no significant adverse impacts on groundwater. c. Impacts on Fresno County for the provision of services including, but not limited to, police, fire protection, schools, and other essential public services are adequately mitigated. f. Provide for monitoring of mitigation measures established by the required environmental impact report.

Public Facilities and Services Element

Applicable goals and policies from the Public Facilities and Services Element are presented below.

Water Supply and Delivery

Policies in this section seek to ensure an adequate water supply for both domestic and agricultural users by providing necessary facility improvements, ensuring water availability, and utilizing water conservation measures.

Goal PF-C:	To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.
Policy PF-C.1:	The County shall actively engage in efforts and support the efforts of others to retain existing water supplies within Fresno County.
Policy PF-C.2:	The County shall actively engage in efforts and support the efforts of others to import flood, surplus, and other available waters for use in Fresno County.
Policy PF-C.3:	To reduce demand on the County's groundwater resources, the County shall encourage the use of surface water to the maximum extent feasible.
Policy PF-C.4:	The County shall support efforts to expand groundwater and/or surface water storage that benefits Fresno County.

Goal PF-C:	To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.
Policy PF-C.5:	The County shall develop a County water budget to determine long-term needs and to determine whether existing and planned water resource enhancements will meet the County's needs over the 20-year General Plan horizon.
Policy PF-C.6:	The County shall support water banking when the program has local sponsorship and involvement and provides new benefits to the County.
Policy PF-C.7:	The County shall recommend to all cities and urban areas within the County that they adopt the most cost-effective urban best management practices published and updated by the California Urban Water Agencies, California Department of Water Resources, or other appropriate agencies as a means of meeting some of the future water supply needs.
Policy PF-C.8:	The County shall require preparation of water master plans for areas undergoing urban growth.
Policy PF-C.9:	The County shall work with local irrigation districts to preserve local water rights and supply.
Policy PF-C.11:	The County shall assure an on-going water supply to help sustain agriculture and accommodate future growth by allocation of resources necessary to carry out the water resource management programs.
Policy PF-C.12:	The County shall approve new development only if an adequate sustainable water supply to serve such development is demonstrated.
Policy PF-C.13:	In those areas identified as having severe groundwater level declines or limited groundwater availability, the County shall limit development to uses that do not have high water usage or that can be served by a surface water supply.
Policy PF-C.14:	The County shall require that water supplies serving new development meet U.S. Environmental Protection Agency and California Department of Health Services and other water quality and quantity standards.
Policy PF-C.16:	If the cumulative effects of more intensive land use proposals are detrimental to the water supplies of surrounding areas, the County shall require approval of the project to be dependent upon adequate mitigation. The County shall require that costs of mitigating such adverse impacts to water supplies be borne proportionately by all parties to the proposal.
Policy PF-C.17:	The County shall, prior to consideration of any discretionary project related to land use, undertake a water supply evaluation.
Policy PF-C.18:	In the case of lands entitled to surface water, the County shall approve only land use-related projects that provide for or participate in effective utilization of the surface water entitlement.
Policy PF-C.21:	The County shall promote the use of surface water for agricultural use to reduce groundwater table reductions.
Policy PF-C.22:	The County supports short-term water transfers as a means for local water agencies to maintain flexibility in meeting water supply requirements. The County shall support long-term transfer, assignment, or sale of water and/or water entitlements to users outside of the County only under circumstances identified in the General Plan.
Policy PF-C.23:	The County shall regulate the transfer of groundwater for use outside of Fresno County. The regulation shall extend to the substitution of groundwater for transferred surface water.
Policy PF-C.24:	The County shall encourage the transfer of unused or surplus agricultural water to urban uses within Fresno County.
Policy PF-C.25:	The County shall require that all new development within the County use water conservation technologies, methods, and practices as established by the County.
Policy PF-C.26:	The County shall encourage the use of reclaimed water where economically, environmentally, and technically feasible.
Policy PF-C.27:	The County shall adopt, and recommend to all cities that they also adopt, the most cost-effective urban best water conservation management practices circulated and updated by the California Urban Water Agencies, California Department of Water Resources, or other appropriate agencies.
Policy PF-C.28:	The County shall encourage agricultural water conservation where economically, environmentally, and technically feasible.
Policy PF-C.29:	The County shall, in order to reduce excessive water usage, require tiered water pricing within County service areas and County waterworks districts.

Goal PF-C:	To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.
Policy PF-C.30:	The County shall generally not approve land use-related projects that incorporate a manmade lake or pond that will be sustained by the use of groundwater.

Storm Drainage and Flood Control

Policies in this section seek to ensure safe, efficient, and environmentally sound means to drain stormwater and provide flood control by providing necessary facility improvements, ensuring adequate funding, providing a means to detain/retain runoff, and ensuring the facilities meet state environmental regulations.

Goal PF-E:	To provide efficient, cost-effective, and environmentally sound storm drainage and flood control facilities that protect both life and property and to divert and retain stormwater runoff for groundwater replenishment.
Policy PF-E.1:	The County shall coordinate with the agencies responsible for flood control or storm drainage to assure that construction and acquisition of flood control and drainage facilities are adequate for future urban growth authorized by the County General Plan and city general plans.
Policy PF-E.2:	The County shall encourage the agencies responsible for flood control of storm drainage to coordinate the multiple use of flood control and drainage facilities with other public agencies.
Policy PF-E.3:	The County shall encourage the Fresno Metropolitan Flood Control District to spread the cost of construction and acquisition of flood control and drainage facilities in the most equitable manner consistent with the growth and needs of this area.
Policy PF-E.4:	The County shall encourage the local agencies responsible for flood control or storm drainage to require that storm drainage systems be developed and expanded to meet the needs of existing and planned development.
Policy PF-E.5:	The County shall only approve land use-related projects that will not render inoperative any existing canal, encroach upon natural channels, and/or restrict natural channels in such a way as to increase potential flooding damage.
Policy PF-E.6:	The County shall require that drainage facilities be installed concurrently with and as a condition of development activity to ensure the protection of the new improvements as well as existing development that might exist within the watershed.
Policy PF-E.7:	The County shall require new development to pay its fair share of the costs of Fresno County storm drainage and flood control improvements within unincorporated areas.
Policy PF-E.8:	The County shall encourage the local agencies responsible for flood control or storm drainage to precisely locate drainage facilities well in advance of anticipated construction, thereby facilitating timely installation and encouraging multiple construction projects to be combined, reducing the incidence of disruption of existing facilities.
Policy PF-E.9:	The County shall require new development to provide protection from the 100-year flood as a minimum.
Policy PF-E.10:	In growth areas within the jurisdiction of a local agency responsible for flood control or storm drainage, the County shall encourage that agency to design drainage facilities as if the entire areas of service were developed to the pattern reflected in the adopted General Plans to assure that the facilities will be adequate as the land use intensifies.
Policy PF-E.11:	The County shall encourage project designs that minimize drainage concentrations and maintain, to the extent feasible, natural site drainage patterns.
Policy PF-E.12:	The County shall coordinate with the local agencies responsible for flood control or storm drainage to ensure that future drainage system discharges comply with applicable State and Federal pollutant discharge requirements.
Policy PF-E.13:	The County shall encourage the use of natural stormwater drainage systems to preserve and enhance natural drainage features.
Policy PF-E.14:	The County shall encourage the use of retention-recharge basins for the conservation of water and the recharging of the groundwater supply.

Goal PF-E:	To provide efficient, cost-effective, and environmentally sound storm drainage and flood control facilities that protect both life and property and to divert and retain stormwater runoff for groundwater replenishment.
Policy PF-E.15:	The County should require that retention-recharge basins be suitably landscaped to complement adjacent areas and should, wherever possible, be made available to the community to augment open space and recreation needs.
Policy PF-E.16:	The County shall minimize sedimentation and erosion through control of grading, cutting of trees, removal of vegetation, placement of roads and bridges, and use of off-road vehicles. The County shall discourage grading activities during the rainy season, unless adequately mitigated, to avoid sedimentation of creeks and damage to riparian habitat.
Policy PF-E.17:	The County shall encourage the local agencies responsible for flood control or storm drainage retention-recharge basins located in soil strata strongly conducive to groundwater recharge to develop and operate those basins in such a way as to facilitate year-round groundwater recharge.
Policy PF-E.18:	The County shall encourage the local agencies responsible for flood control or storm drainage to plan retention-recharge basins on the principle that the minimum number will be the most economical to acquire, develop, operate, and maintain.
Policy PF-E.19:	In areas where urbanization or drainage conditions preclude the acquisition and use of retention-recharge basins, the County shall encourage the local agencies responsible for flood control or stormwater drainage to discharge storm or drainage water into major canals and other natural water courses subject to established conditions.
Policy PF-E.20:	The County shall require new development of facilities near rivers, creeks, reservoirs, or substantial aquifer recharge areas to mitigate any potential impacts of release of pollutants in floodwaters, flowing rivers, streams, creeks, or reservoir waters.
Policy PF-E.21:	The County shall require the use of feasible and practical best management practices (BMPs) to protect streams from the adverse effects of construction activities, and shall encourage the urban storm drainage systems and agricultural activities to use BMPs.
Policy PF-E.22:	The County shall encourage the local agencies responsible for flood control or storm drainage to control obnoxious odors or mosquito breeding conditions connected with any agency facility by appropriate measures.

Fire Protection and Emergency Medical Services

Policies in this section seek to ensure the prompt and efficient provision of fire and emergency medical facility and service needs, ensure adequate funding is available in new development areas, and protect the life and property of residents of and visitors to Fresno County.

Goal PF-H:	To ensure the prompt and efficient provision of fire and emergency medical facility and service needs, to protect residents of and visitors to Fresno County from injury and loss of life, and to protect property from fire.
Policy PF-H.1:	The County shall work cooperatively with local fire protection districts to ensure the provision of effective fire and emergency medical services to unincorporated areas within the County.
Policy PF-H.2:	Prior to the approval of development projects, the County shall determine the need for fire protection services. New development in unincorporated areas of the County shall not be approved unless adequate fire protection facilities are provided.
Policy PF-H.3:	The County shall require that new fire stations be located to achieve and maintain a service level capability consistent with services for existing land uses.
Policy PF-H.4:	The County shall reserve adequate sites for fire and emergency medical facilities in unincorporated locations in the County.
Policy PF-H.5:	The County shall require that new development be designed to maximize safety and minimize fire hazard risks to life and property.
Policy PF-H.6:	The County shall limit development to very low densities in areas where emergency response times will be more than 20 minutes.

Goal PF-H:	To ensure the prompt and efficient provision of fire and emergency medical facility and service needs, to protect residents of and visitors to Fresno County from injury and loss of life, and to protect property from fire.
Policy PF-H.7:	The County shall encourage local fire protection agencies in the County to maintain the following as minimum fire protection standards (expressed as Insurance Service Organization (ISO) ratings): a. ISO 4 in urban areas; b. ISO 6 in suburban areas; and c. ISO 8 in rural areas.
Policy PF-H.10:	The County shall ensure that all proposed developments are reviewed for compliance with fire safety standards by responsible local fire agencies per the Uniform Fire Code and other State and local ordinances.

Open Space and Conservation Element

The Open Space and Conservation Element is concerned with protecting and preserving natural resources, preserving open space areas, managing the production of commodity resources, protecting and enhancing cultural resources, and providing recreational opportunities. Applicable goals and policies are presented below.

Productive Resources

Water Resources

Policies in this section seek to protect and enhance the surface water and groundwater resources in the County. The policies address broad water planning issues, groundwater recharge, the relationship of land use decisions to water issues, and water quality problems.

Goal OS-A:	To protect and enhance the water quality and quantity in Fresno County's streams, creeks, and groundwater basins.
Policy OS-A.1:	The County shall develop, implement, and maintain a plan for achieving water resource sustainability, including a strategy to address overdraft and the needs of anticipated growth.
Policy OS-A.2:	The County shall provide active leadership in the regional coordination of water resource management efforts affecting Fresno County and shall continue to monitor and participate in, as appropriate, regional activities affecting water resources, groundwater, and water quality.
Policy OS-A.3:	The County shall provide active leadership in efforts to protect, enhance, monitor, and manage groundwater resources within its boundaries.
Policy OS-A.4:	The County shall update, implement, and maintain its Groundwater Management Plan.
Policy OS-A.5:	The Fresno County Water Advisory Committee shall provide advice to the Board of Supervisors on water resource management issues.
Policy OS-A.6:	The County shall support efforts to create additional water storage that benefits Fresno County, and is economically, environmentally, and technically feasible.
Policy OS-A.7:	The County shall develop a repository for the collection of County water resource information and shall establish and maintain a centralized water resource database. The database shall incorporate surface and groundwater data and provide for the public dissemination of water resource information.
Policy OS-A.8:	The County shall develop and maintain a water budget (i.e., an accounting of all inflows and outflows of water into a specified area) for the County to aid in the determination of existing and future water resource needs. The water budget shall be incorporated into the County Geographic Information System (GIS) and included in the water resource database.
Policy OS-A.9:	The County shall develop, implement, and maintain a program for monitoring groundwater quantity and quality within its boundaries. The results of the program shall be reported annually and shall be included in the water resource database.

Goal OS-A:	To protect and enhance the water quality and quantity in Fresno County's streams, creeks, and groundwater basins.
Policy OS-A.10:	The County shall develop and maintain an inventory of sites within the County that are suitable for groundwater recharge. The sites shall be incorporated into the County GIS and included in the water resource database.
Policy OS-A.11:	The County shall develop and implement public education programs designed to increase public participation in water conservation and water quality awareness.
Policy OS-A.13:	The County shall encourage, where economically, environmentally, and technically feasible, efforts aimed at directly or indirectly recharging the County's groundwater.
Policy OS-A.14:	The County shall support and/or engage in water banking (i.e., recharge and subsequent extraction for direct and/or indirect use on lands away from the recharge area) based on the established criteria.
Policy OS-A.15:	The County shall, to the maximum extent possible, maintain local groundwater management authority and pursue the elimination of unwarranted institutional, regulatory, permitting, and policy barriers to groundwater recharge within Fresno County.
Policy OS-A.16:	The County shall permit and encourage, where economically, environmentally, and technically feasible, overirrigation of surface water as a means to maximize groundwater recharge.
Policy OS-A.17:	The County shall directly and/or indirectly participate in the development, implementation, and maintenance of a program to recharge the aquifers underlying the County. The program shall make use of flood and other waters to offset existing and future groundwater pumping.
Policy OS-A.19:	The County shall require the protection of floodplain lands and, where appropriate, acquire public easements for purposes of flood protection, public safety, wildlife preservation, groundwater recharge, access, and recreation.
Policy OS-A.20:	The County shall support the policies of the San Joaquin River Parkway Master Plan to protect the San Joaquin River as an aquatic habitat, recreational amenity, aesthetic resource, and water source.
Policy OS-A.21:	The County shall, where economically, environmentally, and technically feasible, encourage the multiple use of public lands, including County lands, to include groundwater recharge.

Natural Resources

Wetland and Riparian Areas

Policies in this section seek to protect riparian and wetland habitats in the County while allowing compatible uses where appropriate.

Goal OS-D:	To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions will positively affect aesthetics, water quality, floodplain management, ecological function, and recreation/tourism.
Policy OS-D.1:	The County shall support the "no-net-loss" wetlands policies of the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. Coordination with these agencies at all levels of project review shall continue to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed.
Policy OS-D.2:	The County shall require new development to fully mitigate wetland loss for function and value in regulated wetlands to achieve "no-net-loss" through any combination of avoidance, minimization, or compensation. The County shall support mitigation banking programs that provide the opportunity to mitigate impacts to rare, threatened, and endangered species and/or the habitat that supports these species in wetland and riparian areas.
Policy OS-D.3:	The County shall require development to be designed in such a manner that pollutants and siltation do not significantly degrade the area, value, or function of wetlands. The County shall require new developments to implement the use of best management practices to aid in this effort.
Policy OS-D.7:	The County shall support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient storage, and wildlife habitats.

Vegetation

Policies in this section seek to protect native vegetation resources primarily on private land within the County.

Goal OS-F:	To preserve and protect the valuable vegetation resources of Fresno County.
Policy OS-F.1:	The County shall encourage landowners and developers to preserve the integrity of existing terrain and natural vegetation in visually-sensitive areas such as hillsides and ridges, and along important transportation corridors, consistent with fire hazard and property line clearing requirements.
Policy OS-F.2:	The County shall require developers to use native and compatible nonnative plant species, especially drought-resistant species, to the extent possible, in fulfilling landscaping requirements imposed as conditions of discretionary permit approval or for project mitigation.
Policy OS-F.6:	The County shall require that development on hillsides be limited to maintain valuable natural vegetation, especially forests and open grasslands, and to control erosion.
Policy OS-F.7:	The County shall require developers to take into account a site's natural topography with respect to the design and siting of all physical improvements in order to minimize grading.
Policy OS-F.9:	The County shall support the continued use of prescribed burning to mimic the effects of natural fires to reduce fuel volumes and associated fire hazards to human residents and to enhance the health of biotic communities.

Recreation and Cultural Resources

Parks and Recreation

Policies in this section seek to enhance recreational opportunities in the County by encouraging the further development of public and private recreation lands, and requiring development to help fund additional parks and recreation facilities.

Goal OS-H:	To designate land for and promote the development and expansion of public and private recreational facilities to serve the needs of residents and visitors.
Policy OS-H.11:	The County shall support the policies of the San Joaquin River Parkway Master Plan to protect the San Joaquin River as an aquatic habitat, recreational amenity, aesthetic resource, and water source.
Policy OS-H.13:	The County shall require that structures and amenities associated with the San Joaquin River Parkway be designed and sited to ensure that such features do not obstruct flood flows, do not create a public safety hazard, or result in a substantial increase in off-site water surface elevations, and that they conform to the requirements of other agencies having jurisdiction. For permanent structures, such as bridge overcrossings, the minimum level of flood design protection shall be the greater of the Standard Project Flood (which is roughly equivalent to a 250-year event) or the riverine requirements of other agencies having jurisdiction to ensure flood flows are not dammed and to prevent flooding on surrounding properties.

Historic, Cultural, and Geological Resources

Policies in this section seek to preserve the historic, archeological, paleontological, geological, and cultural resources of the County through development review, acquisition, encouragement of easements, coordination with other agencies and groups, and other methods.

Goal OS-J:	To identify, protect, and enhance Fresno County's important historical, archeological, paleontological, geological, and cultural sites and their contributing environment.
Policy OS-J.1:	The County shall require that discretionary development projects, as part of any required CEQA review, identify and protect important historical, archeological, paleontological, and cultural sites and their contributing environment from damage, destruction, and abuse to the maximum extent feasible. Project-level mitigation shall include accurate site surveys, consideration of project alternatives to preserve archeological and historic resources, and provision for resource recovery and preservation when displacement is unavoidable.

Fresno County Ordinances

The Fresno County General Plan provides policy direction for land use, development, open space protection, and environmental quality, but this policy direction must be carried out through numerous ordinances, programs, and agreements. The following ordinances are among the most important tools for implementing the general plan and/or are critical to the mitigation of hazards identified in this plan.

Emergency Organization (Title 2, Chapter 2.44)

The declared purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within the County in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of the County with all other public agencies, corporations, organizations, and affected private persons.

Health Authority (Title 8, Chapter 8.70)

Among the primary purposes of the health authority are to meet the problems of delivery of publicly assisted medical care in the County and to demonstrate ways of promoting quality care and cost efficiency.

Groundwater Management (Title 14, Chapter 14.03)

This chapter protects the County's important groundwater resources by requiring a permit from the County to extract, on a long-term basis, groundwater for transfer outside the County, including groundwater extracted to replace a surface water supply that has been, is being, or will be transferred for long-term use outside of Fresno County. This chapter is limited to requiring a permit for the long-term direct or indirect transfer of groundwater outside the County and is not intended to regulate groundwater in any other way.

Building Code (Title 15, Chapter 15.08)

This chapter adopts the California Building Code, including the appendices, as referenced, except as otherwise provided in the 2001 California Building Standards Code and the Uniform Building Code Standards.

Fire Code (Title 15, Chapter 15.10)

This chapter adopts the California Fire Code as referenced in the 2001 California Fire Code.

Grading and Excavation (Title 15, Chapter 15.28)

This chapter establishes that Chapter 33 and Chapter 33 of the Appendix of the 1998 California Building Code is adopted by reference and except as otherwise provided is applicable to and shall cover all grading and excavation within the unincorporated area of the County.

Flood Hazard Areas (Title 15, Chapter 15.48)

It is the purpose of this chapter to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

This chapter includes methods and provisions to:

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

Requirements of this chapter apply to all new development, substantial improvements, minor improvements, and conversions of existing nonresidential structures to residential uses within flood hazard areas. Notably, it requires that a development permit be obtained before start of construction or beginning of development within any area of special flood hazard. It appoints the

director of the Public Works and Planning Department to administer and implement the chapter by granting or denying development permit applications in accordance with its provisions.

This chapter addresses the following for construction in areas of special flood hazard:

- Standards of construction
- Standards for storage of materials and equipment
- Standards for utilities
- Standards for subdivisions
- Standards for manufactured homes and manufactured home parks and subdivision
- Provisions for floodway development

California Department of Forestry State Responsibility Area Fire Safe Regulations of the County (Title 15, Chapter 15.60)

This chapter provides for basic emergency access, perimeter wildfire protection measures, signing and building numbering, private water supply reserves for emergency fire use, and vegetation modification.

Development requirements in this chapter address setbacks for structures, road improvements, road width, cul-de-sacs and dead-end roads, one-way roads, driveways, gates, road signs, building signs, flammable vegetation and fuels, water supply, and hydrant locations.

Fire District Development Impact Mitigation Fees (Title 15, Chapter 15.64)

The purpose of this chapter is to implement the Fresno County General Plan policy providing for the adoption of development impact mitigation fees and for the collection of such fees at the time of the issuance of building permits or other permits. Subject to the requirements of this chapter, such fees are to be allocated to a fire district within the Fresno County for the acquisition of capital facilities to ensure the provision of the capital facilities necessary to maintain current levels of fire protection services necessitated by new development.

Subdivisions (Title 17, Chapters 17.01-17.60)

Chapters 17.04 through 17.60 makeup Fresno County's subdivision ordinance, which is deemed necessary to protect the public health, safety, and general welfare. It addresses orderly growth and development of the County; beneficial use of land in the public interest; and conservation, stabilization, and protection of property values and assures adequate provision for necessary utilities, public roads, and other public conveniences in subdivided areas. The subdivision ordinance regulates the design and improvement of land divisions and the dedication of public improvements needed in connection with land divisions. All land divisions must by law be consistent with the general plan and the zoning ordinance.

Drainage of Land (Title 17, Chapter 17.64)

Since the development of land for urban uses substantially accelerates the concentration of surface water and stormwater, it is necessary to require the construction of, and to establish and collect fees to defray the actual or estimated cost of, planned local drainage facilities for the control and safe disposal of surface water and stormwater from local drainage areas to promote and protect the public welfare, safety, peace, comfort, convenience, and the general welfare.

Fresno County Zoning Ordinance

The purpose of the zoning ordinance is to classify and regulate the best use of buildings, structures, and land in the unincorporated area of Fresno County in a manner consistent with the Fresno County General Plan. This ordinance incorporates zoning regulations implementing the Fresno County General Plan and all of its elements.

One of the zones created by the ordinance is the Open Space Conservation District (Section 815). This zone is intended to provide for permanent open spaces in the community and to safeguard the health, safety, and welfare of the people by limiting developments in areas where police and fire protection, protection against flooding by stormwater, and dangers from excessive erosion are not possible without excessive costs to the community.

Fresno Area Regional Groundwater Management Plan

The Fresno Area Regional Groundwater Management Plan is a comprehensive strategy to enhance and maintain the quantity and quality of local groundwater resources. It provides a vehicle for future groundwater management actions. As part of a regional effort, other basin-specific plans have also been developed for the Kings River and San Joaquin River basins. There are also efforts to create a statewide water management plan. All plans are coordinated for the County through the Public Works and Planning departments.

Fresno County Hazardous Waste Management Plan

The Fresno County Hazardous Waste Management Plan is designed to ensure that safe, effective, and economical facilities for the management of hazardous wastes are available when they are needed. To attain this goal, the plan establishes goals, policies, and programs to encourage the safe handling, storage, and transportation of hazardous materials. The Fresno County Environmental Health Department administers this plan.

Special Districts

There are numerous special districts that provide a variety of public services in Fresno County. Special districts can provide one or more types of public services, facilities, or infrastructure within a prescribed boundary, and they play an important role in growth management because the availability of their services can encourage or discourage new development. Special districts can tax the properties within their boundaries to pay for the services they provide. Monthly fees

may also be assessed. Some of the special districts that provide mitigation-related services in Fresno County are presented below.

Fresno Metropolitan Flood Control District

The Fresno Metropolitan Flood Control District is a special act district. It was created to provide fully coordinated and comprehensive stormwater management and related services on a regional basis through a quasi-joint powers relationship between the Cities of Fresno and Clovis and the County of Fresno. The district service area includes most of the Fresno-Clovis metropolitan area (excluding the community of Easton), and unincorporated lands to the east and northeast.

The mission of the district is to provide to the citizens living within its boundaries the ability to control and manage the water resources of the area so as to prevent damage, injury, and inconvenience; to conserve such waters for local, domestic, and agricultural use; and to maximize the public use and benefit of the district's programs and infrastructure. The district maintains a services plan that presents district goals, program objectives, current program descriptions, and implementation strategies.

(See Annex J: Fresno Metropolitan Flood Control District for more information.)

Lower San Joaquin Levee District

The Lower San Joaquin Levee District is a special act district. It was created to operate, maintain, and repair levees, bypasses, and other facilities built in connection with the Lower San Joaquin River Flood Control Project. The district encompasses approximately 468 square miles in Fresno, Madera, and Merced counties, of which 94 square miles are in Fresno County.

(See Annex K: Lower San Joaquin Levee District for more information.)

Kings River Conservation District

The Kings River Conservation District is a special act district. It is responsible for planning for the proper management of water within its service area, including essential flood control and groundwater management services. The district contains about 2,049 square miles in Fresno, Kings, and Tulare counties. The Fresno County portion has 1,001 square miles. It encompasses the Cities of Clovis, Fresno, Fowler, Kerman, Kingsburg, Parlier, Reedley, San Joaquin, Sanger, and Selma and intervening agricultural lands.

Fresno County Fire Protection Districts

Fire protection districts provide a variety of services, which may include fire protection, rescue, emergency medical, hazardous material emergency response, and ambulance services.

- Bald Mountain Fire Protection District
- Fig Garden Fire Protection District
- Fresno County Fire Protection District

- North Central Fire Protection District
- Orange Cove Fire Protection District

Fresno County Irrigation Districts

Irrigation districts provide water for irrigation to users within their boundaries. They may also use water under their control for other beneficial purposes and provide flood protection measures.

- Alta Irrigation District
- Central California Irrigation District
- Consolidated Irrigation District
- Fresno Irrigation District
- Hills Valley Irrigation District
- James Irrigation District
- Laguna Irrigation District
- Orange Cove Irrigation District
- Riverdale Irrigation District
- Tranquillity Irrigation District

Fresno County Drainage Districts

Drainage districts control storm and other waste waters within a district's boundaries, protect property and infrastructure within a district from damage by stormwater or wastewater, and conserve stormwater and waste water for beneficial purposes.

- Camp 13 Drainage District
- Dos Palos Drainage District
- Panoche Drainage District
- Silver Creek Drainage District

Fresno County Mosquito Abatement Districts

Mosquito abatement districts provide mosquito surveillance and control.

- Coalinga-Huron Mosquito Abatement District
- Consolidated Mosquito Abatement District
- Fresno Mosquito and Vector Control District
- Fresno-Westside Mosquito Abatement District

Fresno County Pest Control Districts

Pest control districts are comprised of local growers to control, eradicate, or respond to the effects of pests and/or diseases affecting crops.

- Central Valley Pest Control District
- West Fresno County Red Scale Protective District

Reclamation Districts

Reclamation districts reclaim and protect any body of swampland and overflowed salt marsh, tidelands, or other lands subject to overflow to irrigate lands inside or outside their boundaries. Services include drainage, levee maintenance, and irrigation services.

- No. 1606
- Zalda No. 801

Fresno County Resource Conservation Districts

Resource conservation districts address a wide variety of conservation issues such as forest fuel management, water and air quality, wildlife habitat restoration, soil erosion control, conservation education, and much more.

- Excelsior/Kings River Resource Conservation District
- Firebaugh Resource Conservation District
- James Resource Conservation District
- Los Banos Resource Conservation District
- Navelencia Resource Conservation District
- Panoche Resource Conservation District
- Poso Resource Conservation District
- San Luis Resource Conservation District
- Sierra Resource Conservation District (See Annex L)
- Tranquillity Resource Conservation District
- Westside Resource Conservation District

Fresno County Water Districts (California)

Water districts provide water services. Powers may include the acquisition and operation of works for the production, storage, transmission, and distribution of water for irrigation, domestic, industrial, and municipal purposes and any related drainage or reclamation works.

- Broadview Water District
- Eagle Field Water District
- Farmers Water District
- Firebaugh Canal Water District

- Fresno Slough Water District
- Garfield Water District
- International Water District
- Kings River Water District
- Liberty Water District
- Mercy Springs Water District
- Mid-Valley Water District
- Oro Loma Water District
- Pacheco Water District
- Panoche Water District
- Pleasant Valley Water District
- Raisin City Water District
- San Luis Water District
- Santa Rita Water District
- Stinson Water District
- Tri-Valley Water District
- Westlands Water District
- Wildren Water District

Fresno County Water Districts (County)

County water districts furnish imported water.

- Freewater County Water District
- Malaga County Water District
- Pinedale County Water District

Fresno County Local Boards, Commissions, and Committees

There are a number of local boards, commissions, and committees in Fresno County. Those that have responsibilities related to hazard mitigation are described briefly below.

- **Agricultural Land Conservation Committee**—This committee reviews agricultural preserve applications and makes recommendations to the Board of Supervisors.
- **Association of Metropolitan Water Agencies**—This organization is charged with providing sufficient quality water to satisfy future requirements for municipal, industrial, and agricultural uses within the areas served by the member agencies.
- **Planning Commission**—This commission has jurisdiction, powers, and duties to formulate, approve, adopt, and enact general plans, zoning ordinances, official plans, and precise plans and do any and all things related to local and area planning.
- **Water Advisory Committee**—This committee advises the Board of Supervisors on water resource matters that affect or may affect Fresno County.

Fire Safe Councils

The Fire Safe Council provides resources for establishing and maintaining local fire safe councils to mobilize Californians to protect their homes, communities, and environments from wildfire. These councils serve as forums for stakeholders to share and validate fire safety and fire planning information. There are two fire safe councils in Fresno County:

- Highway I-168 Fire Safe Council (northeastern Fresno County, see Annex L)
- Highway I-80 Oak to Timberline Fire Safe Council (southeastern Fresno County)

4.5.2 Fresno County's Administrative/Technical Mitigation Capabilities

Table 4.59 identifies the County personnel responsible for activities related to mitigation and loss prevention in Fresno County.

Table 4.59. Fresno County's Administrative and Technical Mitigation Capabilities

Personnel Resources	Department/Position
Planner/engineer with knowledge of land development/land management practices	Public Works and Planning Development Services Division, principal planner/senior engineer
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Public Works and Planning Development Services Division, supervising plan check engineer/senior engineer
Planner/engineer/scientist with an understanding of natural hazards	Public Works and Planning Development Services Division (no one official is designated, all are familiar)
Personnel skilled in GIS	Public Works and Planning, Development Services Division, staff analyst; Computer Data Services
Full-time building official	Public Works and Planning Development Services Division, director
Floodplain manager	Public Works and Planning Development Services Division
Emergency manager	Office of Emergency Services
GIS data—Hazard areas	Public Works and Planning, Development Services Division, staff analyst (Very limited)
GIS data—Critical facilities	Office of Emergency Services
GIS data—Land use	Public Works and Planning Development Services Division, staff analyst
GIS data—Assessor's data	Public Works and Planning, Development Services Division, staff analyst; Computer Data Services

Fresno County Department of Community Health

A number of important mitigation programs and services are located in the Fresno County Department of Community Health, which provides health promotion, surveillance, and disease prevention services to protect the public health. Some of these are described below:

Office of Emergency Services/Fresno County Operational Area Master Emergency Services Plan

The Fresno County Office of Emergency Services (OES) is within the Department of Public Health. The OES coordinates planning, preparedness, response, and recovery efforts for disasters in unincorporated Fresno County.

The department coordinates the development and maintenance of the Fresno County Operational Area Master Emergency Services Plan, which serves as a guide for the County's response to emergencies/disasters in the unincorporated areas of the Fresno County Operational Area, and to coordinate and assist with disaster response in jurisdictions both within and outside of the Fresno County Operational Area. Five plan elements supplement the master plan: Dam Failure Evacuation, Radio Amateur Civil Emergency Service, Resources Directory, Emergency Procedures for Potable Water Procurement and Distribution, and Hazardous Material Incident Response.

Certified Unified Program Agency

The Certified Unified Program Agency (CUPA) is responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that require hazardous materials business plans, require California accidental release prevention plans or federal risk management plans, operate storage tanks, generate hazardous waste(s), and have onsite treatment of hazardous waste(s)/tiered permits.

Land Use Program

Land Use program staff are responsible for reviewing proposed land use development applications submitted to the various planning agencies in the County and providing comments regarding project compliance with the appropriate environmental health standards relative to the staff's areas of expertise. The program evaluates proposed land developments for compliance with laws and regulations pertaining to domestic and public water supplies and vector control, among other things.

Water Surveillance Program

The Water Surveillance Program permits, monitors, and inspects small public water systems and state small water systems within Fresno County and permits new water well construction, reconstruction of existing wells, and destruction of abandoned wells within unincorporated Fresno County. These activities are designed to help assure that a reliable supply of pure, wholesome, and potable water is provided to small public and state small water systems within Fresno County. In addition, the water well permitting program helps assure that private water wells are constructed to minimize the potential for contamination of the groundwater supply and eliminate safety hazards associated with abandoned wells.

Communicable Disease Division

The Communicable Disease Division of the Public Health Department participates in hazard mitigation in several ways, including immunizations, education, and preventive medication to prevent and/or control the spread of disease. The ultimate result is a reduction in human suffering, medical costs, and lost productivity.

In the case of a pandemic influenza or bio-terrorism event, the division would mobilize to mitigate the effects on the general population as well as first responders and essential personnel by administering antivirals, antibiotics, and immunizations. The County has a pandemic response plan that is implemented by this division.

Education and Prevention Services

Education and Prevention Services supports the public health objectives of the Department of Community Health. It conducts research on current health issues and, where appropriate, develops and implements programs to provide information, education, and services that promote and improve the public health and safety within the Fresno community. Staff also participate in a variety of public health partnerships with schools, community-based organizations, health and safety coalitions, public health agencies, managed care, medical institutions, and community members. Activities include:

- Conducting research and development on identified unmet public health needs;
- Developing, implementing, and evaluating primary prevention interventions intended to address targeted health needs of children, youth, and families;
- Providing consumer, youth, and employer health and wellness education;
- Creating and implementing informational marketing campaigns on health and safety topics;
- Coordinating selected training, assessment, and evaluation activities for the department.

Public Health Laboratory

The Public Health Laboratory provides surveillance and detects the presence of disease producing agents that have the potential to adversely affect the health of an entire community. The information generated by this testing is furnished to other agencies and departments to be used for the purpose of monitoring infectious disease outbreaks and environmental threats to the public's health. The information can then be used to plan containment strategies and assess the effectiveness of various health education programs.

Fresno County Heat Emergency Contingency Plan

Administered by a number of the departments within the Department of Community Health, the Fresno County Heat Emergency Contingency Plan was developed to reduce the incidence of morbidity and mortality associated with local extreme heat events. The plan describes County operations during heat-related emergencies and provides guidance for County departments and personnel.

Fresno County Department of Public Works and Planning

The Fresno County Department of Public Works and Planning is responsible for a wide variety of programs and activities related to planning, zoning, permits, water, community service districts, housing, community and economic development, and roads and bridges for the unincorporated portion of Fresno County. Most of the department's mitigation activities take place in the Development Services Division, which consists of the following sections:

- **Building and Safety Section**—Responsibilities include administration of building codes and regulations to ensure the public's safety.
- **Land Development, Policy Planning, and Environmental Analysis sections**—Responsibilities include processing of land use applications, land division, the County's general plan and specific plans, urban growth management, and project-related amendments to zoning text.
- **Water, Geology, and Natural Resources Section**—Responsibilities include water planning, analysis, and administration of County water-related issues.

The department's Community Development Division provides a variety of services and activities to improve the quality of life and ensure a healthy economy for residents of unincorporated Fresno County and its partner cities. The division is responsible for the administration of the Community Development Block Grant Program, which provides funding, including mitigation funding, to upgrade low and moderate income neighborhoods.

The department is also responsible for floodplain administration and administers the National Flood Insurance Program (NFIP) for unincorporated areas of the County. The NFIP is a FEMA program that makes flood insurance available to communities that have enacted local ordinances restricting development within the 100-year floodplain. Fresno County has been an NFIP participant since 1982.

Floodplain management in Fresno County is guided by the 2005 FEMA Flood Insurance Study, which contains revised and updated information on flood hazards in the geographic area of Fresno County, including the Cities of Clovis, Coalinga, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cover, Parlier, Reedley, Sanger, San Joaquin, and Selma and the unincorporated areas of Fresno County. This study developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management.

Fresno County Department of Agriculture

The Fresno County Department of Agriculture, under direction of the California Department of Food and Agriculture, is responsible for conducting regulatory and service functions pertaining to the multi-billion dollar agricultural industry in Fresno County. The primary purpose and objective of the department is the promotion and protection of the County agricultural industry and the general public. Three divisions carry out the department's program objectives:

- Pest Detection and Exclusion Division
- Environmental Protection and Pest Management Division
- Weights and Measures/Standardization and Statistics Division

County Administrative Office

The County Administrative Office functions as the operations arm of the County Board of Supervisors and carries out its mission of delivering the highest quality of public services. The office administers the County's $1.45 billion dollar budget that funds services in public safety, law enforcement, agriculture, public works, human services, libraries, and elections. It takes the lead in activities to improve the quality of life in Fresno County, including economic development, capital improvements, and tourism.

Fresno County Public Library

The Fresno County Public Library provides collections and services through its Central Resource Library and 34 branches. It is part of the San Joaquin Valley Library System, a cooperative network of nine public library jurisdictions in the counties of Fresno, Kern, Kings, Madera, Mariposa, and Tulare. The library is an excellent resource for information about hazards and emergency preparedness.

State and Federal Programs

A number of state and federal programs exist to provide technical and financial assistance to local communities for hazard mitigation. Some of the primary agencies/departments that are closely involved with local governments in the administration of these programs include:

- California Governor's Office of Emergency Services
  - State of California Multi-Hazard Mitigation Plan
- California Department of Water Resources (San Joaquin District)*
  - San Joaquin River Management Plan
- California Department of Forestry and Fire Protection (Fresno King's Unit)*
- California Environmental Protection Agency
- California Department of Fish and Game*
- California Department of Transportation (Caltrans)
- California Highway Patrol
- California State Parks and Recreation Department*
- California State Lands Commission*
- San Joaquin River Conservancy*
- Federal Emergency Management Agency (Region IX)
- U.S. Army Corps of Engineers (South Pacific Division/Sacramento District)*
- Bureau of Reclamation (Mid-Pacific Region, Hollister planning area)*
- USDA Forest Service (Pacific Southwest Region)*

- National Parks Service (Pacific West Region)*
- USDA Natural Resources Conservation Service (Fresno Service Center)*
- U.S. Environmental Protection Agency (Region IX)
- American Red Cross (Fresno/Madera)

*Owns and/or manages land and/or facilities (or has some sort of administrative role, e.g., fire protection) in the County, potential partner for mitigation activities

4.5.3 Fresno County's Fiscal Mitigation Capabilities

Table 4.60 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.60. Fresno County's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Based on direction of chief administrative officer and Board approval
Capital improvements project funding	Yes	Based on direction of chief administrative officer
Authority to levy taxes for specific purposes	Yes	Based on approval by Board of Supervisors and taxpayers
Fees for water, sewer, gas, or electric services	No/Yes	
Impact fees for new development	Yes	Based on approval by Board of Supervisors
Incur debt through general obligation bonds	Yes	Based on approval by Board of Supervisors, via County election process
Incur debt through special tax bonds	Yes	Based on approval by Board of Supervisors, via County election process
Incur debt through private activities	Yes	Based on approval by Board of Supervisors
Withhold spending in hazard prone areas	Yes	Based on direction of chief administrative officer and Board approval

5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the Fresno County Multi-Hazard Mitigation Plan. It describes how the County and participating jurisdictions met the requirements for the following from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the action plan in Section 5.3 Mitigation Action Plan. Taking all of the above into consideration, the HMPC developed the following overall mitigation strategy:

- **Communicate** the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- **Implement** the action plan recommendations of this plan.
- **Use** existing rules, regulations, policies, and procedures already in existence. Given the flood hazard in the planning area, an emphasis should be placed on continued compliance with the National Flood Insurance Program and participation by all communities in the Community Rating System.
- **Monitor** multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

5.1 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment with the HMPC. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and the ultimate mitigation strategy for the Fresno County planning area.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

HMPC members were given a list of sample goals to consider. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was each given three index cards and asked to write a goal statement on each card. Goal statements were collected and grouped into similar themes and pasted onto the wall of the meeting room. The goal statements were then grouped into similar topics. New goals from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use. Next, the HMPC developed objectives that summarized strategies to achieve each goal.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals and objectives, which provide the direction for reducing future hazard-related losses within the Fresno County planning area. In some instances, participating jurisdictions chose to modify the countywide goals to better reflect the desires specific to their communities. Modified goals are included in the jurisdictional annexes to this plan.

Goal 1: Provide Protection for People's Lives from Hazards

Objective 1.1: Provide timely notification and direction to the public of imminent and potential hazards

Objective 1.2: Protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters

Objective 1.3: Improve community transportation corridors to allow for better evacuation routes for the public and better access for emergency responders

Goal 2: Improve Communities' Capabilities to Mitigate Hazards and Reduce Exposure to Hazard-Related Losses

Objective 2.1: Reduce wildfires/protect life, property, and natural resources from damaging wildfires

Objective 2.2: Reduce flood and storm-related losses

Objective 2.3: Reduce hazards that adversely impact the agricultural industry

Objective 2.4: Minimize the impact to the communities due to recurring drought conditions that impact both ground water supply and the agricultural industry

Objective 2.5: Minimize the risk/loss to endangered species, native plants, land (erosion), and native wildlife

Goal 3: Improve Community and Agency Awareness about Hazards and Associated Vulnerabilities that Threaten Fresno County Planning Area Communities

Objective 3.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, what is vulnerable, and recommended responses to identified hazards (i.e., both preparedness and response)

Goal 4: Provide Protection for Critical Facilities, Utilities, and Services from Hazard Impacts

Goal 5: Maintain Coordination of Disaster Planning

Objective 5.1: Coordinate with changing U.S. Department of Homeland Security/FEMA needs

Objective 5.2: Coordinate with other community plans

Objective 5.3: Maximize the use of shared resources between jurisdictions and special districts for mitigation/communication

Objective 5.4: Standardize systems among agencies to provide for better interoperability

Goal 6: Maintain/Provide for FEMA Eligibility and Work to Position Jurisdictions for Grant Funding

Objective 6.1: Provide County departments and other jurisdictions with information regarding mitigation opportunities

Objective 6.2: As part of plan implementation, review actions in this plan on an annual basis to be considered for annual FEMA Pre-Disaster Mitigation grant allocations or after a presidential

disaster declaration in California for Hazard Mitigation Grant Program funding as well as for other local, state, and federal funding opportunities

5.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 Identifying Hazards: Natural Hazards was evaluated. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

These priority hazards are:

- Agricultural Hazards
- Dam Failure
- Drought
- Earthquake
- Flood
- Human Health Hazards
  - Epidemic/Pandemic
  - West Nile Virus
- Severe Weather
  - Extreme Temperatures
  - Fog
  - Heavy Rain/Thunderstorm/Hail/Lightning/Wind
- Wildfire

Hazardous materials release (from a fixed facility or transportation accident) was also identified by the HMPC as a priority hazard.

The HMPC eliminated the hazards identified below from further consideration in the development of mitigation actions because the risk of a hazard event in the County is unlikely or nonexistent, the vulnerability of the County is low, or capabilities are already in place to mitigate negative impacts. The eliminated hazards are:

- Avalanche
- Landslide
- Severe Weather
  - Snow

  - Tornado
- Soil Hazards
  - Erosion
  - Expansive Soils
  - Land Subsidence
- Volcano

It is important to note, however, that all the hazards addressed in this plan are included in the countywide multi-hazard public awareness mitigation action as well as in other multi-hazard, emergency management actions.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- Prevention
- Property protection
- Structural projects
- Natural resource protection
- Emergency services
- Public information

The HMPC was also provided with examples of potential mitigation actions for each of the above categories. A facilitated discussion then took place to examine and analyze the options. This was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

5.2.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another., STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?

- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the Disaster Mitigation Act requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?
- What will the action cost?
- What is the timing of available funding?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix C: Mitigation Categories, Alternatives, and Selection Criteria.

With these criteria in mind, HMPC members were each given a set of eighteen colored dots, six each of red, blue, and yellow. The dots were assigned red for high priority (worth five points), blue for medium priority (worth three points), and yellow for low priority (worth one point). The team was asked to use the dots to prioritize actions with the above criteria in mind. The point score for each action was totaled. Appendix C contains the total score given to each identified mitigation action.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to collectively prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. After completing the prioritization exercise, some team members expressed concern that prioritizing all the actions as a group is not very effective, since many of the actions are jurisdiction- or department-specific. However, the team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.3. Specifically, each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of a High, Medium, or Low priority for each action.

Recognizing the limitations in prioritizing actions from multiple jurisdictions and departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue mitigation action strategy development and implementation according to the nature and extent of damages, the level of protection and benefits each action provides, political support, project cost, available funding, and individual jurisdiction and department priority. This process drove the development of a prioritized action plan for the Fresno County planning area. Cost-effectiveness will be considered in greater detail through a formal benefit-cost analysis when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This action plan was developed to present the recommendations developed by the HMPC for how the Fresno County planning area can reduce the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. Table 5.1 identifies the mitigation actions and lead jurisdiction for each action. Only those actions where the County is the lead jurisdiction are detailed further in this section. Actions specific to other participating jurisdictions, or where other jurisdictions are taking the lead, are detailed in the jurisdictional annexes.

It is important to note that Fresno County and the participating jurisdictions have numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as community wildfire protection plans and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The Fresno County planning area also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Table 5.1 Fresno County's Mitigation Actions

Action	Lead Fresno County Jurisdiction
Multi-Hazard Mitigation Actions	
Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program	Fresno County

Action	Lead Fresno County Jurisdiction
Identify Critical Facilities and Inspect for Vulnerability to Major Hazards	Fresno County
Upgrade or Replace Critical County Facilities Found to be Vulnerable to Major Hazards	Fresno County
Implement Mass Notification System for Fresno County	Fresno County
Enhance the County Emergency Operations Center	Fresno County
Develop Animal Carcass Disposal Plan	Fresno County
Develop and Conduct Disaster Response/Disaster Management Training for Designated County/City Staff	Fresno County
Establish Post-Disaster Action Plan for City Continuity of Operations Plan	City of Clovis
Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment	City of Clovis
Construct a Water Intertie between the Cities of Clovis and Fresno	City of Clovis
Modernize Information Technology Backup Infrastructure	City of Clovis
Improve the City's Capabilities for Sheltering Animals in a Disaster	City of Clovis
Implement a System of Automatic Vehicle Location	City of Clovis
Install Battery Back-Up Systems at Traffic Signals in the City Of Clovis on Major Transportation Routes	City of Clovis
Replace Traffic Management Center Software and Herndon Avenue Traffic Signal Equipment and Implement Communications Upgrades	City of Clovis
Modify and Enhance Emergency Traffic Control System	City of Clovis
Purchase Hazard Mitigation Public Notification Boards	City of Clovis
Make Improvements to Emergency Evacuation and Emergency Vehicle Routes	City of Clovis
Implement a System to Share Information with City Police Officers/Employees (SharePoint)	City of Clovis
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Clovis
Establish Post-Disaster Action Plan for City Continuity of Operations Plan	City of Fresno
Improve the City's Capabilities for Sheltering Animals in a Disaster	City of Fresno
Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment	City of Fresno
Enhance Traffic Diversion System	City of Kingsburg
Conduct Disaster Response Training	City of Kingsburg
Establish Post-Disaster Action Plan for City Continuity of Operations Plan	City of Sanger
Install Battery Back-Up Systems at Traffic Signals in the City of Sanger on Major Transportation Routes	City of Sanger
Add Potable Water Storage Capacity (500,000 Gallon above Ground Tank) to the City of Sanger's Water System	City of Sanger
Provide Backup Power to City Pumps/Wells	City of Sanger
Institute a Disaster Preparedness Education Program for the Public	City of Selma
Multi-Hazard Mitigation Actions (continued)	
Construct a Railroad Crossing Underpass	City of Selma
Strengthen Non-Native Noxious Weed Control Efforts	Sierra Resource Conservation District
Agricultural Hazards Mitigation Actions	
Control E. Coli through Wild Hog Population Management	Fresno County
Control Bubonic Plague through Coyote and California Ground Squirrel Population Management	Fresno County
Dam Failure Mitigation Actions	

Action	Lead Fresno County Jurisdiction
Minimize Flood Events by Exercising Reclamation's Emergency Action Plan and Provide an Early Warning System to Downstream Emergency Response Agencies	Fresno County
Strengthen Dam Failure/Flood Planning, Coordination, and Training	Sierra Resource Conservation District
Drought Mitigation Actions	
Develop Mitigation and Monitoring Program for Groundwater Supplies in the Northeast Portion of the County	Fresno County
Create and Maintain a Water Stewardship Forum of Stakeholders in Northeastern Fresno County	Fresno County
Create an Integrated Regional Water Management Plan for Eastern Fresno County	Sierra Resource Conservation District
Conduct a Fractured Rock Groundwater Capacity Study for Eastern Fresno County	Sierra Resource Conservation District
Earthquake Mitigation Actions	
Conduct a Seismic Vulnerability Assessment of City-Owned Critical Facilities	City of Clovis
Inventory At-Risk Buildings	City of Coalinga
Improve Nonstructural Earthquake Mitigation in Public Buildings	City of Coalinga
Provide Bilingual Neighborhood Emergency Response Team (NERT) Training to Community Residents and Businesses	City of Coalinga
Flood Mitigation Actions	
Conduct Feasibility Study for Panoche-Silver Creek Flood Detention Facility (see Mendota)	Fresno County
Investigate and Construct Water Storage Options for the Upper San Joaquin River Basin	Fresno County
Analyze System, Condition, and Management of Flood Water Conveyance Facilities	Fresno County
Prepare Stormwater Drainage Master Plans	Fresno County
Construct Channel Improvements for Dog Creek Stream, South of Gettysburg-Ashlan	City of Clovis
Improve Flow Design Parameters for Big Dry Creek and the Enterprise Canal	City of Clovis
Implement a Flood Awareness Program for the Public	City of Clovis
Improve City's Floodplain Management Program and Apply to Community Rating System	City of Clovis
Continue to Enforce Master Drainage Plan Requirements	City of Clovis
Implement a Flood Awareness Program for the Public	City of Fresno
Conduct Local Floodwater Mitigation	City of Huron
California Avenue Parallel Storm Drain Line	City of Kerman
Replace Storm Drains on Lewis and Washington Streets	City of Kingsburg
Build a Stormwater Catch Basin	City of Mendota
Implement a Flood Awareness Program for the Public	City of Sanger
Improve City's Floodplain Management Program and Apply to Community Rating System	City of Sanger
Replace Old Drainage System to Prevent Flooding	City of Sanger
Install Back-up Power for Storm Drain Pumps	City of Selma
Sheridan Street Pump Station	City of Selma
Construct Control Structures and Flood Channel for Mud Creek Flows between the Gould and Fresno Canals	Fresno Metropolitan Flood Control District
Construct Improvements to the Vernon Drain Between the Gould and Fresno Canals	Fresno Metropolitan Flood Control District
Provide for Local Stormwater Drainage System Infrastructure	Fresno Metropolitan Flood Control District

Action	Lead Fresno County Jurisdiction
Retain 200-Year Flood Control Protection	Fresno Metropolitan Flood Control District
Retrofit Areas with Surface Outlets to Protect Existing Structures	Fresno Metropolitan Flood Control District
Install Back-up Generators for Pump Only Facilities	Fresno Metropolitan Flood Control District
Institute a Dredging Management Program for the Purpose of Flood Damage Reduction	Lower San Joaquin Levee District
Institute an Invasive Vegetation Management Program for the Purpose of Flood Damage Reduction	Lower San Joaquin Levee District
Human Health Hazards: West Nile Virus Mitigation Actions	
Control West Nile Virus through Beaver Population Management	Fresno County
Severe Weather: Fog Mitigation Actions	
Install Automated Fog Warning System	Fresno County
Warning Lights for the Intersection of State Route 145 and Highway 180	City of Kerman
Technological Hazards Mitigation Actions	
Construct New Police and Fire Department Headquarters	City of Selma
Wildfire Mitigation Actions	
Improve Alternate Emergency Access Roads	Sierra Resource Conservation District
Conduct Community Fuel Break Construction and Maintenance on a Landscape Scale	Sierra Resource Conservation District
Create a Fuel Break Along Highway 168	Sierra Resource Conservation District
Implement a Neighborhood Chipper Program	Sierra Resource Conservation District
Conduct Prescribed Fires	Sierra Resource Conservation District
Establish a System of Fire Pumper/Tanker Fill Stations and Water Storage	Sierra Resource Conservation District
Implement a Public Fire Prevention, Survival, and Mitigation Education Program	Sierra Resource Conservation District
Other Hazards Mitigation Actions	
Establish an Abandoned Water Well Program	Fresno County
Install a System of Surface Water Hazard Detection	City of Clovis
Provide Fire Department Office Security	City of Sanger
Provide Compound Security for Police and Fire Departments	City of Sanger

Multi-Hazard Mitigation Actions

1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program

Issue/Background: Fresno County is subject to several natural hazards. Each poses a different degree of risk and associated vulnerability. Some hazards have a combination of attributes, including a high likelihood of occurrence, a specific location that would likely be impacted, and proven approaches that could reduce the impact. For other hazards, where either the likelihood of occurrence is very low, the area of likely impact is not specifically known, or there is very little that can be done to reduce the impacts, the HMPC has determined that the best approach is public awareness. People should have information describing historical events and losses, the likelihood of future occurrences, the range of possible impacts, appropriate actions to save lives and minimize property damage, and where additional information can be found. Any information provided through this effort should be accurate, specific, timely, and consistent with current and accepted local emergency management procedures as promoted by the California State Office of Emergency Services and the American Red Cross. This public outreach effort should be conducted annually and should include:

- Using a variety of information outlets, including local news media;
- Creating and printing (where applicable) brochures, leaflets, water bill inserts, websites, and public service announcements;
- Displaying current brochures and flyers in County and City office buildings, libraries, and other public places; and
- Developing public-private partnerships and incentives to support public education activities.

Other Alternatives: Continue public information activities currently in place

Responsible Office: Fresno County Office of Emergency Services, Department of Public Works and Planning, and Chamber of Commerce; American Red Cross

Priority (High, Medium, Low): High

Cost Estimate: $5,000-20,000 annually, depending on printing and mailing costs, level of volunteer participation, and scope and frequency of events

Potential Funding: FEMA's Hazard Mitigation Grant Program, Fresno County funds, other available grants

Benefits (Avoided Losses): Life safety, reduction in property losses, relatively low cost

Schedule: Part of seasonal multi-hazard public awareness campaign

2. Identify Critical Facilities and Inspect for Vulnerability to Major Hazards

Issue/Background: The County has various facilities that may need to function in times of crisis and/or emergency.

- The facilities should be identified.
- The identified facilities should be reviewed and inspected to determine if the infrastructure can withstand and operate under critical conditions.
- Required upgrades to each of the facilities should be identified and prioritized.

Other Alternatives: No action

Responsible Office: Fresno County Department of Public Works and Planning Capital Projects Division

Priority (High, Medium, Low): High

Cost Estimate: Up to $3 million, depending on the number of facilities identified for review

Potential Funding: Annual budgets

Benefits (Avoided Losses): The County will be able to develop a plan to methodically upgrade the infrastructure and systems necessary to operate in times of emergency.

Schedule: 1-5 years

3. Upgrade or Replace Critical County Facilities Found to be Vulnerable to Major Hazards

Issue/Background: The County has various facilities that may need to function in times of crisis and/or emergency. The County should upgrade or replace those facilities found to be vulnerable in accordance with a developed prioritized schedule.

Other Alternatives: Contact other jurisdictions to determine if capacity exists to accommodate County critical functions within facilities they control.

Responsible Office: Fresno County Department of Public Works and Planning Capital Projects Division

Priority (High, Medium, Low): High

Cost Estimate: Unknown at this time, will depend on the number of facilities identified, total cost could approach $100 million or more

Potential Funding: FEMA's Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program, state funds, Fresno County budgets

Benefits (Avoided Losses): The County will have reliable infrastructure and systems necessary to operate in times of emergency

Schedule: 2-10 years

4. Implement Mass Notification System for Fresno County

Issue/Background: Fresno County is 6,000 square miles in size with 15 cities and more than 900,000 citizens. During an emergency, the current methods available to notify the citizens consist of the use of mass media alerts, sheriff deputy door to door contacts, loudspeakers, and volunteers. Of these notification methods, mass media reaches a large group of people quickly if they are tuned to that source. The other methods of contact are slow and inefficient.

Not everyone is listening to mass media, but most people are within access of a phone. A telephone notification system that incorporates geographical information would allow direct contact to specific areas of the County and help reach those persons missed by mass media. This would increase the speed in which all persons are notified of an emergency and provide information regarding how to mitigate its impacts.

Other Alternatives: Signage, loudspeakers

Responsible Office: Fresno County Office of Emergency Services

Priority (High, Medium, Low): High

Cost Estimate: $500,000

Potential Funding: Fresno County General Fund, FEMA's Hazard Mitigation Grant Program

Benefits (Avoided Losses): The more time people are given to prepare for a potential emergency, the better chance they have of avoiding danger and saving lives. The phone messaging system would be another tool to help notify people quickly and save lives.

During the recent fires in San Diego County, this system was used extensively, and the resulting evacuations were reported to be orderly and efficient.

Schedule: 36 months

5. Enhance the County Emergency Operations Center

Issue/Background: The Emergency Operations Center (EOC) for Fresno County is located in multiple rooms on multiple floors within the Public Health Department. Because the EOC sections are isolated, communications are limited, and section staff are unable to interact well. A centralized modern day EOC in a single location would greatly enhance communications and improve the effectiveness of those who work in it.

During a major rain event in 1995, the Arroyo Pasajero became flooded, and the rapidly moving water washed trees into the channel. The trees damaged the bridge where the waterway passed under I-5, causing the bridge to fail. The bridge failure resulted in the deaths of seven people. An efficient EOC could have gathered flood information quicker and distributed that information to the appropriate agencies sooner, possibly mitigating the effects of the event.

Estimated damage:

- Seven lives @ $3.1 million/each: $21.7 million
- One interstate highway bridge: $20 million
- Private property damage: $5 million
- Total cost: $28.5 million

Other Alternatives: Enhance the EOCs of other jurisdictions and activate them in the event of an emergency

Responsible Office: Fresno County Office of Emergency Services

Priority (High, Medium, Low): High

Cost Estimate: $2.5 million

Potential Funding: Fresno County General Fund, grants

Benefits (Avoided Losses): A modern EOC in one location would decrease emergency response time and the public notification process, reducing potential loss of life and damage. The more time people are given to prepare for a potential emergency, the better chance they have of avoiding the effects of that event.

Schedule: 72 months

6. Develop Animal Carcass Disposal Plan

Issue/Background: In some instances (e.g., due to heat, freeze, or animal disease), the number of animal carcasses exceeds the rendering capacity for the area. There is no legal disposal location for unrenderable carcasses within the County. Dead animal carcasses are a significant reservoir for disease that is detrimental to human health. A plan is necessary to identify options for disposing of animal carcasses in Fresno County.

Within the counties of Fresno, Kings, and Tulare, there are over 1 million head of dairy cattle alone. This does not include the large numbers of beef cattle, poultry, and horses, etc. that also exist in the area. The only approved way of disposing of dead animal carcasses is to render them. For these three counties, there is limited rendering capacity, with only two rendering plants in operation (Baker Commodities and Darling Delaware). Both of these plants are located in Fresno County and carcasses are shipped from other counties to the plants. When one of the plants

experiences problems, or more animals die off than the plants can process, there is a disposal issue. Fresno County landfills are not permitted to take animal carcasses unless there is an emergency. Fresno County has had to declare an emergency at least once a year for the last two years to legally dispose of carcasses in the landfill. This has created significant short- and long-term issues for the landfill.

Direct disposal costs from one event in which 25 20-ton truckloads were hauled to a disposal location outside of the County exceeded $100,000. Within the last two years, there were approximately 10 disposal events costing an estimated $1 million.

Most experts agree that it is only a matter of time before there will be an outbreak of a disease that will require mass culling of animal stocks. Pre-determined disposal options would shorten the disposal interval and reduce human exposure to the disease.

Other Alternatives:

- Limit growth of animal numbers through Fresno County Planning Department policies until the number of rendering plants is adequate to meet demand
- Install new plants
- Create new disposal locations for carcass disposal

Responsible Office: Fresno County Environmental Health

Priority (High, Medium, Low): Medium

Cost Estimate: $250,000

Potential Funding: Fresno County General Fund, local agricultural industry, grants

Benefits (Avoided Losses): Reduced human exposure to disease due to the proper disposal of animal carcasses; reduced disposal costs

Schedule: 36 months

7. Develop and Conduct Disaster Response/Disaster Management Training for Designated County/City Staff

Issue/Background: During an emergency, County personnel are expected to manage the response. It is important that all staff know their roles and responsibilities so that they may efficiently and adequately respond. This requires regular training of both new and existing staff. Current staff training is limited by funding. The County needs to develop and maintain a robust training program for disaster management.

In October 2007, multiple wildfires threatened the area between San Diego and Los Angeles. California Governor's Office of Emergency Services (OES) staff coordinated the notification

and evacuation of 500,000 people and the sheltering of 20,000 people. Incident managers are required by state law to use the Standardized Emergency Management System (SEMS) to manage disaster. The use of SEMS requires expertise in the areas of management, operations, planning, logistics, and finance. This expertise is only gained through regular training and the practice of those skills. Other tools that were used to manage this event included a Reverse 911 telephone messaging system and WebEOC software. These tools also require regular training to maintain staff proficiency.

Fires in Southern California in 2003 resulted in the evacuation of 56,000 people, the destruction of 2,000 homes, and 15 deaths. Many people never received the notice to evacuate. The cost was estimated at over $2 billion. In 2007, several of those areas were again on fire. This time, 500,000 people were evacuated, 1,500 homes were destroyed, and 9 people died. The cost for this fire was estimated at over $1 billion. One of the differences between the two events was OES staff efficiency gained from training to use the tools needed to manage an event.

Other Alternatives:

- Hire only trained staff
- Use free, state training when possible

Responsible Office: Fresno County Office of Emergency Services

Priority (High, Medium, Low): Medium

Cost Estimate: $500,000 per year

Potential Funding: Fresno County General Fund, grants

Benefits (Avoided Losses): Disaster training increases the efficiency of emergency responders and decreases the impacts of a disaster.

Schedule: 72 months

Agricultural Hazards Mitigation Actions

8. Control E. Coli through Wild Hog Population Management

Issue/Background: Wild hogs are free ranging wildlife that are present in the eastern and western foothills of Fresno County. Wild hogs cause extensive agricultural crop and property damage to farm, private land, and infrastructure. Wild pig damage has increased steadily since 2005, when there was reported damage totaling $3,550 for 4,612 acres. In 2006 and 2007, reported damage was $104,000 and $84,000 for 10,882 and 4,612 acres, respectively.

Wild hogs are known to carry and transmit 30 different diseases both to humans and livestock. When wild hogs damage commercial leafy vegetable fields there is potential for contamination

of E. coli through their feces. Wild hogs can double their population every three months. This large population buildup will greatly increase the potential for E. coli contamination. The recent dramatic rise in the wild hog population has created safety hazards in schools, County parks, and public nature trails.

Other Alternatives: Promote the California Department of Fish and Game hunter/grower pig hunt program

Responsible Office: Fresno County Department of Agriculture Wildlife Damage Management

Priority (High, Medium, Low): High

Cost Estimate: $100,000

Potential Funding: Fresno County General Fund, California Department of Public Health, leafy vegetable growers associations, unrefunded gas tax

Benefits (Avoided Losses): By reducing wild hog populations, 75 percent of the incidence of infection will be reduced and the resulting fatalities will be reduced.

- One human life saved is $3.1 million
- Avoids disease transmissions to humans: $30,000
- Avoids treatment cost to cattle through brucellosis
- Avoids treatment cost to commercial pigs due to pseudo rabies
- Avoids sewage contamination and Kings River cleanup efforts when Sanger sewage treatment plant is breached

Schedule: Annually, November through April yearly

9. Control Bubonic Plague through Coyote and California Ground Squirrel Population Management

Issue/Background: Bubonic plague is endemic to parts of Fresno County. Coyotes and the California ground squirrel are free ranging wildlife that are present in all of Fresno County. Coyotes and ground squirrels cause extensive agricultural livestock, crop, and property damage. Coyotes are very mobile and can travel 20 to 25 miles in a day. Coyotes are known to carry and transmit diseases to humans, domestic animals, and livestock. Coyotes are carriers of the bubonic plague bacteria, which they receive from the bite of an infected flea. Coyotes can spread the disease to various California ground squirrel colonies. Human interaction with ground squirrels in open spaces, parks, and recreational areas can potentially result in bubonic plague infection through flea bites. Blood samples from coyotes can be tested for the presence of bubonic plague.

Other Alternatives: No action

Responsible Office: Fresno County Department of Agriculture Wildlife Damage Management

Priority (High, Medium, Low): High

Cost Estimate: $100,000

Potential Funding: Fresno County General Fund, California Department of Public Health, unrefunded gas tax

Benefits (Avoided Losses):

- One human life saved is $3.1 million
- Avoids disease transmission to humans
- Reduces the discomfort and adverse effects of flea bites

Schedule: Annually, June through October

Dam Failure Mitigation Actions

10. Minimize Flood Events by Exercising Reclamation's Emergency Action Plan and Provide an Early Warning System to Downstream Emergency Response Agencies

Issue/Background: Friant Dam was constructed in 1942 and is located 20 miles northeast of the City of Fresno. It serves as a water conservation and flood control facility. The dam has a structural height of 319 feet with a top of crest elevation of 581.25 feet. Millerton Lake reservoir has a storage capacity of 520,500 acre-feet.

The Bureau of Reclamation has the ability to divert water to the Friant Kern Canal, Madera Canal, and the San Joaquin River. During unforeseen events, the Bureau of Reclamation may be required to release water into the San Joaquin River that may exceed the river channel capacity.

Other Alternatives: Divert flood water to the Friant Kern Canal and the Madera Canal, reduce encroachment of development in the San Joaquin River floodplain, construct a new storage facility

Responsible Office: Bureau of Reclamation, South Central California Area Office-Fresno; U.S. Army Corps of Engineers Sacramento Branch

Priority (High, Medium, Low): High

Cost Estimate: $5,000-10,000 to exercise and update emergency action plan

Potential Funding: FEMA's Hazard Mitigation Grant Program, state funding, other available grants

Benefits (Avoided Losses): Minimized risk of loss of life and property damage

Schedule: 1-3 years

Drought Mitigation Actions

11. Develop Mitigation and Monitoring Program for Groundwater Supplies in the Northeast Portion of the County

Issue/Background: The area of focus is generally bounded by the San Joaquin River to the north, the Kings River to the south, the Enterprise Canal to the west, and the Friant-Kern Canal to the northeast. The area is adjacent to and northeasterly of the California Department of Water Resources Kings Groundwater Basin and the Fresno/Clovis metropolitan area. Groundwater in this area as well as the Kings Basin is in a critical state of overdraft. The area is nearly solely dependent on groundwater for its water. Much of the area has limited groundwater because of shallow bedrock, and groundwater recharge is highly limited. Much of the groundwater supply comes from fractured hard rock as it transitions into valley aquifer. Any water recharged into the ground in the study area tends to offset groundwater pumping and help maintain the down-gradient flow into the aquifer underlying the metropolitan area. Due to the critically overdrafted state of the groundwater in the area, drought conditions can result in dry wells and water shortages for domestic uses.

Landowners have indicated to the County that groundwater levels have been declining in the project area, but there is limited amount of information that has been collected to support this. The proposed project would develop a comprehensive program plan to facilitate recharge to offset groundwater pumping and to gain new groundwater information in an area where there is not currently an ongoing monitoring program.

Other Alternatives: Promote recharge in relation to granting of entitlements and promote voluntary well monitoring and data collection

Responsible Office: Fresno County Public Works and Planning Department

Priority (High, Medium, Low): High

Cost Estimate: $250,000-500,000

Potential Funding: Grant funding, in-kind contributions, program fees

Benefits (Avoided Losses): This project will help prevent hard-rock wells from going dry, health risks associated with lack of adequate water for domestic purposes, and agricultural crop losses due to further decline in critically overdrafted aquifer.

Schedule: Two years to develop recharge and monitoring programs, ongoing development and maintenance

12. Create and Maintain a Water Stewardship Forum of Stakeholders in Northeastern Fresno County

Issue/Background: The northeastern area of Fresno County (northeast of the Friant-Kern Canal) is nearly solely dependent on groundwater for its water. Much of the area has limited groundwater because of shallow bedrock; much of the groundwater comes from fractured hard rock. Landowners in the area have indicated to the County that groundwater levels have been declining. In response to landowner concerns, the Fresno County Board of Supervisors contracted for the preparation of a water study in the area.

The study was the first step in evaluating the severity of water supply problems and recommended several actions to protect the groundwater resources and sustain current and projected water use in the foothill and mountain areas. The recommendations include development of a well monitoring and data acquisition program, preparation of water budgets, and development of a comprehensive water management plan.

Implementation of the study recommendations will require outreach to, and input from, residents in the area. A Water Stewardship Forum has been initiated in the northeast area to address declining water supplies and planning efforts to mitigate further decline in groundwater levels. The forum will promote water education and voluntary well monitoring and has been tasked with facilitating development of the recommended comprehensive water management plan. The forum could function as a steering group for development of a California integrated regional water management plan for the foothill and mountain areas.

Other Alternatives: Promote voluntary well monitoring, data collection, and water planning through other means

Responsible Office: Fresno County Public Works and Planning Department

Priority (High, Medium, Low): High

Cost Estimate: $25,000-50,000 for Water Stewardship Forum organization, outreach, education, and voluntary data collection; $50,000-350,000 for comprehensive water management plan/integrated regional water management plan development

Potential Funding: Grant funding, in-kind contributions, fund-raising activities

Benefits (Avoided Losses): This project will help prevent hard-rock wells from going dry, health risks associated with lack of adequate water for domestic purposes, and loss of native species and forest habitat resulting from surface and groundwater declines.

Schedule: One year to develop Water Resource Forum, two to four years to develop water management plans

Flood Mitigation Actions

13. Conduct Feasibility Study for Panoche-Silver Creek Flood Detention Facility

Issue/Background: Panoche-Silver Creek downstream of the California Aqueduct causes frequent flooding of Belmont Avenue, a major transportation corridor connecting west Fresno County to I-5, the future Route 180 alignment, and the City of Mendota, a downstream community. Flooding occurs during normal-intensity storm events. High-intensity events result in extended road closures in an area of the County with limited transportation corridors. A feasibility study is needed to assess feasibility and location of facilities to route flood flows to a detention reservoir.

Other Alternatives: None identified

Responsible Office: Joint, possible partners include California Department of Water Resources, Bureau of Reclamation, Fresno County, City of Mendota, Westlands Water District

Priority (High, Medium, Low): High

Cost Estimate: $1.2 million

Potential Funding: State or federal grant sources

Benefits (Avoided Losses): Finding potential solution to reduce traffic disruptions

Schedule: 2-5 years

14. Investigate and Construct Water Storage Options for the Upper San Joaquin River Basin

Issue/Background: The Upper San Joaquin River Storage Investigation will investigate feasibility and cost to provide on- or off-stream storage in the upper San Joaquin River Basin. The objectives are conjunctive beneficial uses, including restoration of the San Joaquin River, increased management and exchange opportunities to secure and stabilize deliveries to urban and agricultural uses, flood control, recreation, reduced groundwater overdraft, and potentially hydropower.

Other Alternatives: No action

Responsible Office: California Department of Water Resources, Bureau of Reclamation

Priority (High, Medium, Low): High

Cost Estimate: Study—to be determined; resulting project—$1-1.5 billion

Potential Funding: State or federal sources

Benefits (Avoided Losses): Reduction of flood risk downstream of Friant Dam

Schedule: 5-10 years

15. Analyze System, Condition, and Management of Flood Water Conveyance Facilities

Issue/Background: Flood water conveyance occurs over a disparate system of natural and manmade channels, levees, irrigation canals, and ad-hoc structures whose primary function may be for purposes other than flood management. A systemwide inventory and analysis is needed to develop priorities across many jurisdictions, both public and private, for rehabilitation and upgrade of critical flood management facilities, including public and private levees.

Other Alternatives: No action

Responsible Office: Potentially San Joaquin Valley-wide, possible lead or joint lead entities include California Department of Water Resources; Bureau of Reclamation; irrigation, water, and conservation districts; regional partners through integrated regional water management plans; Fresno County

Priority (High, Medium, Low): High

Cost Estimate: $5 million (Fresno County)

Potential Funding: State and federal grant funding

Benefits (Avoided Losses): Reduced flood risk and flood losses

Schedule: 10-20 years

16. Prepare Stormwater Drainage Master Plans

Issue/Background: Some unincorporated communities in Fresno County do not have master plans for stormwater drainage, which provide for flow, collection, and diversion of stormwater from public streets to detention or recharge facilities. Lacking appropriate drainage, stormwater may flood streets and/or property, and standing water may persist, leading to health or traffic safety concerns.

Other Alternatives: No action

Responsible Office: Special or community service districts or County service area zones of benefit

Priority (High, Medium, Low): Medium

Cost Estimate: $150,000-500,000 per community

Potential Funding: Undetermined

Benefits (Avoided Losses): Reduced property damage and adverse impacts on health and traffic safety

Schedule: 3-5 years

Human Health Hazards: West Nile Virus Mitigation Actions

17. Control West Nile Virus through Beaver Population Management

Issue/Background:

Between 2004 and 2007, there were over 2,000 cases of West Nile virus in California; 71 of those cases resulted in fatalities. On August 2, 2007, the governor of California declared a disaster in three California counties because of deaths related to the virus. Fresno County had 111 cases with 4 fatalities between the years of 2004 and 2007. Fresno County has averaged one virus-related death and 28 virus cases per year since 2004.

West Nile virus is transmitted by mosquitoes. One breeding area for mosquitoes is beaver ponds. Beavers are native to Fresno County, and their dams create ponds in waterways. Beaver dams cause streams and waterways to overflow, which causes flooding of farm and private land. The resulting excess standing water provides another breeding source for mosquitoes. The Mosquito Abatement District estimates that removing the beaver ponds from waterways near residential areas will reduce mosquito populations, thus potentially reducing the number of West Nile virus infections.

Other Alternatives: No action

Responsible Office: Fresno County Department of Agriculture Wildlife Damage Management

Priority (High, Medium, Low): High

Cost Estimate: $10,000-25,000

Potential Funding: California Department of Public Health, Fresno County general fund

Benefits (Avoided Losses):

- Reduction of incidence of infection and resulting fatalities: .5 human lives saved is $1.55 million
- Reduction in the number of cases, resulting in improved human health and reduced medical costs
- Reduction in discomfort and adverse effects of mosquito bites
- Reduction in treatments to suppress mosquito population by the Mosquito Abatement District and related jurisdictions

- Reduction of future costs associated with mosquito control
- Repeated removal of beaver dams

Schedule: Annually, February through June

Severe Weather: Fog Mitigation Actions

18. Install Automated Fog Warning System

Issue/Background: Fog is pervasive in the winter months and causes visibility difficulties for motorists. Fog-related multi-vehicle accidents are not uncommon due to motorists traveling excessive speeds for the conditions. For State Route 99, a comprehensive fog program has been developed that includes public education, use of changeable message signs (CMS), visibility sensors, visibility signs, and pacing of vehicles by the California Highway Patrol (CHP). It is proposed to enhance the program by installing an automated fog warning system that will have CMSs and visibility sensors every two miles, smaller CMSs or extinguishable message signs every half mile, and speed sensors every quarter mile. The program will also include use of highway advisory radio for fog messages, increased public education, and additional opportunities for pacing by the CHP if available.

Other Alternatives: No action

Responsible Office: California Department of Transportation District 6 Division of Maintenance and Operations

Priority (High, Medium, Low): High

Benefits (Avoided Losses): A reduction of fog-related collisions and associated injuries and fatalities

Cost Estimate: **$**9.5 million

Potential funding: State Highway Operation Protection Program and the Rural Safety Innovation Program

Schedule: Construction anticipated by November 1, 2009

Other Hazards Mitigation Actions

19. Establish an Abandoned Water Well Program

Issue/Background: Proper destruction of abandoned water wells is necessary to protect groundwater resources and public safety. Improperly destroyed wells can provide a conduit for surface or near surface contaminates to reach the groundwater. In addition, undesired mixing of water with different chemical qualities from different strata can occur in improperly destroyed wells. At this time, it is required that known abandoned wells be properly destroyed. However,

many exploratory wells, nonpermitted wells, and old wells exist that have not been properly destroyed. These wells constitute a serious public health hazard.

The proposed Abandoned Water Well Program would seek to educate the public about the hazards of abandoned wells and to identify abandoned well locations by funding proper well abandonment. Generally, property owners know the location of improperly abandoned wells but fear a financial liability from disclosure. When aware of the public health threat, most property owners would welcome the opportunity to protect the quality of their drinking water through proper destruction of an abandoned well and would disclose its location if doing so did not impose a financial obligation. Once disclosed and evaluated, an abandoned well could be properly destroyed or rehabilitated for use as a monitoring well.

Each improperly abandoned well subjects the public to groundwater contamination exposure. Most improperly abandoned wells are located in rural agricultural or foothill/mountain environments that rely on untreated groundwater for their drinking water. Improperly abandoned wells in these areas can go undetected for years, exposing the groundwater aquifer or hard-rock fracture system to contamination ranging from trapped animals to chemical dumping. By the time the contamination is detected, it can migrate to adjacent areas and become a public health emergency. The proposed project would develop a comprehensive program that provides incentive for property owners to report abandoned wells and to facilitate proper destruction or utilization of such wells for groundwater quantity and quality monitoring.

Other Alternatives: Continue to require proper destruction of abandoned wells when discovered; promote voluntary abandoned well disclosure

Responsible Office: Fresno County Public Works and Planning Department

Priority (High, Medium, Low): High

Cost Estimate: $250,000-500,000

Potential Funding: Grant funding, in-kind contributions

Benefits (Avoided Losses): Avoided remediation of contamination plumes and closure or treatment of contaminated groundwater wells used for drinking water purposes

Schedule: One year to develop the program; ongoing implementation

6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Fresno County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. This adoption also establishes compliance with AB 2140 requiring adoption by reference or incorporation into the safety element of the general plan. The governing board for each participating jurisdiction has adopted this multi-hazard mitigation plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix A: Adoption Resolutions.

7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

7.1 Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the general plans for Fresno County and the participating jurisdictions. The County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Fresno County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or

participation requirements. When funding does become available, the participating jurisdictions will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the participating jurisdictions will be tasked with plan implementation and maintenance. The participating jurisdictions, led by the Fresno County Office of Emergency Services, agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Fresno County Board of Supervisors and the governing boards of the other participating jurisdictions; and
- Inform and solicit input from the public.

The primary duty of the participating jurisdictions is to see the plan successfully carried out and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance Schedule

The Fresno County Office of Emergency Services is responsible for initiating plan reviews and will consult with the other participating jurisdictions. In order to monitor progress and update the mitigation strategies identified in the action plan, the Office of Emergency Services will revisit

this plan annually and after a hazard event. In conjunction with the other participating jurisdictions, they will submit a five-year written update to the state and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

7.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will follow the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the jurisdictional lead on action status and provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional lead will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the Fresno County Office of Emergency Services deems

appropriate and necessary, and as approved by the Fresno County Board of Supervisors and the governing boards of the other participating jurisdictions. In keeping with the process of adopting the plan, a public involvement process to receive public comment on plan maintenance and updating will be held during the annual review period, and the final product will be adopted by the governing boards.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and City plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The point is re-emphasized here. As described in this plan's capability assessment, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County and City general and master plans
- County and City Emergency Operations Plans
- County and City ordinances
- Flood/stormwater management/master plans
- Community Wildfire Protection plans
- Drought plans
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessments in the jurisdictional annexes
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc, as appropriate. As described in Section 7.1, Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- monitoring other planning/program agendas
- attending other planning/program meetings
- participating in other planning processes
- monitoring community budget meetings for other community program opportunities

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Examples of incorporation of the LHMP into existing planning mechanisms include:

1) As recommended by Assembly Bill 2140, each community should adopt (by reference or incorporation) this LHMP into the Safety Element of their General Plan(s). Evidence of such adoption (by formal, certified resolution) shall be provided to CA-OES and FEMA.

2) Integration of wildfire actions identified in this mitigation strategy with the actions and implementation priorities established in existing Community Wildfire Protection Plans (CWPPs). This is already in process. Specifically, key people responsible for development of the Highway 168 Fire Safe Council, CWPP participated as a member of the HMPC in the development of this LHMP. They identified key projects in the CWPP and integrated them into the Mitigation Strategy of this LHMP. Likewise, actual implementation of these wildfire projects will likely occur through the CWPP implementation process through the efforts of these same individuals.

3) Using the risk assessment information to update the hazard analysis in the Fresno County Operational Area, Master Emergency Services Plan.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4 Continued Public Involvement

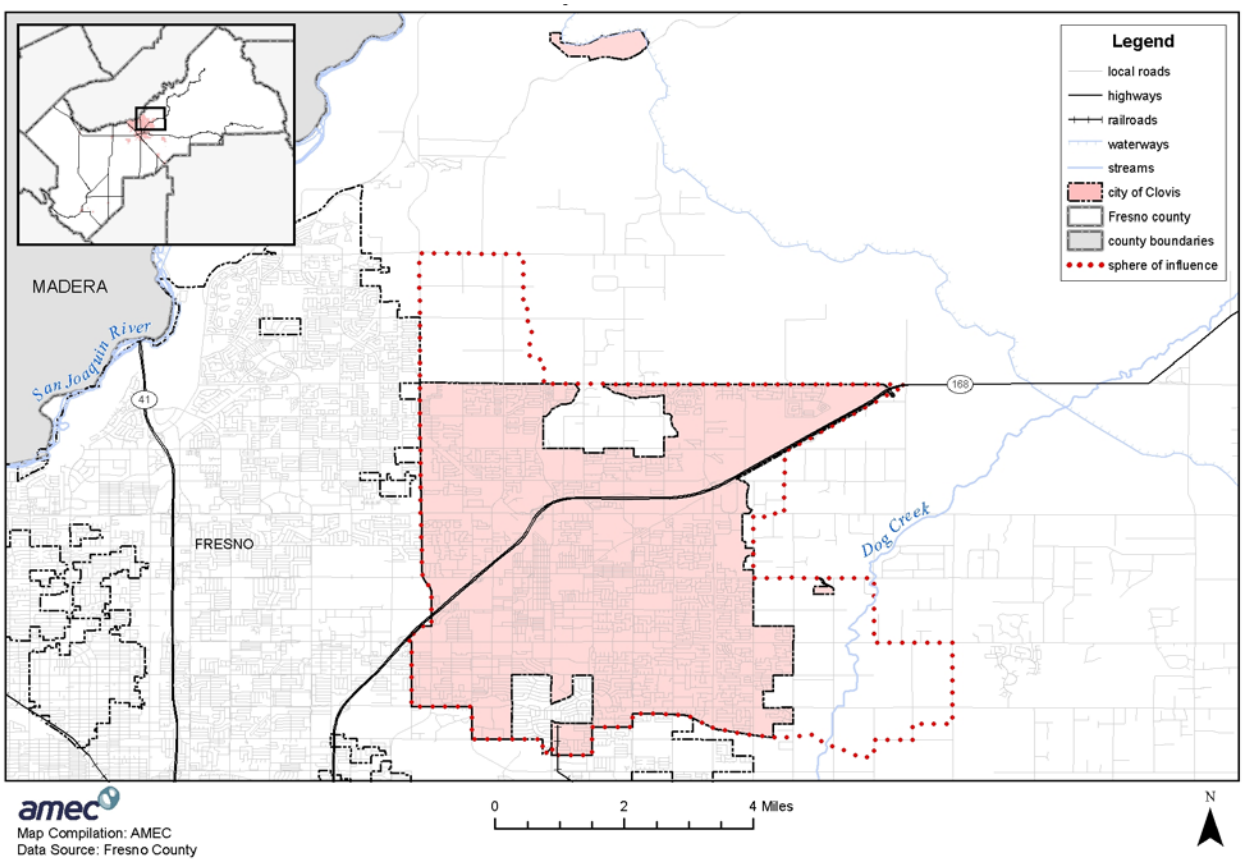
Continued public involvement is also imperative to the overall success of the plan's implementation. The update process provides an opportunity to publicize success stories from the plan implementation and seek additional public comment. A public hearing(s) to receive public comment on plan maintenance and updating will be held during the update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, and press releases to local media.

ANNEX A: CITY OF CLOVIS

A.1 Community Profile

Figure A.1 displays a map and the location within Fresno County of the City of Clovis and its Sphere of Influence.

Figure A.1. The City of Clovis



A.1.1 Geography and Climate

Located in the northeast quadrant of the Fresno-Clovis Metropolitan Area in northern Fresno County, Clovis is situated in the midst of the agriculturally rich San Joaquin Valley. It covers a 74.17 square mile area that encompasses the City of Clovis and unincorporated Fresno County, inclusive of the City's Sphere of Influence. All lands outside of the City's Sphere of Influence are regulated by the Fresno County General Plan and zoning designations. However, state law requires that cities plan for areas outside of their immediate jurisdiction if the areas have a direct relationship to planning needs.

Clovis consists of three distinct geographical areas: the City, which represents the incorporated City within the City limit boundaries; the Sphere of Influence, which corresponds to the City's existing Sphere of Influence; and the study area, which includes unincorporated Fresno County lands outside of the City's Sphere of Influence. Immediately beyond Clovis to the northeast are the western foothills of the Sierra Nevada Mountains. The City of Fresno and its Sphere of Influence are located to the southwest. The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature, comprised of agricultural, rural, residential, and vacant land uses.

Clovis has an average annual temperature of 63.2°F and receives 10.2 inches of rain. While the average is relatively temperate, summer and winter months bring unique weather patterns to the region. During the winter, high temperatures hover around 55°F. Combined with the regional geography and precipitation during this time, Clovis experiences numerous days with dense fog, which has its greatest impact on transportation: accident rates jump 50 percent on foggy days.

During the summer months, the region has extended periods where temperatures exceed 100°F. While the average temperature is 90°F during the summer, these extended heat waves impact the medically fragile, elderly, and animal populations. In addition to heat waves, the Fresno County region continues to suffer regular drought due to lower than normal snowpack in the Sierra Nevada, which supplies water for agricultural use and replenishes the groundwater supply.

A.1.2 History

The City of Clovis was named after the spirited pioneer, Clovis M. Cole, who spent nearly all of his life in the vicinity. The area was known for the thousands of acres of wheat that he had cultivated. The first thoughts of settlement, however, are credited to Padre Martin, who explored the area in 1806 while searching for a mission site. Missionaries and trappers were the first nonnative people to roam the area. Miners soon followed during the gold rush, displacing the many Native American tribes that were settled in the foothills and near the rivers.

Another early settler, Marcus Pollasky, proposed and coordinated the construction of a railroad through the grain, cattle, and mining country and into the timber-rich forests of the nearby Sierra. The City eventually grew up around the San Joaquin Division of the Southern Pacific Railroad, which played an important role in the founding and growth of Clovis. In addition to the arrival of the railroad, the completion of the 42-mile-long Shaver log flume, development of the 40-acre Clovis mill and finishing plant, expansion of grain production, and the livestock industry all contributed to the founding of Clovis in 1891. The City was incorporated in 1912.

A.1.3 Economy

The City's economic base consists of retail sales and services and light manufacturing. Availability of housing, quality hospital care, excellent schools with modern facilities,

responsive safety services, a mild climate, access to varied recreational opportunities, and strong community identity all contribute to Clovis' reputation as a great place to live.

Clovis has maintained a small town community spirit as envisioned by its early founders, which is exemplified by such community events as the annual Rodeo Days, Big Hat Days, and Clovisfest celebration. This community pride, combined with Clovis' unique growth opportunities, continues to attract new residents, developers, businesses, and industries to the City.

A large number of new Clovis residents work in health care (17 percent) and government (13 percent). Also, 7 percent work in education. Overall, the new residents are employed in similar occupations as the residents that have lived in the City for some time. The breakdown of the Clovis residential employment sector is as follows:

- Education, health and social services: 24 percent
- Retail: 13 percent
- Manufacturing: 8 percent
- Professional, scientific, management, administration, and waste management: 8 percent
- Public administration: 8 percent
- Arts, entertainment, recreation, accommodation and food service: 7 percent
- Construction: 7 percent
- Finance, insurance, and real estate: 7 percent
- Other services (except public administration): 5 percent
- Transportation and warehousing, and utilities: 5 percent
- Wholesale: 4 percent
- Information: 3 percent
- Agriculture, forestry, fishing and hunting, and mining: 2 percent

A.1.4 Population

In 2007, the total population for the City of Clovis was estimated at 92,269.

A.2 Hazard Identification and Summary

Clovis' planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Clovis (see Table A.1). In the context of the plan's planning area, there are no hazards that are unique to Clovis.

Table A.1. City of Clovis—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Unlikely	Limited	Limited	Low
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Critical	Low
Drought	Occasional	Extensive	Critical	High
Earthquake	Occasional	Extensive	Critical	Medium
Flood	Occasional	Significant	Critical	High
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Cold/Freeze	Occasional	Extensive	Negligible	Low
Extreme Heat	Highly Likely	Extensive	Negligible	Medium
Fog	Highly Likely	Extensive	Negligible	Low
Snow	Unlikely	Extensive	Limited	Low
Tornado	Occasional	Limited	Critical	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Medium
Soil Hazards:				
Erosion	Unlikely	Limited	Negligible	Low
Expansive Soils	Occasional	Limited	Negligible	Low
Land Subsidence	Occasional	Extensive	Negligible	Low
Volcano	Unlikely	Extensive	Critical	Low
Wildfire	Occasional	Limited	Limited	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

A.3 Vulnerability Assessment

The intent of this section is to assess Clovis' vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

A.3.1 Assets at Risk

This section considers Clovis' assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table A.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Clovis.

Table A.2. 2007 Roll Values for the City of Clovis by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	10	2,415,799	1,048,369	1	5,081,640	11	8,545,808
Commercial	686	611,907,131	256,726,627	207	68,845,410	893	937,479,168
Industrial	220	111,601,138	33,293,291	48	11,184,455	268	156,078,884
Open Space	1	181,660	100,629	-	-	1	282,289
Residential	24,830	4,666,840,465	1,546,891,750	1,876	119,487,219	26,706	6,333,219,434
Other	27	32,820,897	11,242,413	67	4,638,662	94	48,701,972
Total	**25,774**	**5,425,767,090**	**1,849,303,079**	**2,199**	**209,237,386**	**27,973**	**7,484,307,555**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Assets directly owned and controlled by the City of Clovis include a range of properties and equipment from each department. Each year, the City performs an assessment through the Central San Joaquin Valley Risk Management Authority that includes property type, construction type, valuation, square footage, and flood zone. According to the report, total valuation of real City property was $116.7 million in 2007. Additional personal property values in these facilities was $37.8 million. None of the facilities are in the floodplain.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are the third category.

Essential Facilities

Essential facilities as identified by HAZUS-MH are as follows:

- Clovis Fire/Police Department Headquarters—1233 Fifth Street
- Clovis Fire Stations
  - CFD 1—633 Pollasky
  - CFD 2—2300 Minnewawa
  - CFD 3—555 North Villa
  - CFD 4—2427 Armstrong
  - CFD 5—790 North Temperance
  - CFD Logistics Center—650 Fowler
- Clovis Community Medical Center—2755 Herndon
- Kaiser Medical Offices—2071 Herndon
- Central Valley Indian Health Inc.— 20 North DeWitt

High Potential Loss Facilities

High potential loss facilities as identified by FEMA HAZUS-MH are located throughout Clovis. Clovis works closely with the Clovis Unified School District, Fresno Metropolitan Flood Control District, and elder care property owners in monitoring and assessing facilities that fall into this category that are not owned by the City.

Transportation and Lifeline Facilities

Transportation and lifeline facilities are located in the center and northeast portion of Clovis. Highway 168 is the major thoroughfare through Clovis. The surface water treatment plant converts raw water from the Enterprise Canal (originating from the Kings River) into potable water for the residents of Clovis. This additional water production enables the City to turn off a portion of its groundwater wells throughout the year, resulting in the replenishment of the water table. The plant is capable of treating and delivering up to 15 million gallons per day of potable water to the City's customers (expandable to 45 million gallons per day).

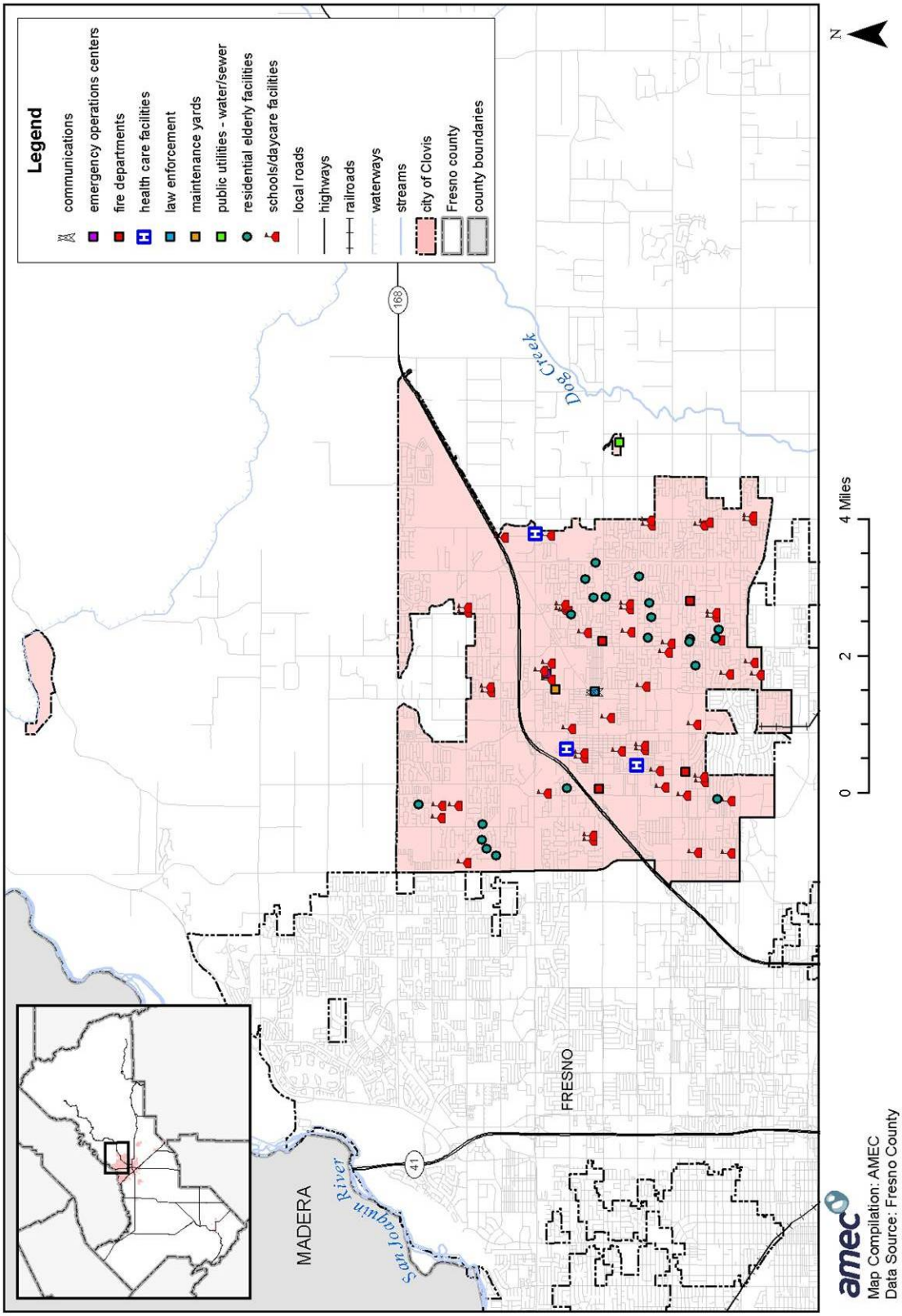
An inventory of critical facilities in the City of Clovis from Fresno County GIS is provided in Table A.3 and illustrated in Figure A.2.

Table A.3. City of Clovis' Critical Facilities

Critical Facilities Type	Number
Airports	-
Communications Centers	1
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	2
Fire Departments	5
Health Care Facilities	3
Law Enforcement Facilities	1
Maintenance Yards	1
Residential Elderly Facilities	21
Schools and Day Care Facilities	56
Public Utilities—Water/Sewer	1
Totals	**91**

Source: Fresno County GIS

Figure A.2. City of Clovis' Critical Facilities



Historic Resources

While the City of Clovis has no registered state or federal historic sites, there are several assets within Clovis that define the community and represent the City's history. Some of the historical sites of importance to Clovis are listed below.

- The Tarpey Depot—Northeast corner of Pollasky and Fourth
- First National Bank of Clovis/Clovis Museum—Southeast corner of Pollasky and Fourth*
- Carnegie Library Building—325 Pollasky*
- Hoblitt/Clovis Hotel —Northwest corner of Pollasky and Fourth
- American Legion—Southeast corner of Fourth and Woodworth
- Dr. McMurtry Home—431 Fourth
- May Case Home—420 Woodworth
- Whiton Home—446 Woodworth
- Burke Home—460 Woodworth
- United Methodist Church—Southwest corner of Woodworth and Fifth
- Mayo/Flume House—406 Fifth Street
- Masonic Temple—Northwest corner of Fifth and DeWitt
- The Jackson/Brandon Home—406 DeWitt
- Clovis M. Cole Home—304 Harvard
- Blasingame House—406 Oxford
- Richard Norrish Home—36 Pollasky
- Agnes G. de Jahn House—6 Pollasky
- Gibson Home 940—Third Street*
- Clovis Union High School—901 Fifth
- Clovis Water Towner—Southeast corner of Clovis
- Nestor Freitas Hall—500 Club
- John Good Building—Northwest corner of Clovis and Fifth
- McFarland Building—Southeast corner of Fifth and Pollasky
- Lewis Gibson Store—Northwest corner of Fifth and Pollasky
- Ingmire House—Seventh and Pollaksy
- Macias House—931 Pollasky

* Fresno County Historical Landmarks

Economic Assets

Clovis is the home of two of the largest agile manufactures in the Central Valley—PELCO (1,600 employees) and Anlin (350 employees). Loss of either employer would have the net result of 2,000 displaced employees and sales tax revenue in the millions of dollars.

Growth and Development Trends

Over the past five years, Clovis has become the premier choice for housing developers and home buyers in the Fresno/Clovis metropolitan area. The City has been aided by an outstanding school district, which ranks among the best in the nation. The City has a reputation for being a safe and friendly community to raise a family. However, land is costly and becoming very short in supply for housing, commercial, and industrial development. As Clovis strives to be more than a bedroom community, attention needs to be paid to preserving land for job generating activity in order to meet the jobs/housing balance.

In August 2003, 3,080 surveys were sent to homeowners in Clovis who were identified as probable new residents. These are people that moved to Clovis after August 1999. The survey asked specific questions, including how long residents had lived in Clovis, where they moved from, and what type of work they did. *Destination Clovis* was published based on the findings. This report gave City of Clovis staff a good understanding of the new Clovis residents. In Clovis, the average owner-occupied household size is 2.95 people. Fifty-seven percent of all new Clovis residents moved from outside of Clovis but from somewhere in Fresno, Madera, Tulare, or Kings county or the northern parts of Kern County. Forty-three percent of all new residents moved to Clovis from outside the Fresno area. Out of these people:

- 2,100 people moved from the San Francisco Bay area, the San Jose/Silicon Valley area, Sacramento, or Northern California, accounting for 712 homes;
- 1,853 people moved from the Los Angeles/Orange County area and Southern California, accounting for 628 homes;
- 960 people moved from other parts of the United States, accounting for 326 homes; and
- 50 people moved from outside the United States, accounting for 17 homes.

Forty-two percent of new Clovis residents moved to Clovis seeking a higher quality of life and a lower cost of living. They were also attracted to the quality of the Clovis Unified School District. Many households moved to Clovis because the model home they wanted was only available in Clovis, and the community offered an environment that was conducive to raising a family.

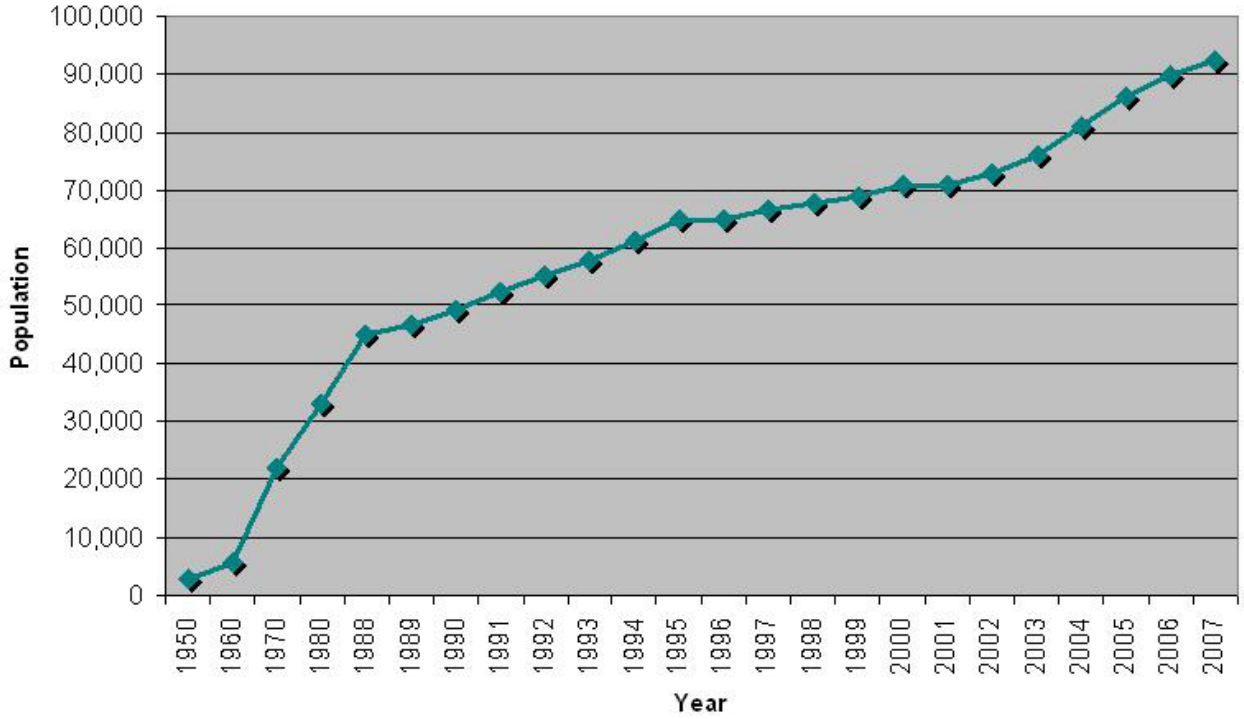
Table A.4 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007. As of 2007, the population of Clovis was 92,269 with a ten-year average growth rate of 3.26 percent (see Figure A.3).

Table A.4. City of Clovis' Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
68,516	92,269	+34.67	25,265	33,353	+32.01

Source: California Department of Finance, www.dof.ca.gov/Research/

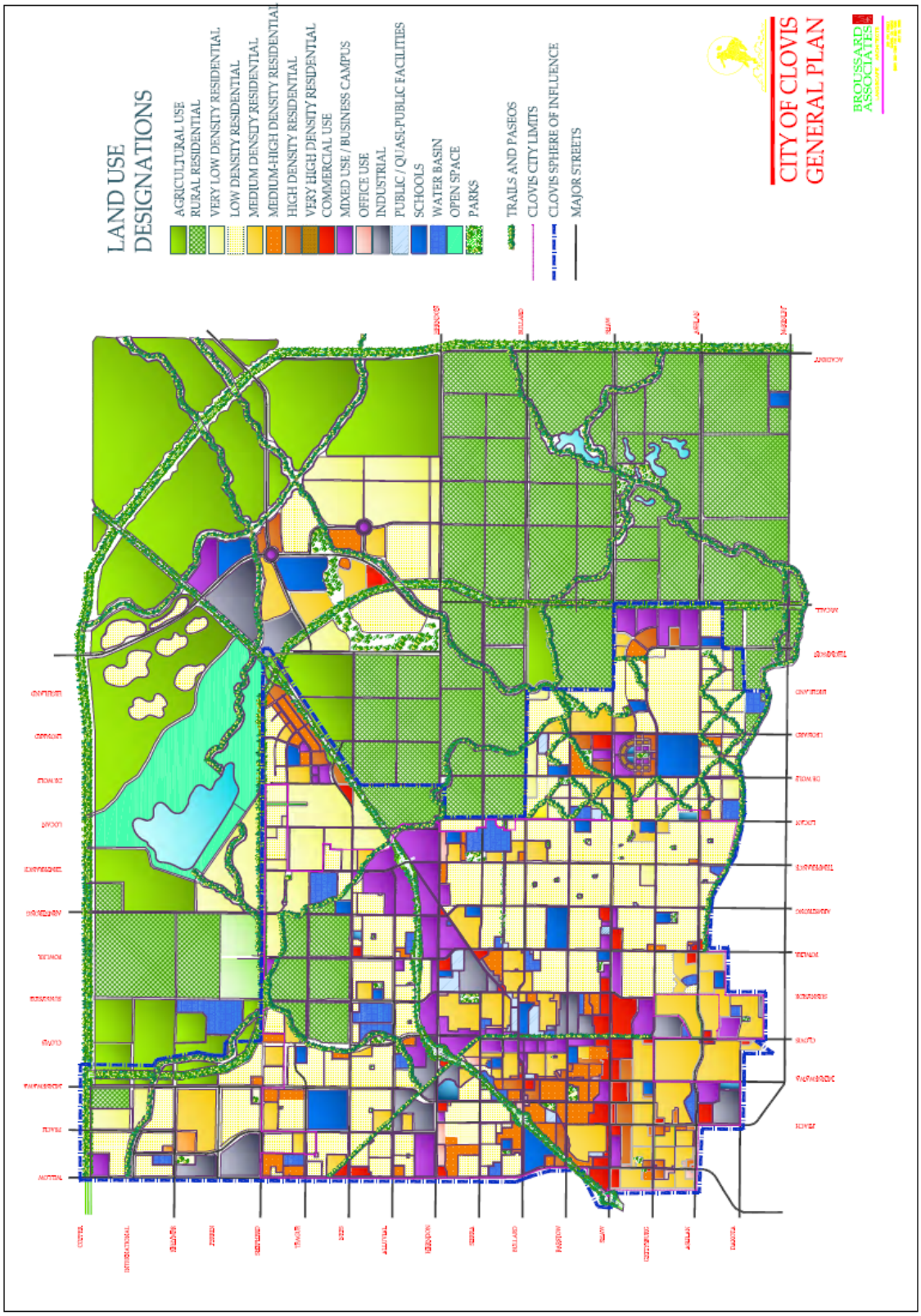
Figure A.3. City of Clovis' Population Growth



The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature, and characterized by agriculture, rural, residential and vacant land uses.

California state law (Government Code Section 65302) requires each city and county to have an adopted general plan, a blueprint for future growth and development that addresses issues directly related to land use decisions (see Figure A.4 for current land use designations). The law specifies that each general plan address seven issue areas: land use, circulation, open space, conservation, housing, safety, and noise. Adopted in 1993, the City of Clovis General Plan Program provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition. Estimates are made about future population, household types, and employment base, so that plans for land use, circulation, and facilities can be made to meet future needs. The general plan represents an agreement on the fundamental values and vision that is shared by the residents and the business community of Clovis and the surrounding area of interest. Its purpose is to provide decision makers and City staff with direction for confronting present issues as an aid in coordinating planning issues with other governmental agencies and for navigating the future.

Figure A.4. City of Clovis' Land Use Designations



Clovis' 1993 general plan is an update, expansion, and reorganization of the 1974 general plan, the 1986 Parks and Recreation Element, and the 1991 Housing Element. Significant changes to the 1974 planning area have occurred, expanding the boundaries of the new planning area to the north and east to include both a Sphere of Influence and a study area beyond the sphere. Pressure for development in the metropolitan area in and around the City of Clovis, the need for linkage to the regional transportation network, and the desire to establish Clovis in a pivotal position in the regional context warrant the decision to greatly expand the planning area as the foundation for the update and augmentation of the general plan. Clovis' general plan consists of three separate documents: a general plan document, an environmental impact report, and technical appendices.

For more information on hazard mitigation-related aspects of the general plan, see the discussion in Section A.4.1 Regulatory Mitigation Capabilities.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

A.3.2 Estimating Potential Losses

Table A.2 above shows Clovis' exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 6,152 parcels in the 100- and 500-year floodplains in the City of Clovis. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

In 1988, 45 California counties experienced water shortages that adversely affected about 30 percent of the state's population, much of the dry farmed agriculture, and over 40 percent of the irrigated agriculture. Fish and wildlife resources suffered, recreational use of lakes and rivers decreased, forestry losses and fires increased, and hydroelectric power production decreased. Since 1976, Clovis has experienced one state declaration for drought within Fresno County and one U.S. Department of Agriculture declaration for crop losses associated with drought.

Earthquake

Clovis is subject to relatively low seismic hazards compared to many other parts of California. The primary seismic hazard is ground shaking produced by earthquakes generated on regional faults. The northwest-trending Clovis fault is believed to be located approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a

few miles south of Fancher Creek. It is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.

The most probable sources of earthquakes that might cause damage in Clovis are the Owens Valley Fault Group about 68 miles to the northeast, the Foothills Suture Fault Zone approximately 75 miles to the north, the San Andreas fault approximately 80 miles to the southwest, and the White Wolf fault located about 120 miles to the south. A maximum probable earthquake on any of the major faults would produce a maximum ground acceleration in the area of about 0.lg as ground deceleration generally decreases with increasing distance from the earthquake source.

Several unreinforced masonry buildings are located in the Old Town part of the City. The recreation building also may be vulnerable to earthquakes.

Flood

Clovis is traversed by three natural stream systems. Each of these systems consists of substreams or creeks that collect together to discharge to a centralized natural drainage channel. These systems are the Red Bank, Fancher, and Dog Creek System; the Dry and Dog Creek System; and the Pup Creek/Alluvial Drain System. The latter is a tributary of the original Dry Creek channel. These stream systems collect storm runoff from the foothills east of Clovis and convey such runoff through the Clovis/Fresno metropolitan areas to the Fresno Slough, which is located west of the City of Fresno.

Many of these channels have been modified over time such that they have become duel use stormwater conveyance channels and irrigation water conveyance channels. Those streams that have not been used for irrigation purposes have essentially remained in their natural state and have flowed uncontrolled during storm runoff events. These stream channels have limited flow capacity. In some cases, the uncontrolled grading of land has obliterated or severely modified the natural channels to the extent that their flow capacity has been seriously limited. Flooding has been a serious problem in the Clovis/Fresno metropolitan area when these channel capacities are exceeded.

The flat slope characteristics in Clovis that exhibit natural slopes of less than .001 feet per foot can make the control of drainage runoff difficult and many natural depressions within the flat topography naturally collect and pond stormwater runoff. Nevertheless, the soils within or relatively near the stream courses tend to be the loamy, well-drained soils with high permeability.

The major sources of flooding include areas along the Pup Creek alignment from the northeasterly portion of the Clovis through the center of the City of Clovis. Most of this flooding is confined to the areas in and around the Pup Creek channel. Pup Creek enters the northeastern portion of the City of Clovis near the intersection of Armstrong and East Bullard avenues. Most flood flows enter a culvert at Minnewawa Avenue, north of Barstow Avenue, and are conveyed

to Dry Creek in the vicinity of North Helm and Mitchell Avenues. Dry Creek enters the northwestern portion of the City of Clovis near the intersection of the Union Pacific Railroad and Herndon Avenue. The creek flows out of the City at the southwestern corporate limits just south of the intersection of Shaw and Winery avenues.

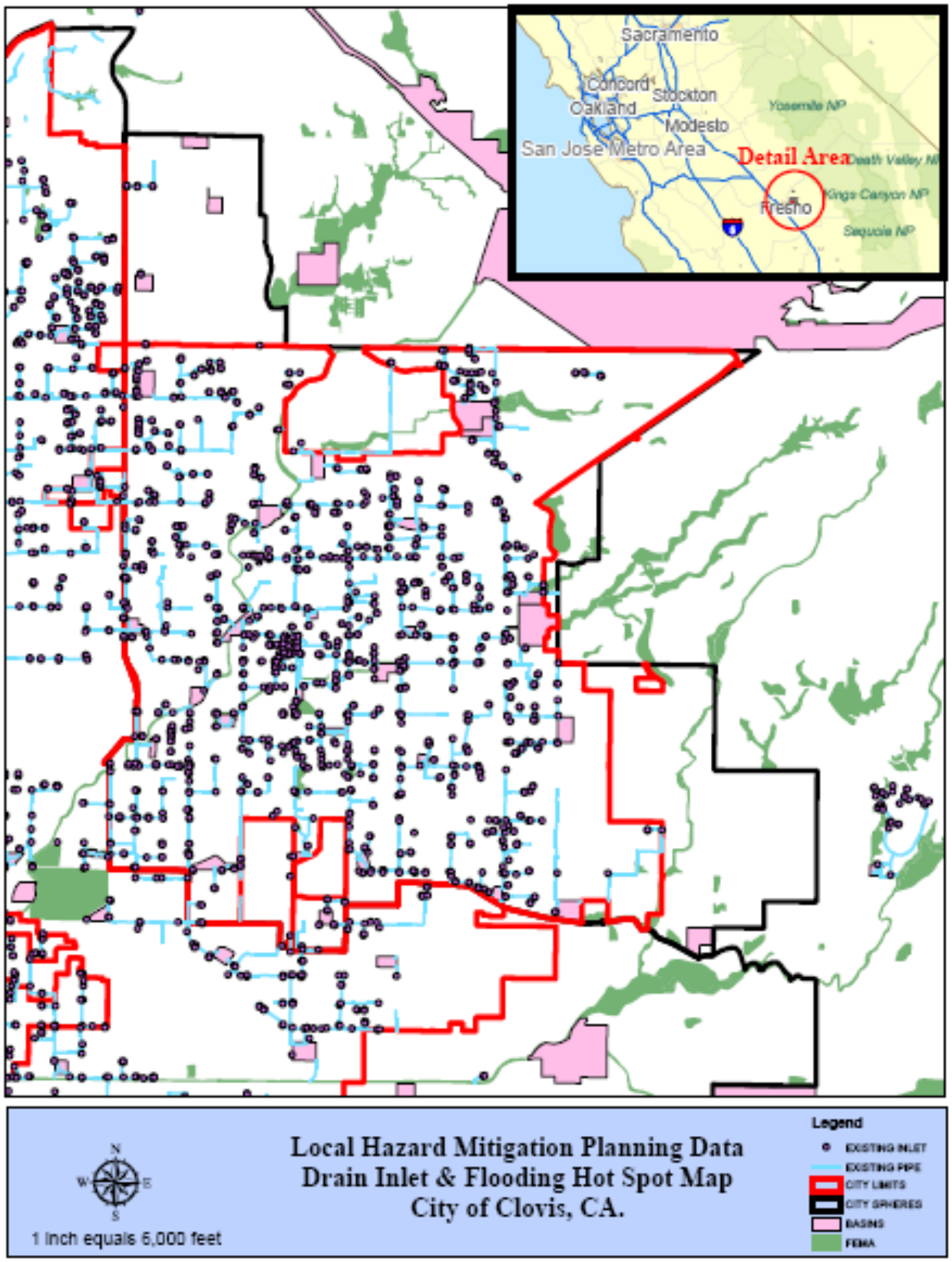
Other areas of flooding are related to the Alluvial Drain area, the Big Dry Creek Reservoir and its possible overflow areas, along the Dog Creek channel alignment, and in low depressed areas along the easterly sides of the Enterprise Canal. Small areas of localized flooding occur in the southeastern part of the City during periods of moderate rainfall or heavy cloudburst storms. There are also a number of ponding areas in the City:

- The ponding area at the northern corporate limits of the City of Clovis, east of Dry Creek and north of the railroad, is caused by the limited channel capacity of Dry Creek from the vicinity of Herndon Avenue to the vicinity of Nees Avenue outside the corporate limits of the City of Clovis.
- The ponding area along Pup Creek between Minnewawa and Peach avenues is caused by excessive overland losses from Dry Creek and limited culvert capacity for Pup Creek at Minnewawa Avenue.
- The ponding area south of Pup Creek and east of the railroad between Jefferson and Barstow avenues is caused by excessive overbank losses on Pup Creek crossing back over the railroad and from a local drainage problem east of Brookhaven Avenue.

The City of Clovis actively uses GIS and FEMA's Flood Insurance Rate Map (FIRM) to assess flood risk and infrastructure mitigation. According to the City's FIRM, all City facilities are within B, C, or X zones, which are outside the 100-year floodplain; insurance purchase is not required in these zones. While past flooding has resulted in reimbursable expenses, the majority of the costs were for emergency protective measures and not direct property loss.

Figure A.5 shows the City inlet system compared to the FEMA 100-year floodplain threat.

Figure A.5. City of Clovis' Drain Inlet and Flooding Hot Spot Map



Flood protection in the City of Clovis is afforded by Big Dry Creek Dam on Dry Creek. Big Dry Creek Dam is located approximately 3.5 miles upstream of the City of Clovis. Its main purpose is flood control, and it has a storage capacity of 16,250 acre-feet. Big Dry Creek Reservoir has prevented an estimated $15 million in damage in the Fresno-Clovis area since its completion in 1948.

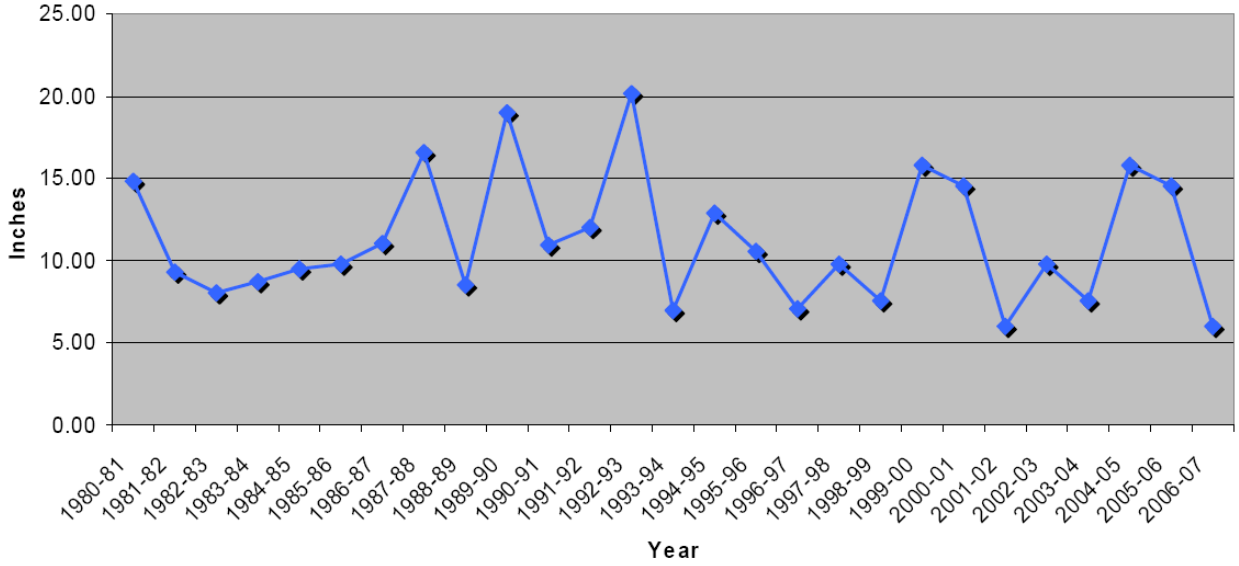
Even with significant investment in planning/mitigation and water management through Fresno Metropolitan Flood Control District, portions of the City of Clovis, the Sphere of Influence areas, and the unincorporated Fresno County area, have been subject to historical flooding. Most recently, flooding occurred in January 2006 (CDAA-2006-01) and March of 2006 (CDAA-2006-03). The combined impact of these storms left Clovis with $14,562 in damage that was reimbursable since Fresno County received state declarations for the storms. In both instances, there were short periods when intersections were closed due to flooding and customers could not reach businesses.

According to FEMA's 2005 Flood Insurance Study, damaging floods also occurred in the area in 1938, 1955, 1958, 1969, and 1978. Details on some of these events follow:

- **December 1955**—Pup Creek overflowed and flooded more than 20 homes in the vicinity of Clovis Avenue and Ninth Street. Floodwater two feet deep in some places blocked streets and disrupted traffic.
- **March 1958**—Pup Creek overflowed and flooded areas along Ninth Street. Floodwater was up to three feet deep, but damage was limited to streets, external residential improvements, and disruption of traffic.
- **January-February 1969**—Creeks and canals in the area overflowed and inundated agricultural land, residential property, and streets and roads. Many homes were evacuated and others protected by sandbags. Traffic was disrupted by flooded streets and roads. Dry Creek and tributaries flooded approximately 1,400 acres and caused an estimated $329,000 in damage below Big Dry Creek Reservoir.
- **February 1978**—Pup Creek overflowed. Residential property was inundated, homes were evacuated, roads and streets were closed, and traffic was disrupted. The recurrence interval of this flood was 74 years.

Figure A.6 illustrates annual rainfall in Clovis between 1980 and 2007.

Figure A.6. City of Clovis' Annual Rainfall Totals, 1980-2007



For information about flooding related to dam failure, see the Other Hazards section below.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Clovis was created (see Figure A.7). Tables A.5-A.7 summarize the values at risk in the City's floodplain. Table A.5 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table A.6 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table A.7 shows loss estimates by flood.

Figure A.7. City of Clovis' 100- and 500-Year Floodplains

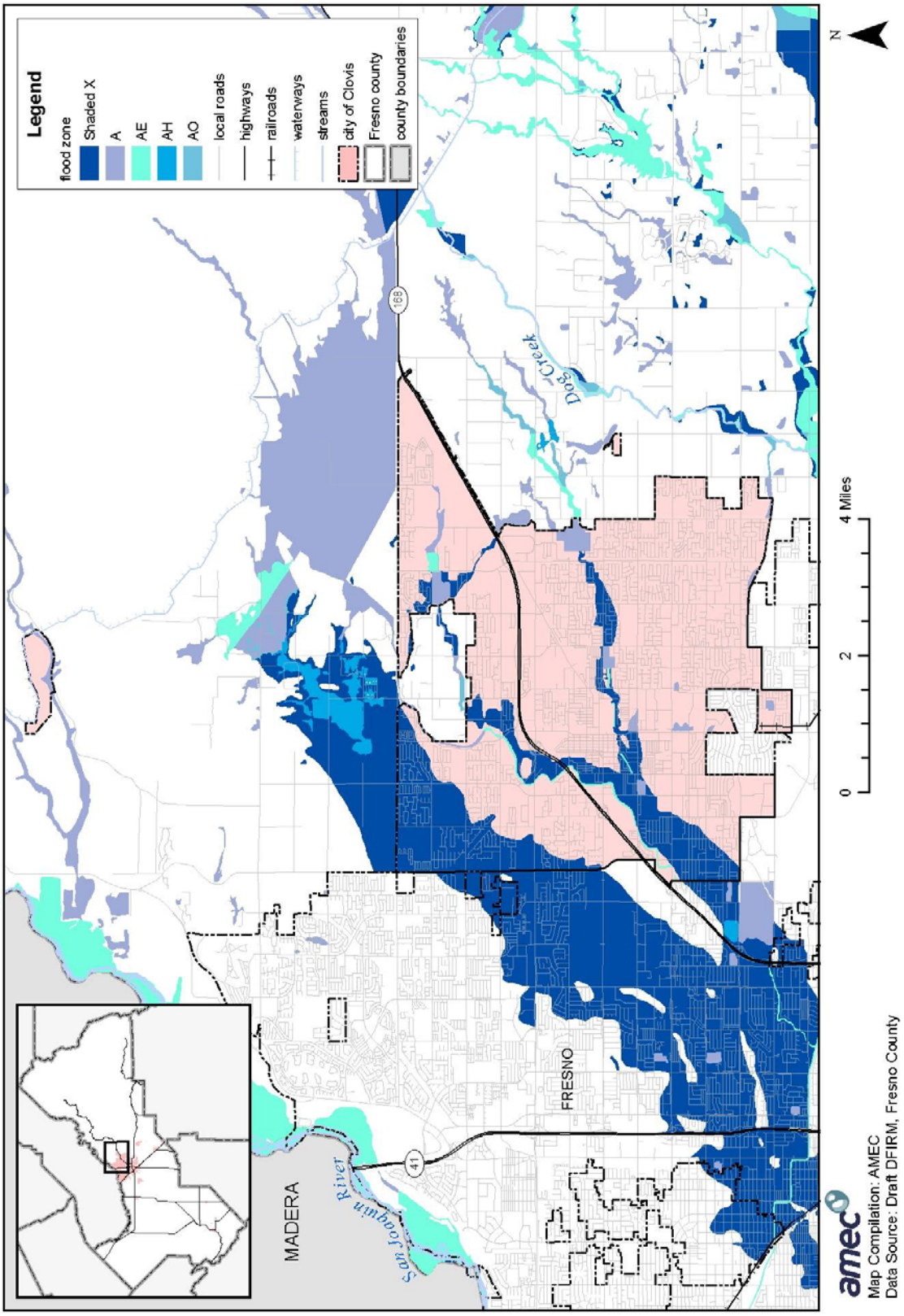


Table A.5. Count and Improved Value of Parcels in Floodplain by Zone—City of Clovis

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	23	8,473,464	-	-	-	-
Industrial	15	2,165,871	1	26,010	-	-
Open Space	-	-	-	-	-	-
Residential	58	16,169,577	33	5,714,587	-	-
Total	**96**	**26,808,912**	**34**	**5,740,597**	**-**	**-**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	-	-	1	206,439	11	2,219,077
Commercial	-	-	149	138,964,061	730	459,101,290
Industrial	-	-	21	4,002,043	235	143,392,734
Open Space	-	-	-	-	1	181,660
Residential	-	-	5,851	1,072,324,877	20,822	3,584,982,591
Total	**-**	**-**	**6,022**	**1,215,497,420**	**21,799**	**4,189,877,352**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table A.6. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Clovis

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	-	-	1	206,439	1	206,439
Commercial	23	8,473,464	149	138,964,061	172	147,437,525
Industrial	16	2,191,881	21	4,002,043	37	6,193,924
Open Space	-	-	-	-	-	-
Residential	91	21,884,164	5,851	1,072,324,877	5,942	1,094,209,041
Total	**130**	**32,549,509**	**6,022**	**1,215,497,420**	**6,152**	**1,248,046,929**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table A.7. Fresno County Flood Loss Estimates—City of Clovis

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	130	32,549,509	16,274,755	48,824,264	9,764,853
500-Year Flood	6,022	1,215,497,420	607,748,710	1,823,246,130	364,649,226
Total Flood**	**6,152**	**1,248,046,929**	**624,023,465**	**1,872,070,394**	**374,414,079**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Clovis has significant assets at risk to the 100-year and greater floods. 130 improved parcels are within the 100-year floodplain for a total value of roughly $33 million. An additional 6,022 improved parcels valued at $1.2 billion fall within the 500-year floodplain.

Applying the 20 percent damage factor as previously described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $10 million in damage in the City of Clovis and a .2 percent chance in any given year of a 500-year flood causing roughly $374 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Population at Risk

Based on information from HAZUS-MH (Census 2000) and the digital flood insurance rate map, the following are at risk to flooding in the City of Clovis:

- **100-year flood**—1,091 people
- **500-year flood**—14,794 people
- **Total flood**—15,885 people

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Clovis joined the National Flood Insurance Program (NFIP) on March 16, 1983. NFIP Insurance data indicates that as of November 30, 2007, there were 56 flood insurance policies in force in the City with $15,148,000 of coverage. Of the 56 policies, 54 were residential (51 for single-family homes) and 2 were nonresidential. 18 of the policies were in A zones (the remaining 38 were in B, C, and X zones).

There have been 13 historical claims for flood losses totaling $118,652.32; all were for residential properties; 11 were in A zones and 2 were in B, C or X zones; and 12 were pre-FIRM structures (the one post-FIRM structure with a reported loss was in a B, C, or X zone). There were no repetitive or severe repetitive loss structures.

Critical Facilities at Risk

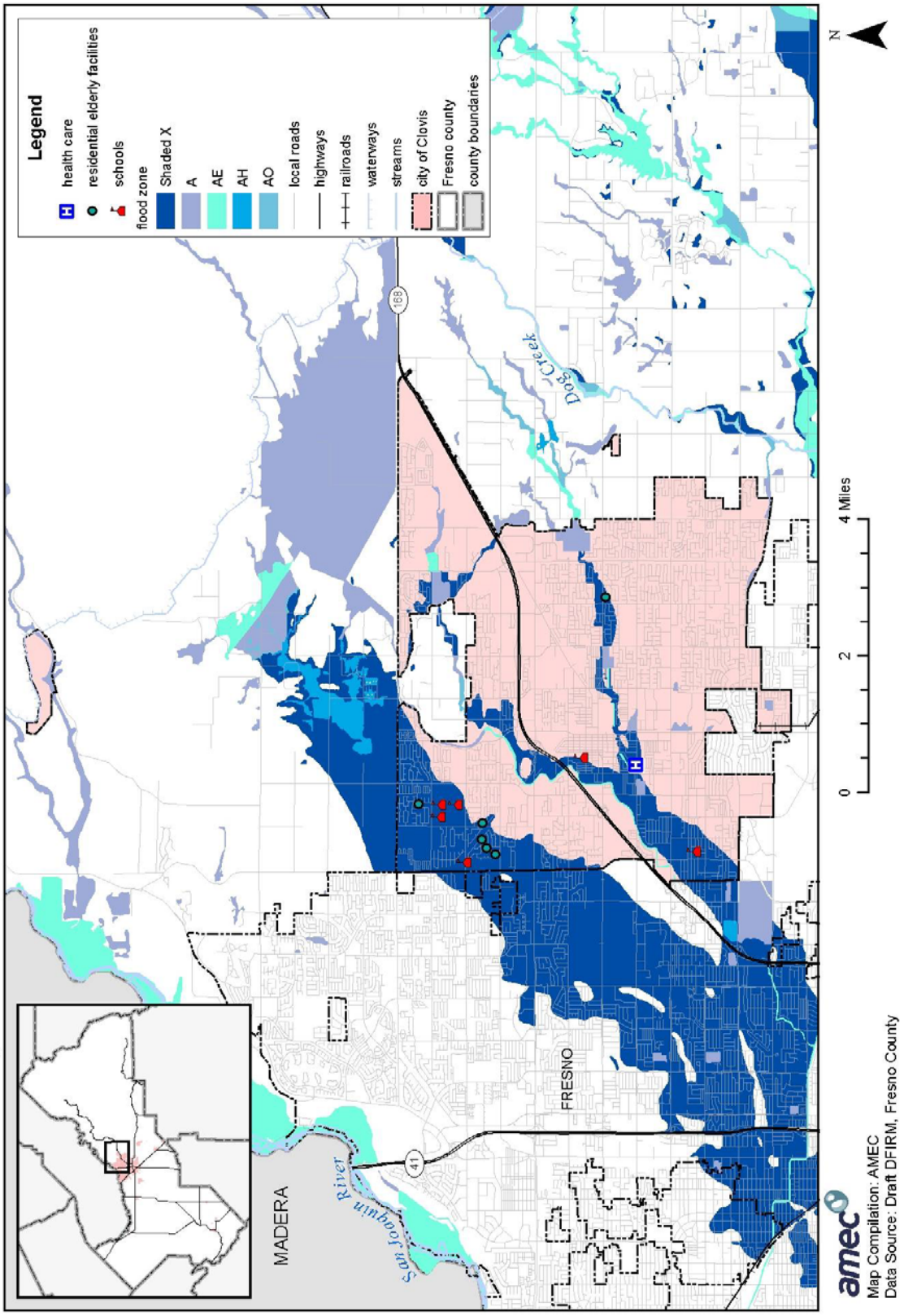
Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table A.8 lists the critical facilities in the City's 100- and 500-year floodplains, and Figure A.8 illustrates their locations. The impact to the community could be great if these critical facilities are damaged or destroyed during a flood event.

Table A.8. Critical Facilities in the 100- and 500-Year Floodplains: City of Clovis

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Health Care Facilities	-	1
Schools and Day Care Centers	-	6
Residential Elderly Facilities	-	6
Total	**-**	**13**

Source: Fresno County GIS

Figure A.8. Critical Facilities in the 100- and 500-Year Floodplains: City of Clovis

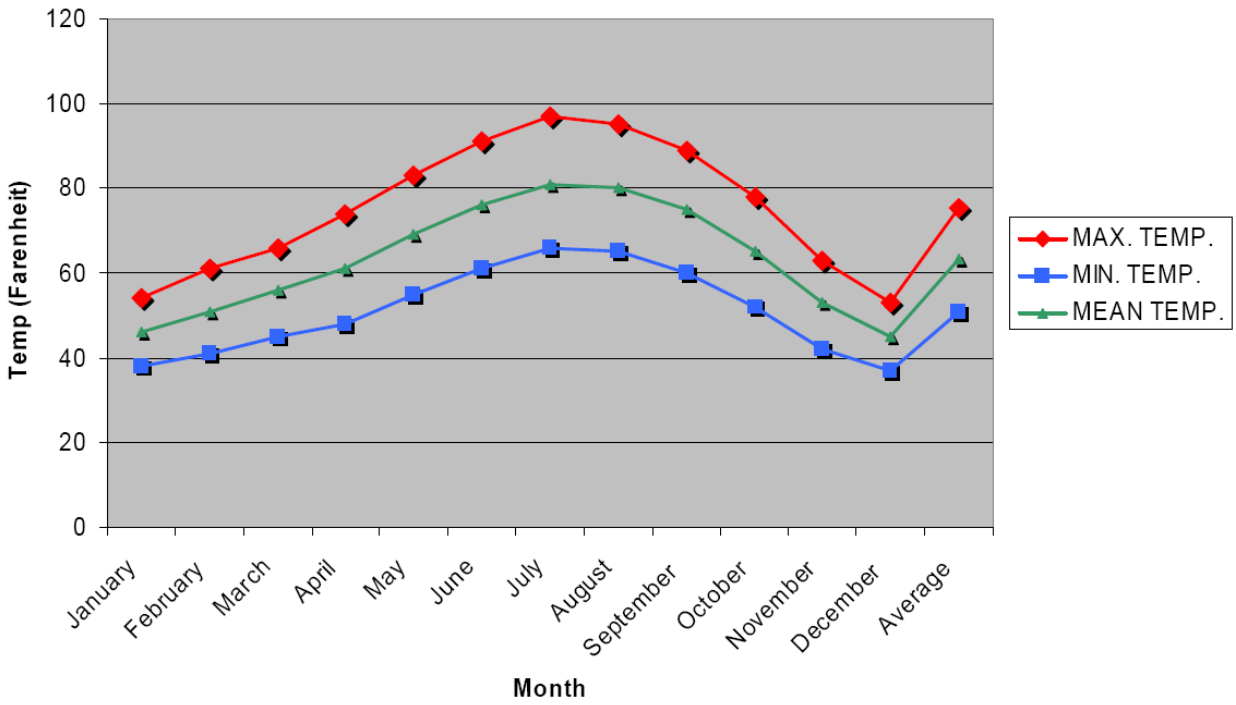


There are no critical facilities in the City's 100-year floodplain, but according to the risk assessment for the County, floods in Clovis tend to be 500-year events. Thus, it is particularly important to note that the critical facilities in the 500-year floodplain are all facilities that serve vulnerable populations and thus should be given special attention.

Severe Weather: Extreme Heat

As recently as 2006 and 2007, Clovis experienced heat waves that exceeded 24 days. While no direct loss of livestock was reported, the City staffed cooling centers to protect vulnerable populations, and there were several power outages that rotated through the area. Figure A.9. shows historical temperatures in Clovis.

Figure A.9. Historical Temperatures in Clovis



It is not uncommon in Clovis to have consecutive days over 100°F. The following chronicles heat waves in Clovis:

High Temperature of 112°F or Greater

- 4 days from 7/30/1908 – 8/2/1908
- 5 days from 7/22/2006–7/26/2006

High Temperature of 110°F or Greater

- 4 days from 6/29/1891–7/2/1891

- 4 days from 7/8/1896–7/11/1896
- 6 days from 7/26/1898–7/31/1898
- 5 days from 7/5/1905–7/9/1905
- 5 days from 7/29/1908–8/2/1908
- 4 days from 7/24/1931–7/27/1931
- 5 days from 7/22/2006–7/26/2006

High Temperature of 105°F or Greater

- 10 days from 7/28/1889–8/6/1889
- 9 days from 7/6/1896–7/14/1896
- 10 days from 7/18/1931–7/27/1931
- 9 days from 7/21/1980–7/29/1980
- 14 days from 7/17/1988–7/30/1988
- 9 days from 7/13/2005–7/21/2005
- 12 days from 7/16/2006–7/27/2006

High Temperature of 95°F or Greater

- 51 days from 6/23/1908–8/12/1908
- 53 days from 7/6/1910–8/27/1910
- 51 days from 7/7/1939–8/26/1939
- 50 days from 6/6/1967–8/24/1967
- 51 days from 6/30/2006–8/19/2006

In response to extreme heat events in 2007, the City implemented Phase II of the City's Heat Emergency Plan, which entailed opening facilities and using volunteer staff from 12–10 p.m. to provide cooling for individuals impacted by the heat. The cost to provide this level of service was negligible since the facility used was already open and volunteers staffed the center. While few people sought relief, the most significant benefit was from volunteers checking the welfare of vulnerable seniors who rely on swamp coolers for cooling and who cannot always determine their physiological need for hydration. For the summer, Phase II of the plan was activated seven times. Over 20 individuals sought refuge in the center, and volunteers placed over 183 personal welfare calls to the medically fragile. In Clovis, there was no loss of human or livestock life.

Other Hazards

Although ranked of lower planning significance relative to other hazards, the following information about dam failure, extreme cold/freeze, fog, landslide, and wildfire should still be noted:

Dam Failure

Potential flooding also exists in the form of reservoirs to the northeast and southeast of Clovis: Fancher Creek Reservoir and Big Dry Creek Reservoir. The major inundation areas from

potential overflows from the Big Dry Creek Reservoir affect a major part of the northwesterly portion of Clovis as well as the northwesterly portions of the current City Sphere of Influence and City boundaries.

The Big Dry Creek Dam, approximately 3.5 miles upstream from the City of Clovis, impounds stormwater runoff from Big Dry Creek in the Big Dry Creek Reservoir. The Big Dry Creek Reservoir is owned and operated by the Fresno County Metropolitan Flood Control District and is intended primarily for flood control of winter runoff from the Dry Creek and Dog Creek watersheds. In the 1990s, modifications were made to increase the capacity of the reservoir, and it now provides protection against the 200-year flood.

Under wet conditions, the Big Dry Creek Reservoir captures runoff and controls releases into artificial ditches and canals, which drain into either Little Dry Creek, located north of the reservoir, or in a southerly direction into Mill Ditch. Flows from Little Dry Creek and Mill Ditch eventually drain to the San Joaquin River. Flows from the reservoir can also be diverted into Dog Creek, which also eventually drains into the San Joaquin River. During dry weather conditions, the reservoir does not discharge water and is normally empty, with the exception of a 156 acre-foot residual pool. The top of the pool remains below the elevation of an existing discharge gate.

Severe Weather: Extreme Cold/Freeze

Figure A.9 above illustrates the average temperature by month. From the figure, one can see that December and January have the greatest potential for extreme cold/freeze with an average minimum temperature of 37.5°F. In Clovis, it is not uncommon to have consecutive days with a minimum overnight low temperature of 32°F. Clovis has been impacted by severe freezing in winters past. Most notable were the freezes of 1997/98 and 2006/2007. Severe cold/freeze declarations occurred in 1990, 1998, and 2001. These incidents impacted local agriculture and City infrastructure. Estimated agricultural losses in 2006/2007 totaled $1 million with another $10,000 in damage to infrastructure. The following chronicles historic periods of extreme cold in Clovis:

Low Temperature of 20°F or Below

- 2 days from 1/16/1888–1/17/1888
- 2 days from 1/6/1913–1/7/1913
- 2 days from 1/10/1949–1/11/1949
- 3 days from 12/22/1990–12/24/1990

Low Temperature of 24°F or Below

- 4 days from 1/14/1888–1/17/1888
- 4 days from 1/3/1949–1/6/1949
- 5 days from 1/3/1950–1/7/1950
- 6 days from 12/12/1963–1/17/1963
- 5 days from 12/31/1975–1/4/1976

- 6 days from 12/21/1990–12/26/1990

Low Temperature of 28°F or Below

- 12 days from 1/7/1888–1/18/1888
- 7 days from 1/12/1963–1/18/1963
- 9 days from 1/17/1966–1/25/1966
- 14 days from 12/20/1990–1/2/1991
- 8 days from 1/20/1998–12/27/1998

Low Temperature of 32°F or Below

- 21 days from 1/3/1947–1/22/1947
- 15 days from 12/28/1960–1/11/1961
- 15 days from 1/11/1963–1/25/1963
- 16 days from 12/19/1990–1/2/1991
- 19 days from 1/6/2007–1/24/2007

During the January 2007 freeze (CDAA 2007-02), Clovis experienced 19 days of consecutive low temperatures at or below 32°F. In response, Clovis coordinated the resources and staff necessary to establish a warming station at the Clovis Senior Center. Public safety personnel continually monitored calls for service related to vulnerable populations, such as the homeless and seniors who might have needed these services. In addition, fire prevention staff checked on mobile home residents during their normal smoke alarm check/installs. Fortunately, Clovis residents were prepared, and the City did not have to open a warming center.

School facilities incurred $55,000 in damage. In the urban area, there was some damage to wells, and some small businesses reported leaky/broken sprinkler pipes. City damage reimbursable through the state declaration totaled $9,373. Agricultural losses were greatest in the citrus growing and packaging industry. Local growers/packers included P&R Farms and Harlan Ranch. Since P&R Farms primarily handles stone fruit (i.e., peaches, apricots), impact to their crops was minimal. Harlan Ranch suffered 100 percent crop loss due to the fact that their primary commodity was citrus, and they had planted over 100 new acres of trees. At last check, their crop loss was $2.5 million. While some oranges were juiced, Harlan Ranch representatives said the juice market was break-even at best.

Severe Weather: Fog

In Fresno/Clovis, the average number of days with dense fog per year is 35.1 (see Table A.9). The most consecutive days with dense fog were the following:

- 14 days from 12/19/1929-1/2/1930
- 16 days from 12/13/1985-12/28/1985

Table A.9. Average Number of Days in Fresno/Clovis with Dense Fog

Month	Number of Days
January	11.5
February	5.1
March	1.5
April	0.2
May	0
June	0
July	0
August	0
September	0
October	0.6
November	5.2
December	11.0
Annual	**35.1**

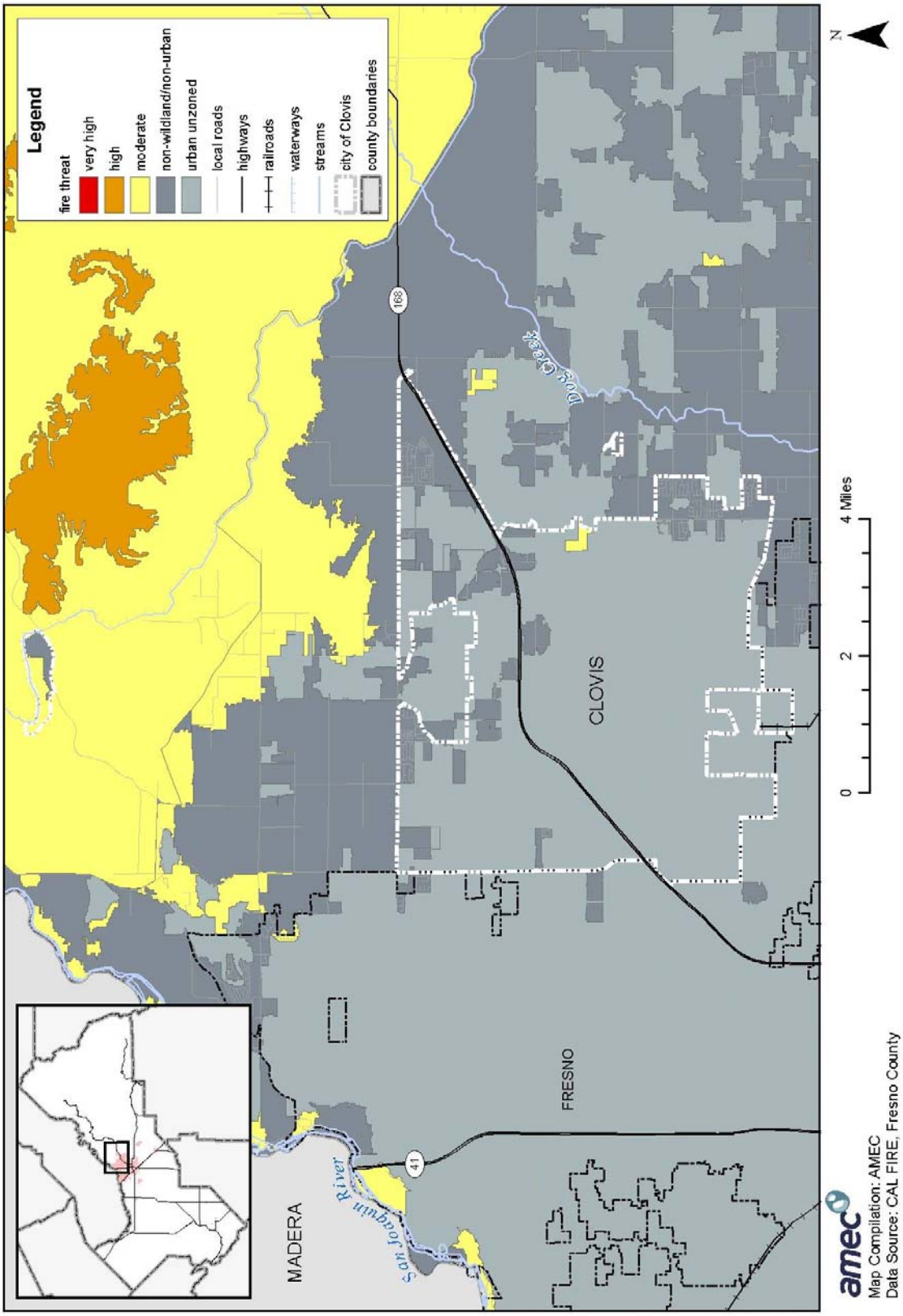
Soil Hazards: Landslide

Slope stability is not a concern in the Clovis area. Clovis has a natural mild gradient from northeast to southwest. The highest elevation coincides with the Friant/Kern Canal north of Tollhouse Road at 460 feet. The lowest elevation is 335 feet near the intersection of Winery and Ashlan avenues.

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Clovis was created (see Figure A.10). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Clovis.

Figure A.10. City of Clovis' Wildfire Threat



A.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

A.4.1 Regulatory Mitigation Capabilities

Table A.10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Clovis.

Table A.10. City of Clovis' Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	1993
Zoning ordinance	Yes	1971
Subdivision ordinance	Yes	1991
Site plan review requirements	Yes	1971
Growth management ordinance	No	Incorporated as concept within General Plan
Floodplain ordinance	Yes	1989
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	Water Conservation (2005), Stormwater (2007)
Building code	Yes	Version: 2001
Fire department ISO rating	Yes	Rating: 3
Erosion or sediment control program	Yes	1991
Stormwater management program	Yes	2007
Capital improvements plan	Yes	2007
Economic development plan	Yes	2004
Local emergency operations plan	Yes	1997
Other special plans	Yes	Emergency Services Municipal Code (Title 4—Chapter 4.2) Heat Emergency Contingency Plan
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

The City of Clovis General Plan Program, 1993

The City of Clovis General Plan Program serves as the blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition (see the discussion in Section A.3.3 Growth and Development Trends).

The general plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development of the Clovis planning area. Identified hazards

include fire, geologic/seismic, flooding, and hazardous materials. Mitigation-related goals, policies, and actions are presented below.

Goal 1:	**Protect the Clovis community from hazards associated with the natural environment.**
Policy 1.1:	Minimize risks of personal injury and property damage associated with natural hazards.
	Actions: · Educating the community on procedures regarding preparedness and response to natural disasters providing information describing procedures and evacuation routes to be followed in the event of a disaster. · Establishing design criteria for publicly accessible stream corridors, detention basins, and drainage facilities to minimize potential for accidents and injury. · Preserve as open space areas along waterways, detention basins, and ponding areas, and in areas of wildfire and known flooding hazards where building for human occupancy is hazardous.
Policy 1.2:	Provide flood protection for existing development and for areas planned for new development.
	Actions: · Coordinate with the Fresno Metropolitan Flood Control District (FMFCD) in its efforts to enact a program of channel preservation, renovation, and maintenance. · Support the FMFCD in the creation of an inventory of all streams draining from the foothills areas and identifying all channels that have been obliterated or altered. · Require, as a condition of development, protection of channel alignments, identification of floodway areas, and construction of channel improvement so that projected 100-year flood flows can pass without affecting new development. · Utilize zoning and other land use regulation to limit and or prohibit development in flood-prone areas. · Map dam inundation areas and develop, maintain, and inform the public of an evacuation procedure for all affected areas in the event of failure of dams.
Policy 1.3:	Utilize the unprotected 100-year floodplain for low density uses such as agriculture, open space, recreation, and for reclaiming water and wetlands.
	Actions: · Establish development set-back requirements from natural water courses that traverse the project areas.
Policy 1.4:	Mitigation potential adverse impacts of geologic and seismic hazards.
	Actions: · Require geologic and soils studies to identify potential hazards as part of the approval process for all new development prior to grading activities. · Conduct a building survey to identify structures that are substandard in terms of seismic safety. Develop a program to bring these structures up to current seismic safety code standards. · Require that underground utilities be designed to withstand seismic forces. · Coordinate with the FMFCD to regularly inspect and repair levees as part of their proposed program of channel preservation, renovation, and maintenance. · Incorporate appropriate earthquake prevention standards into the uniform technical codes and require that all new structures are engineered to meet seismic safety code standards.

The Public Facilities Element of the general pdefines policy for public facilities and services, including infrastructure, and addresses the issues of providing adequate infrastructure and community services to expanding populations by planning in conjunction with land use. Clovis' infrastructure consists of water, wastewater, storm drainage/flood control, and solid waste systems. The element does not address how new facilities and infrastructure are sited in regard to known hazard areas. It does include hazard-related policies to provide effective storm drainage facilities for planned development by maintaining agreement with the Fresno Metropolitan Flood

Control District to reduce the effect that development has on natural watercourses and to ensure that adequate water supply can be provided through water reuse and water conservation.

Clovis Municipal Code

The following ordinances are used for implementing the general plan and/or are critical to the mitigation of hazards identified in this plan.

Zoning Ordinance (Title 9—Chapter 9.3)

The purpose of the Zoning Ordinance is to encourage, classify, designate, regulate, restrict, and segregate the highest and best locations for, and uses of, buildings, structures, and land for agriculture, residence, commerce, trade, industry, water conservation, or other purposes in appropriate places; to regulate and limit the height, number of stories, and size of buildings and other structures hereafter designed, erected, or altered; to regulate and determine the size of yards and other open spaces; and to regulate and limit the density of population, and for such purposes to divide the City into districts of such number, shape, and area as may be deemed best suited to provide for their enforcement. Further, the Zoning Ordinance addresses the following:

- Most appropriate uses of land
- Conservation and stabilization of property values
- Provision of adequate open space for light and air and to prevent and fight fires
- Prevention of undue concentration of population
- Lessening of congestion of streets
- Facilitation of adequate provision of community utilities, such as transportation, water, sewerage, schools, parks, and other public requirements
- Promotion of the public health, safety, and general welfare

Site Plan Ordinance (Title 9—Chapter 9.3.208.6)

The site plan review is performed by the Clovis Planning and Development Services Department. During the review, the owner of a parcel is required to submit a plan to scale demonstrating all of the uses for a specific parcel of land. This review ensures compliance with applicable law and the zoning requirements within the City.

Subdivision Ordinance (Title 9—Chapter 9.2)

The Subdivision Ordinance specifically provides for proper grading and erosion control and prevention of sedimentation or damage to off-site property. Each local agency may by ordinance regulate and control other subdivisions, provided that the regulations are not more restrictive than the regulations commencing in California Government Code Section 66410.

Erosion or Sediment Control Program (Title 9—Chapter 9.2.309)

Every map approved pursuant to the provisions of the Subdivisions Ordinance are conditioned on compliance with the requirements for grading and erosion control, including

the prevention of sedimentation or damage to off-site property, set forth in Appendix Chapter 70 of the Uniform Building Code, current adopted edition, as adopted and amended by the City.

Flood Hazard Ordinance (Title 8—Chapter 8.12)

Flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards that increase flood heights and velocities also contribute to flood loss. It is the purpose of the Flood Hazard Ordinance to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

In order to reduce flood losses, the ordinance includes methods and provisions to:

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

Emergency Services Ordinance (Title 4—Chapter 4.2)

The declared purposes of the Emergency Services Ordinance are to provide for the preparation and carrying out of plans for the protection of persons and property within the City in the event

of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private persons.

Stormwater Management Program (Emergency Flood Control Procedures 2007-2008)

The City's Public Utilities Department has three Stormwater Patrol teams, made up of 22 public utilities employees, to implement emergency flood control measures. The plan contains information and procedures to rapidly address flooding throughout the City. Contact information and team assignment data is updated regularly as are geographic locations subject to flooding. Appendices include suppliers/contractors, storm basin list, problem drain lists, and partnerships and agencies with shared responsibility for storm preparedness, mitigation, and response.

Five-Year Community Investment Program

The Five-Year Community Investment Program (CIP) represents an effort to identify major capital needs and schedule projects consistent with community priorities and available funding. A major portion of the funding for these projects comes from development fees. Projects identified in the CIP are broken down as follows:

- **General Government Facilities**—The capital projects for the General Government Facilities program consist of acquisition of new facilities, improvement to existing facilities, and maintenance of existing improvements required by City departments to enable them to adequately carry our their mission.
- **Sewer Capital Projects**—The Enterprise budget includes projects that will repair and/or replace existing sanitary sewer mains that are severely deteriorated or are not adequately sized for the flows being experienced. The Developer budget includes the debt service payments for the 2007 Sewer Revenue Bond for the Sewage Treatment and Water Reuse Facility.
- **Parks Improvements**—These primarily consist of master planning and design and construction of park improvements. Community park improvements are funded by development fees and state grants when available. Neighborhood parks are installed by development. Park fees are paid by all new developments constructed within the City of Clovis.
- **Street Improvements**—These include traffic signal installation, street repair and improvement, sidewalk installation/modification, and design work throughout the City.
- **Water**—This includes projects that will continue to improve the water distribution system, and improve water quality through the addition of treatment facilities at existing wells, and increase the reliability of the water supply by the addition of auxiliary power generators.
- **Refuse**—This includes regulatory design and maintenance of City-owned landfill and associated projects.

- **Clovis Community Development Agency**—This focuses on projects that provide affordable housing in the community and on encouraging and enhancing the business environment of Clovis.
- **Police/Fire**—This addresses facility design and maintenance for satellite locations and main headquarters.

Economic Development Strategy

The City of Clovis adopted the initial Economic Development Strategy in March 1998. The 1998 strategy included a mission statement as well as goals and objectives for three individual strategies: Industrial Development, Commercial Development, and Tourism. The City of Clovis believes that these three individual strategies make up the basis for a well-rounded economic development program. If progress is made in the implementation of the stated goals and objectives in each of these strategies, the City will be better able to create the wealth necessary to provide municipal services to Clovis residents and businesses.

On November 3, 2003, the City Council appointed 20 community members to the Economic Development Strategy Advisory Committee (EDSAC) to work with City staff for the purpose of reviewing and updating the 1998 Economic Development Strategy. For nine months, EDSAC members heard presentations from experts regarding perspectives on current markets, the regulatory environment, access to capital, characteristics of the local labor force, public incentive programs, and the local commercial and industrial real estate market. The committee then analyzed relevant data and formulated draft strategies provided by City staff to create the Economic Development Strategy update.

City of Clovis Emergency Operations Plan

The City of Clovis Emergency Operations Plan (EOP) Basic Plan addresses the planned response for the City of Clovis to emergencies associated with disasters, technological incidents, or other dangerous conditions created by either man or nature. It provides an overview of operational concepts, identifies components of the City emergency management organization, and describes the overall responsibilities of local, state, and federal entities. The City will place emphasis on emergency planning; training of full-time, auxiliary, and reserve personnel; public awareness and education; and assuring the adequacy and availability of sufficient resources to cope with emergencies. Emphasis will also be placed on mitigation measures to reduce losses from disasters, including the development and enforcement of appropriate land use, design, and construction regulations.

The EOP's section on hazard mitigation establishes actions, policies, and procedures for implementing Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a presidentially declared emergency or major disaster. It also assigns hazard mitigation responsibilities to various elements of federal, state, and local governments in California.

Heat Emergency Contingency Plan

The Heat Emergency Contingency Plan describes City operations during heat-related emergencies and provides guidance for City departments and personnel. It recognizes the need to communicate and coordinate with local agencies and mobilize and initiate actions in advance of local requests and supports local actions according to the Standardized Emergency Management System and the National Incident Management System. The plan goal is to reduce the incidence of morbidity and mortality associated with local extreme heat events.

Urban Water Management Plan

Clovis proactively manages water supplies and has policies in place to effectively deliver water to local residents. In order to appropriately manage water resources within Clovis, the City updated its Urban Water Management Plan in 2005 in coordination with the City of Fresno, County of Fresno, Fresno Irrigation District, and Fresno Metropolitan Flood Control district. The City of Clovis utilizes many water management tools and options to maximize water resources and minimize the need to import water. The City has an existing groundwater management plan (1997) and is involved in the Fresno-Area Regional Groundwater Management Plan.

Clovis Unified School District Hazard Mitigation Plan

The Clovis Unified School District is a K-12 public school system that serves the Cities of Clovis and Fresno, some unincorporated areas of Fresno County, and the rural community of Friant. It covers approximately 198 square miles and has a student population of nearly 38,000.The overall goal of the Clovis Unified School District Hazard Mitigation Plan is to reduce or prevent injury and damage from natural hazards in the District by addressing the hazards that present the greatest risk to the District, its students, staff, facilities, infrastructure, properties, and the natural environment. The plan examines past events and hazard mitigation programs already in place and prioritizes additional mitigation activities for the District. Planning goals include facilitating the integration of City and County hazard mitigation planning activities into District efforts.

A.4.2 Administrative/Technical Mitigation Capabilities

Table A.11 identifies the personnel responsible for activities related to mitigation and loss prevention in Clovis.

Table A.11. City of Clovis' Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Deputy City Planner
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Building Official
Planner/engineer/scientist with an understanding of natural hazards	Yes	Deputy City Planner
Personnel skilled in GIS	Yes	GIS Analyst
Full time building official	Yes	Building Official
Floodplain manager	Yes	Building Official
Emergency manager	Yes	Emergency Preparedness Manager
Grant writer	Yes	Emergency Preparedness Manager
Other personnel	Yes	Engineering Supervisor
GIS Data—Land use	Yes	GIS Analyst
GIS Data—Links to Assessor's data	Yes	GIS Consultant
Warning systems/services (Reverse 9-11, outdoor warning signals)	No	

A.4.3 Fiscal Mitigation Capabilities

Table A.12 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table A.12. City of Clovis' Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

A.4.4 Mitigation Outreach and Partnerships

The City of Clovis has two fire prevention specialists dedicated to public education, reaching 17,000 kids per year in the school system. The City also has a Clovis Emergency Response Team volunteer program.

A.4.5 Other Mitigation Efforts

The fire department is accredited through the Commission on Fire Accreditation International, which is part of the Center for Public Safety Excellence.

A.5 Mitigation Strategy

A.5.1 Mitigation Goals and Objectives

The City of Clovis adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

A.5.2 Mitigation Actions

The planning team for the City of Clovis identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

1. Establish Post-Disaster Action Plan for City Continuity of Operations Plan

Issue/Background: Establish a post-disaster action plan to be part of the City's continuity of operations plan (COOP) that will include the following elements:

- Procedures for public information
- Post-disaster damage assessment
- Grant writing
- Code enforcement
- Redundant operations

The plan will also include annexes from local businesses and large employers to improve economic and employment recovery. The plan will also identify a mechanism for the City to help businesses without COOPs develop a COOP to be incorporated into the City's plan.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness Manager

Priority (High, Medium, Low): High

Cost Estimate: $500,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-planning. A City COOP and local business COOPs will reduce the impact of a disaster on the local economy and employment.

Schedule: Long term

2. Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment

Issue/Background: City inspectors play a vital role in post-disaster building assessment and damage assessment. Pre-training and certification is vital in response and recovery to reduce loss of life, relocate populations, and ensure the rebuilding of local economies.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services

Priority (High, Medium, Low): High

Cost Estimate: $200,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-training and certification of individuals responsible for performing assessment of structures and facilities impacted by disasters.

Schedule: Long term

3. Construct a Water Intertie between the Cities of Clovis and Fresno

Issue/Background: The City of Clovis operates a water system that serves over 95,000 residents. During rolling power blackouts or earthquakes or due to potential contamination of the water supply, there is a need to have a backup supply of potable water available. The City has an agreement with the City of Fresno to construct an intertie between the two water systems to act as an emergency backup.

Other Alternatives: The City has backup power at many of its facilities but not all of them. Additionally backup power will not help if the issue is unrelated to a power blackout.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: $890,000

Potential Funding: City of Clovis Water Enterprise Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: November 2008

4. Install a System of Surface Water Hazard Detection

Issue/Background: The City operates a surface water treatment plant that supplies water to a community of over 95,000 people. The water is delivered to the plant via an open canal that travels approximately 30 miles from the source to the plant. There have been several incidents where items have been dumped into the canal, requiring the plant to shut down. The City is concerned that the dumping of hazardous chemicals could occur and, without some advance notification, that the chemicals could get through the treatment plant and into the distribution system, making customers sick.

Equipment is available that can be installed upgradient from the plant that will sample the water, analyze the water on-site, and provide notification to the plant prior to it reaching the plant.

Other Alternatives: Continue patrolling the canal on a daily basis.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: $100,000

Potential Funding: City of Clovis Water Operations Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: November 2008

5. Construct Channel Improvements for Dog Creek Stream, South of Gettysburg-Ashlan

Issue/Background: Dog Creek has been identified in the Fresno Metropolitan Flood Control District's (FMFCD) Rural Streams Program as a facility that needs master planned drainage improvements to adequately convey rural stream floodwaters. The FMFCD requires all development within rural stream areas to provide and construct the necessary channel improvements. The channel improvements required of Dog Creek include relocation/reconstruction of the existing channels geometry to allow a flow of 315 cubic feet per second to be passed. In order to meet this flow capacity, Dog Creek must have geometry of approximately 60 feet in width and 12 feet in depth.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: $700,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to improve flood management of Dog Creek for future development, as planned for in the area, thus minimizing the potential of rural stream flows to flood urbanized areas. Development activity in the City of Clovis is managed through the FMFCD for both urbanized development and rural stormwater flows. FMFCD policy does not allow for the mixing of urban and rural flows in the same channel.

Schedule: Long term

6. Improve Flow Design Parameters for Big Dry Creek and the Enterprise Canal

Issue/Background: In order to meet the Fresno Metropolitan Flood Control District's flow design parameters for Big Dry Creek and the Enterprise Canal, the existing siphon at the confluence of the two waterways needs to be replaced with a similar type structure. The new structure will have enhanced flow measurement and control for both the Big Dry Creek and Enterprise Canal and would incorporate a walkway to accommodate a path along Big Dry Creek for the general public.

The primary purpose of the project is to provide for the long term integrity of the siphon to pass Big Dry Creek and Enterprise Canal flows. The existing structure on the Enterprise Canal (located beneath Dry Creek) was constructed in the early 1900s (estimated 1915). The replacement of this structure is essential to the reliable delivery of water over the long term. The existing structure consists of a box culvert with an integrally constructed weir. Material strength testing was conducted at the siphon, which included two concrete cores and rebar mapping of the top slab. This testing determined that the concrete compressive strength was a minimum of 4,300 pounds per square inch. Several large cracks were found in the center culvert wall approximately ¼ inch wide by 10 feet long. The cut-off wall located at the end of the apron extending from the weir structure had significant damage where rebar has been exposed and pieces of concrete have broken off.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, City of Clovis Public Utilities Department, Fresno Irrigation District, Fresno County, City of Fresno, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: $845,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to provide for the long-term integrity of the siphon to carry Dry Creek and Enterprise Canal flows.

Schedule: Long term

7. Modernize Information Technology Backup Infrastructure

Issue/Background: During the last emergency operations center exercise, it became evident that many of the technology systems needed to coordinate services during a disaster were limited or not available at all. Personal computer systems were out of date, the telecommunications system and phones were not properly functioning, and many resources (software applications) were not configured or available. The City could benefit from disaster recovery/business continuity technology systems that use virtualization and storage area network backup infrastructure systems for emergency operations center operations.

Other Alternatives: Tapes and backup systems that are not real time are not as reliable and cause delays in data restoration.

Responsible Office: City of Clovis Information Services Division

Priority (High, Medium, Low): High

Cost Estimate: $100,000

Potential Funding: General fund

Benefits (Avoided Losses): Ensures business continuity and avoids downtime. Thus, speeds up relief efforts during a disaster.

Schedule: January 2009

8. Implement a Flood Awareness Program for the Public

Issue/Background: The City needs a program to educate flood-prone property owners and the citizens of Clovis about the flood threat and how best to prepare, mitigate, and insure their properties.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department —Emergency Preparedness

Priority (High, Medium, Low): Medium

Cost Estimate: $5,000/year

Potential Funding: General fund, grants

Benefits (Avoided Losses): This will prevent the loss of human life and economic and property losses.

Schedule: Long term

9. Improve City's Floodplain Management Program and Apply to Community Rating System

Issue/Background: Seek Community Rating System (CRS) classification improvements within the capabilities of City programs, including adoption and administration of FEMA-approved ordinances and flood insurance rate maps.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Medium

Cost Estimate: $300,000

Potential Funding: General fund, FEMA's Pre-Disaster Mitigation grants

Benefits (Avoided Losses): Participation in the CRS and improvements outlined by the system will translate into improved flood mitigation and reduced flood insurance rates for local citizens. Ultimately, it will prevent the loss of human life and economic and property losses.

Schedule: Long term

10. Conduct a Seismic Vulnerability Assessment of City-Owned Critical Facilities

Issue/Background: The City is interested in performing a building-specific, seismic vulnerability assessment of City-owned critical facilities constructed prior to 1980 (including infrastructure). Included in this assessment will be recommended mitigation alternatives that meet goals and objectives of this plan.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services—Building

Priority (High, Medium, Low): Medium

Cost Estimate: $200,000

Potential Funding: General fund, FEMA's Pre-Disaster Mitigation grants

Benefits (Avoided Losses): This will prevent the loss of human life, economic loss, and property loss.

Schedule: Long term

11. Improve the City's Capabilities for Sheltering Animals in a Disaster

Issue/Background: During a disaster, not only do people need to be rescued, but their pets do also. Hurricane Katrina showed the nation that shelters do not typically allow pets, so pets may be left behind when their owners evacuate. The care of the animals left behind falls to local animal shelters. Currently, the City of Clovis Animal Shelter does not have the supplies to handle a large scale animal emergency. The City has approximately 8,000 licensed dogs. If a disaster occurred, they would only be able to house 102 of them. Overcrowding of animals usually causes diseases and loss of animal life. Purchasing new cages would alleviate some of the overcrowding created by a disaster.

Other Alternatives: Ask other agencies for supplies, if they have them available.

Responsible Office: City of Clovis Police Department

Priority (High, Medium, Low): High

Cost Estimate: $44,000

Potential Funding: General fund

Benefits (Avoided Losses): This will cut down on the spread of disease and animal loss during an emergency or disaster.

Schedule: July 2009

12. Implement a System of Automatic Vehicle Location

Issue/Background: The City of Clovis Police Department is working with Fresno County on a new computer-aided dispatch, mobile dispatch, records management system, and automatic vehicle locator (AVL) with GPS capability. This new AVL system will offer real-time location of emergency response vehicles, allowing the department to track, coordinate, and locate first responder vehicles during the confusion of a disaster. It will increase the efficiency of response to disaster areas and public safety. Under this system, it will give Fresno County the opportunity to have emergency vehicles directed and located, regionally. The City of Clovis is the second largest City in Fresno County and has mutual agreements with the surrounding agencies for disaster response. Currently the department does not have AVL capability.

Other Alternatives: Rely on radio transmission from first responders for their location.

Responsible Office: City of Clovis Police Department

Priority (High, Medium, Low): High

Cost Estimate: $125,000

Potential Funding: General fund

Benefits (Avoided Losses): To mitigate the confusion during a disaster regarding the location of first responders, increasing efficiency by sending the nearest unit to respond to a call. This will also increase public safety and officer safety.

Schedule: January 2009

13. Install Battery Back-Up Systems at Traffic Signals in the City Of Clovis on Major Transportation Routes

Issue/Background: Keeping the traffic signals in operation during power outages will enhance safety, mobility, efficiency, and transportation productivity. The City of Clovis currently has such devices in operation, but not at all signalized intersections on major routes due to funding constraints.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, City of Clovis Public Utilities Department

Priority (High, Medium, Low): High

Cost Estimate: $200,000

Potential Funding: None at this time

Benefits (Avoided Losses): The project goal is to install battery back-up systems at critical intersections within the City, which will reduce demands and increase response time of emergency services by keeping routes open and free from congestion and traffic collisions.

Schedule: Short term

14. Replace Traffic Management Center Software and Herndon Avenue Traffic Signal Equipment and Implement Communications Upgrades

Issue/Background: The Intelligent Transportation System (ITS) Vision for Fresno County is to enhance safety, mobility, efficiency, and transportation productivity and to improve the quality of life and environment through the use of cost effective ITS technologies and systems.

Herndon Avenue is a main arterial/expressway between Highways 99, 41, and 168 connecting the Cities of Fresno and Clovis. Herndon Avenue also is the main route to the Clovis Community Hospital, St. Agnes Hospital, and Kaiser Hospital. Herndon Avenue and Shaw Avenue are vital supply routes in Clovis.

The primary purpose of the project is to install an Advance Traffic Management System (ATMS) at the Traffic Management Center, upgrade traffic signal controllers on Herndon Avenue to Model 2070, and install fiber optic communication cable (conduit were necessary) in Herndon Avenue, linking all the components together. The City of Fresno recently installed an ATMS system. By installing the same system components, both cities will have the capabilities to read, coordinate, and, if necessary, provide emergency back-up should one system fail.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department

Priority (High, Medium, Low): Medium

Cost Estimate: $618,000

Potential Funding: U.S. Department of Transportation's Congestion Mitigation and Air Quality Improvement Program

Benefits (Avoided Losses): The project goal is to improve the ITS system in Clovis to enhance safety, mobility, efficiency, and transportation productivity and allow for compatibility between the agencies and the City of Fresno.

Schedule: Long term

15. Modify and Enhance Emergency Traffic Control System

Issue/Background: Electrical outages resulting from natural hazards and rolling blackouts affect large portions of the City traffic signal/control system. Presently, the system changes into a four-way stop during the event. Without electrical backup, motorists and property are at risk due to driver inattention. This project would fund mobile generators and modification of existing signal/traffic signals on a backup system to keep them online.

Other Alternatives: Maintain current system.

Responsible Office: City of Clovis Public Utilities Department

Priority (High, Medium, Low): Medium

Cost Estimate: $700,000

Potential Funding: Grants

Benefits (Avoided Losses): This will allow for improved contraflow and traffic control during local emergencies and power outages.

Schedule: Long term

16. Purchase Hazard Mitigation Public Notification Boards

Issue/Background: Purchase mobile self-contained changeable message signs to pre-alert motorists to avoid a "real time" traffic (or other) hazard.

Other Alternatives: Rely on contract service providers who may not be able to respond with adequate resources in a timely fashion.

Responsible Office: City of Clovis Engineering Division Traffic Management Group, Public Utilities Department Streets Division, Police Department, and Fire Department

Priority (High, Medium, Low): High

Cost Estimate: 4 signs @ $35,000 each = $140,000

Potential Funding: Departmental operational budgets or grant funding

Benefits (Avoided Losses): Provides the ability for City forces to aid emergency response crews by dispatching mobile sign units to be stationed at critical locations to alert motorists and citizens of potential hazard areas. This will allow for better routing of nonessential vehicle traffic that may impede the delivery of critical health and safety services and ultimately result in quicker overall response delivery times.

Schedule: Fiscal year 2008/2009

17. Make Improvements to Emergency Evacuation and Emergency Vehicle Routes

Issue/Background: Currently, there are several street segments within the City of Clovis that could serve as evacuation routes or detour routes in the event of a disaster. These segments are currently deficient in terms of traffic carrying capacity and serviceability. Improvements to these routes would provide the additional pavement width necessary to provide increased flexibility and capacity in routing traffic and emergency vehicles. Routes include:

- Shepherd Avenue from Clovis to Fowler (1 mile)
- Nees Avenue from Clovis to Armstrong (1.6 miles)
- Alluvial Avenue from Sunnyside to Temperance (1.25 miles)
- Sunnyside Avenue from Nees to Shepherd (1 mile)

Other Alternatives: No action. Existing road segments would remain constricted, impeding evacuation expediency and limiting detour alternatives.

Responsible Office: City of Clovis Public Utilities Department—Long-term Maintenance, City of Clovis Engineering Department—Construction

Priority (High, Medium, Low): High

Cost Estimate: $7,500,000

Potential Funding: None identified, potential for federal or state grant funding

Benefits (Avoided Losses): Improved traffic flow and increased flexibility in moving traffic and emergency vehicles during a disaster

Schedule: One year

18. Implement a System to Share Information with City Police Officers/Employees (SharePoint)

Issue/Background: The City of Clovis Police Department does not have a way to disseminate critical information to their officers and/or City employees. Such a system would allow the department a central location to receive and disseminate terrorist information, "be on the lookout information," public safety, officer safety, and new training information. Information that is received through teletype or other agencies is currently housed in a briefing room, and if an officer or employee does not get to that location, they may never see the information.

Information distribution is now a necessity for law enforcement agencies, and with the amount of data that is accumulated, it is essential to have an efficient and effective method to distribute and archive information. Under this system, officers would be able to retrieve this information in one central location, both in a briefing setting and in their patrol vehicles. This would also allow the department to let City employees access information that is of public safety nature.

Responsible Office: City of Clovis Police Department

Priority (High, Medium, Low): Medium

Cost Estimate: $20,000

Potential Funding: General fund

Benefits (Avoided Losses): Increased officer and public safety, more efficient dissemination of critical information, ability to keep officers and personnel in touch with information in the area of public safety

Schedule: July 2008

19. Continue to Enforce Master Drainage Plan Requirements

Issue/Background: The City of Clovis requires a master drainage plan as part of the approval process for all specific plans and large development projects as determined by the City's Public Works director. The master drainage plan should consider cumulative regional drainage and flooding mitigation. The intent of a master drainage plan is to ensure that the overall rate of runoff from a project does not exceed pre-development levels. If necessary, this objective shall be achieved by incorporating run-off control measures to minimize peak flows and/or assistance in financing or otherwise implementing comprehensive drainage plans.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Low

Cost Estimate: Developer-based funding under specific plan requirements

Potential Funding: Developer-based funding under specific plan requirements

Benefits (avoided Losses): This will prevent the loss of human life and economic and property losses.

Schedule: Long term

20. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Issue/Background: Local jurisdiction reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9. Specifically, this section requires that the City must adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the safety element of its general plan adopted pursuant to subdivision (g) of Section 65302. It is important to fold Clovis' LHMP annex into the safety element as part of the next general plan update.

Other Alternatives: No feasible alternatives

Responsible Office: The City of Clovis Fire Department is responsible for making the application. The City of Clovis Planning and Development Services Department is responsible for processing the application and preparing reports for Planning Commission review and Council review and approval.

Priority (High, Medium, Low): High

Cost Estimate: $8,000-10,000 application fees

Potential Funding: City of Clovis Fire Department operating fund

Benefits (avoided Losses): Planning documents will help the City maximize potential for state reimbursement

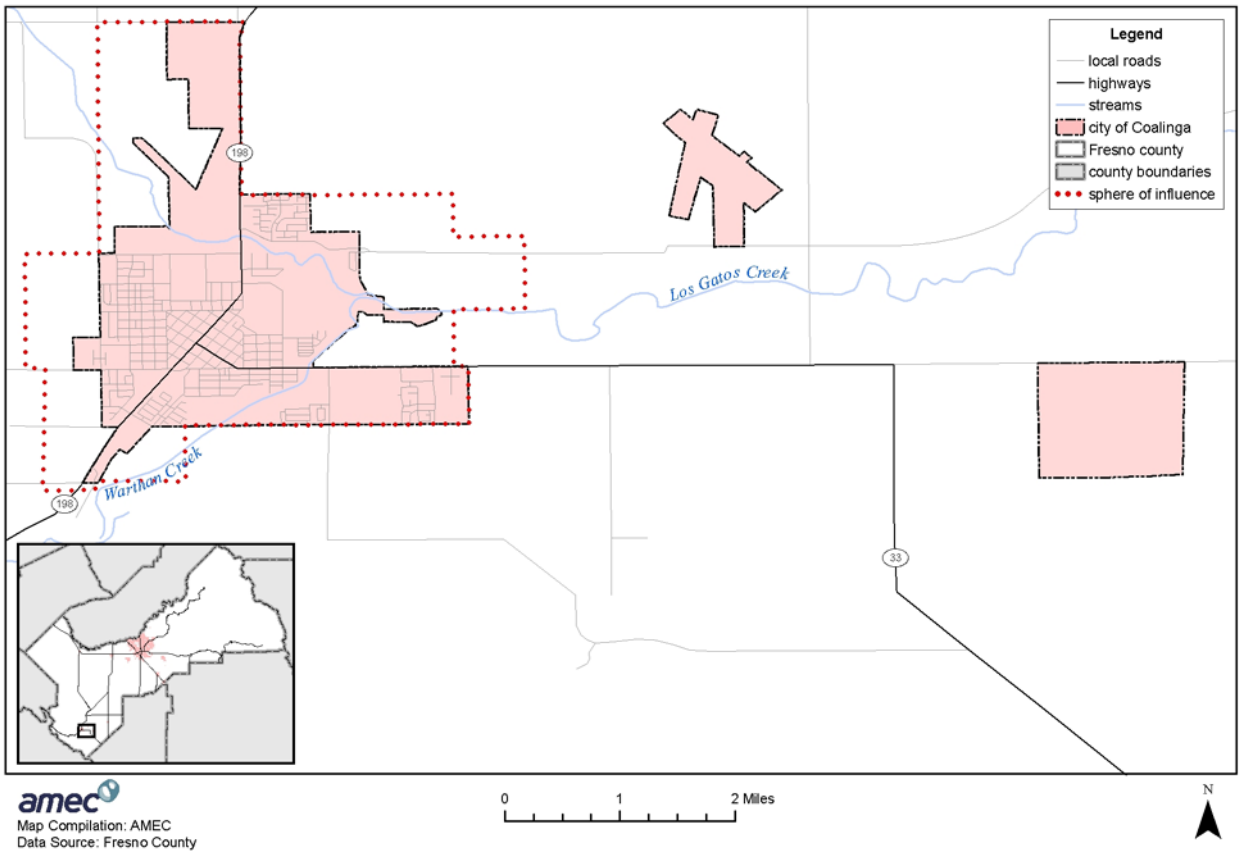
Schedule: As soon as possible

ANNEX B: CITY OF COALINGA

B.1 Community Profile

Figure B.1 displays a map and the location within Fresno County of the City of Coalinga and its Sphere of Influence.

Figure B.1. The City of Coalinga



B.1.1 Geography and Climate

The City of Coalinga is located in the southwestern portion of the San Joaquin Valley in an area known as Pleasant Valley. Access to Coalinga is by State Routes 198 and 33. Interstate 5 is located approximately 13 miles to the east. The City's total land area encompasses 6.58 square miles. Existing development in the City is characterized by residential neighborhoods with commercial uses concentrated along State Routes 198 and 33 and Polk Street.

The City of Coalinga lies over or near more than one earthquake fault and lateral or blind thrust fault. It is approximately 29 miles from the Town of Parkfield, which is located on the San Andreas fault and has been the site of an earthquake study since the late 1970s.

The climate is mild and damp in the winter and hot and dry in the summer. High temperatures average 64°F in January and 103°F in July. Low temperatures average 29°F in January and 53°F in July. Annual precipitation is 8.4 inches.

B.1.2 History

The following history of the City of Coalinga is from the City of Coalinga General Plan Update, 2007.

For many centuries, numerous tribes of Native Americans, all belonging to the Yokut, inhabited the San Joaquin Valley. Although it is not clear when the first people made their way to Coalinga, it is known that the Tache (Tachi), one of the largest of all the Yokut tribes, found a permanent water supply at a place called Posa Chanet near the City's present site. From this encampment, the Tache scoured the hills for trade goods. They discovered oil seeps and thick tar. Oil was an important item to early inhabitants of the Pleasant Valley. Seepages in the area provided asphalt used to line baskets and was a good traded among other tribes. Eventually, Spaniards and Basques, who wanted the land for its cattle and seep grazing potential, displaced the Indians.

As new settlers came to the west seeking a new life and greater opportunities, interest in oil seepages inspired an oil rush in 1865. In 1867, a specialized oil-drilling rig, shipped from the east coast, began drilling for oil north of the present site of Coalinga. However, shipping problems caused early interest to die down; the world had not yet discovered the full potential of petroleum.

In the late 1800s, stories of sheepherders who burned rocks at night to keep warm drew the attention of Messer's Robins and Rollins, English second sons. Excited by the promise of coal in the area, they established a mine in a slash of hillside where the Coalinga Rifle Range now exists. It was never profitable. The coal was actually shale. However, the potential of coal from the mine and in nearby Priest Valley was enough to induce the Southern Pacific Railroad to extend its southern route. It crossed Huron and stretched slightly beyond the Coalinga area.

There is debate about how Coalinga got its name. The usual version is that while deposits of oil saturated shale, or "coal," were being mined in the hills nearby "Coaling Station A," "Coaling Station B," and "Coaling Station C" were situated along the rail line for loading purposes. "Coaling Station A" was eventually shortened to "Coalinga." This story does not stand close scrutiny, and a more likely explanation is that Coalinga was given the final "a" for musical effect. The truth may never be known, since the great quake and fire in San Francisco in 1906 destroyed the Southern Pacific Railroad's office and all its records. Whatever the origin, "Coalinga" was in use fairly quickly after the rail line opened in July 1888.

The extension of the railroad coincided with a significant worldwide interest in oil production. A second oil rush occurred around 1890. By 1910, Coalinga was the third largest shipping point for the railroads in California with nearly all tonnage connected to oil production.

The town grew quickly in the late 1800s. In 1889, the Coalinga post office was established. In 1891, Southern Pacific Railroad purchased the 160-acre homestead of M.L. Curtis for $900 and laid out the town site of Coalinga as a square cut diagonally by the railroad tracks. Street numbers from one to eight went north to south and the letters A to H from west to east. The Coalinga Women's Improvement Society later changed the alphabetical names to botanical ones. A succession of historically important oil wells brought "boomers" into Coalinga by the thousands.

With over 15 years of continuous prosperity behind them, a handful of local citizens began the process of incorporation, which was completed in April 1906. In 1909, the Coalinga Chamber of Commerce was organized, and in its first report dated April 16, 1910, they excitedly spoke about the promise of the City. The Coalinga oil field was the largest in California. In September 1909, the Silver Tip well, located just one-half mile from the City limits, blew with the greatest gusher known in California at that time. This discovery caused enough excitement among the financiers of California that the Los Angeles Stock Exchange was closed on a Friday in November and a special excursion train traveled to Coalinga so potential investors could marvel at the sight.

During the early years of production, there were several important developments in Coalinga. In 1904, a six-inch oil pipeline was laid from Coalinga to Monterey on the coast (104 miles) to provide tanker oil for overseas buyers. The pipeline was built in 90 days and crossed two mountain ranges with maximum elevation of 2,000 feet. In 1916, Coalinga oilfield workers fought for and won the industry's first eight-hour workday. In 1919, A&W Root Beer was formulated in downtown Coalinga. During World War II, Signal Hill oil in Long Beach was brought in. The supply was so great that the existing pipeline flow from Coalinga to the Los Angeles refineries was revered and excess Signal Hill oil was stored in a massive tank farm called Caliola about 10 miles east of Coalinga. Coalinga's oil fields produced some of the oil industry's giants, including R.C. Baker, founder of Baker Oil Tools. His original buildings in Coalinga are now home of the R.C. Baker Memorial Museum, which focuses on oil as well as pioneer life in the Coalinga area.

From the outset, it was said that whiskey was easier to get than water in Coalinga. The natural well water had high amounts of dissolved minerals in it, making it suitable for only the most basic uses of washing and irrigating. To meet this challenge, Coalinga's drinking water was imported. Until 1960, the major source of drinking water was Southern Pacific water wells in Armona. In time, a municipal water service was provided for the central area of town.

In 1960, Coalinga was selected for experimental systems to soften hard water and make it suitable for human consumption. The first of these was an ionic system that was later replaced by

the reverse osmosis method. In April 1972, Coalinga received its first delivery of San Luis Canal water from the state water system.

B.1.3 Economy

While oil was the staple of the local economy, agriculture always played an important role. Before 1972, agriculture was limited to cotton and other salt water resistant crops. With the arrival of canal water, the area has become a region of specialty crops, which include lettuce, tomatoes, asparagus, and a variety of nut and fruit trees.

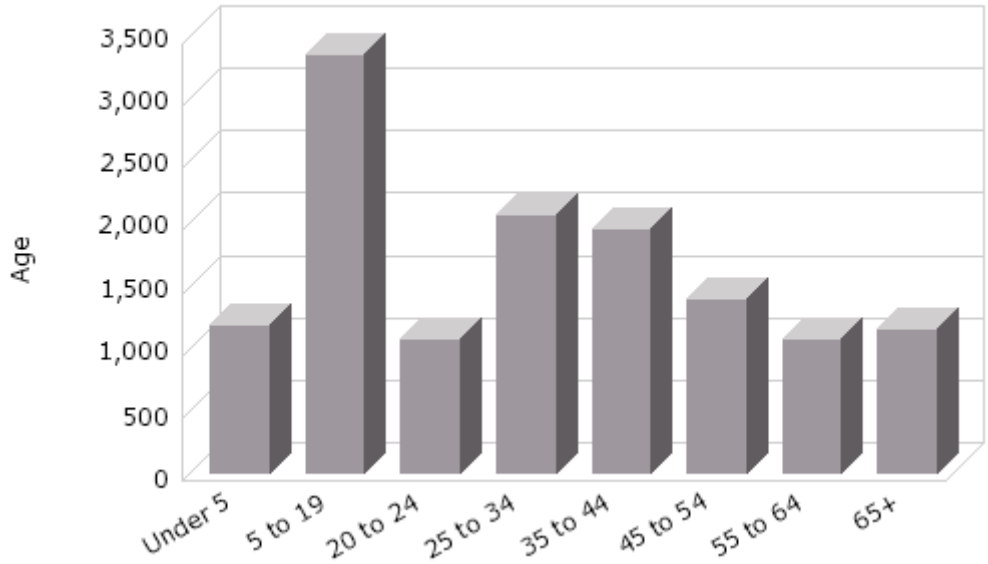
While there was open speculation that Coalinga would not survive the May 1983 earthquake, the disaster became the catalyst that inspired revitalization. In 1988, the residents approved a bond issue for a new $14 million community hospital facility to replace the one destroyed in the earthquake. Coalinga completed an 800-acre annexation to include Pleasant Valley State Prison and the new airport in the City limits in 1991. In 1994, the Department of Corrections located a major prison facility in Pleasant Valley. With this as an economic base, the City developed a 40-acre industrial park. To address concerns about proximity to schools and associated noise hazards, the airport was relocated four miles to the east. A brand new $8 million airport facility was built in 1996. The Coalinga Regional Medical Center was completed in 2002, and construction of a new mental health facility, the Coalinga State Hospital, was completed in the spring of 2005. In the oilfields, a process of steam injection promises to produce $2.3 billion more barrels of oil, perhaps as much as has already been mined.

Since the 1983 earthquake, significant efforts have been made to rebuild and revitalize the City. These efforts, combined with Coalinga's central geographical location and proximity to the busy Interstate 5 corridor, are expected to diversify the City's economy as state growth continues.

B.1.4 Population

The City had a current estimated population of 18,061 in 2007. According to the 2000 Census, Coalinga's racial composition is 57.3 percent white, 2.4 percent black or African American, 1.5 percent American Indian/Alaska Native, 1.7 percent Asian, and 32.5 percent other races. 49.8 percent of the population is Hispanic (of any race). The City's population by age in 2006 is illustrated in Figure B.2.

Figure B.2. Coalinga's Population by Age, 2006



Source: City of Coalinga and Coalinga-Huron Unified School District–Natural Hazard Mitigation Plan

B.2 Hazard Identification and Summary

Coalinga's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Coalinga (see Table B.1). In the context of the plan's planning area, there are no hazards that are unique to Coalinga.

Table B.1. City of Coalinga—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	n/a	n/a	n/a	n/a
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	n/a	n/a	n/a	n/a
Drought	Occasional	Extensive	Catastrophic	High
Earthquake	Highly Likely	Extensive	Critical	High
Flood	Occasional	Limited	Limited	Medium
Landslide	n/a	n/a	n/a	n/a
Severe Weather:				
Extreme Cold/Freeze	Likely	Extensive	Critical	Medium
Extreme Heat	Likely	Extensive	Critical	High
Fog	n/a	n/a	n/a	n/a
Snow	n/a	n/a	n/a	n/a
Tornado	n/a	n/a	n/a	n/a
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Catastrophic	High
Soil Hazards:				
Erosion	n/a	n/a	n/a	n/a
Expansive Soils	n/a	n/a	n/a	n/a
Land Subsidence	Likely	Significant	Critical	Medium
Volcano	n/a	n/a	n/a	n/a
Wildfire	Likely	Significant	Limited	Medium

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

B.3 Vulnerability Assessment

The intent of this section is to assess Coalinga's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

B.3.1 Assets at Risk

This section considers Coalinga's assets at risk, including population (previously discussed in Section B.1.4); values at risk; critical facilities and infrastructure; and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table B.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Coalinga.

Table B.2. 2007 Roll Values for the City of Coalinga by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	2	146,759	154,483	3	30,033	5	331,275
Commercial	205	38,457,852	13,116,329	41	2,097,872	246	53,672,053
Industrial	43	8,886,218	2,110,259	10	272,632	53	11,269,109
Open Space	-	-	-	-	-	-	-
Residential	2,850	309,973,709	89,023,416	369	24,698,955	3,219	423,696,080
Other	4	225,430	246,375	3	48,135	7	519,940
Total	**3,104**	**357,689,968**	**104,650,862**	**426**	**27,147,627**	**3,530**	**489,488,457**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Coalinga from Fresno County GIS is provided in Table B.3 and mapped in Figure B.3.

Table B.3. City of Coalinga's Critical Facilities

Critical Facilities Type	Number
Airports	-
Communications Centers	1
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	2
Health Care Facilities	2
Law Enforcement Facilities	2
Maintenance Yards	2
Residential Elderly Facilities	1
Schools and Day Care Facilities	16
Public Utilities—Water/Sewer	-
Totals	**27**

Source: Fresno County GIS

Figure B.3. City of Coalinga's Critical Facilities

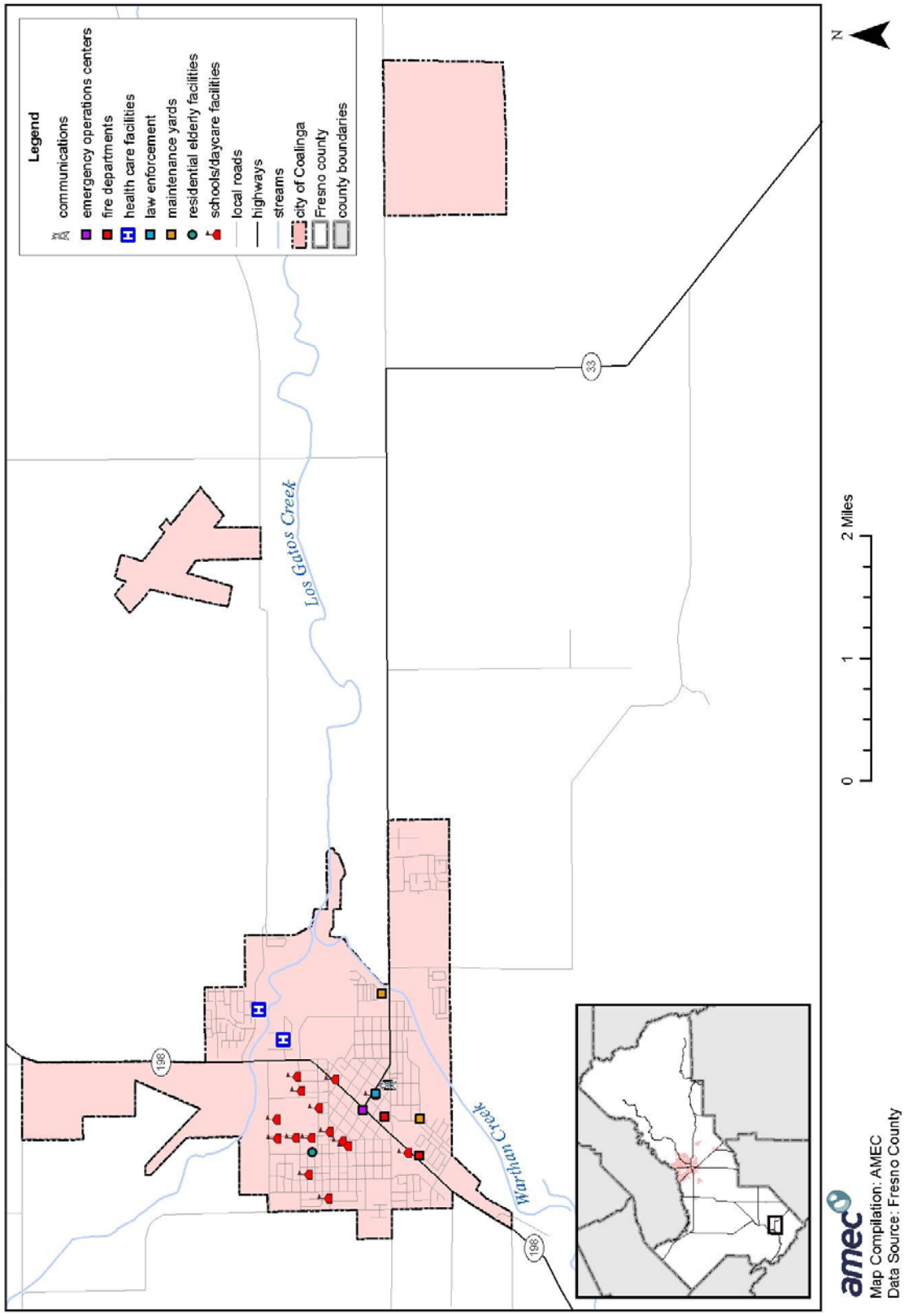


Table B.4 lists particular critical facilities and other community assets identified by Coalinga's planning team as important to protect in the event of a disaster.

Table B.4. Specific Critical Facilities and Other Community Assets Identified by the City of Coalinga's Planning Team

Name of Asset	Replacement Value ($)	Occupancy/ Capacity #
City Hall Building, 160 W. Elm Avenue	1,925,148	15,791
City Hall Building (Building Expansion), 155 W. Durian Avenue	4,901,358	21,060
Claremont Custody Center, 185 W. Gale	16,703,574	71,820
Corporation Yard, 135 Sacramento, Equipment Storage	33,101	1,600
Corporation Yard, 135 Sacramento, Parts Storage	36,526	160
Corporation Yard, 135 Sacramento, Parts Storage	5, 773	1,820
Corporation Yard, 135 Sacramento, Meeting Rooms/Office	59,080	1,770
Coalinga Airport Facility	6,602,127	
Sewer Farm Facility	528,000	
Water System, Palmer Avenue	188,515	250,000 gallons
Water System, Oil King	377,029	500,000 gallons
Water System, Derrick Avenue	3,198,468	8,000,000 gallons
Water System, Palmer Avenue	1,421,543	3,000,000 gallons
Water System, Calaveras Avenue	1,444,290	5,000,000 gallons
Water Filtration Plant, 25034 W. Palmer Avenue	6,841,332	
Chemical Plant, 25034 W. Palmer Avenue		
380-390 Coalinga Plaza	477,783	6427
265-299 Coalinga Plaza	637,044	10,277
Palmer Ave, Repeater Station, Emergency Communications	9,198	
Fire Station, City	1,421,543	12,254
Fire Hydrants/Alarm Boxes	97,753	
Radio Antenna Masts on Buildings	5,749	
Gas Meters and Regulators	40,251	
Recycling Center, 125 E. Elm Avenue	119,835	
Airplane Hangers	574,707	
Maintenance Hanger, Airport	114,9423	3,000
Flight Service Center, Airport	57,470	2,800
Fuel System Above Ground Airport	114,942	

Growth and Development Trends

Table B.5 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table B.5. City of Coalinga's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
15,798	18,061	+14.32	3,714	4,040	+8.78

Source: California Department of Finance, www.dof.ca.gov/Research/

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

B.3.2 Estimating Potential Losses

Table B.2 above shows Coalinga's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 963 buildings in the 100- and 500-year floodplains in the City of Coalinga. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Earthquake

There are several faults in the vicinity of Coalinga that could cause problems in the future. These include the Nuñez fault, located about ten kilometers northwest of Coalinga; the Coalinga fault, located five kilometers northeast of Coalinga; and the New Idria fault; located approximately 21 miles northwest of Coalinga. The U.S. Geological Survey is predicting an earthquake in Parkfield in Monterey County, approximately 15 miles southwest of Coalinga. Coalinga is the only urban area in the County directly affected by earthquake-related settlement.

Two earthquakes of note that occurred in or near Coalinga are described below:

- **May 2, 1983**—In Coalinga, a surface rupture occurred along the Nuñez fault. The main shock was magnitude 6.7 on the Richter scale. Approximately 800 buildings were destroyed and 1,000 people left homeless. No deaths resulted, but 200 people were injured. Private homeowner losses exceeded $25 million. Public agency losses approximated $6 million. The commercial section of Coalinga was heavily damaged; however, most schools and the hospital received only slight damage. Production in nearby oil fields was shut down. The City was left with numerous vacant parcels and city-owned lots. Local, state, and federal disaster declarations resulted.
- **August 4, 1985**—A magnitude 6.0 earthquake occurred that was centered about 10.5 kilometers east of Coalinga.

Flood

According to FEMA's 2005 Flood Insurance Study (FIS), Coalinga's principal flood problems are associated with Los Gatos Creek and Warthan Creek. The Los Gatos Creek headwaters are approximately 22 miles northwest of the City in the eastern foothills of the Coast Range. The creek enters the northern portion of the City flowing east-southeast. The creek flows just north of the sewage treatment plant. The Warthan Creek headwaters are located approximately 16 miles southwest of the City in the eastern foothills of the Coast Range. Warthan Creek enters Coalinga from the south and flows through the southeastern portion of the City before leaving just north of the intersection of East Polk Street and Alicia Avenue. From there, the creek continues for less than a mile to its confluence with Los Gatos Creek just northwest of the sewage treatment plant. Some areas in the City are subject to shallow overland flooding caused by insufficient channel capacity of Los Gatos Creek or insufficient levee height on Warthan Creek.

According to the FIS, floods occurred in or around Coalinga in 1952, 1958, 1962, 1966, 1969, 1976, and 1978. Details on some of these events follow:

- **April 1958**—Flooding affected mainly agricultural lands and public facilities, such as roads and bridges.
- **December 1966**—Flooding caused extensive road and bridge damage in the upper reaches of Los Gatos and Warthan Creeks. East of the City, sewage treatment facilities and the levees along Warthan Creek were damaged, the Los Gatos Creek channel was severely eroded, and there was extensive damage to utilities and agricultural land. Damage totaled approximately $570,000, and floodwater inundated 4,500 acres.
- **February 1969**—The largest and most damaging flood in Coalinga's recorded history occurred when floodwater from Los Gatos and Warthan Creeks covered 16,600 acres and caused approximately $4.5 million in damage. Flooding extended from the foothills west of the City to the valley east of the City. Bridges and roads were washed out, agricultural land was eroded, farm and ranch improvements and petroleum installations were damaged and destroyed, areas were isolated, traffic was disrupted, and residential and commercial areas in the northwest and southeast portions of the City were damaged.
- **February 1978**—Flooding occurred along Los Gatos Creek from the foothills to the valley floor and damaged agricultural lands, roads and bridges, and utilities. An estimated 4,500 acres were flooded. Damage totaled $160,000.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Coalinga was created (see Figure B.4). Tables B.6-B.8 summarize the values at risk in the City's floodplain. Table B.6 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table B.7 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table B.8 shows loss estimates by flood.

Figure B.4. City of Coalinga's 100- and 500-Year Floodplains

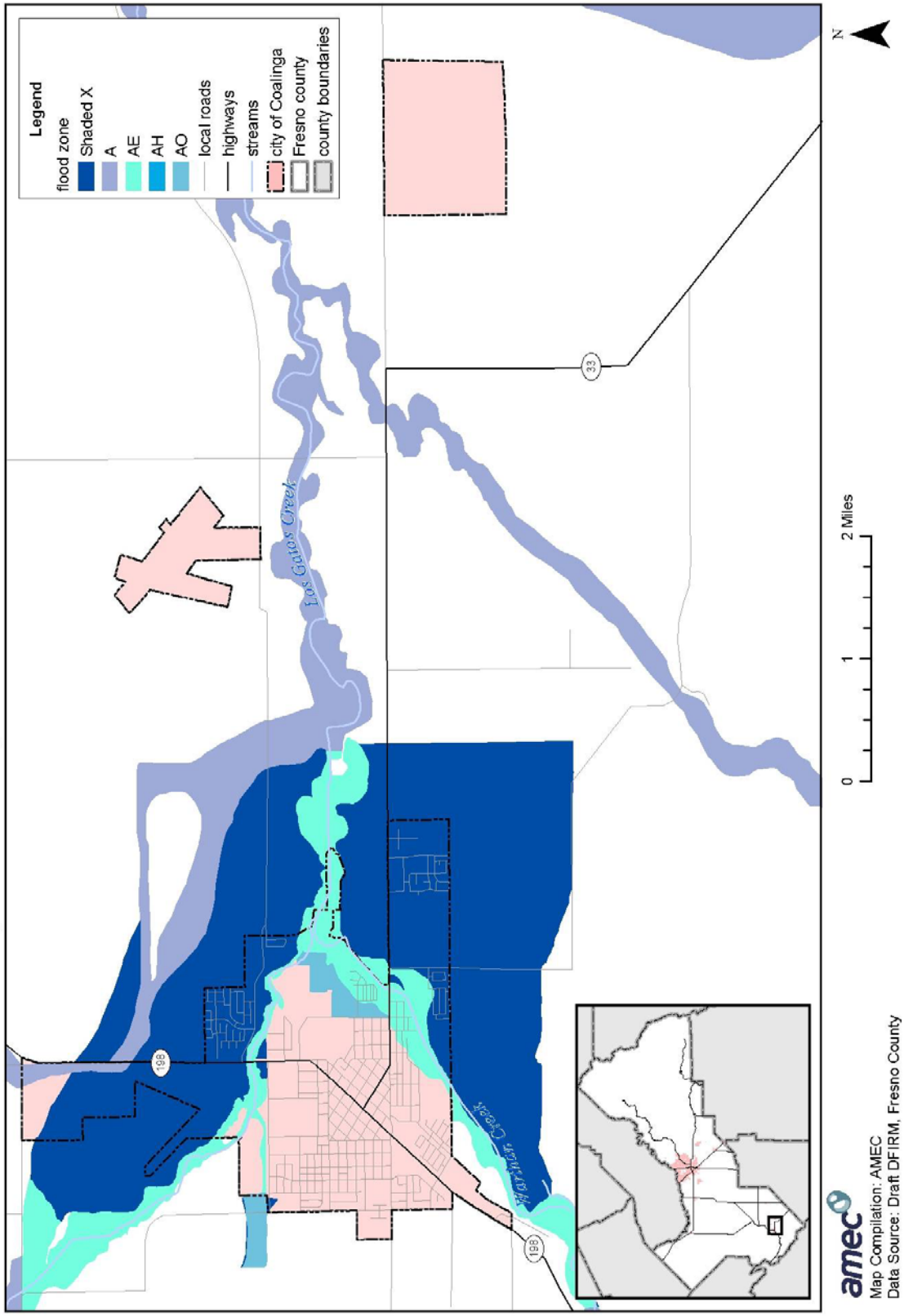


Table B.6. Count and Improved Value of Parcels in Floodplain by Zone—City of Coalinga

Property Type	Zone A		Zone AE		Zone AH	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	-	-	3	146,759	-	-
Commercial	-	-	10	1,092,437	-	-
Industrial	1	-	-	-	-	-
Open Space	-	-	-	-	-	-
Residential	1	-	190	10,933,718	-	-
Total	**2**	**-**	**203**	**12,172,914**	**-**	**-**

Property Type	Zone AO		Shaded Zone X		Zone X	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	-	-	1	-	1	-
Commercial	-	-	12	5,279,534	229	33,010,747
Industrial	-	-	3	3,235,280	48	4,775,338
Open Space	-	-	-	-	-	-
Residential	17	1,546,303	725	76,456,151	2,294	220,874,091
Total	**17**	**1,546,303**	**741**	**84,970,965**	**2,572**	**258,660,176**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table B.7. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Coalinga

Property Type	Total 100-Year Flood*		Total 500-Year Flood		Total Flood**	
	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)	# of Parcels	Improved Value ($)
Agriculture	3	146,759	1	-	4	146,759
Commercial	10	1,092,437	12	5,279,534	22	6,371,971
Industrial	1	-	3	3,235,280	4	3,235,280
Open Space	-	-	-	-	-	-
Residential	208	12,480,021	725	76,456,151	933	88,936,172
Total	**222**	**13,719,217**	**741**	**84,970,965**	**963**	**98,690,182**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table B.8. Fresno County Flood Loss Estimates—City of Coalinga

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	222	13,719,217	6,859,609	20,578,826	4,115,765
500-Year Flood	741	84,970,965	42,485,483	127,456,448	25,491,290
Total Flood**	**963**	**98,690,182**	**49,345,091**	**148,035,273**	**29,607,055**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Coalinga has significant assets at risk to the 100-year and greater floods. Twenty-two improved parcels are within the 100-year floodplain for a total value of roughly $14 million. An additional 741 improved parcels valued at roughly $85 million fall within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $4 million in damage in the City of Coalinga and a .2 percent chance in any given year of a 500-year flood causing roughly $30 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Coalinga joined the National Flood Insurance Program (NFIP) on August 23, 1982. NFIP Insurance data indicates that as of November 30, 2007, there were 97 flood insurance policies in force in the City with $15,783,000 of coverage. Of the 97 policies, 96 were residential (single-family homes) and one was nonresidential. 90 of the policies were in A zones (the remaining 7 were in B, C, and X zones). There have been no historical claims for flood losses and there were no repetitive or severe repetitive loss structures.

Population at Risk

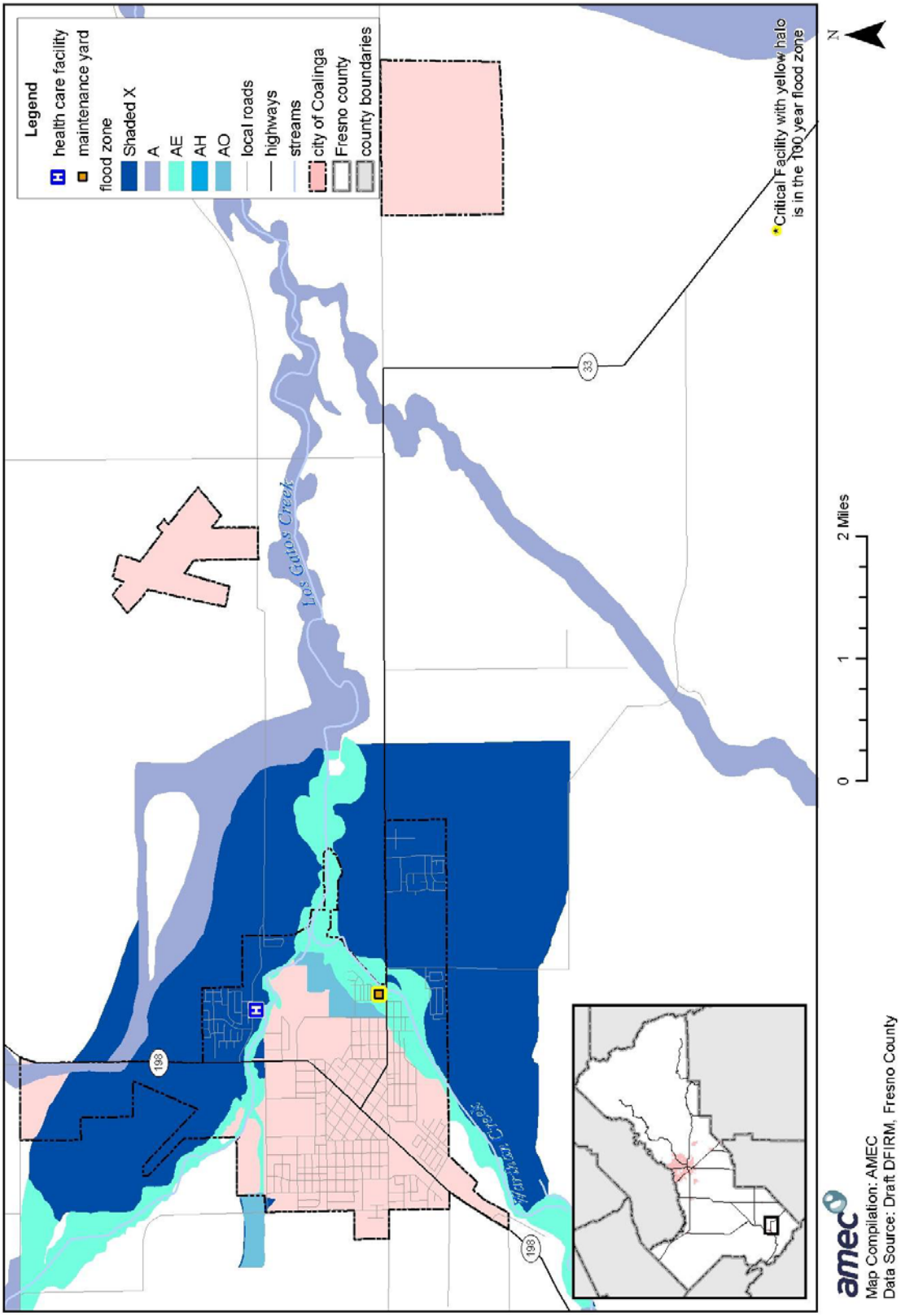
Based on information from HAZUS-MH MR3 (Census 2000) and the City's digital flood insurance rate map, the following are at risk to flooding in the City of Coalinga:

- **100-year flood**—1,308 people
- **500-year flood**—1,682 people
- **Total flood**—2,990 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Figure B.5 illustrates the locations of critical facilities relative to the floodplain in the City of Coalinga. According to data from Fresno County GIS and the digital flood insurance rate map, there is only one critical facility in Coalinga's 100-year floodplain, which is a maintenance yard, and one critical facility in the 500-year floodplain, which is a health care facility.

Figure B.5. Critical Facilities in the 100- and 500-Year Floodplains: City of Coalinga



Severe Weather

The City of Coalinga does not have a reported history of severe weather (extreme temperatures, heavy rain/thunderstorm/hail/lightning/wind). The most common wind condition in Coalinga is caused by severe winter storms. The City has experienced both very high and significantly low temperatures. High temperatures have exceeded 110°F and resulted in loss of crops, livestock, and wages (workers were sent home) as well as the temporary closure of schools. Very high temperatures in August 1997 contributed to five deaths. Also, during California's fire season, high temperatures have hampered firefighting efforts.

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a fire map for the City of Coalinga was created (see Figure B.6). An analysis was performed using GIS software to determine where populations, values at risk, and critical facilities are located within wildfire threat zones. Table B.9. shows the values at risk in the moderate and high wildfire threat zones (there are no values at risk in the very high threat zone). Figure B.7 shows that among the City's critical facilities, two are located in wildfire threat zones: a maintenance yard is in the high fire hazard zone and a health care facility is in the moderate fire hazard zone.

Table B.9. Values at Risk to Wildfire in the City of Coalinga

Property Type	Parcels	Improved Value ($)	Contents Value ($)	Total Value ($)
Moderate				
Agriculture	3	89,182	44,591	133,773
Commercial	4	1,803,587	901,794	2,705,381
Industrial	19	1,459,148	729,574	2,188,722
Open Space	-	-	-	-
Residential	576	62,865,046	31,432,523	94,297,569
Total	**602**	**66,216,963**	**33,108,482**	**99,325,445**
High				
Agriculture	2	57,577	28,789	86,366
Commercial	8	2,792,365	1,396,183	4,188,548
Industrial	-	-	-	-
Open Space	-	-	-	-
Residential	253	30,136,248	15,068,124	45,204,372
Total	**263**	**32,986,190**	**16,493,095**	**49,479,285**

Sources: 2007 Certified Roll Values, Fresno County

Based on this analysis, the City of Coalinga has significant assets at risk to a wildfire. 1,593 people and 602 improved parcels valued at roughly 99 million are within the moderate wildfire threat zone. 1,094 people and 263 improved parcels valued at roughly $49 million are within the high wildfire threat zone. Most of the parcels in both of these zones are residential.

Figure B.6. City of Coalinga's Wildfire Threat

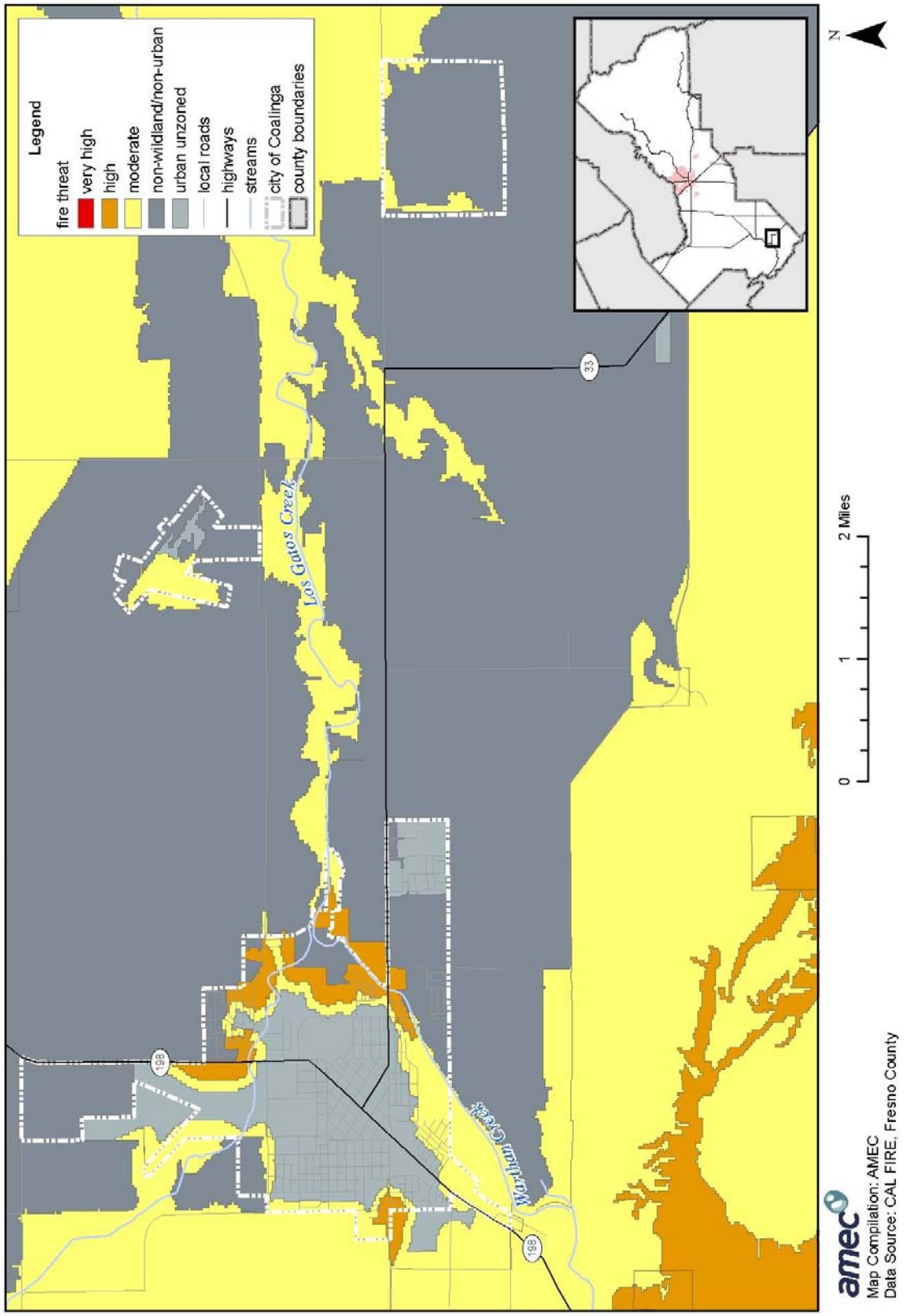
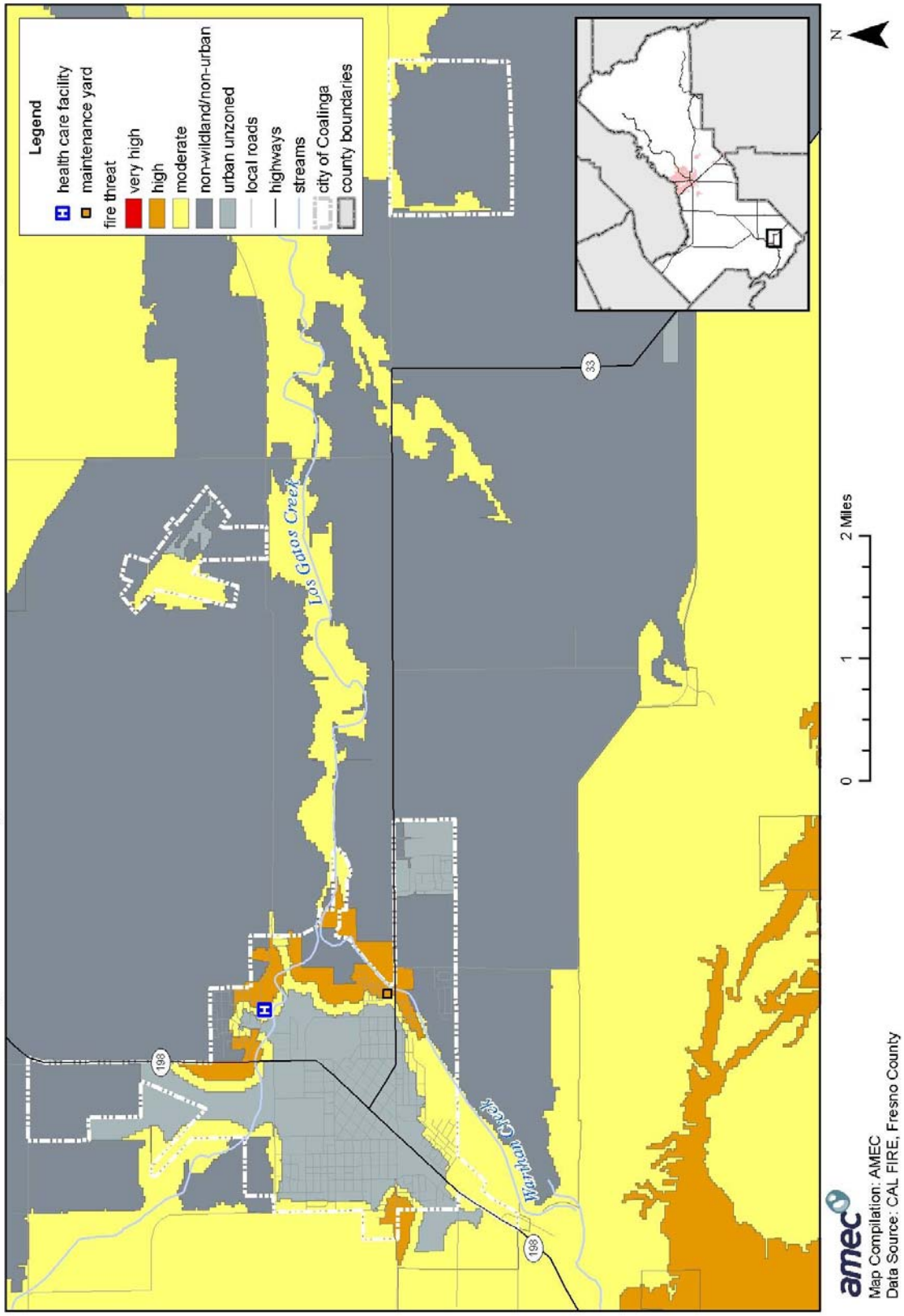


Figure B.7. Critical Facilities at Risk to Wildfire: City of Coalinga



B.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into four sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation outreach and partnerships.

B.4.1 Regulatory Mitigation Capabilities

Table B.10 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Coalinga.

Table B.10. City of Coalinga's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	To be certified by Council 7/08
Zoning ordinance	Yes	Currently adopted
Subdivision ordinance	Yes	Uses by reference Subdivision Map Act
Site plan review requirements	Yes	Included in Zoning Ordinance
Growth management ordinance	No	Included in Zoning Ordinance and proposed in general plan update
Floodplain ordinance	Yes	Adopted in 2006 in accordance with FEMA and OES guidelines and FEMA approved
Other special purpose ordinance (stormwater, water conservation, wildfire)	No	Storm Water Mater Plan, Water Conservation to be approved on April 3, 2008
Building code	Yes	Adopted by reference in the Municipal Code
Fire department ISO rating	Yes	Rating: 3
Erosion or sediment control program	No	By reference in Subdivision Map Act and Zoning Ordinance/Building Code
Stormwater management program	No	Adopted Storm Water Master Plan
Capital improvements plan	Yes	Five-year implementation plan
Economic development plan	Yes	RDA % yr. Implementation Plan
Local emergency operations plan	Yes	
Other special plans	Yes	Wastewater Master Plan Water Master Plan, Natural Gas Master Plan, Downtown Design Guidelines
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

B.4.2 Administrative/Technical Mitigation Capabilities

Table B.11 identifies the personnel responsible for activities related to mitigation and loss prevention in Coalinga.

Table B.11. City of Coalinga's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Community Development Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Tri-City Engineering
Planner/engineer/scientist with an understanding of natural hazards	Yes	
Personnel skilled in GIS	No	
Full time building official	No	
Floodplain manager	Yes	City Engineer
Emergency manager	Yes	City Manager
Grant writer	Yes	Community Development Director
Other personnel	No	
GIS Data—Land use	No	Participation with Fresno County
GIS Data—Links to Assessor's data	No	Participation with Fresno County
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	
Other	Yes	Community Development Director

B.4.3 Fiscal Mitigation Capabilities

Table B.12 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table B.12. City of Coalinga's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Fresno County administered
Capital improvements project funding	Yes	Development impact fees
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Connection fees, utility fees, and development impact fees
Impact fees for new development	Yes	Sec. 66000 Development Impact Fee
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

B.4.4 Mitigation Outreach and Partnerships

The City of Coalinga partnered with the Coalinga-Huron Unified School District in the development of the Coalinga-Huron Unified School District Natural Hazards Mitigation Plan, which was completed in 2005.

B.5 Mitigation Strategy

B.5.1 Mitigation Goals and Objectives

The City of Coalinga adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

B.5.2 Mitigation Actions

The planning team for the City of Coalinga identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Inventory At-Risk Buildings

Issue/Background: Since the 1983 earthquake, the City's population has changed and grown. New organizations and businesses may not have experienced the event and therefore may not be aware of the associated hazards. The City needs to develop inventories of at-risk buildings and facilities and prioritize mitigation projects that will reduce risk and facilitate recovery and resumption of business as usual to prevent the loss of revenue to the City.

Ideas for Implementation: Coordinate with the Coalinga-Huron Unified School District and neighboring jurisdictions to identify available resources should any part of a jurisdiction's infrastructure be overwhelmed or fail and impact the City.

Other Alternatives: No action

Responsible Office: City of Coalinga Fire Department

Partners: Coalinga-Huron Unified School District

Priority (High, Medium, Low): High

Cost Estimate: $50,000 to $80,000

Potential Funding: Internal funding, FEMA grants, private grants, Coalinga-Huron Unified School District budget

Benefits (Avoided Losses): Completing inventory would allow a systematic refurbishing of structures when funding is available from private, public, or agencies.

Schedule: Ongoing

2. Improve Nonstructural Earthquake Mitigation in Public Buildings

Issue/Background: Since the 1983 earthquake, the City's population has changed and grown. New organizations and businesses may not have experienced the event and therefore may not be aware of the associated hazards. All items in structures require securing in order to prevent movement due to future seismic activity

Ideas for Implementation: Within the Coalinga-Huron Unified School District, City of Coalinga, and neighboring jurisdictions, fire service personnel, volunteers, and agency employees will work with private staff to physically secure all moveable items in public structures.

Other Alternatives: No action

Responsible Office: City of Coalinga Fire Department

Partners: Coalinga-Huron Unified School District, Fresno County Fire Protection District, Coalinga-Huron Parks District

Priority (High, Medium, Low): High

Cost Estimate: $50,000

Potential Funding: Internal funding, FEMA grants, private grants, Coalinga-Huron Unified School and Parks district budgets

Benefits (Avoided Losses): Securing contents within public structures will minimize losses and physical injuries to people during seismic events.

Schedule: Ongoing

3. Provide Bilingual Neighborhood Emergency Response Team (NERT) Training to Community Residents and Businesses

Issue/Background: Since the 1983 earthquake, the City's population has grown and changed into a bilingual community. Many new residents and business owners may not have experienced the event and therefore may not be aware of the associated hazards and potential impacts from future earthquakes. Residents should be prepared to cope with initial emergencies, fires, vehicular accidents, medical emergencies, and the loss/shortage of emergency responders for the first 49 to 96 hours after to seismic event.

Ideas for Implementation: Within the City of Coalinga and the Coalinga-Huron Unified School District, fire service personnel and agency volunteers will be trained as instructors for NERTs and provide such instruction in a bilingual format within the community.

Other Alternatives: No action

Responsible Office: City of Coalinga Fire Department

Partners: Coalinga-Huron Unified School District, Fresno County Fire Protection District, Coalinga Huron Parks District

Priority (High, Medium, Low): High

Cost Estimate: $60,000

Potential Funding: Internal funding, FEMA grants, private grants, Coalinga-Huron Unified School and Parks district budgets

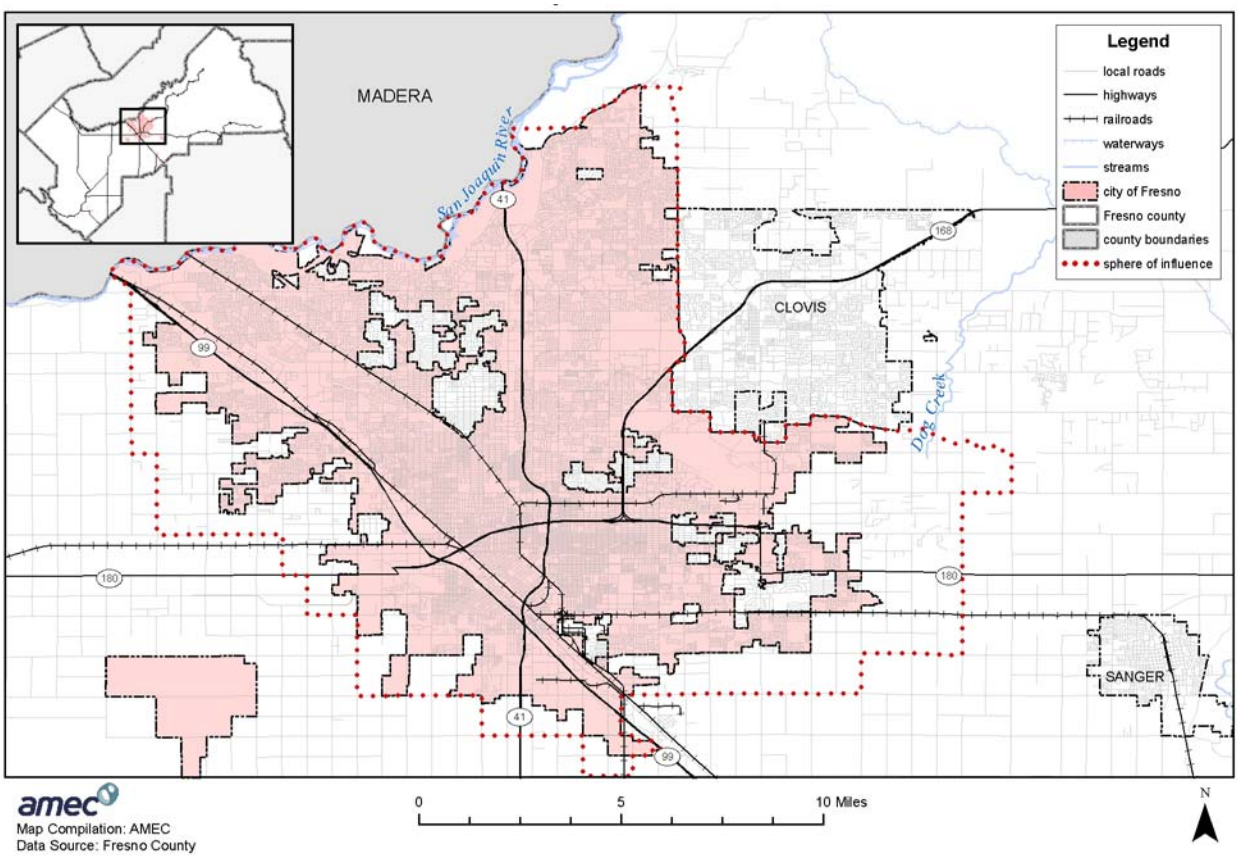
Benefits (Avoided Losses): Community residents would be self-sufficient for the first 48 to 96 hours after an earthquake, thus better enabling the formal response system to coordinate a full response.

Schedule: Two years, then ongoing

C.1 Community Profile

Figure C.1 displays a map and the location within Fresno County of the City of Fresno and its Sphere of Influence.

Figure C.1. The City of Fresno



C.1.1 Geography and Climate

Except for the deep channel of the San Joaquin River at the northern boundary of the City, Fresno's topography is generally level and slopes gently to the west. The upper San Joaquin River lies at the City's northerly boundary and has carved a deep channel, confining the river between steep bluffs that range from 20 to approximately 100 feet in height.

Fresno has a Mediterranean climate, averaging over 300 sunny days per year and little or no measurable precipitation from June through September. Annual rainfall typically totals 12-14

inches in episodic events lasting up to a few days at most. Fresno's prevailing winds are typically light and from the northwest.

Storms with strong weather disturbances (lightning and very agitated winds) may occur from autumn months through the spring, with the strength of the storm dependent upon temperature gradients between moving weather fronts.

Winter evenings are often below freezing but only rarely as low as, or below, 20ºF; winter daytime high temperatures almost always approach or exceed 40ºF. Snowfall is an extremely rare and transient phenomenon, although "black ice" from precipitated fog may temporarily affect some roadways and bridges during the winter.

Summer daytime peak temperatures are high in Fresno. Some heat waves last over a week with daytime highs well over 100ºF and issuance of health advisories. Summer evenings provide for cooling of 10-20ºF, depending on humidity (low humidity allows for more radiant cooling).

Geography and climate combine to create a general accumulation of air pollutants in the San Joaquin Valley (and in the City of Fresno) that occasionally result in unhealthy air quality conditions. Air quality problems are exacerbated by dust storms, human activities (e.g., vehicle emissions and fireplace and wood stove use), and atmospheric photochemical processes. The City has chronically failed to attain some of the national and state ambient air quality standards, but due to the efforts of the California Air Resources Board and the regional San Joaquin Valley Unified Air Pollution Control District, progress toward attainment of ozone (oxidant) and particulate matter standards is being made. Carbon monoxide standards were deemed to have been attained in the 1990s.

C.1.2 History

Development of what today is the City of Fresno began in 1871, when the Central Pacific Railroad chose the Fresno Station for its San Joaquin Valley rail line. The City soon became the County seat and the shipping and distribution hub for the region's agricultural industry. An economic boom across California in the 1880s helped transform Fresno from a village to a city, and helped drive its incorporation in 1885. Today, the City of Fresno is the center of trade, commerce, finance, and transportation for the San Joaquin Valley.

C.1.3 Economy

The most comprehensive economic data available for the City of Fresno comes from the U.S. Census Bureau by way of the American Community Survey (ACS). Select estimates of economic characteristics for the City of Fresno are shown in Table C.1.

Table C.1. City of Fresno's Economic Characteristics, 2006

Characteristic	City of Fresno
Families below Poverty Level	18.6%
All People below Poverty Level	22.8%
Median Family Income	$43,946
Median Household Income	$40,328
Per Capita Income	$18,697
Population in Labor Force	218,958
Population Employed*	194,640
Unemployment	11%

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/
*Excludes armed forces

Tables C.2 and C.3 show how the City of Fresno's labor force breaks down by occupation and industry based on estimates from the 2006 American Community Survey.

Table C.2. City of Fresno's Employment by Occupation, 2006

Occupation	# Employed	% Employed
Sales and Office Occupations	57,426	29.50
Management, Professional, and Related Occupations	52,013	26.72
Service Occupations	35,587	18.28
Production, Transportation, and Material Moving Occupations	25,297	13.00
Construction, Extraction, Maintenance and Repair Occupations	19,164	9.85
Farming, Fishing, and Forestry Occupations	5,153	2.65
Total	**194,640**	**100.00**

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/

Table C.3. City of Fresno's Employment by Industry, 2006

Industry	# Employed	% Employed
Educational Services, and Health Care, and Social Assistance	41,980	21.57
Retail Trade	27,247	14.00
Professional, Scientific, and Management, and Administrative and Waste Management Services	17,911	9.20
Manufacturing	16,275	8.36
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	16,121	8.28
Construction	16,093	8.27
Finance and Insurance, and Real Estate and Rental and Leasing	12,754	6.55
Public Administration	11,616	5.97
Other Services, Except Public Administration	8,717	4.48
Wholesale Trade	8,532	4.38
Transportation and Warehousing, and Utilities	7,775	3.99
Agriculture	5,982	3.07
Information	3,637	1.87
Total	**194,640**	**100.00**

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/

With the economic growth and diversification of the middle part of the 2000-2010 decade, unemployment rates trended lower but have recently increased due to the depressed real estate and construction market and signs of a pending recession. The most recent annual data from the State of California Employment Development Department indicates that in 2007 there were 225,800 people in the City of Fresno labor force. Of these, 207,600 were employed; 18,200 were not. The unemployment rate was 8 percent.

C.1.4 Population

According to the California Department of Finance, the City of Fresno's population was estimated to be 481,035 in 2007. Select demographic and social characteristics for the City of Fresno from the U.S. Census Bureau's 2006 American Community Survey are shown in Table C.4.

Table C.4. City of Fresno's Demographic and Social Characteristics, 2006*

Characteristic	City of Fresno
Gender/Age	
Male	49.7%
Female	50.3%
Median age	28.8
Under 5 years	8.7%
Under 18 years	30.3%
65 years and over	9.3%
Race/Ethnicity**	
White	52.7%
Asian	11.9%
Black or African American	8.0%
American Indian/Alaska Native	1.1%
Hispanic or Latino (of any race)	43.4%
Education	
High school graduate or higher	74.8%
Disability Status	
Population 5 years and over	17.6%

Source: U.S. Census Bureau American Community Survey, 2006, www.census.gov/
*Based on a 2006 estimated population of 477,468
**Of the 95.81% reporting one race

These estimates indicate that ethnic minorities make up roughly 50 percent of the City's population. It is projected that by 2010, the City of Fresno's minority population will be over 72 percent of the total. By that date, Hispanic residents are expected to make up 45 percent of the City's population, while Asian and Pacific Islander residents are expected to make up over 13 percent. (Fresno's Southeast Asian community continues to grow, even though the final exodus of refugees from the Vietnam and Cambodian conflicts has arrived in the United States.) It is

anticipated that the non-Hispanic White and Black or African American populations will decrease almost 20 percent and 3 percent, respectively, between 2000 and 2010.

For information about how some of these demographics affect social vulnerability and how they compare to other Fresno County jurisdictions, California, and the United States, see “Social Vulnerability” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan. A more in-depth look at the population of the City of Fresno, including the City’s special needs populations, is available in the Draft [City of Fresno General Plan] Housing Element 2008-2013 commissioned by the City of Fresno Planning and Development Department and prepared by Quad Knopf, Inc (available at www.fresno.gov/).

C.2 Hazard Identification and Summary

The City of Fresno’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Fresno (see Table C.5). In the context of the plan’s planning area, there are no hazards that are unique to Fresno.

Table C.5. City of Fresno—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Unlikely	Limited	Limited	Low
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Unlikely	Significant	Limited	Medium
Drought	Occasional	Extensive	Critical	High
Earthquake	Occasional	Extensive	Critical	Medium
Flood	Occasional	Significant	Critical	High
Human Health: Pandemic/Epidemic	Likely	Extensive	Critical	Medium
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Cold/Freeze	Occasional	Extensive	Negligible	Low
Extreme Heat	Highly Likely	Extensive	Negligible	Medium
Fog	Highly Likely	Extensive	Negligible	Medium
Snow	Unlikely	Extensive	Limited	Low
Tornado	Occasional	Limited	Critical	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Medium
Soil Hazards:				
Erosion	Unlikely	Limited	Negligible	Low
Expansive Soils	Occasional	Limited	Negligible	Low
Land Subsidence	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Extensive	Critical	Low
Wildfire	Occasional	Limited	Limited	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

C.3 Vulnerability Assessment

The intent of this section is to assess the City of Fresno's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

C.3.1 Assets at Risk

This section considers Fresno's assets at risk, including values at risk; critical facilities and infrastructure; historic, cultural, and natural resources; economic assets; and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table C.6 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Fresno.

Table C.6. 2007 Roll Values for the City of Fresno by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	34	815,128	4,189,900	5	2,642,917	39	7,647,945
Commercial	3,766	1,368,533,170	398,849,442	616	58,273,050	4,382	1,825,655,662
Industrial	1,845	1,217,294,101	255,555,781	511	38,501,695	2,356	1,511,351,577
Open Space	-	-	-	2	463,974	2	463,974
Residential	47,040	4,795,296,090	1,512,846,619	3,991	209,614,182	51,031	6,517,756,891
Other	3	533,979	97,723	5	30,444	8	662,146
Total	**52,688**	**7,382,472,468**	**2,171,539,465**	**5,130**	**309,526,262**	**57,818**	**9,863,538,195**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

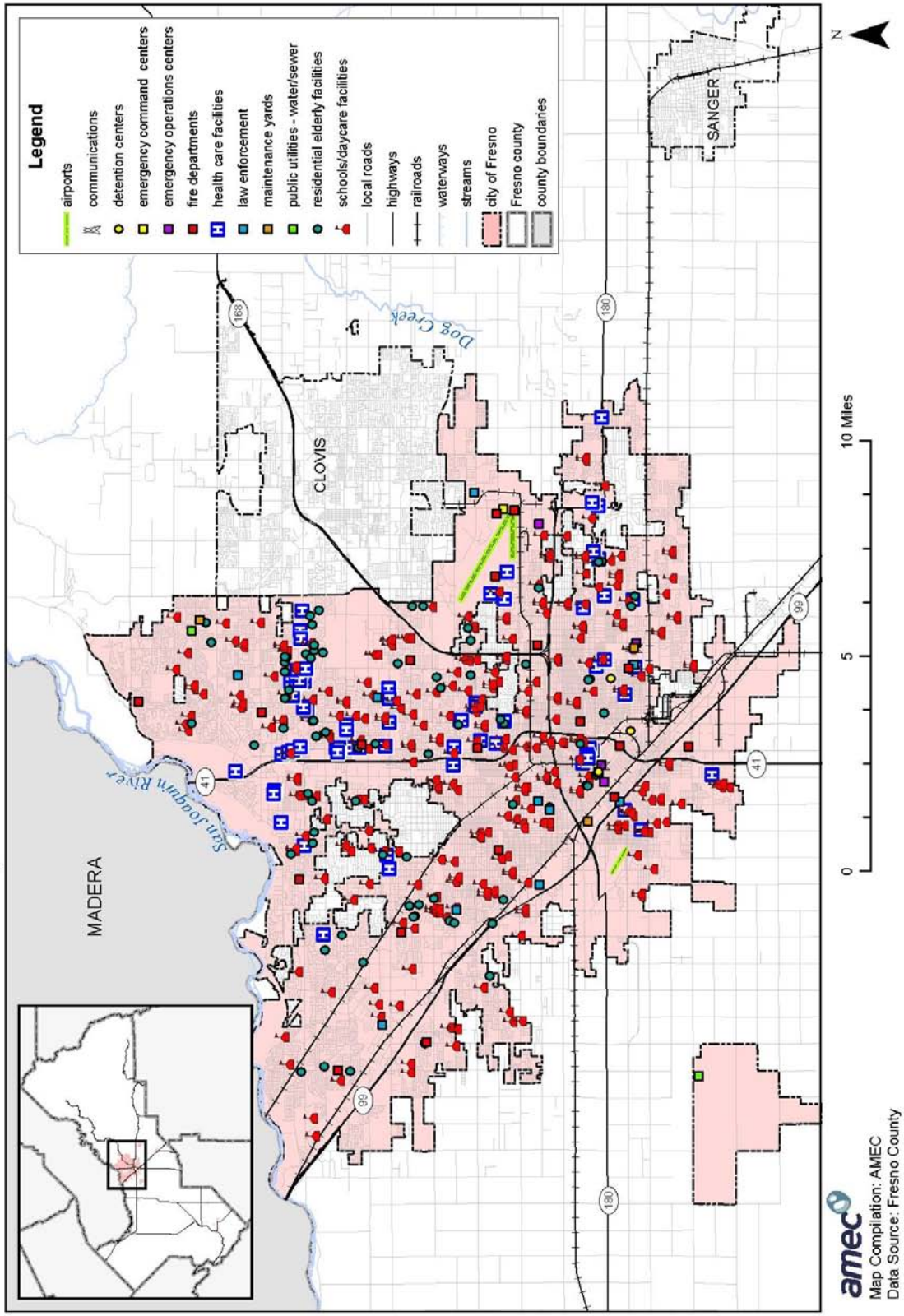
A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Fresno from Fresno County GIS is provided in Table C.7 and mapped in Figure C.2.

Table C.7. City of Fresno's Critical Facilities

Critical Facilities Type	Number
Airports	2
Communications Centers	2
Detention Centers	5
Emergency Command Centers	1
Emergency Operations Centers	5
Fire Departments	19
Health Care Facilities	77
Law Enforcement Facilities	12
Maintenance Yards	3
Residential Elderly Facilities	77
Schools and Day Care Facilities	310
Public Utilities—Water/Sewer	2
Totals	**515**

Source: Fresno County GIS

Figure C.2. City of Fresno's Critical Facilities



The list of specific critical facilities and community assets is maintained by the City of Fresno Police Department. The Fresno Urban Area Critical Infrastructure List is considered confidential and may be accessed through the Fresno Police Department Homeland Security Division.

Historic, Cultural, and Natural Resources

Historic and Cultural Sites

The Cultural Resource Facility located on the California State University, Bakersfield campus maintains a database, maps, and descriptive surveys of prehistoric sites in the Fresno area. Details of the locations are kept confidential due to the risk of theft or vandalism of artifacts. The general location of these sites is along the San Joaquin River and its bluffs, where permanent Native American settlements were established near a permanent water supply and seasonal salmon fishery.

The City of Fresno maintains a local official register of historic resources (available from the historic preservation officer in the City's Planning and Development Department). There are approximately 260 properties on the register. Seventeen of the properties were demolished or destroyed by fire after being placed on the list, and three other properties have been relocated to sites outside the City of Fresno. The local register includes 29 properties that are on the National Register of Historic Places (see Table C.8).

Table C.8. City of Fresno's Properties on the National Register of Historic Places

Property Name	Address	Date Listed
Bank of Italy	1015 Fulton Mall	10/29/1982
Brix, H. H., Mansion	2844 Fresno Street	9/15/1983
Einstein House	1600 M Street	1/31/1978
Forestiere Underground Gardens	5021 W. Shaw Avenue	10/28/1977
Fresno Bee Building	1555 Van Ness Avenue	11/1/1982
Fresno Brewing Company Office and Warehouse	100 M Street	1/5/1984
Fresno Memorial Auditorium	2425 Fresno Street	5/10/1994
Fresno Republican Printery Building	2130 Kern Street	1/2/1979
Fresno Sanitary Landfill	West and Jensen Avenues	8/7/2001
Holy Trinity Armenian Apostolic Church	2226 Ventura Street	7/31/1986
Hotel Californian	851 Van Ness Avenue	4/21/2004
Kearney, M. Theo, Park and Mansion	7160 Kearney Boulevard	3/13/1975
Kindler, Paul, House	1520 E. Olive Avenue	10/29/1982
Maulbridge Apartments	2344 Tulare Street	5/6/1982
Meux House	1007 R Street	1/13/1975
Old Administration Building, Fresno City College	1101 University Avenue	5/1/1974
Old Fresno Water Tower	2444 Fresno Street	10/14/1971
Pantages, Alexander, Theater	1400 Fulton Street	2/23/1978
Physicians Building	2607 Fresno Street	11/20/1978
Rehorn House	1050 S Street	1/8/1982
Romain, Frank, House	2055 San Joaquin Street	1/11/1982

Property Name	Address	Date Listed
San Joaquin Light & Power Corporation Building	1401 Fulton Street	1/3/2006
Santa Fe Hotel	935 Santa Fe Avenue	3/14/1991
Santa Fe Passenger Depot	2650 Tulare Street	11/7/1976
Southern Pacific Passenger Depot	1033 H Street	3/21/1978
Tower Theatre	1201 N. Wishon Avenue	9/24/1992
Twining Laboratories	2527 Fresno Street	3/26/1991
Warehouse Row	722, 744, and 764 P Street	3/24/1978
YWCA Building	1660 M Street	9/21/1978

Source: National Register of Historic Places, www.nps.gov/nr/

Other historic resources in the City of Fresno include the following historic districts:

- The Porter Tract Historic District (45 homes)
- The Chandler Field/Fresno Municipal Airport Historic District (four historic structures)

As comprehensive as the City's register may be, it does not include all properties in the City with potential historic or cultural significance. The list is continually being expanded as sites are discovered through routine analysis of proposed development areas and through proposed new listings of historic districts. The pool of potentially historic properties also changes through time, since federal law provides for a 50-year retrospective review, which now encompasses the post-World War II building boom era. Ten properties that were recommended for the City's register but were denied inclusion by the Fresno City Council are still recognized for their historic/cultural significance (heritage properties), which is taken into account when any actions are undertaken on them pursuant to provisions of the California Environmental Quality Act. (Three of these properties have been since been demolished.)

While a detailed assessment of seismic and flood risks for the listed properties in Fresno is currently beyond the available staff resources of the City's Historic Preservation Office, it can be generally assumed that most of the structures have not been seismically reinforced and that their masonry is vulnerable to strong ground shaking.

While many of the structures are in Fresno's old downtown and were built when this area was largely within the 100-year floodplain of the Fresno Stream Group, efforts by the Fresno Metropolitan Flood Control District in conjunction with the U.S. Army Corps of Engineers and the City of Fresno have provided for flood detention structures and ponding basins that have greatly reduced the size and extent of the floodplain in the downtown, helping to preserve these historic resources.

Natural Resource Areas

San Joaquin River Corridor

While the City maintains many community and neighborhood parks, its natural resources are primarily along the San Joaquin River. Owing to the year-round presence of water, the riverbottom and bluffs host the richest aquatic and riparian forest biota in the City. It is in this

area where migratory waterfowl and federally and state-listed endangered wildlife are most likely be encountered. These species include the valley elderberry longhorn beetle, the giant garter snake, and the American bald eagle (recently recommended for delisting from the National Endangered Species list).

Over past decades, land in the river corridor has been purchased and aggregated by state agencies (Department of Fish and Game, San Joaquin River Conservancy), by nonprofit groups (San Joaquin River Parkway Trust, Fresno Sportsmen's Club), and by the City and County (the City's Woodward Park and Milburn Unit, the County's Lost Lake Park). The ultimate goal of the San Joaquin River Conservancy Plan is to fashion a regional parkway with continuity of wildlife corridors and to manage it for joint recreational, habitat conservation, and floodplain protection uses.

Due to its location, this natural resource area is flood-prone. In some areas, this risk has been increased due to removal of massive amounts of sand and gravel (from mining), which lowered the ground surface over past decades. While the native riparian plants and animals have largely evolved with coping mechanisms for periodic severe flooding, any developed recreation facilities would be at risk. The face of the bluff is also very vulnerable to wildfire because of its vegetative overgrowth and nearly vertical slopes. Fire prevention efforts are difficult here because the soils are too unstable for vegetative removal projects or for irrigation that would keep the plants well watered.

Vernal Pool Areas

In the northerly parts of the City, outside the river corridor, certain clay soils have the capacity to form impermeable hardpans and layers that do not allow rapid percolation of rainwater. During the rainy season, shallow vernal pools form that are populated by a host of specialized plants and animals. Many species associated with vernal pools are federally and state-listed species (e.g., the California tiger salamander, various types of fairy shrimp crustaceans, orcutt grass, button celery species, meadowfoam, and owl clover). Vernal pools are also heavily utilized by nonlisted species, such as migratory waterfowl, rodents, furbearing predators, and raptors that prey on other animals.

Wildfire is not considered a major risk to these natural communities, because they evolved with dry season fires as a common occurrence (the plants have very resistant seeds and the crustaceans and amphibians go into protected parts of their life cycles such as deep dormancy). Human encroachment through agriculture and land development is the greatest risk to vernal pool areas. If the clay layers are disrupted by "deep ripping" plowing, water cannot accumulate on the surface and the pools will not form. If the land is subjected to year-round irrigation, specially adapted vernal pool species will be out-competed by other species. Conversion of land to urban development with structures, paving, lawns, pets, and people will destroy vernal pool natural communities.

Economic Assets

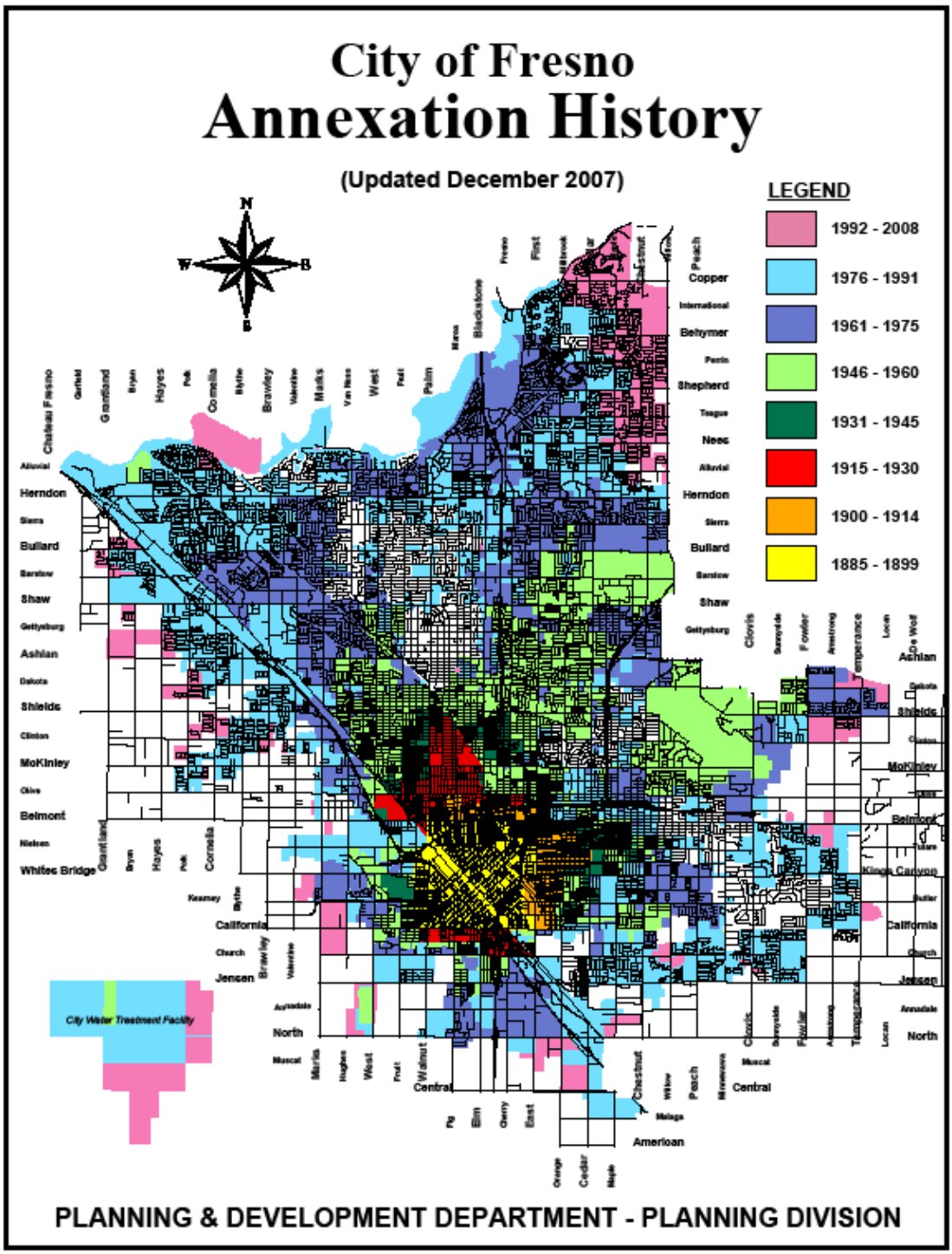
The City of Fresno's economic sector includes both private and public entities that have been compiled into clusters in order to identify key economic assets. These ten clusters, known as the Regional Job Initiative (RJI) clusters, are Advanced Manufacturing, Clean Energy, Construction, Food Processing, Healthcare, Info Processing (Call Centers, Logistics, and Distribution), Software Development, Tourism, and Water Technology. Among these clusters are major employers like Saint Agnes, Pelco, Gottschalks, and Ruiz Foods that both boost Fresno's economic growth and provide employment opportunities.

If a disaster struck the City, it could have a severe impact on Fresno's economic assets. Sectors of greatest concern include all the RJI clusters, but in particular Food Processing, which includes the agricultural industry, and Healthcare.

Growth and Development Trends

The City of Fresno is growing at a rapid pace. Its growth from incorporation in 1885 to the present day (December 2007) is illustrated in Figure C.3. Even more growth is anticipated in the years to come.

Figure C.3. City of Fresno's Annexation History



Source: Joe Simone, City of Fresno Planning and Development Department

Table C.9 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007 alone.

Table C.9. City of Fresno's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
427,652	481,035	+12.48	149,025	164,190	+10.18

Source: California Department of Finance, www.dof.ca.gov/Research/

One of the key factors driving the City of Fresno's growth and influencing its economic status is the City's high birth rate. While there have been periods of increased in-migration from other countries, states, and regions, the birth rate has sustained an annual population rate increase of approximately 2 percent. Data on Fresno's household size also reflects the increase in the population of children. The average number of people per household in the City of Fresno has increased from 2.59 in 1980 to an estimated 3.05 in 2006. An annual average increase of over 7,100 people per year is projected for the City of Fresno from 2000 to 2013.

By 2013, the City population is estimated to grow to 520,808. By December 31, 2025 (the "buildout" year of the most recent Fresno General Plan), it is estimated that 790,000 people will reside in the Fresno Metropolitan Area (which would include County islands and areas inside the City's Sphere of Influence but not yet annexed). This figure of 790,000 would be 61 percent of the projected 2025 Fresno County population of 1,301,204 (analysis by the Central California Futures Institute affiliated with California State University, Fresno).

As of April 2008, the City of Fresno comprised 111.2 square miles of annexed (incorporated) land within its 156.6-square mile Sphere of Influence. Development had reached the natural and political northerly boundary of the City, the San Joaquin River, and begun expanding to the west and southeast through conversion of rural residential and agricultural land. Within the Sphere of Influence, there continued to be "County islands" and partially urbanized fringe areas. An urban unification annexation program may reduce the numbers and sizes of these enclaves in the coming decade.

The 2025 Fresno General Plan made a concerted effort to revitalize the City's downtown by balancing new growth areas to geographically recenter the downtown. With construction of a major sewer trunk along the Grantland Avenue alignment and proposed construction of new wastewater and water treatment plants in the southeastern area, the City's future growth is expected to concentrate primarily to the west and southeast.

The Fresno Metropolitan Flood Control District (FMFCD) has commenced major flood control facility construction on Fancher Creek in the eastern portion of the City's Sphere of Influence. As the City's Southeast Growth Area Specific Plan is completed, the FMFCD will compile technical studies and update its master service plan in conjunction with the City's land use plan for this new growth area.

The 2025 Fresno General Plan also directed that new development be more compact and that single-family residential densities be higher than the City's traditional 4± dwelling units/acre pattern for subdivisions. Therefore, the Southeast Growth Area Specific Plan and other plan amendments and projects in process (and proposed in the future) will feature smaller lots, multi-story housing, multi-family units, and reduced setbacks.

Unless the cost of manufactured housing units would provide a substantial savings over site-built homes, it is not expected that the proportion of manufactured housing in the City of Fresno will greatly increase. It is possible that there will be some increase as producers of these units create models with appropriate roof pitches and other features to meet the City's design review standards.

More information about the City of Fresno's growth and current housing stock is available in the Draft [City of Fresno General Plan] Housing Element 2008-2013 commissioned by the City of Fresno Planning and Development Department and prepared by Quad Knopf, Inc (available at www.fresno.gov/). More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

C.3.2 Estimating Potential Losses

Table C.6 above shows Fresno's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 27,847 buildings in the 100- and 500-year floodplains in the City of Fresno. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

Annual rainfall in the City of Fresno is typically 12-14 inches. This makes the region vulnerable to episodic drought and to chronic drawdown of aquifer levels (the U.S. Environmental Protection Agency has designated the groundwater below Fresno as a sole source aquifer). Water in this aquifer has historically flowed through permeable strata from north and northeast toward the south and west, but the aquifer has been so affected by drawdown that a "cone of depression" has been created, reversing the historic flow directions (the "groundwater gradient") in portions of west and south Fresno.

Earthquake

The seismic hazard in the City of Fresno is low relative to California coastal and mountain communities and is lower than in the Sierra and western areas of Fresno County. There are no known earthquake faults underlying Fresno, and the City has never been the epicenter of a known seismic event. However, Fresno is considered to have a moderate risk of earthquake damage due to the presence of major fault systems to the west, south, and east and due to Fresno's large population and number of buildings, critical facilities, and infrastructure and other development that could be vulnerable to more severe ground shaking.

Historically, Fresno has sustained very little damage from major earthquakes occurring on California's major faults: the Owens Valley earthquake of 1872 toppled an unreinforced masonry (brick) church steeple. More recent major earthquakes in the past three decades (with epicenters near Coalinga and the Bay Area) have resulted in some perceptible tall building swaying in Fresno, minor injuries (attributable to shelved items falling), and slight damage (e.g., minor cracked plaster, etc.). To date, no soil liquefaction has been observed in Fresno from any seismic event.

The most serious impacts of an earthquake in Fresno would probably arise from damage to large dams in the Sierra Nevada on the upper reaches of the San Joaquin River very close to active Long Valley Caldera-related faults. Should either of the two most easterly (and largest) dams in this area be severely damaged or breached, the resulting sequential dam failures could cause floodwaters to overtop Friant Dam northeast of the City. While the dam failure inundation map for Friant shows that most of the flooded area would be expected in the northwest part of town (where the confining river bluffs are not as high), there are some residences and important infrastructure in the river channel itself that would be inundated and gravely damaged (or destroyed), including highway bridges and the inlet of the Friant-Kern Canal, which supplies Bureau of Reclamation surface water to the Fresno area and to other communities in the southern San Joaquin Valley.

Flood

As noted in the preceding section, there is some flood risk to the City from San Joaquin River major dam failure inundation, but the more common flood risk, repetitively experienced in Fresno, is that of shallow "sheet" flooding from major precipitation events. Except for the San Joaquin River, streams in the Fresno-Clovis Metropolitan Area originate in the Sierra foothills to the east and extend into the valley floor west of State Route 99 by way of dual-use irrigation and storm runoff channels and disperse into numerous smaller irrigation canals. Overflow from these canals and urban stormwater from intense precipitation events is sent back to the San Joaquin River or to farmland southwest of Fresno via spillway channels.

In the City of Fresno, these canals and channels are under control of the Fresno Irrigation District, an independent public agency, but their use during storm events is shared by another independent district, the Fresno Metropolitan Flood Control District (FMFCD). The FMFCD

was created to develop flood control facilities to prevent further repetitive losses created by the Fresno Stream Group and to provide an urban drainage network. This District is responsible for administering a Storm Drainage and Flood Control Master Plan. The City's municipal code supports these efforts by including a Drainage Fee Ordinance to ensure that grading and development comply with the FMFCD's Master Plan and standards and provide proportionate shares of storm drain and ponding basin infrastructure.

The City of Fresno's Floodplain Ordinance further coordinates and supports FMFCD efforts. This ordinance and the 2025 Fresno General Plan Safety Element policies require conformance to FEMA floodplain management policies and to those of California's Central Valley Flood Prevention Board (which regulates the designated floodway along the San Joaquin River channel). Still, in areas not completely developed to urban standards, areas where the urban drainage network is not yet completed, and in some County "island" areas (land within the City that the County has authority over), stormwater drainage facilities may not prevent localized shallow flooding during intense runoff events.

According to FEMA's 2005 Flood Insurance Study (FIS), the following major canals and ditches run through the City:

- **Central Canal** flows southwest through the southeastern part of the City of Fresno.
- **Dry Creek Canal** begins at the confluence of Mill Ditch and Herndon Canal, just downstream of North Millbrook Avenue, and flows southwest through the southwestern portion of the City.
- **Fancher Creek Canal** flows southwest along the eastern corporate limits of the City of Fresno and joins Central Canal at the southeast corner of the City.
- **Herndon Canal** begins at the confluence of Mill Ditch and Dry Creek Canal. It flows west through the center of the City of Fresno, then flows northwest through the northwestern part of the City.
- **Mill Ditch** flows west along East McKinley Avenue to its confluence with Herndon and Dry Creek Canals.

The FIS details the City of Fresno's flood history as follows:

In February 1884, floodflows from streams of the Fresno-Clovis group inundated the business section of the City of Fresno. Frequent flooding was a problem in the City throughout the 1880. Suburban areas of the City were flooded in spring 1920; the downtown area was inundated in 1923; flooding occurred in the Fig Garden area in 1936; and parts of the City, especially in the northeast section, were flooded in March 1938. Since the 1938 flood, which had an estimated discharge of 2,700 cubic feet per second (cfs) on Dry Creek at the Big Dry Creek Dam site, high flows occurred on that stream in December 1955 (3,800 cfs), January 1969 (5,700 cfs), and February 1969 (4,500 cfs). During December 1955, approximately 500 acres of agricultural and suburban land were flooded by overflow from irrigation canals, and damage, mostly to public facilities, totaled approximately $50,000. The largest and most damaging flood period was

January and February 1969, when the combined discharges of Dry, Dog, Redbank, Fancher, and Mud Creeks flooded an estimated 14,500 acres and caused almost $4.7 million in damage. Most of the flooding was in the eastern and northeastern parts of the City. It occurred because many of the streams in the Fresno-Clovis group discharged floodwater into various irrigation canals, causing them to overflow.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Fresno was created (see Figure C.4). Tables C.10-C.12 summarize the values at risk in the City's floodplain. Table C.10 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table C.11 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table C.12 shows loss estimates by flood.

Figure C.4. City of Fresno's 100- and 500-Year Floodplains

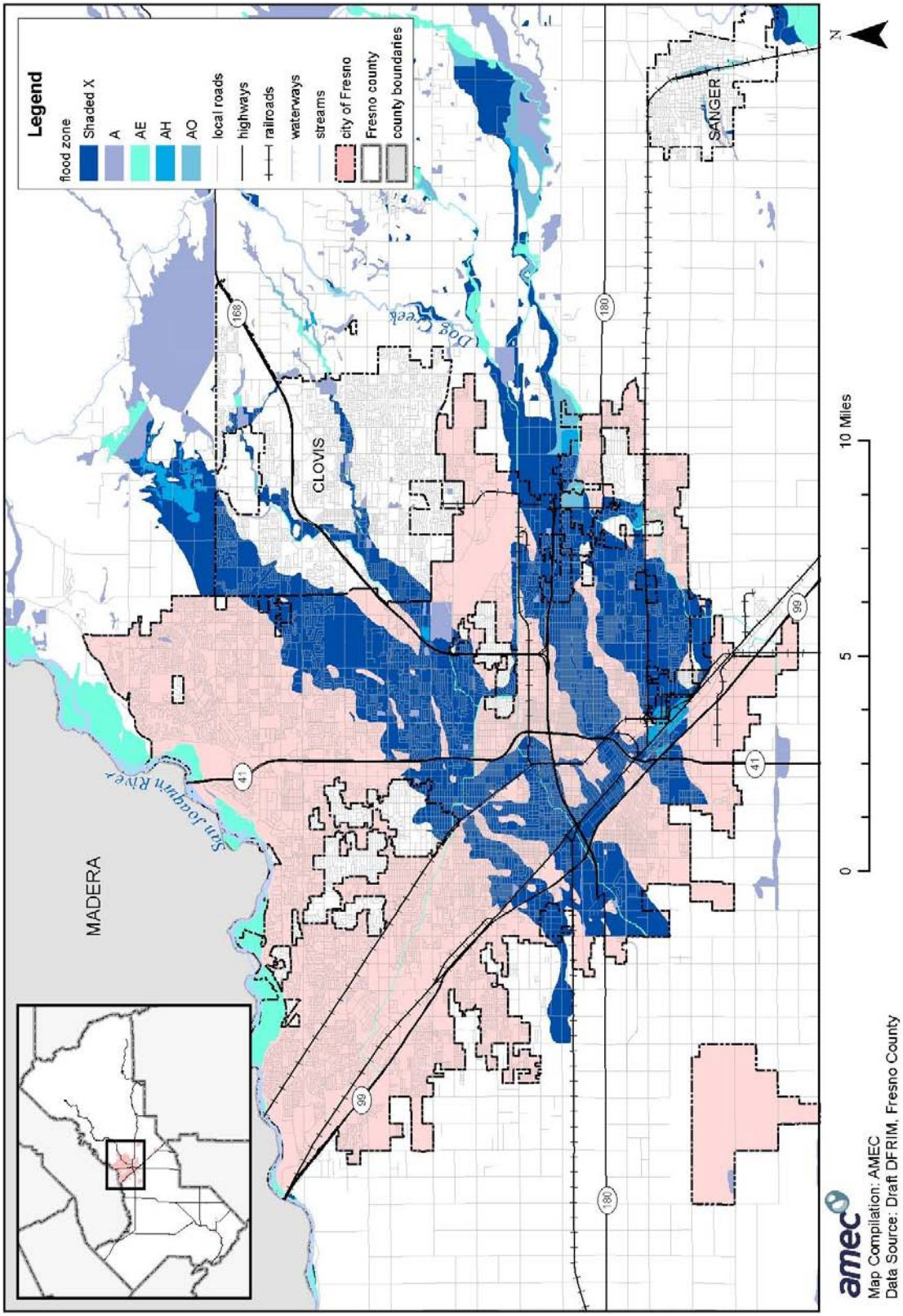


Table C.10. Count and Improved Value of Parcels in Floodplain by Zone—City of Fresno

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	-	-	2	43,424	-	-
Commercial	-	-	23	10,386,993	22	1,370,658
Industrial	3	207,152	5	66,156	141	31,336,236
Open Space	-	-	-	-	-	-
Residential	11	3,007,963	99	10,392,966	131	15,125,113
Total	**14**	**3,215,115**	**129**	**20,889,539**	**294**	**47,832,007**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	1	76,861	6	91,090	35	780,793
Commercial	6	1,802,855	2,743	847,219,448	1,667	519,842,619
Industrial	-	-	903	244,200,067	1,342	669,086,780
Open Space	-	-	-	-	2	0
Residential	94	10,112,783	23,657	2,077,876,426	27,154	2,686,448,551
Total	**101**	**11,992,499**	**27,309**	**3,169,387,031**	**30,200**	**3,876,158,743**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table C.11. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Fresno

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	3	120,285	6	91,090	9	211,375
Commercial	51	13,560,506	2,743	847,219,448	2,794	860,779,954
Industrial	149	31,609,544	903	244,200,067	1,052	275,809,611
Open Space	-	-	-	-	-	-
Residential	335	38,638,825	23,657	2,077,876,426	23,992	2,116,515,251
Total	**538**	**83,929,160**	**27,309**	**3,169,387,031**	**27,847**	**3,253,316,191**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table C.12. Fresno County Flood Loss Estimates—City of Fresno

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	538	83,929,160	41,964,580	125,893,740	25,178,748
500-Year Flood	27,309	3,169,387,031	1,584,693,516	4,754,080,547	950,816,109
Total Flood**	**27,847**	**3,253,316,191**	**1,626,658,096**	**4,879,974,287**	**975,994,857**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Fresno has significant assets at risk to the 100-year and greater floods. 538 improved parcels are within the 100-year floodplain for a total value of roughly $84 million. An additional 27,309 improved parcels valued at roughly $3.2 billion fall within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $25.2 million in damage in the City of Fresno and a .2 percent chance in any given year of a 500-year flood causing roughly $976 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Fresno joined the National Flood Insurance Program (NFIP) on December 1, 1982. In addition to providing insurance for properties at risk of flooding, the program collects and publishes statistics on flood-related losses in participating jurisdictions.

NFIP insurance data for the City of Fresno indicates that as of November 30, 2007, there were 510 flood insurance policies in force in the City with $99,316,700 in coverage. Of the 510 policies, 470 were residential (448 for single-family homes) and 40 were nonresidential. 279 of the policies were in A zones (the remaining 231 were in B, C, and X zones).

There have been 76 historical claims for flood losses totaling $719,301; 68 were for residential properties; 37 were in A zones and 31 were in B, C, or X zones; and 51 were pre-FIRM structures (15 of the 17 post-FIRM structures with reported losses were in a B, C, or X zone). There were no repetitive or severe repetitive loss structures.

Population at Risk

Based on information from HAZUS-MH MR3 (Census 2000) and the digital flood insurance rate map, the following are at risk to flooding in the City of Fresno:

- **100-year flood**—4,835 people
- **500-year flood**—156,780 people
- **Total flood**—161,615 people

Critical Facilities at Risk

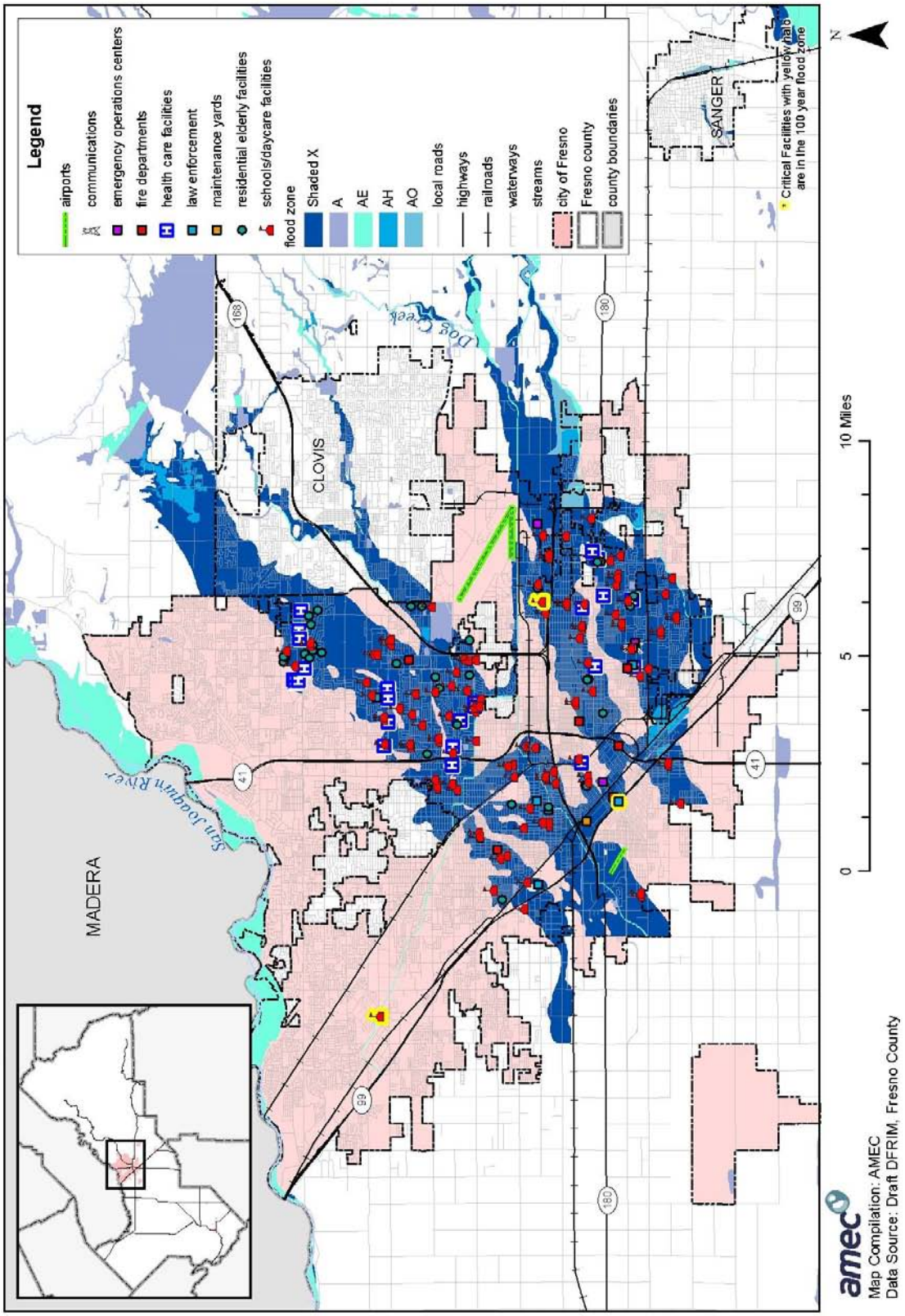
Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table C.13 lists the critical facilities in the City's 100- and 500-year floodplains and Figure C.5 illustrates their locations.

Table C.13. Critical Facilities in the 100- and 500-Year Floodplains: City of Fresno

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Airports	-	2
Communications Centers	-	1
Emergency Operations Centers	-	4
Fire Departments	-	6
Health Care Facilities	-	27
Law Enforcement Facilities	1	5
Maintenance Yards	-	2
Residential Elderly Facilities	-	33
School and Day Care Centers	2	111
Total	**3**	**191**

Source: Fresno County GIS

Figure C.5. Critical Facilities in the 100- and 500-Year Floodplains: City of Fresno



Severe Weather: Extreme Heat

Fresno uses a local version of the California State Plan for Extreme Heat. This plan was used during the extreme heat event during the summer of 2006 and worked well. The City operates cooling centers, which are primarily geared toward the homeless. Public notification during extreme heat events is conducted through the Public Affairs office in coordination with Fresno County.

Severe Weather: Fog

The San Joaquin Valley is hemmed in on three sides by mountain ranges, with resulting inversion layers trapping cooler air on the valley floor. This predisposes Fresno to severe episodes of fog in winter months, when barometric pressures are high, humidity is increased, and ambient temperatures are low. In Fresno/Clovis, the average number of days with dense fog per year is 35.1 (see Table C.14). The most consecutive days with dense fog were the following:

- 14 days from 12/19/1929-1/2/1930
- 16 days from 12/13/1985-12/28/1985

Table C.14. Average Number of Days in Fresno/Clovis with Dense Fog

Month	Number of Days
January	11.5
February	5.1
March	1.5
April	0.2
May	0
June	0
July	0
August	0
September	0
October	0.6
November	5.2
December	11.0
Annual	**35.1**

Other Hazards

Although ranked of lower planning significance relative to other hazards, the following information about agricultural hazards, epidemic/pandemic, extreme cold/freeze, tornado/wind, expansive soils, land subsidence, hazardous materials release, and wildfire should still be noted:

Agricultural Hazards

Very little land in the City is used for agricultural purposes. Agricultural losses due to hazard events have greater economic impact on the small communities and rural areas of the County than on the City of Fresno. However, ornamental and garden plants in the City, and pets and incidental livestock kept within City limits, may become involved in any countywide responses

to crop pests or infectious agents, because these urban plants and animals provide reservoirs for the diseases and crop pests that adversely affect, or threaten, the County's agriculture.

One of the agricultural-related risks recognized in recent years is the potential for outbreaks of foodborne illness disseminated through processing plants for meat and produce. Recent outbreaks have been due to infectious agents such as E. coli biotype157 and listeria monocytogenes, but food intoxication from accidentally or intentionally introduced substances is also possible. Food producers in the County are regulated by state and federal agencies and are required to implement extensive food security measures. Since the City hosts many of the larger processing plants because it provides municipal water and sewer utilities, the City has a supporting role in preventing, and responding, to these agricultural hazards as well.

Human Health Hazards: Epidemic/Pandemic

Fresno's population includes many residents who have limited access to health care, with causes related to low household income levels, lack of insurance coverage, a limited number of primary health care facilities and acute care beds, a low ratio of public health and medical professionals to population, and language barriers. Highly communicable diseases tend to affect a large percentage of the City, perhaps due to large household size and the mobility of the population. If a highly communicable disease outbreak occurred that caused serious or life-threatening illness for most infected persons, health care and other public service systems would experience disruption or breakdown and would require outside intervention with resources from other communities, the state, or the federal government.

Severe Weather: Extreme Cold/Freeze

Freeze events occur occasionally in Fresno, but impacts are greater to the agriculture industry in the County than to the City. In January 2007, overnight minimum temperatures fell below freezing between January 6 and 10. The event led to a presidential disaster declaration due to the estimated $0.71 billion in agricultural damage in the Central and South Valley. The 2007 event occurred in another eight-year interval after the devastating citrus freezes of 1998 and 1990. The event caused frozen pipes in Fresno but little other property damage. The City also has a plan for freezing temperature events and opens warming centers. Again, these centers are primarily geared toward the homeless population.

Severe Weather: Tornado/Wind

Fresno's prevailing winds are typically light and from the northwest. High wind conditions are occasionally created by strong weather fronts. Occasionally, there are funnel clouds of low intensity. Past structural damage has been light, infrequent, and very limited in geographic extent. Injuries have been extremely rare. Most of this damage has occurred secondary to large trees being blown over. The City's design wind load, the level of wind force that new structures are required to be engineered to withstand, is 70 mph.

Soil Hazards: Expansive Soils

These types of soils occur in northern Fresno in the far northeastern portions of its Sphere of Influence (in the "Copper River" area). Expansive clay soils can cause cavitation over time and require special construction standards for foundations.

Soil Hazards: Land Subsidence

Despite long-term overdrafting of groundwater that has lowered the static water table under Fresno by as much as 100 feet over the past century, ground level subsidence has not been noted in the vicinity of the City (this is probably due to the geologic strata underlying the City, which features layers of clay and hardpan interleaved with sand and gravel layers).

Technological Hazards (Hazardous Materials Release)

- Train derailments
- Kinder-Morgan pipeline
- Chevron petroleum pipelines
- Storage facilities

Wildfire

Similar to many areas of the County, Fresno has high temperatures in the summer with low rainfall creating fire hazard conditions. There is some wildfire risk in the San Joaquin River Bluff area in northern Fresno due to vegetation and steep slopes.

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Fresno was created (see Figure C.6). An analysis was performed using GIS software to determine where populations, values at risk, and critical facilities are located within wildfire threat zones. Table C.15 shows the values at risk in the moderate wildfire threat zone (there are no values at risk in the high or very high threat zones). There are not any critical facilities in wildfire threat zones in the City of Fresno.

Table C.15. Values at Risk to Wildfire (Moderate Threat) in the City of Fresno

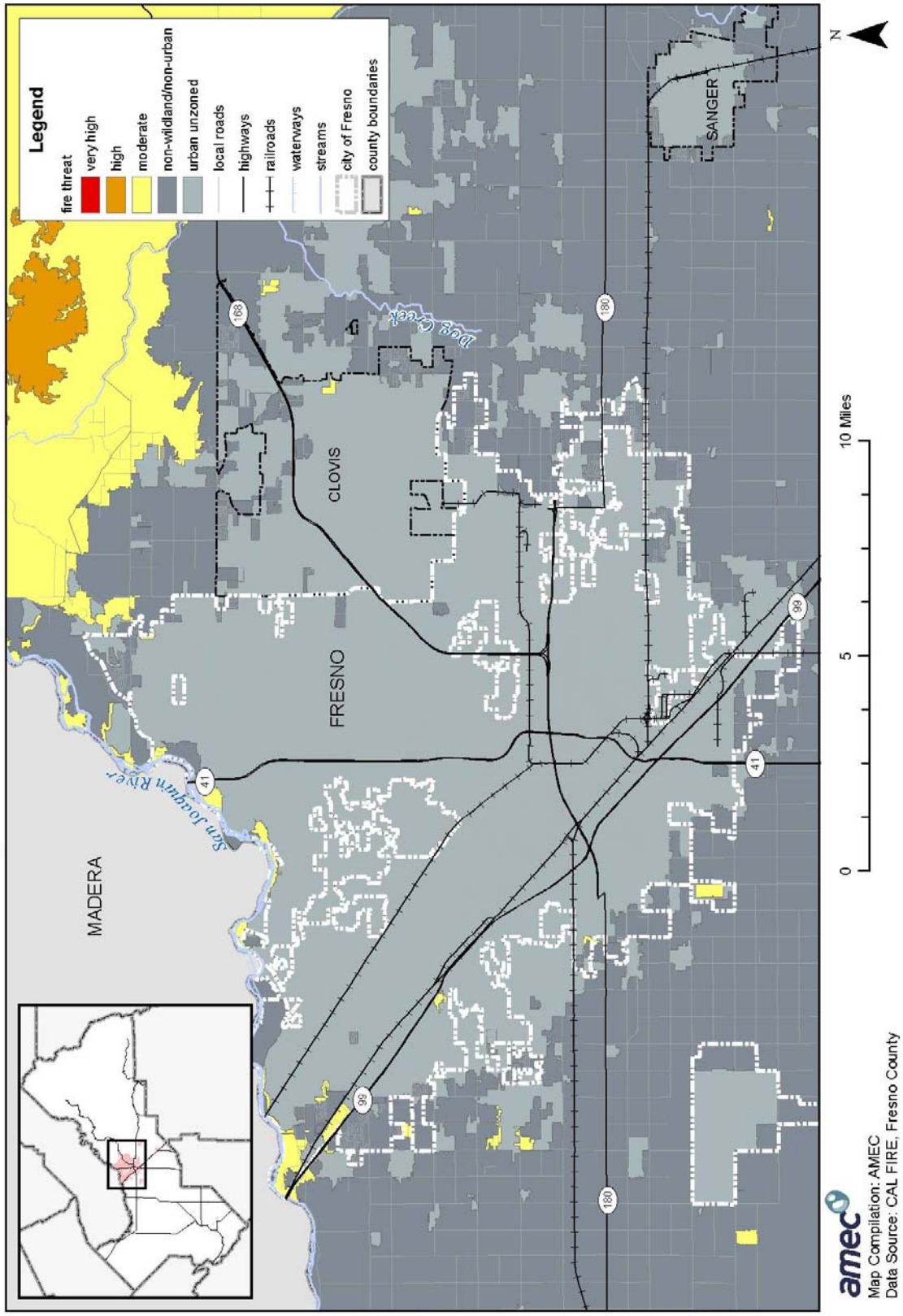
Property Type	Parcels	Improved Value ($)	Contents Value ($)	Total Value ($)
Moderate				
Agriculture	-	-	-	-
Commercial	-	-	-	-
Industrial	3	485,526	242,763	728,289
Open Space	-	-	-	-
Residential	-	-	-	-
Total	3	485,526	242,763	728,289

Sources: 2007 Certified Roll Values, Fresno County

Based on this analysis, the City of Fresno's moderate wildfire threat affects 1,232 people and three improved parcels valued at roughly $728,000. All of the parcels are industrial. This

discrepancy is due to the use of differing methodologies to best assess populations and parcels at risk. Almost all of the parcels are in the San Joaquin River corridor, where development is very restricted due to flood risk and bluff instability. Other parcels are in industrial areas, where the City's weed abatement ordinances (requiring vegetation control by April) would reduce the wildfire risk.

Figure C.6. City of Fresno's Wildfire Threat



C.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

C.4.1 Regulatory Mitigation Capabilities

Table C.16 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fresno.

Table C.16. City of Fresno's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	The 2025 Fresno General Plan has a Safety Element with policies for fire, seismic/geologic, flood, hazmat, and airport safety
Zoning ordinance	Yes	Fresno Municipal Code Chapter 12; Zoning Ordinance has requirements related to health and safety (e.g., dwelling unit density controls, building setbacks for fire protection, masonry walls along major streets)
Subdivision ordinance	Yes	Fresno Municipal Code Chapter 12 requires multiple points of access for ingress/egress, fire protection provisions, etc.
Site plan review requirements	Yes	Required for all nonresidential development projects and multi-family projects over two units; required for duplexes in some zone districts; plot plan review required for even single-family residential construction
Growth management ordinance	Yes	Fresno Municipal Code Chapter 12 provides for extension of urban infrastructure and services including sewer treatment, water supply, and fire protection
Floodplain ordinance	Yes	Fresno Municipal Code Chapter 13 (local building codes) includes the Flood Damage Prevention Ordinance
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	- Within the Zoning Ordinance, there is a Bluff Preservation Overlay district with requirements for soil stability analysis and setbacks from the San Joaquin bluff edge - Pretreatment Ordinance and environmental control program for wastewater system to prevent and abate any hazardous material releases
Building code	Yes	Version: 2001 California Building Code with a few City modifications: fire sprinkler ordinance, swimming pool ordinance, and security ordinance
Fire department ISO rating	Yes	Rating: 4

Regulatory Tool	Yes/No	Comments
Erosion or sediment control program	Yes	The Bluff Preservation Ordinance, as well as grading plan review and stormwater pollution prevention plans, which are required for all development projects through project conditions and CEQA review
Stormwater management program	Yes	In conjunction with Cal-EPA, Regional Water Quality Control Board, and Fresno Metropolitan Flood Control District
Capital improvements plan	Yes	Public Works Department and Department of Public Utilities formulate and administer these plans
Economic development plan	Yes	Fresno Redevelopment Agency and Economic Development Division of the Planning and Development Department
Local emergency operations plan	Yes	Ratified by City Council in 2005
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

2025 Fresno General Plan (Adopted November 19, 2002)

The 2025 Fresno General Plan is a blueprint of how the City anticipates directing and managing growth while minimizing potential impacts for existing and future generations. It provides long-range planning strategies for the continued development, enhancement, and revitalization of the Fresno Metropolitan Area. The plan goals are the guiding principals and provide the framework for the objectives and policies that can be found in the plan elements. The following general plan goals directly or indirectly mitigate hazards identified in this plan:

- **Goal 1**—Enhance the quality of life for the citizens of Fresno and plan for the projected population within the moderately expanded Fresno urban boundary in a manner which will respect physical, environmental, fiscal, economic, and social issues.
- **Goal 2**—Pursue coordinated regional planning with Fresno and Madera counties and the City of Clovis.
- **Goal 4**—Promote a partnership among citizens, industry, and government that fosters well-planned and efficiently processed development.
- **Goal 11**—Protect, preserve, and enhance significant biological, archaeological, and paleontological resources and critical natural resources, including, but not limited to, air, water, agricultural soils, minerals, plants, and wildfire resources.
- **Goal 13**—Plan for a healthy business and diversified employment environment, and provide adequate timely services to assure that Fresno is competitive in the marketplace.
- **Goal 14**—Protect and improve public health and safety.

Some of the elements of the general plan also contain objectives and policies relevant to protecting human health and safety (e.g., supporting objectives and policies in the Public Facilities [and Services] Element direct that drainage infrastructure be provided to prevent localized flooding and that fire and police services be provided). Because the Safety Element is the portion of the general plan most relevant to hazard mitigation, select objectives and policies are extracted and included below.

Safety Element

The safety element seeks to reduce deaths, injuries, illnesses, damage to property, and economic and social dislocation that could result from hazards. Of specific relevance to this plan, it addresses fire hazards (hazardous materials), seismic and geologic conditions, flooding, and hazardous materials.

Fire Hazards (Hazardous Materials)

I-2. Objective: Ensure the public's health, safety, and welfare by implementing appropriate controls and emergency response capability to deal with those materials that, because of their quantity, concentration, physical or chemical characteristics, pose a significant present or potential hazard to human health, safety, or the environment.
I-2-a. Policy: Maintain and enforce the latest adopted California Building Code and Uniform Fire Code standards to ensure safe processing and storage of hazardous materials.
I-2-b. Policy: Maintain a close liaison with the Fresno County Environmental Health Department, Cal-EPA Division of Toxics, and the State Office of Emergency Services to assist in developing and maintaining hazardous material business plans, inventory statements, risk management prevention plans, and contingency/emergency response action plans.

Seismic and Geologic Hazards

I-3. Objective: Ensure the public's health, safety, and welfare by recognizing potentially geologically unstable conditions that could endanger the lives and property of the Fresno-Clovis Metropolitan Area residents.
I-3-a. Policy: The City of Fresno shall enforce the latest adopted Uniform Building Code and the Dangerous Building Ordinance (Article 12 of Fresno Municipal Code, Chapter 12) to ensure seismic protection for new and existing construction.
I-3-b. Policy: Swimming pools and spas shall be considered structures for purposes of engineering evaluations of soil and seismic stability, and these structures shall conform to setback requirements imposed to safeguard construction from unstable strata.
I-3-c. Policy: In areas having potential geologic and/or soils hazards, development shall not have on-site drainage or disposal for wastewater, stormwater runoff, swimming pool/spa water, unless a soil analysis by a registered civil engineer (or engineering geologist specializing in soil geology) concludes that on-site drainage/disposal will not induce, worsen or spread geologic hazards.
I-3-d. Policy: Development shall be prohibited in areas where analysis by a registered civil engineer or registered geologist determines that no corrective measures could feasibly mitigate potential geologic hazards.

I-4. Objective: Minimize the loss of life and property on the San Joaquin River bluffs that could occur due to geologic hazards.
I-4-a. Policy: Maintain and enforce the requirements of the city's Bluff Preservation (BP) Overlay Zone District. Development within 300 feet of the toe of the San Joaquin River bluffs shall require an engineering soils investigation and evaluation report that demonstrates that the site is, or methods by which the site could be made, sufficiently stable to support the proposed development.
I-4-b. Policy: The minimum setback from the San Joaquin River bluff edge (as the bluff edge is defined in the Fresno Municipal Code) for all future structures (including swimming pools, spas, and accessory structures) shall be 30 feet. However, a building setback of less than 30 feet may be permitted if it can be demonstrated to the satisfaction of the City's Building Official and Planning and Development Department Director that a proposed structure will meet the objective of the Bluff Preservation Overlay Zone District, as stated in the Fresno Municipal Code; but in no case shall the minimum building setback from the bluff edge be less than 20 feet for any structure, and no rear yard encroachments shall be allowed within that 20 feet.

Flooding Hazards

I-5. Objective: Protect the lives and property of current and future residents of the Fresno-Clovis Metropolitan Area from the hazards of periodic floods. Recognize and institute adequate safeguards for the particular flooding hazards of areas on the San Joaquin riverbottom and bluffs.
I-5-a. Policy: Support the full implementation of the Fresno Metropolitan Flood Control District Storm Drainage and Flood Control Master Plan, the completion of planned flood control and drainage system facilities, and the continued maintenance of stormwater and flood water retention and conveyance facilities and capacities.
I-5-b. Policy: The San Joaquin River will not be channelized, and levees will not be used in the river corridor for flood control, excepting those alterations in river flow that are approved with surface mining and subsequent reclamation activities for mined sites (e.g., temporary berms and small side channel diversions to control water flow through ponds).
I-5-c. Policy: Ensure implementation of the Fresno Metropolitan Flood Control District's control programs for the Fresno County Stream Group and the rural streams program to provide protection to the urban community from waters originating outside the urban area.
I-5-d. Policy: Ensure implementation of the Fresno Metropolitan Flood Control District urban drainage program, including completion of the urban storm drainage systems to provide protection to the urban community from waters originating within the urban area.
I-5-e. Policy: Ensure implementation of land grading and development policies which protect area residents from flooding caused by urban runoff produced by events which exceed the capacity of the Storm Drainage and Flood Control Master Plan system of facilities.
I-5-f. Policy: The minimum level of design flood protection shall be the 100-year (one percent) event, as established by the best and most current available data from the U.S. Army Corps of Engineers and the California Department of Water Resources, pursuant to FEMA direction.
I-5-g. Policy: Establish special building standards for private structures, public structures, and infrastructure elements in the San Joaquin riverbottom which would protect construction in this area from being damaged by the intensity of flooding in the riverbottom, water quality in the San Joaquin River watershed from flood damage-related nuisances and hazards (e.g., the release of raw sewage), and public health, safety, and general welfare from the effects of flood events.
I-5-h. Policy: Complete studies addressing the limitations of the area's geological and hydrological status and all the relevant features of the proposed project will be required prior to the approval of any construction or development project proposed in the San Joaquin riverbottom or below the top of the San Joaquin River bluffs.
I-5-i. Policy: The City of Fresno shall preserve flood-prone areas within the City of Fresno and its Sphere of Influence, particularly the San Joaquin riverbottom, for uses which will not have permanent improvements that would be adversely affected by periodic floods.
I-5-j. Policy: The City of Fresno shall continue to assign open space zoning to all undeveloped areas which are within the Designated Floodway of the San Joaquin River and the floodway channels of Dry Creek, Redbank Creek, Fancher Creek, and other streams.
I-5-k. Policy: Except in the San Joaquin riverbottom (where new residential subdivisions are not allowed by the multi-use open space land use designation), the City of Fresno shall require developers of residential subdivisions to preserve those portions of development sites as open space, which may be subject to 100-year flood events, unless the flood hazard can be substantially mitigated by development project design. This shall be a condition of subdivision map and special permit approval. The density of developable adjacent land may be increased to allow the same number of dwelling units as if the entire site were developed. In such instances, the open space area should be incorporated into the project design to provide amenity and passive open space for future residents. This open space should be improved and maintained by the developer, or through the use of such mechanisms as homeowners association fees or maintenance districts.
I-5-l. Policy: New residential uses which are inconsistent with "AE-20"/Exclusive Twenty-Acre Agricultural District zoning will be prohibited in the San Joaquin riverbottom.
I-5-m. Policy: A valid beneficial use of the San Joaquin River corridor is to transport floodwater, and this use must be protected. Riverbottom land uses will be managed with the following objectives: - To control and reduce erosion in the floodway. - To maintain the combined existing flow capacity in the river channel and the Designated Floodway by establishing ordinances and policies to prevent nuisance blocking of flood flow. - To maintain the river stage required to pass any given flow, so as not to increase the extent of flooded area (no increase in the Designated Floodway), unless any resulting loss in private land value is first purchased from willing sellers. - To coordinate any snagging and clearing activities for river channel enhancement with resource agencies to minimize conflicts with natural habitat preservation and mineral extraction activities (including reclamation).

I-5-n. Policy: As new information becomes available, maps of record which designate areas subject to flooding will be amended.
I-5-o. Policy: Pursuant to state law, the city shall prepare and update emergency dam failure inundation plans, evacuation plans, and other emergency response plans for designated flood-prone areas, including the San Joaquin riverbottom.

Hazardous Materials

I-6. Objective: Reduce and control the adverse effects of hazardous materials on the public's health, safety, and welfare so as to promote the public health and welfare of local residents and the productive capacity of industry.
I-6-a. Policy: Hazardous materials will be defined as those that, because of their quantity, concentration, physical or chemical characteristics, pose significant potential hazard to human health, safety, or the environment. Specific federal, state, and local definitions and listings of hazardous materials will be used by the City of Fresno.
I-6-b. Policy: The city will coordinate and cooperate with other local, state, and federal agencies with expertise and responsibility for hazardous materials.
I-6-f. Policy: All commercial and industrial special permits will be conditioned upon proper containment, use, safeguarding, and disposal of hazardous materials.
I-6-g. Policy: The city will continue to prevent, assess, and seek remediation for, any hazardous material contamination within, and affecting, its planning area.
I-6-j. Policy: Disaster and emergency response preparedness and planning for the city will include procedures and policies appropriate to hazardous materials.
I-6-l. Policy: The city will continue to assist in providing information to the public on hazardous materials.

Fresno Flood Plain Ordinance

The City of Fresno's Flood Plain Ordinance was revised in the late 1990s and formally adopted by the Fresno City Council on September 20, 2005. (In late 2007, the Fresno Municipal Code was republished with its chapters somewhat reorganized. There was no change in the text of the Flood Plain Ordinance at that time, but due to this rechaptering of its content its most recent adoption effective date is January 17, 2008.) The Fresno Flood Plain Ordinance is Article 6 of Chapter 11 of the Fresno Municipal Code.

The purpose of this ordinance is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

In order to accomplish its purposes, the ordinance includes the following methods and provisions:

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

This ordinance applies to all areas of special flood hazards within the jurisdiction of the City as identified by FEMA's Flood Insurance Study for Fresno County, California and incorporated areas dated September 30, 2005, with accompanying Flood Insurance Rate Maps, and all subsequent amendments and/or revisions. It appoints the building official to administer, implement, and enforce the ordinance by granting or denying development permits in accord with its provisions.

This ordinance includes the following standards of construction related to special flood hazard areas:

- Anchoring
- Construction materials and methods
- Elevation and floodproofing
- Residential construction
- Nonresidential construction
- Flood venting
- Standards for utilities
- Standards for subdivisions
- Standards for manufactured homes
- Standards for recreational vehicles
- Floodways
- Standards for storage of materials and equipment

In conjunction with Fresno's Drainage Fee Ordinance (Fresno Municipal Code Chapter 12, Article 19), which requires local grading and development to conform to the Fresno Metropolitan Flood Control District Master Drainage Plan and to provide proportionate shares of drainage infrastructure, the Fresno Flood Plain Ordinance and its preceding Flood Damage Prevention Ordinance have reduced flood damage losses in the City.

National Flood Insurance Program/Community Rating System

The City of Fresno joined the National Flood Insurance Program (NFIP) on December 1, 1982. It has been a member of the Community Rating System (CRS) since October 1, 1992. The City's Floodplain Administrator duties are assigned to the building official. The Building and Safety Division of the Planning and Development Department works to improve the City's CRS rating, which determines the price paid for flood insurance policies issued in the jurisdiction. The rating is based on detailed biannual audits conducted by FEMA and/or a designee agency (currently, the California Department of Water Resources). The primary means of improving and maintaining a good CRS rating is through administration of the Fresno Flood Plain Ordinance. As part of its efforts to improve its community rating, the City of Fresno has hosted periodic FEMA Region IX NFIP/CRS training.

The City currently has a CRS rating of "6," which reflects the loss of one point in the most recent audit. Other jurisdictions in California also lost a point because the state did not adopt the most recent International Code provisions. The state has since addressed some relevant provisions of the International Code, so ratings may be enhanced in the next audit cycle.

San Joaquin River Bluff Preservation Ordinance, 1980

After an interagency San Joaquin River Reconnaissance Plan was completed in the late 1970s, the City of Fresno adopted the San Joaquin River Bluff Specific Plan to preserve this important open space and habitat feature and to safeguard the bluff face, which is the most unstable geologic feature in the City. The San Joaquin River Bluff Specific Plan was later subsumed by the 1988 Bullard Community Plan, which carried forward protective policies for this area of Fresno.

The regulation of land use, development, and grading in this portion of Fresno is ongoing pursuant to the Bluff Preservation Ordinance. This ordinance, part of the City's zoning regulations, delineates an overlay zone district along the river bluff (the Bluff Preservation Overlay District), established allowable and prohibited land uses, and set forth conditions and requirements for using or modifying property in the district. The regulations of the district are deemed to be necessary for the preservation of the special qualities of the bluffs and for the protection of the health, safety, and general welfare of owners and users of property in the area.

The Bluff Preservation Ordinance is administered by the Fresno Planning and Development Department through its special permit process and grading plan checks. Anyone applying for a building permit is required to submit a site plan review with accompanying soil investigation and evaluation report (prepared by an appropriately licensed professional engineer or registered geologist). The department's Code Enforcement Division also conducts periodic surveillance of bluff properties for grading and construction done without permits and institutes abatement actions when these conditions are discovered.

Hazardous Material Incident Safeguards

The Fresno Fire Department works with Fresno County Environmental Health to review hazardous material business plans that detail flammable, explosive, toxic, and otherwise hazardous materials used by businesses in the City. The Fire Department has its own permitting requirement for liquid and gaseous fuel tanks to ensure that they are installed and maintained safely. The City's Hazardous Materials Response Unit (housed in a City fire station) maintains the capability to quickly characterize material releases and spills, to evaluate risks to life and property, and to implement appropriate controls and evacuation measures.

Fire Prevention Policy

The City of Fresno has some of the most progressive and effective fire prevention policies and regulations in the nation relating to water supply (fire flow) required for development, ingress and egress from developed buildings and subdivisions, on-site automatic fire suppression systems (sprinkler and on-site private hydrants), building addressing to facilitate rapid emergency response, marking of unsafe buildings (those older structures with hazardous conditions or a lack of water supply), and instant aid/mutual aid with adjacent fire departments belonging to Fresno County special districts and the City of Clovis.

In addition to its extensive network of well-trained and well-equipped firefighting stations, the Fresno Fire Department has a Fire Prevention Bureau, under supervision of the City's fire marshal, to administer regulations adopted and referenced by the Fresno Municipal Code Chapter 6, Article 5 relating to fire prevention. The Fire Prevention Bureau carries out these responsibilities by conducting routine inspections of all public and commercial buildings, performing detailed development permit and construction plan checks, and investigating arson.

Another component of the City's overall fire protection program is the administration of its public nuisance ordinances to require properties to be kept clean and free of flammable debris and to annually abate weeds and overgrown vegetation before these materials can dry out in the spring to pose a wildfire hazard (Fresno Municipal Code Chapter 10, Article 6 relating to public nuisance abatement). The Planning and Development Department Code Enforcement Division and Department of Public Utilities Community Sanitation Division coordinate their efforts to enforce the nuisance abatement regulations and provide cleanup services when property owners do not take care of matters themselves.

City of Fresno Emergency Operations Plan, 2005

The City of Fresno Emergency Operations Plan (EOP) addresses the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, excessive heat/cold, power outages, and national security emergencies in or affecting the City of Fresno. The plan, which is scheduled for revision/update in 2008, does the following:

- Establishes the emergency management organization required to mitigate any significant emergency or disaster affecting the City of Fresno.
- Identifies the policies, responsibilities, and procedures required to protect the health and safety of City communities, public and private property, and the environment from natural or technological disasters.
- Establishes the operational concepts and procedures associated with initial response operations to emergencies, the extended response operations, and the recovery process.

The EOP is designed to establish the framework for implementation of the California Standardized Emergency Management System/National Incident Management System for the City of Fresno, which is located within the California Governor's Office of Emergency Services' Mutual Aid Region V. It is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between the City of Fresno and the Fresno County Operational Area, including special districts and state agencies, in emergency operations. This plan will be used in conjunction with the Fresno County EOP and the State of California Emergency Plan. The plan is designed to guide the reader or user through each phase of an emergency: preparedness, response, recovery, and mitigation.

Other Plans and Policies

Other hazard mitigation-related policies and plans in place in and observed by the City of Fresno include the following:

- California Code of Regulations Title 23 administrative law for development and use of land in designated floodway areas along the San Joaquin River administered by the Central Valley Flood Protection Board, staffed by the California Department of Water Resources.
- Standards for constructing and maintaining drainage basins and ponds to prevent mosquito breeding and to provide for mosquito control district access for inspection and abatement activities (jointly promulgated by the Planning and Development Department and Public Works Department in fall of 2005).
- Dam failure inundation plans prepared and administered by the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, Fresno Metropolitan Flood Control District, Southern California Edison, and Pacific Gas and Electric Company.
- The California Environmental Quality Act, overseen by the Fresno City Attorney's Office and administered by several City departments, requires consideration of health and safety impacts as they may relate to projects, which are defined as any action that may result in a change in the physical environment and that would include public facilities, and private development, and even adoption/amendment of land use plans and ordinances. An analysis of every project is conducted by the appropriate City department (the Planning and Development Department does the bulk of these analyses). Inquiries regarding project sites and features are distributed to departments and outside agencies that may have knowledge of, or which may regulate, aspects of the proposed project. The information obtained from these requests for comment and from other staff research is compiled into an informational

document for decision-makers and the public. The information is also used to develop a list of mitigation actions to reduce or abate potential adverse impacts of the project. For those projects which may involve federal funds or require federal approvals, a parallel National Environmental Policy Act assessment is also prepared by the City.

- The Planning and Development Department administers regulations in the California Building Code and in Uniform Electrical, Plumbing, and Mechanical Codes as those codes are modified through adoption by the state and City. Plan check and inspection activities of the department ensure structural soundness and compliance with seismic and other regulations.

C.4.2 Administrative/Technical Mitigation Capabilities

Table C.17 identifies the personnel responsible for activities related to mitigation and loss prevention in Fresno.

Table C.17. City of Fresno's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Planning and Development Department (planners), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Planning and Development Department (engineers), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Planner/engineer/scientist with an understanding of natural hazards	Yes	Planning and Development Department (planners and engineers), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Personnel skilled in GIS	Yes	Planning and Development Department, Department of Public Utilities, Public Works Department, Information Services Department
Full time building official	Yes	Planning and Development Department
Floodplain administrator	Yes	Planning and Development Department
Emergency manager	Yes	Fresno Fire Department
Grant writer	Yes	Planning and Development Department, Police Department, Public Works Department, Fire Department
Other personnel	Yes	California registered geologist (Department of Public Utilities), California registered environmental health specialist (Planning and Development Department), licensed water and wastewater treatment operators
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	State Emergency Alert System is coordinated by emergency management team through the National Weather Service
Other	Yes	Emergency notification of San Joaquin River bottom residents in conjunction with the U.S. Bureau of Reclamation and Fresno County

C.4.3 Fiscal Mitigation Capabilities

Table C.18 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table C.18. City of Fresno's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Geographically restricted to designated portions of Fresno based on area income
Capital improvements project funding	Yes	Budgeted out of utility fees and often related to issuance of bonds; City also obtains grants, shares of state gas tax and sales taxes, ballot measure tax revenue, etc.
Authority to levy taxes for specific purposes	Yes	Subject to California Proposition 218 restrictions on new and increased assessments
Authority to levy fees and fines, and to recover costs through lien processes, for nuisance abatement	Yes	Subject to an appeal process that involves administrative law judges retained by the City
Fees for water, sewer, gas, or electric services	Yes	Water, sewer, solid waste, code enforcement (cleanup)
Impact fees for new development	Yes	Master Fee Schedule as originally chartered under the City's Urban Growth Management Ordinance
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	Special Assessment Districts that issue debt and incur the debt but the City only administers
Incur debt through private activities	Yes	The City has the capability of doing them and have in the past but nothing right now
Withhold spending or public infrastructure investment in hazard prone areas	Yes	The Department of Public Utilities retains jurisdiction over water and sewer services and determines its appropriate service areas with risk to facilities being one of the factors leading to a decision not to extend services to Riverbottom properties

C.4.4 Mitigation Outreach and Partnerships

The Fresno Department of Public Utilities, in conjunction with other agencies, provides water conservation and stormwater quality protection public information programs. The Fire Department provides personal preparedness outreach for heat and freeze emergencies and shelter-in-place information for hazardous materials emergencies. Additionally, the City has developed public service announcements for smoke detector battery life, canal safety, and fireworks safety.

The City's Joint Information System disseminates information in Spanish, and the City can obtain translation services for other languages when necessary. A Joint Information Center plan is an annex to the City of Fresno Emergency Operations Plan and provides comprehensive

guidance for early warning notification in all languages and specifically the Americans with Disabilities Act (ADA) community.

Regularly scheduled State of California Golden Guardian Emergency Preparedness Exercises afford the opportunity to include the City of Fresno ADA Committee. Members of the committee and volunteers from the ADA community role play for realistic first responder training. An ADA Emergency Preparedness Symposium was conducted in 2004 and successfully hosted 400 participants. Homeland Security funds are used regularly to support equipment and awareness training for the regional ADA community.

C.4.5 Other Mitigation Efforts

- The City is a certified StormReady community through the National Weather Service.
- The Fire Department, Police Department, and Solid Waste Division are nationally accredited.
- The City has installed security systems for the wastewater treatment facility and for its surface water treatment plant. Generators are installed in critical groundwater pumping stations and these facilities are secured.

C.5 Mitigation Strategy

C.5.1 Mitigation Goals and Objectives

The City of Fresno adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

C.5.2 Mitigation Actions

The planning team for the City of Fresno identified and prioritized the following mitigation actions based on the risk assessment. Background information as well as information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are also included.

1. Establish Post-Disaster Action Plan for City Continuity of Operations Plan

Issue/Background: Establish a post-disaster action plan to be part of the City of Fresno Continuity of Operations Plan (COOP) that will include the following elements:

- Procedures for public information
- Post-disaster damage assessment
- Grant writing
- Code enforcement
- Redundant operations

The plan will also include annexes from local businesses and large employers to improve economic and employment recovery. The plan will also identify a mechanism for the City to help businesses without COOPs develop a COOP to be incorporated, as an annex, into the City's Emergency Operations Plan.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer

Priority (High, Medium, Low): High

Cost Estimate: $150,000

Potential Funding: Local funds, grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-planning. A City COOP and local business COOPs will reduce the impact of a disaster to the local economy and employment.

Schedule: Long term

2. Improve the City's Capabilities for Sheltering Animals in a Disaster

Issue/Background: During a disaster, not only do people need to be rescued, but their pets do also. Hurricane Katrina showed the nation that shelters do not typically allow pets, so pets may be left behind when their owners evacuate. The care of the animals left behind falls to local animal shelters. Currently, the SPCA Animal Shelter does not have the supplies to handle a large scale animal emergency. The City has approximately 18,000 licensed dogs. If a disaster occurred, they would only be able to house a small percentage of them. Overcrowding of animals usually causes diseases and loss of animal life. Purchasing new cages would alleviate some of the overcrowding created by a disaster.

Other Alternatives: Ask other agencies for supplies, if they have them available.

Responsible Office: City of Fresno Emergency Preparedness Officer

Priority (High, Medium, Low): High

Cost Estimate: $50,000

Potential Funding: General fund

Benefits (Avoided Losses): This will cut down on the spread of disease and animal loss during an emergency or disaster.

3. Implement a Flood Awareness Program for the Public

Issue/Background: The City needs a program to educate flood-prone property owners along the San Joaquin River and in frequent annual flooding areas about the flood threat and how best to prepare, mitigate, and insure their properties.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer and Planning and Development Department

Priority (High, Medium, Low): Medium

Cost Estimate: $15,000/year

Potential Funding: General fund, grants

Benefits (Avoided Losses): This will prevent the loss of human life and economic and property losses.

Schedule: Long term

4. Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment

Issue/Background: City inspectors play a vital role in post-disaster building assessment and damage assessment. Pre-training and certification is vital in response and recovery to reduce loss of life, relocate populations, and ensure the rebuilding of local economies.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer and Planning and Development Department

Priority (High, Medium, Low): High

Cost Estimate: $250,000

Potential Funding: Grants

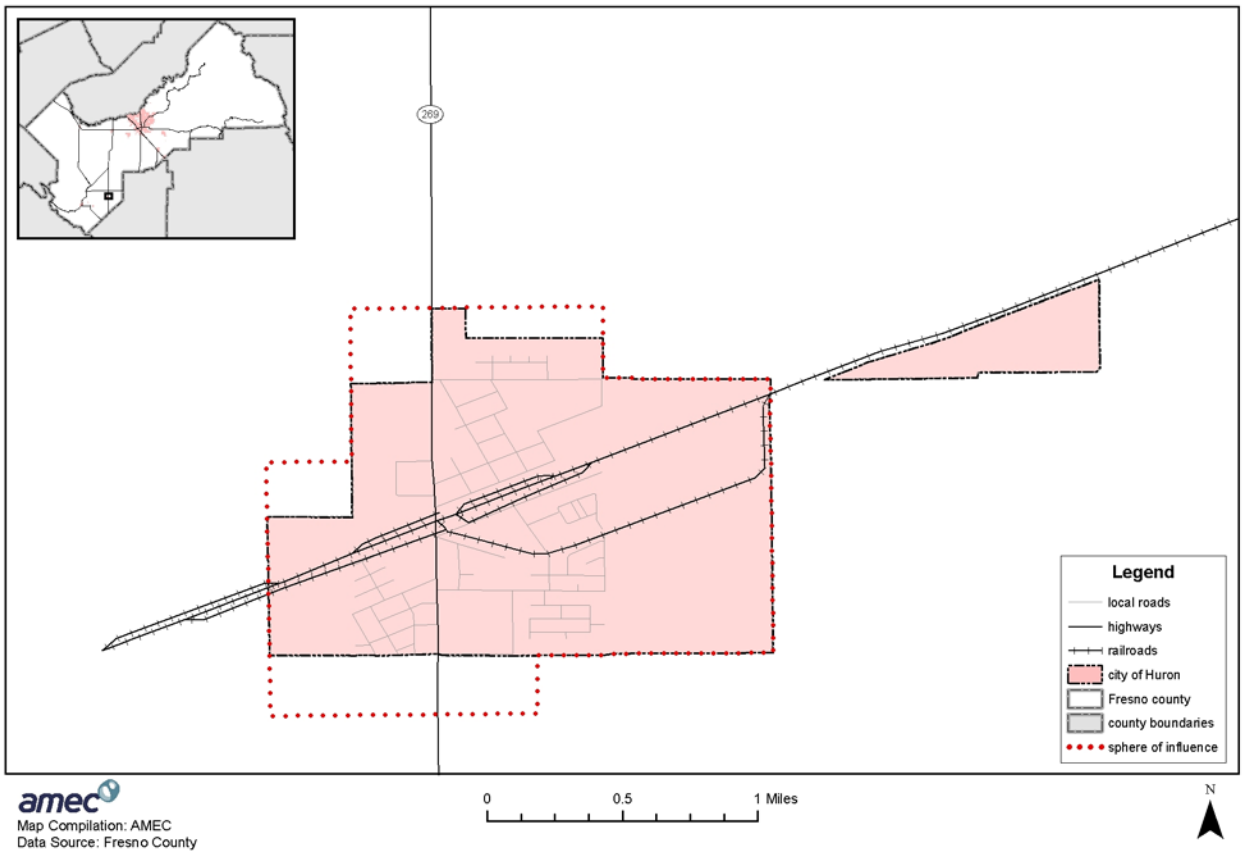
Benefits (Avoided Losses): This will improve response/recovery during an event through pre-training and certification of individuals responsible for performing assessment of structures and facilities impacted by disasters. Certification will also allow qualified staff to mobilize with the State of California Office of Emergency Services (Region 5) Urban Search and Rescue Task Force.

Schedule: Long term

D.1 Community Profile

Figure D.1 displays a map and the location within Fresno County of the City of Huron and its Sphere of Influence.

Figure D.1. The City of Huron



D.1.1 Geography and Climate

The City of Huron lies on the far west side of the San Joaquin Valley in one of the richest and more diverse agricultural areas in the nation. Located in Fresno County, it is nine miles east of Interstate 5 and three miles south of Highway 198 and is approximately half way between Los Angeles and San Francisco. The City has a major state route (269) as its main thoroughfare (main street). The elevation is 398 feet above sea level. The immediate area in and around Huron consists of thousands of acres of low, flat, farmland that is served by the California Aqueduct, which lies just west of Huron and runs parallel to Interstate 5.

For the most part, western Fresno County is served by a year-long pleasant climate that allows the growing season for agriculture to continue the majority of the year. Nevertheless, winters can be quite cold, and summers can be very hot.

D.1.2 History

The area known today as Huron was originally occupied by the Yokut Indian tribe. The area was rich in game and was served by three local creeks. The Yokuts traded with coastal Indian tribes (possible Chumash) and other local tribes south and east of the area such as the Tachi. Mexican settlers began to arrive and settle in the early to mid-1800s. Prominent Mexican families occupied large land grants where livestock were raised. White settlers arrived around 1874.

Huron became known for the raising of livestock and as a shipping point for supplies to surrounding areas. The town site, which was later formally known as Huron, was founded in 1888 when the Southern Pacific Railroad established its rail line there. The name “Huron” was originated by railroad executives. It was derived from a French slang word that they used to describe the wild, untamed nature of the land and people that occupied the area (Mexicans and Indians).

The City was incorporated on May 3, 1951. The building of the California Aqueduct changed the entire complexion of farming for the west side of Fresno County. With the immediate access to water from the aqueduct for irrigation, the number and variety of crops that could be grown exploded. The community continues to derive its livelihood from agriculture.

D.1.3 Economy

Since the beginning, Huron has based its growth and survival on agriculture. Beginning with dry farming (grain crops, cotton, etc.), which did not require large amounts of irrigation, then livestock, and then row crops when aqueduct irrigation enabled greater crop diversity. The community is involved in every aspect of the farming cycle: land preparation, growing, harvesting, packing, and shipping. Local farms provide employment to residents. Local businesses support the needs of the agricultural industry with a wide variety of service-related industries. Large seasonal population increases generate a significant amount of business for local merchants and service providers, which translates to sales tax and other revenue funding streams that are critical for the continued vitality and economic survival of the community.

D.1.4 Population

According to the California Department of Finance, the estimated population of Huron in 2007 was 7,493. Growth has averaged about 2 percent per year. By virtue of the agricultural area, there is a nearly constant, year-round demand for large numbers of farm laborers. The majority of these laborers are migrant and undocumented who follow the harvest seasons. These workers are employed in every aspect of the production cycle from planting to processing. There are

multiple harvesting seasons throughout the year, many lasting for several weeks. It is normal for the resident population to double and even nearly triple during these seasons, which greatly impacts the City's infrastructure and public safety. Based on available census information, the population is approximately 98.27 percent Hispanic.

D.2 Hazard Identification and Summary

Huron's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Huron (see Table D.1). In the context of the plan's planning area, there are no hazards that are unique to Huron.

Table D.1. City of Huron—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Limited	Critical	Medium
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Limited	Limited	Low
Drought	Likely	Extensive	Critical	High
Earthquake	Occasional	Extensive	Critical	High
Flood	Likely	Significant	Critical	High
Landslide	Unlikely	Limited	Limited	Low
Severe Weather:				
Extreme Cold/Freeze	Likely	Extensive	Limited	Medium
Extreme Heat	Highly Likely	Extensive	Limited	Medium
Fog	Likely	Extensive	Negligible	Low
Snow	Likely	Extensive	Limited	Low
Tornado	Occasional	Limited	Limited	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Negligible	Low
Soil Hazards:				
Erosion	Occasional	Extensive	Limited	Low
Expansive Soils	Unlikely	Limited	Limited	Low
Land Subsidence	Occasional	Significant	Limited	Low
Volcano	Unlikely	Limited	Limited	Low
Wildfire	Unlikely	Limited	Limited	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Technological hazards were not assessed in the same manner as the natural hazards, thus they are not included in the table above. Nonetheless, it is important to note that technological hazards (transportation hazards/hazardous materials release) are a big concern for the City of Huron.

D.3 Vulnerability Assessment

The intent of this section is to assess Huron's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

D.3.1 Assets at Risk

This section considers Huron's assets at risk, including values at risk; critical facilities and infrastructure; historic, cultural, and natural resources; economic assets; and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table D.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Huron.

Table D.2. 2007 Roll Values for the City of Huron by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	1	26,910	86,353	3	1,523,123	4	1,636,386
Commercial	65	7,726,692	2,134,501	26	725,201	91	10,586,394
Industrial	27	4,779,921	1,909,752	7	104,247	34	6,793,920
Open Space	-	-	-	2	58,064	2	58,064
Residential	670	61,929,815	15,957,934	184	4,294,403	854	82,182,152
Other	-	-	-	2	557,663	2	557,663
Total	**763**	**74,463,338**	**20,088,540**	**224**	**7,262,701**	**987**	**101,814,579**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical

facilities in the City of Huron from Fresno County GIS is provided in Table D.3 and mapped in Figure D.2.

Table D.3. City of Huron's Critical Facilities

Critical Facilities Type	Number
Airports	-
Communications Centers	1
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	1
Health Care Facilities	2
Law Enforcement Facilities	1
Maintenance Yards	1
Residential Elderly Facilities	-
Schools and Day Care Facilities	6
Public Utilities—Water/Sewer	1
Totals	**14**

Source: Fresno County GIS

Figure D.2. City of Huron's Critical Facilities

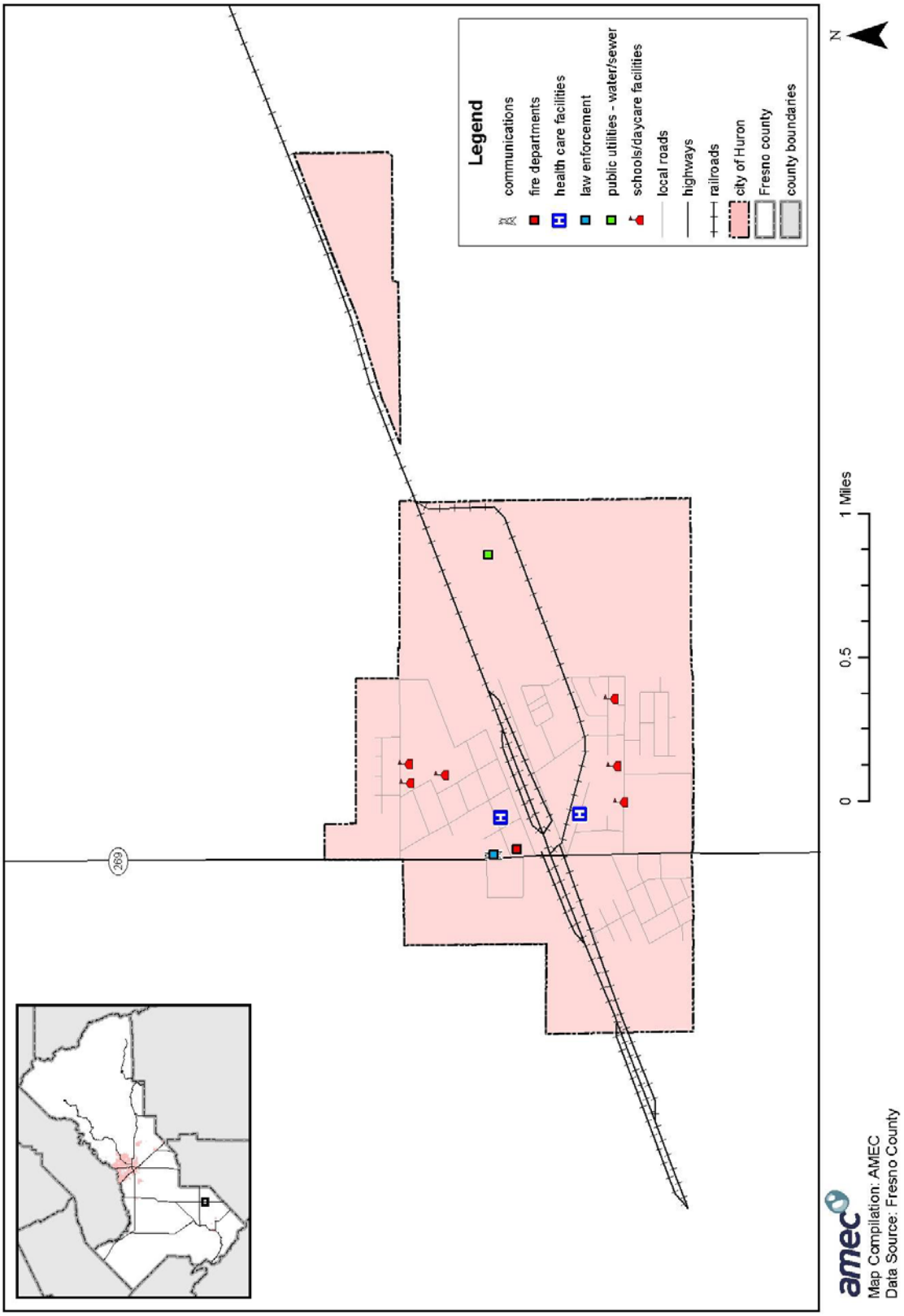


Table D.4 lists particular critical facilities and other community assets identified by Huron's planning team as important to protect in the event of a disaster.

Table D.4. Specific Critical Facilities and Other Community Assets Identified by the City of Huron's Planning Team

Name of Asset	Replacement Value ($)	Hazard Specific Info./Comments
Police Department/City Hall	3.2 million	Houses emergency operations center
Fire Department (CAL FIRE/County)	1-1.5 million (excluding equipment)	Old and undersized
Public Works Maintenance Yard	3-4 million	
Medical Facilities (three private clinics)	Millions	Old construction; not specifically built to house medical facilities
Local Schools (one elementary, one middle, and one continuation)	Millions	
Day Cares (two)	n/a	
Residential Elderly Facility	Millions	

Historic, Cultural, and Natural Resources

There are no known significant local historic or archeological sites in the City or immediate area. The natural resource of the greatest value is clearly the rich, productive farmland, availability of water, temperate climate, and almost year-round growing season.

Economic Assets

Currently, the City of Huron and the surrounding area (if not the entire or majority of the nonurban areas of the County) are extremely dependent on agriculture. The City is small in size and is surrounded by thousands of acres being cultivated. The City contains numerous agriculture-related businesses: trucking companies, packing houses, shipping houses, equipment, chemicals, fuels, labor, and automotive/heavy equipment repair. The downtown business district consists of businesses one would expect to see in a farming or agricultural community with a very large Hispanic population.

Growth and Development Trends

Table D.5 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table D.5. City of Huron's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
6,310	7,493	+18.75	1,415	1,650	+16.61

Source: California Department of Finance, www.dof.ca.gov/Research/

According to the City's General Plan 2025 Policies Statement, projected community needs based on population growth through 2025 show a land demand of 318.4 acres (212 residential acres, 3.6 commercial acres, and 102.8 industrial acres). With only 192.14 vacant acres, there is not enough vacant land to accommodate this growth, and the conversion of agricultural land will be necessary for much of the future urban uses.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

D.3.2 Estimating Potential Losses

Table D.2 above shows Huron's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 833 parcels in the 100- and 500-year floodplains in the City of Huron. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

The City receives water from the California Aqueduct and when necessary from the Westlands Water District. The City currently has three water storage tanks with a capacity of two and a half million gallons. A third million-gallon water storage tank is planned for the immediate future, and the City is actively seeking a funding source to complete the project.

Earthquake

Huron is located in Seismic Hazard Zone 4, the most severe. The area has frequent small earthquakes and has experienced large, damaging events in the past, such as the 1983 Coalinga earthquake. The Coalinga earthquake caused minor injuries to people and minor to moderate damage to property and infrastructure in Huron. Damage was primarily to older and or substandard structures and to public utilities, including water and gas lines and roads.

Huron is 13 miles east of Coalinga, which is a well-known seismically active area. Future earthquake events near Huron are likely to cause structural damage in the City. The planning team identified several buildings that are vulnerable to seismic events, including many of the buildings in downtown, the community center, Lassen Market, and the bank. The police department is in a modular building, a building type that is more likely to sustain damage during earthquake events.

The occurrence of a significant earthquake in this area is always a possibility. Nevertheless, determining the likelihood of another event is best done by experts, such as the U.S. Geological Survey. A significant seismic event would probably destroy most, if not all, of the older buildings and the downtown area. Although earthquakes should be expected, especially in this area, it is not the City's highest priority.

Flood

Flooding generally occurs during winter rain events that saturate fields and then run into the City. The old part of town has no storm drainage system besides "valley gutters" to help with localized flooding. Many of the older, smaller cities in the valley were not initially laid out or designed to include a formal storm or sewage drainage system. Valley gutters are very common and are best described as large, exaggerated deep channels (almost resembling a culvert) located at intersections or other areas adjacent to roadways or where flooding is common. Commonly referred to as "dips" to people not from the area, the valley gutters suffice (in normal rainfall seasons) at channeling the water off the main areas of the roadway and diverting it to other areas where it collects in a drainage system or ponding basin or flows into a creek or river. During heavy rains, the gutters quickly become overwhelmed and create their own set of problems and hazards.

The Arroyo Pasajero Reclamation Area, a large prehistoric open floodplain just north of Huron, is fed by creeks to the west running eastward toward Lemoore. This area floods annually and washes into State Route 269, just north of Huron. The planning team reports that this flooding is an annual event and can last for extended periods. Although few properties are damaged, the flooding can result in the closure of State Route 269 to the north for days, weeks, or even two months at a time, requiring a 30-mile diversion to enter the community from alternate roadways, several of which are in Kings County. This is the main highway running through the City, and its closure results in a loss of approximately 50 percent of the traffic that would normally pass through. This severely impacts the local economy due to loss of business revenue.

Other areas of significant flooding are along Tornado Street in southwest Huron where it intersects with State Route 269 (mixed commercial, residential, and agricultural area); Palmer Avenue, especially on the eastern end where the agricultural area abuts the residential area; and 9th Street at various cross streets.

In the event that the California Aqueduct fails, there is a remote possibility that the water could eventually travel three miles and clear the various barriers and reach Huron, which potentially could be a disaster. However, the aqueduct authority has emergency procedures and plans in place, and the City has been advised that the water flow from the escape could be stopped and controlled in a reasonably timely manner after a failure, which would prevent the water from reaching Huron.

According to FEMA's 2005 Flood Insurance Study (FIS), floods occurred in or around Huron in 1958, 1963, 1966, 1969, and 1978. Details on some of these events follow:

- **April 1958**—Overflow from Los Gatos Creek (formerly Arroyo Pasajero) caused flooding that began approximately two miles west of the City of Huron and extended to the northeast for almost 12 miles. Agricultural land was eroded, crops and farm improvements were damaged, silt and debris were deposited, and roads and bridges damaged. Approximately 5,200 acres were flooded, and damage totaled approximately $275,000.
- **February 1963**—Overflow from Los Gatos Creek (formerly Arroyo Pasajero) caused flooding that began approximately two miles west of the City of Huron and extended to the northeast for almost 12 miles. Agricultural land was eroded, traffic was disrupted for as long as a week, farms and roads were covered with silt and debris, and extensive cleanup and weed control were required. An estimated 7,500 acres were inundated, and damage totaled approximately $175,000.
- **December 1966**—Los Gatos Creek flooding started two miles west of the City of Huron and extended to the northeast for four to five miles and ponded against the west side of the California Aqueduct. The ponded area was approximately .25 miles wide and four to eight miles long from north to south. Crop damage, land erosion, traffic disruption, and silt and debris deposition were the major losses from the flooding. Approximately 4,500 acres were inundated, and damage totaled more than $500,000.
- **February 1969**—Los Gatos Creek flooding started two miles west of the City of Huron. During the flood, the largest and most damaging known in the area, ponding against the California Aqueduct was approximately 1 mile wide and 10 miles long. Flooding extended from State Highway 198 south to the County line. Major flooding from Los Gatos Creek occurred north and east of the City of Huron. Sand, silt, and debris several feet deep were deposited over wide areas of cropland north and west of the City; there was extensive erosion; land leveling and weed control were required throughout the area; traffic was disrupted for several days; roads and bridges were damaged; and crop productivity was severely reduced due to water remaining on the land for extended periods. An estimated 16,680 acres were flooded, and damage amounted to approximately $3.75 million. Minor flood flows from another stream system passed through the southern edge of the City, but no residential damage was reported.
- **February 1978**—Los Gatos Creek flooding started two miles west of the City of Huron and extended to the northeast for four to five miles and ponded against the west side of the California Aqueduct. The ponded area was approximately .25 miles wide and four to eight miles long from north to south. Crop damage, land erosion, traffic disruption, and silt and debris deposition were the major losses from the flooding. Approximately 4,500 acres were inundated, and damage totaled more than $150,000.

According to the HMPC, more recent flooding occurred in 1995 and 2005.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Huron was created (see Figure D.3). Tables D.6-D.8 summarize the values at risk in the City's floodplain. Table D.6 is a detailed analysis that

shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table D.7 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table D.8 shows loss estimates by flood.

Figure D.3. City of Huron's 100- and 500-Year Floodplains

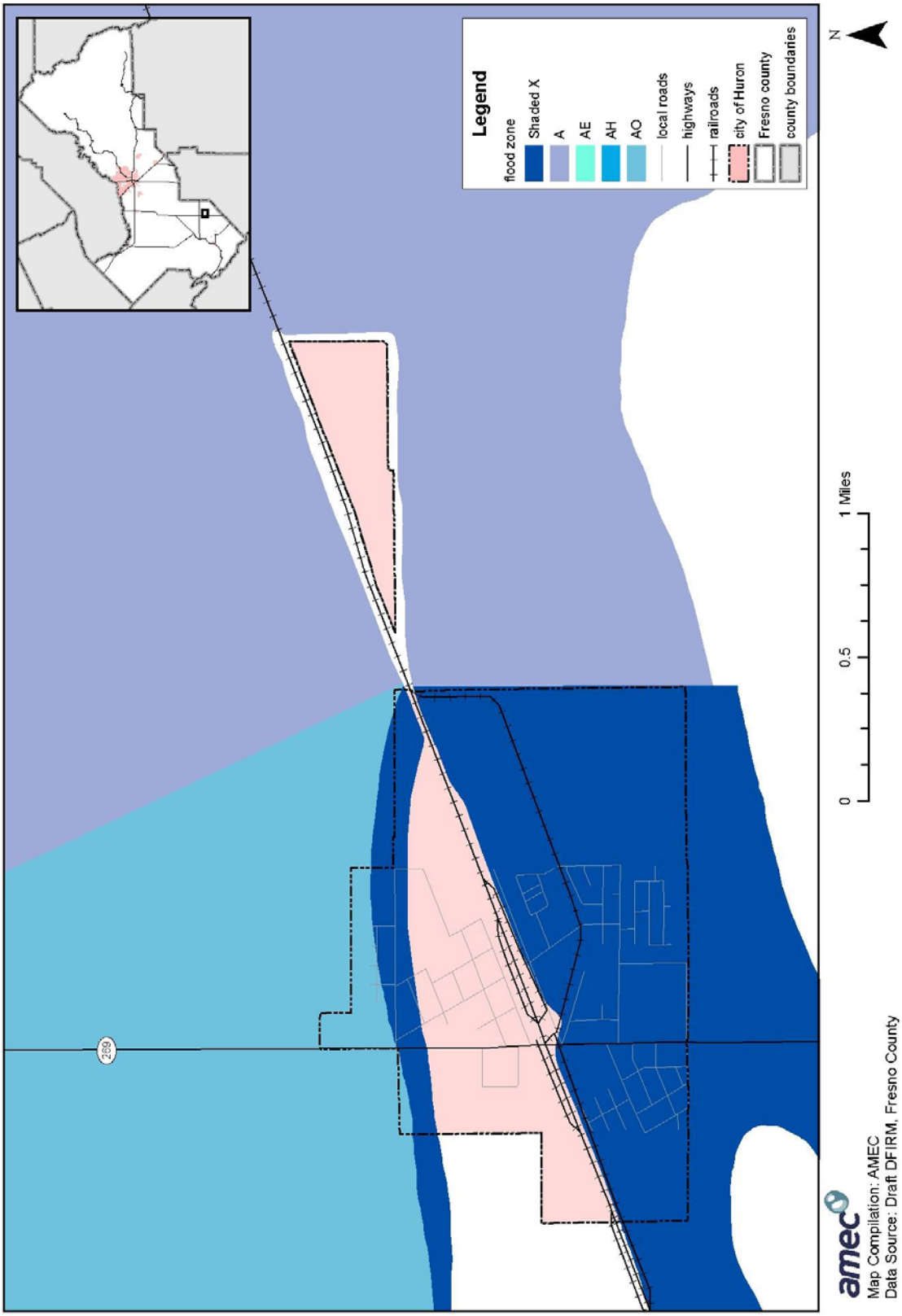


Table D.6. Count and Improved Value of Parcels in Floodplain by Zone—City of Huron

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	-	-	-	-	-	-
Industrial	-	-	-	-	-	-
Open Space	-	-	-	-	-	-
Residential	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	1	26,910	2	-	1	-
Commercial	-	-	68	5,289,927	23	1,969,605
Industrial	-	-	33	3,656,104	2	380,329
Open Space	-	-	2	0	-	-
Residential	22	5,610,000	705	46,087,565	127	10,232,250
Total	**23**	**5,636,910**	**810**	**55,033,596**	**153**	**12,582,184**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table D.7. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Huron

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	1	26,910	2	-	3	26,910
Commercial	-	-	68	5,289,927	68	5,289,927
Industrial	-	-	33	3,656,104	33	3,656,104
Open Space	-	-	2	0	2	0
Residential	22	5,610,000	705	46,087,565	727	51,697,565
Total	**23**	**5,636,910**	**810**	**55,033,596**	**833**	**60,670,506**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table D.8. Fresno County Flood Loss Estimates—City of Huron

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	23	5,636,910	2,818,455	8,455,365	1,691,073
500-Year Flood	810	55,033,596	27,516,798	82,550,394	16,510,079
Total Flood**	**833**	**60,670,506**	**30,335,253**	**91,005,759**	**18,201,152**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Huron has significant assets at risk to the 100-year and greater floods. Twenty-three improved parcels are within the 100-year floodplain for a total value of roughly $5.6 million. An additional 810 improved parcels valued at roughly $55 million fall within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $1.6 million in damage in the City of Huron, and a .2 percent chance in any given year of a 500-year flood causing roughly $18 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Huron joined the National Flood Insurance Program (NFIP) on September 1, 1981. NFIP insurance data indicates that as of November 30, 2007, there were eight flood insurance policies in force in the City with $2 million in coverage. All eight policies were in A zones. There have been no historical claims for flood losses and there were no repetitive or severe repetitive loss structures.

Population at Risk

Based on information from HAZUS-MH MR3 (Census 2000) and the Flood Insurance Rate Map, the following are at risk to flooding in the City of Huron:

- **100-year flood**—290 people
- **500-year flood**—3,890 people
- **Total flood**—4,180 people

Critical Facilities at Risk

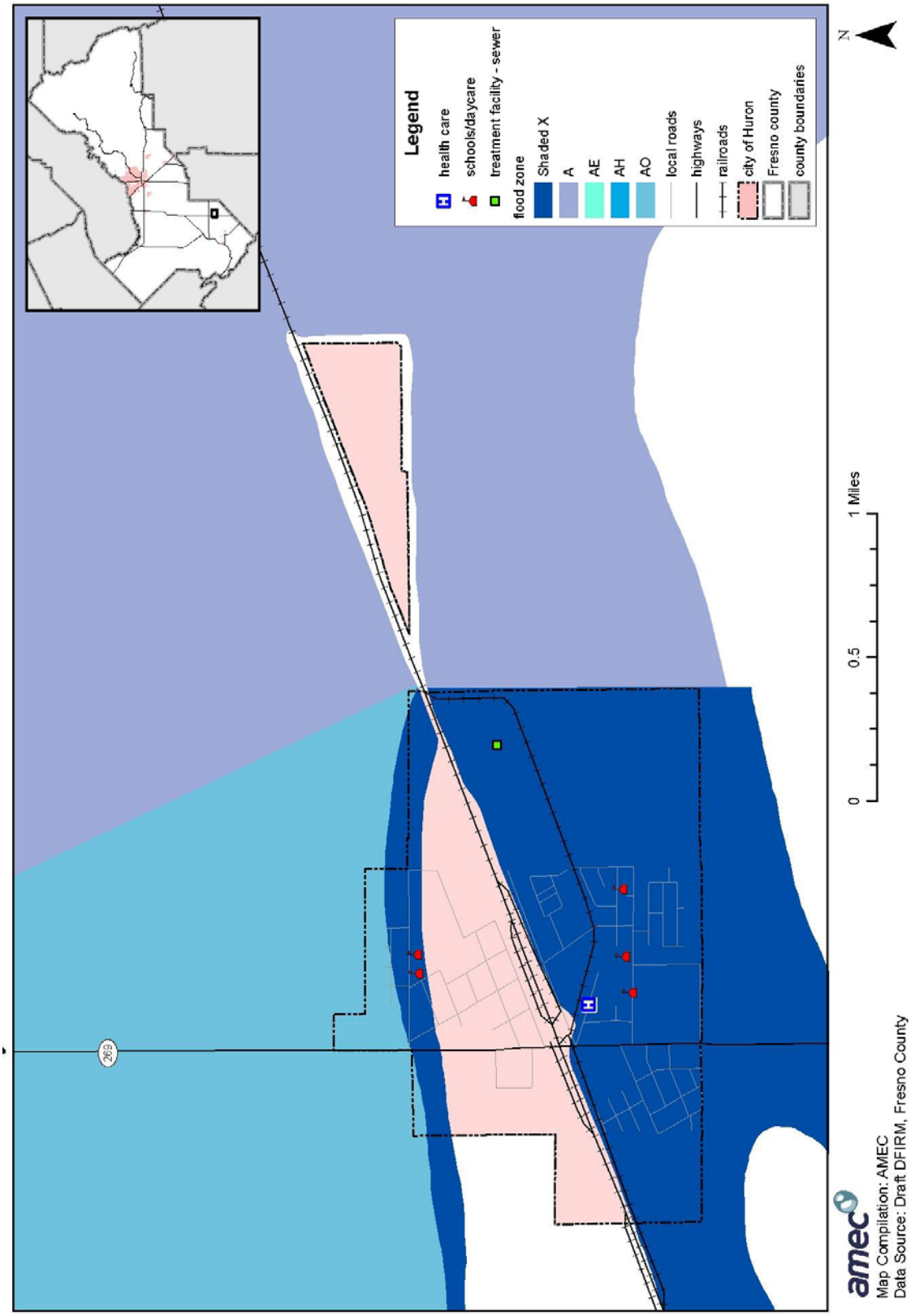
Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table D.9 lists the critical facilities in the City's 100- and 500-year floodplains and Figure D.4 illustrates their locations.

Table D.9. Critical Facilities in the 100- and 500-Year Floodplains: City of Huron

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Health Care Facilities	-	1
Public Utilities - Water/Sewer)	-	1
Schools and Day Care Centers	-	5
Total	**-**	**7**

Source: Fresno County GIS

Figure D.4. Critical Facilities in the 100- and 500-Year Floodplains: City of Huron



There are no critical facilities in the City's 100-year floodplain, but it is particularly important to note that six of the seven critical facilities in the 500-year floodplain are facilities that serve vulnerable populations and thus should be given special attention.

Severe Weather: Extreme Cold/Freeze

During cold temperature events, the Police Department checks in on elderly residents and patrols for transient farm workers that may be vulnerable to the extreme temperatures. These events also cause pipes to break, which have affected local businesses in the past. The City has used Community Development Block Grants to repair this type of damage in the past. Damage to local crops affects the economy of the City. This area was seriously impacted by the 2007 freeze that hit the San Joaquin Valley.

Severe Weather: Extreme Heat

The spring and summer months are normally very hot. Continued triple digit heat for weeks or months is not unusual. Summer months require public safety agencies and emergency medical services to be extra vigilant for heat-related illness and death. The City has no buildings to serve as cooling centers. The Police Department checks on elderly citizens. Because of the small size of the City, the department has knowledge of where elderly citizens live. They also check the senior citizens complex. Extreme heat can affect the City economically when it causes local crop damage.

Technological Hazards (Transportation Hazards/Hazardous Materials Release)

State Route 269 and Palmer Avenue intersect near the middle of Huron and are heavily used by commercial truck traffic. Additionally, there is a railroad spur that runs right through the center of the City and intersects State Route 269. Transported materials include pesticides, fertilizers, and other chemicals used in agriculture. Accidents involving hazardous materials along any of the City's transportation corridors could have severe impacts on the City, especially if the normal prevailing winds exist at the time of an accident. Also, there are several local packing houses, equipment shops, storage buildings, etc., that store and use a wide variety of hazardous materials. The City has not experienced any significant industrial accidents, traffic collisions, or hazardous materials spills.

The City is also concerned about the potential for an aircraft accident. Crop dusting occurs on a regular basis both day and night, and Huron is in the direct, normal flight path of Lemoore Naval Air Station. The crash of a naval aircraft, especially if there is ordinance on board, could create a significant disaster. Additionally, U.S. military protocol for handling downed aircraft (especially if the aircraft carries munitions or is of a confidential nature) is likely to conflict with the City's emergency response and/or recovery efforts. The City is as concerned about this type of hazard event as it is about flooding, since the possibility of an air crash occurring on a daily basis is far greater and more likely than a seasonal flooding event.

Other Hazards

Although ranked of lower planning significance relative to other hazards, the following information about fog, heavy rain/thunderstorm/hail/lightning/wind, and wildfire should still be noted:

Fog

Tule fog events in the Huron area are not as severe as in other parts of the County. Lassen Avenue/State Route 269 is often the worst area for traffic accidents. During fog events, the City increases traffic enforcement and patrolling. They also use extra flares and barricades to slow traffic down. Foggy day schedules are implemented for local schools and school buses.

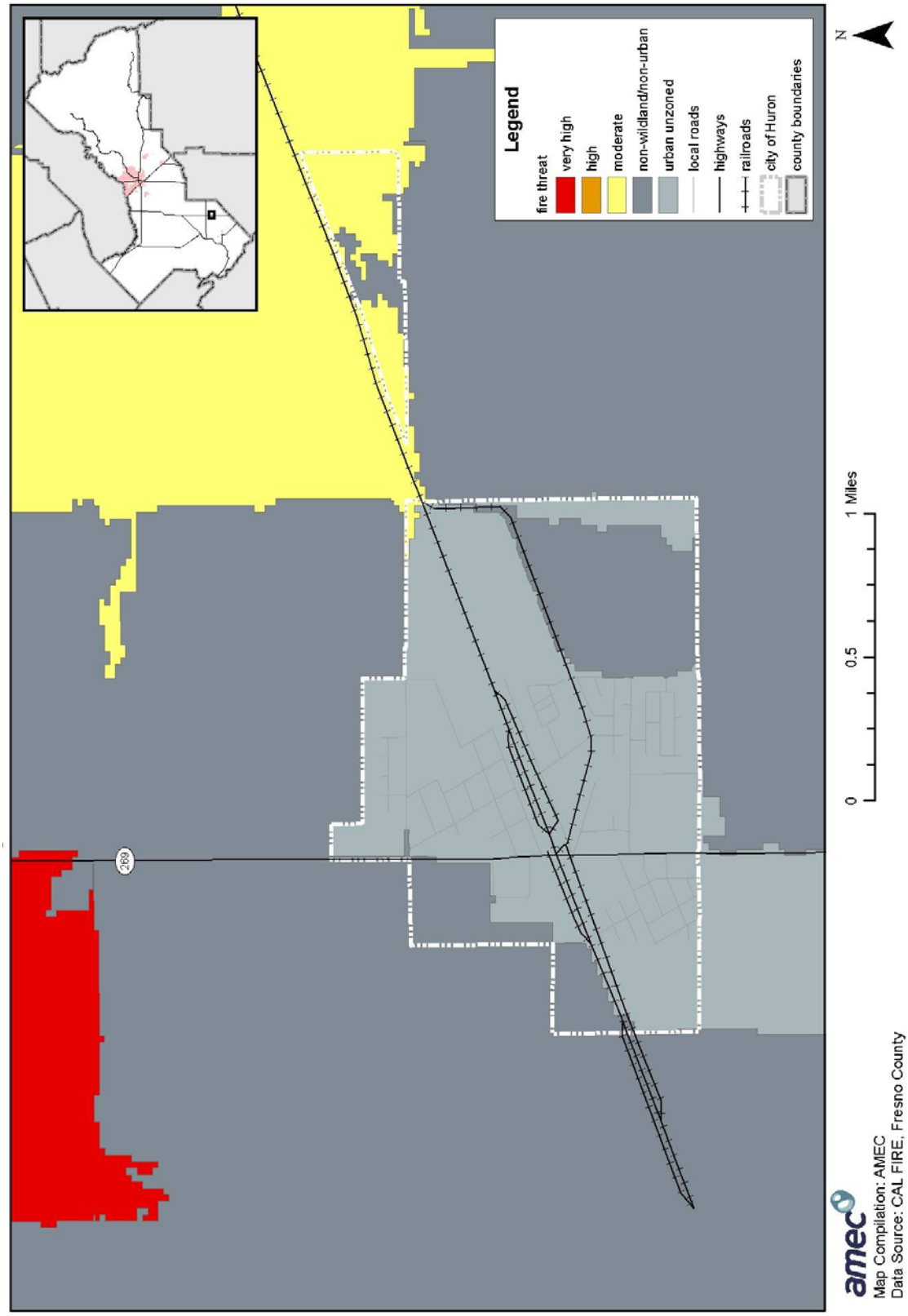
Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind

High wind events do occur in Huron, but rarely result in damage besides that to utilities and downed trees. Pacific Gas and Electric conducts tree trimming around utilities in the area.

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Huron was created (see Figure D.5). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Huron.

Figure D.5. City of Huron's Wildfire Threat



D.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

D.4.1 Regulatory Mitigation Capabilities

Table D.10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Huron.

Table D.10. City of Huron's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2007
Zoning ordinance	Yes	2007
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	No	
Building code	Yes	Version: 1997 Uniform Building Code
Fire department ISO rating	Yes	Rating: 58B
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	Updated in 2003
Other special plans	No	
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005
Elevation certificates	Yes	FEMA

City of Huron General Plan 2025 Policies Statement, 2007

The City of Huron General Plan 2025 Policies Statement expresses the community's development goals and public policies related to the distribution of future land uses. Estimates are made about future population, household types, and employment, so that plans for land use, circulation, and public facilities can be made to meet future needs.

The Safety Element identifies potential hazards in Huron; establishes policies to minimize the danger to residents, workers, and visitors; and contains specific policies to regulate existing and

proposed development in hazard-prone areas. The policies serve as guidelines for reducing the risks associated with criminal activity and natural hazards.

Mitigation-related objectives in the Safety Element include the following:

- Reduce the potential for loss of life and property resulting from natural and manmade hazards to a minimum
- Protect the lives and property of residents from the hazards of flooding
- Adopt and implement safety standards for various hazards
- Avoid exposure of persons or property to geologic hazards

Emergency Operations Plan, 2003

Huron's Emergency Operations Plan (EOP) is in need of a complete update and/or revision based on the large amount of change that has occurred since 2003 and expectations for the immediate future. Although critically important, the EOP update is not the department's top priority. Even though it is outdated, it will suffice. It was deemed unwise to undertake any significant update or revision prior to the approval of the hazard mitigation plan. Once the Fresno County Multi-Hazard Mitigation plan is approved by FEMA, the City of Huron will be able to move forward on the EOP upgrade/revision.

D.4.2 Administrative/Technical Mitigation Capabilities

Table D.11 identifies the personnel responsible for activities related to mitigation and loss prevention in Huron.

Table D.11. City of Huron's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/ No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	City Engineer, contract position	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	City Building Official, contract position	Inspection, plan check, enforcement
Planner/engineer/scientist with an understanding of natural hazards	Yes	City Engineer, contract position	
Personnel skilled in GIS	No		
Full time building official	No		Police officer trained in code enforcement
Floodplain manager	Yes	City Engineer, contract position	
Emergency manager	Yes	City Manager or Police Chief	
Grant writer	Yes	City Manager	Sometimes police chief and paid consultant
Other personnel	No		
GIS Data—Land use	No		
GIS Data—Links to Assessor's data	Yes	City Engineer, contract position	
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	City Building Official, contract position	Inspection, plan check, enforcement

D.4.3 Fiscal Mitigation Capabilities

Table D.12 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table D.12. City of Huron's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water and sewer
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	Yes	

D.4.4 Mitigation Outreach and Partnerships

In Huron, along with other Fresno County communities, water conservation activities are continually emphasized, as water is vital to people, commercial resources, and agriculture. Both the police department and the California Department of Forestry and Fire Protection (CAL FIRE) provide information and education on disaster preparedness. The Fresno County Office of Emergency Services also supports the City in these efforts.

The City of Huron has a very high Spanish-speaking population. City staff speak Spanish, and all City information is publicized in English and Spanish. A significant percentage (perhaps up to one-third) of the population of Huron is made up of illegal residents of the United States. During the agricultural picking seasons, this percentage increases dramatically.

The City has mutual aid agreements in place with different levels of governments. It has mutual aid agreements with the County and Coalinga for public works assistance, which is frequently exercised for normal activities as well as unusual events and emergencies. Often this mutual aid involves agencies outside of Fresno County. Huron is reasonably close to Avenal in Kings County, and the two communities have worked closely together for years. The Huron Police Department has mutual aid agreements in place with all local Fresno County law enforcement and correctional agencies that cover almost every aspect of law enforcement support needs and services. This also includes state and federal agencies when needed. These mutual aid agreements are both formal (written) and informal and have been in place and worked successfully for many years.

Other partnerships include the following:

- During high-volume harvesting seasons or other high volume periods, the Huron Police Department supplements its traffic safety program with the addition of several California Highway Patrol units and commercial enforcement inspection vehicles to identify potentially hazardous commercial and farm vehicles and equipment.
- The Huron Police Department is coordinating with Lemoore Naval air station to provide training on handling military aircraft incidents.

D.4.5 Other Mitigation Efforts

The City of Huron is actively addressing the high priority hazards identified in this planning process. Some of the activities are described below:

- Huron recently constructed a new wastewater treatment plant with financial assistance from a U.S. Department of Agriculture grant. The plant is designed to latest seismic safety codes.
- Emergency operations plans are in place for the water and wastewater treatment plants.
- Under a Fresno County initiative (Measure C), California identified the annual flooding of State Route 269 as a major issue and the project has been identified as a high priority project that will include a bridge over the Pasajaro to be built within the next 5-10 years.
- The City, through the Huron Police Department code enforcement/nuisance abatement program, has been very active addressing hazards and blight throughout the City. This includes everything from private residences to large pieces of commercial property/factories owned by large corporations. The code enforcement officer has initiated a fire safety inspection program with CAL FIRE.
- The City of Huron, through both the Public Works and Police departments is actively seeking funding to address some of the local flooding issues identified in this plan. This would primarily be used to repair or replace dirt run-off canals, build properly sized and located culverts, install drainage pipes or ditches that would properly divert floodwaters, and/or construct additional ponding basins or other collection areas to keep water from flooding surface streets.

D.5 Mitigation Strategy

D.5.1 Mitigation Goals and Objectives

The City of Huron adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

D.5.2 Mitigation Actions

Using the above mentioned mitigation plans and tools, the City will continue to take steady, proactive action to mitigate or remove as many hazards as possible. Due to the small size of the City and its limited funding, the largest amount of the effort will fall upon the code enforcement section of the Huron Police Department, which will use the City attorney when necessary. Grant

funding will be sought from the various traditional funding sources. This grant research is done both by a paid consultant and the police chief. During the current economic crisis, it is difficult to estimate costs or establish a realistic timeline, as the vast majority of the work is assigned to the Huron Police Department as a collateral duty of the chief's office. The police department is understaffed, and the Chief lacks tenured, experienced command staff to delegate part or all of the mitigation duties to.

The mitigation plan will play a significant part in the development of the new EOP, in that the EOP will become more of a living document to be used frequently instead of a reference book that is used periodically. This approach creates a different mentality and philosophy to emergency planning in that the City will be taking a more proactive and responsible approach to identifying and mitigating potential hazards.

The planning team for the City of Huron identified the following mitigation action based on the risk assessment.

1. Conduct Local Floodwater Mitigation

Issue/Background: The City of Huron is a small, rural, agricultural community that lacks modern, properly designed drainage/flood control measures. Lacking a correctly designed stormwater drainage system to effectively and efficiently handle rain or other water sources in the majority of the City, the City is prone to flooding. Traditionally, the City has depended on runoff or unusual water events to go into valley gutters, irrigation ditches, dedicated or improvised collection areas, and/or ponding basins. During heavy rains, the existing "systems" cannot handle the volume of water, quickly fill up, and spill out onto the streets, creating a significant flooding problem of both water and mud, which create property damage, traffic hazards, and financial hardships for residents and business owners. The flooding also places a serious demand on a small, understaffed public works department, which is primarily responsible for cleanup. Due to the limited budget and higher priority public works projects, this area of concern has not been addressed and therefore a permanent solution has not been implemented.

The best, most cost-effective way to the address the problem is to correct the lack of effective drainage in the targeted (worst) areas by repairing existing or constructing new flood control measures (pipes, culverts, channels, ponding basins, etc.) that will properly collect, channel, and store the water, keeping it off City streets and private property. This improvement project would also provide collateral benefits in that the current lack of drainage contributes to public health issues (e.g., large quantities of standing water attract mosquitoes, which transmit diseases like West Nile virus).

Other Alternatives: Based on the geography of the City, the existing roadway designs, historical water flow patterns, existing infrastructure, and other factors, improving these key problem areas is the most cost-effective and timely solution, and will bring the best return for funds spent. Ideally, a properly engineered, contemporary, and constructed master drainage

system added to the current infrastructure would be the long-term solution. Current and future development in the City address this problem through storm and sewer drainage systems.

Responsible Office: City of Huron Department of Public Works with oversight and participation from the City Manager and contract engineering firm

Priority (High, Medium, Low): Medium-High

Cost Estimate: Palmer Avenue Storm Drain (includes pipelines and ponding basin): $450,000; O Street Storm Drain (includes pipelines and ponding basin): $1,275,000

Potential Funding: City of Huron capital improvement project budget (if available), grants (e.g., FEMA mitigation grants, Community Development Block Grants, USDA grants, etc.)

Benefits (Avoided Losses): Reduction of localized flooding, which causes roadway and property damage, creates traffic hazards, causes financial hardships to local residents and merchants; reduction of mosquitoes and associated public health threats; improvement of property value and quality of life issues; and reduction of negative impact to City services, such as police and public works, which have to provide traffic control, accident investigation, road cleanup and repairs.

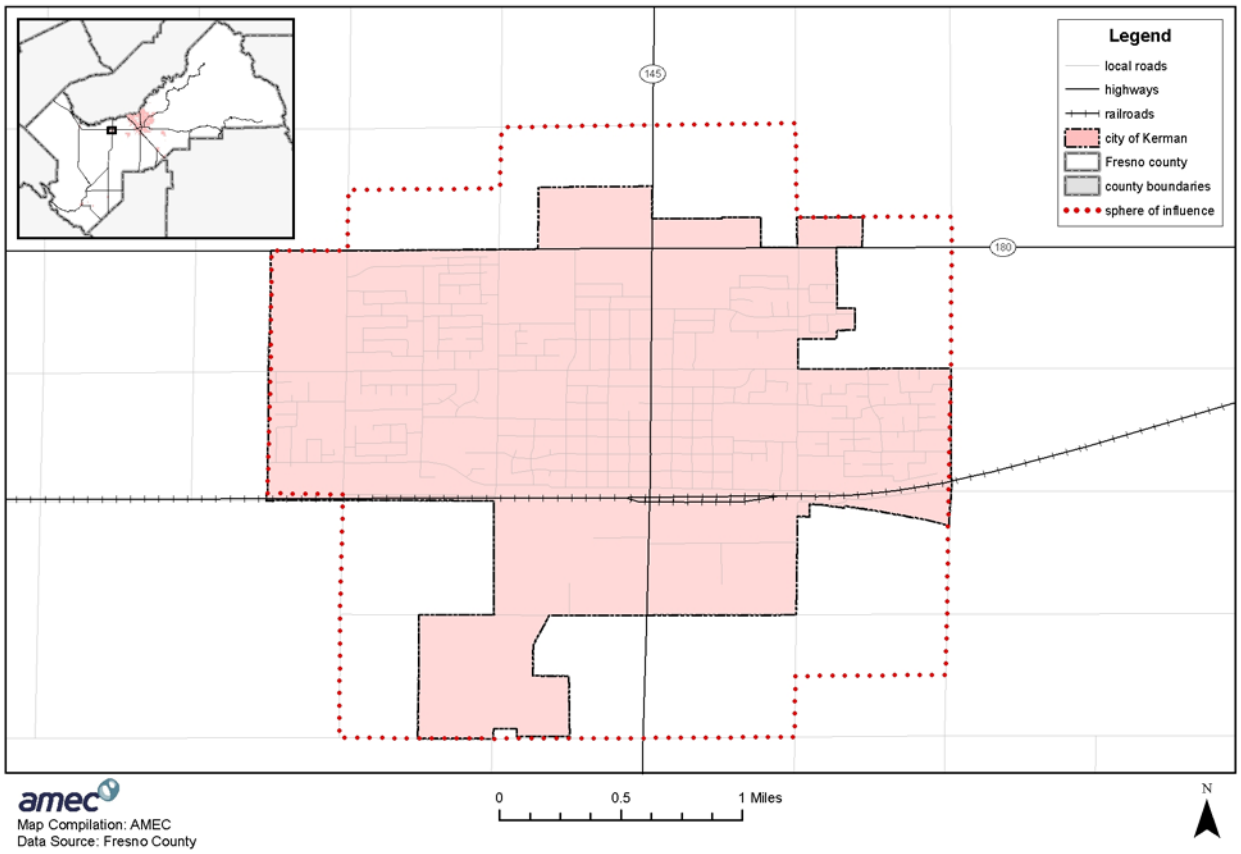
Schedule: This project needs to be done as soon as possible. The best window of opportunity is during the period of May-November (before the rainy season) as this is the best time of year for construction projects. With each passing year, the existing system grows worse.

ANNEX E: CITY OF KERMAN

E.1 Community Profile

Figure E.1 displays a map and the location within Fresno County of the City of Kerman and its Sphere of Influence.

Figure E.1. The City of Kerman



E.1.1 Geography and Climate

Kerman is located on the west side of Fresno County in the central portion of the San Joaquin Valley. It is bisected by State Route 145 (Madera Avenue), which runs north/south, and State Route 180 (Whitesbridge Road), which runs east/west. State Highway 99, the major highway through the San Joaquin Valley, is 15 miles east of Kerman. Kerman is 17 miles south of Madera, the county seat of Madera County, and 15 miles west of Fresno, county seat of Fresno County. The smaller cities of San Joaquin and Mendota are about 13 miles southwest and 18 miles west, respectively.

The mountains of the Coast Range and the Sierra Nevada are roughly equidistant from Kerman, about 35 miles to the southwest and northeast, respectively. The topography in and around Kerman is very level with a gentle, imperceptible slope to the southwest. Elevations in the planning area vary from about 210 feet to 225 feet. There are no natural waterways in the planning area. The largest nearby waterway of consequence is the San Joaquin River, about ten miles north. However, there are several irrigation canals that traverse the planning area.

The climate of the Kerman area is described as Mediterranean, which is typified by hot, dry summers and mild winters. Temperatures recorded at Lemoore Naval Air Station (LNAS), located 41.2 miles south of Kerman, show the mean monthly high temperature for July to be 80.6°F, while the mean temperature for January is 45.1°F. It is not uncommon for maximum temperatures to exceed 100°F during the summer months; nor for temperatures to drop below freezing in the winter. The highest temperature ever recorded at LNAS was 113°F in July of 1975. The lowest temperature of record was 14°F in January of 1962.

Approximately 90 percent of all rainfall in Kerman occurs between November and April. Average rainfall measured in Kerman is 6.08 inches per year compared to 7.83 inches in Coalinga and 9.5 inches in Fresno.

Air movement through the San Joaquin Valley is in a southeasterly direction. Wind enters the valley over the passes east of the San Francisco Bay and exits through mountain passes at the southern end of the San Joaquin Valley. Meteorological data from LNAS indicates that the average wind speed is 4-6 knots with maximum gusts of 40-50 knots recorded from October to May. The prevailing wind direction is from the north and north-northwest, except in December and January, when the winds blow from the southeast or east-southeast.

E.1.2 History

The site of Kerman was first established by the Southern Pacific Railroad Company as a way station with a pump and watering tank in 1891. The site was originally named Collis in honor of the president of the railroad Collis P. Huntington. It was at this site in 1892 that the famous Sontag and Evans gang held up the San Francisco-Los Angeles passenger train, one of the last train robberies in the country and perhaps the most historical event to occur in Kerman.

Settlement and cultivation of the Kerman area began and continued through the turn of the century as irrigation projects brought water to the area, primarily from the Kings River to the south. In 1900, William G. Kerckhoff and Jacob Mansar purchased some 3,027 acres of land from the Bank of California. These men formed the Fresno Irrigated Farms Company. In 1906, Collis was renamed Kerman from the men's names (Kerckhoff and Mansar).

By 1914, Kerman had an estimated population of 400 people surrounded by 29,000 acres of producing crop land. The Kerman Creamery was producing about 1,600 pounds of butter daily. In 1921, Madera Avenue was paved from the Southern Pacific railroad tracks north to the San Joaquin River, and streetlights were installed from the tracks to Whitesbridge Road. By 1936,

development of Kerckhoff Park had begun. Oil and gas exploration was being conducted several miles south of town and culminated in 1941 with the development of the largest gas well in the state (at the time).

In 1946, the residents of Kerman voted to incorporate, and the City of Kerman was born. In the 1950s, new subdivisions began to develop, expanding the urban area outward from the original town site. New development and subdivision activity has continued to the present time.

E.1.3 Economy

Despite Kerman's location in the center of a highly productive agricultural area, agriculture is not the dominant employer in the community. This position is occupied by the services category, employing 33.7 percent of the City's work force. This category includes business and repair services, personal services, entertainment and recreation services, professional services, health services, educational services, and other services. Agriculture is the next largest employer, with 21.7 percent of the City's work force. In contrast to some other cities in the region, Kerman does not have extensive packing houses and agricultural processing facilities in its industrial area.

E.1.4 Population

In 2007, the population of the City of Kerman was estimated to be 13,591.

E.2 Hazard Identification and Summary

Kerman's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Kerman (see Table E.1). In the context of the plan's planning area, there are no hazards that are unique to Kerman.

Table E.1. City of Kerman—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Significant	Limited	Low-Medium
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Highly unlikely	Limited	Limited	Low
Drought	Likely	Significant	Critical	High
Earthquake	Likely	Limited	Critical	Medium
Flood	Occasional	Significant	Limited	Medium
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Cold/Freeze	Likely	Significant	Critical	Medium
Extreme Heat	Highly Likely	Extensive	Limited	Low
Fog	Highly Likely	Extensive	Limited	Low
Snow	Likely	Significant	Limited	Medium
Tornado	Unlikely	Significant	Limited	Medium
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Likely	Significant	Limited	Medium
Soil Hazards:				
Erosion	Unlikely	Limited	Negligible	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Land Subsidence	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Limited	Negligible	Low
Wildfire	Unlikely	Limited	Negligible	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Technological hazards were not assessed in the same manner as the natural hazards, thus they are not included in the table above. Nonetheless, it is important to note that technological hazards (transportation hazards/hazardous materials release) are a concern for the City of Kerman.

E.3 Vulnerability Assessment

The intent of this section is to assess Kerman's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

E.3.1 Assets at Risk

This section considers Kerman's assets at risk, including values at risk, critical facilities and infrastructure, economic assets, and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table E.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Kerman.

Table E.2. 2007 Roll Values for the City of Kerman by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	4	198,546	238,529	1	-	5	437,075
Commercial	119	35,397,013	10,965,907	28	1,605,725	147	47,968,645
Industrial	15	13,583,553	1,942,286	8	341,402	23	15,867,241
Open Space	-	-	-	-	-	-	-
Residential	2,627	355,314,165	117,630,986	437	28,908,510	3,064	501,853,661
Other	3	183,978	183,854	-	-	3	367,832
Total	**2,768**	**404,677,255**	**130,961,562**	**474**	**30,855,637**	**3,242**	**566,494,454**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Kerman from Fresno County GIS is provided in Table E.3 and mapped in Figure E.2. This is the information that was used for mapping and analysis purposes. It should be noted that the City had different data, which is indicated in parentheses in the table. (City data was not used for analysis since it was not available in GIS format.)

Table E.3. City of Kerman's Critical Facilities

Critical Facilities Type	Number*
Airports	-
Communications Centers	- (1)
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	1
Health Care Facilities	2 (3)
Law Enforcement Facilities	1
Maintenance Yards	1 (3)
Residential Elderly Facilities	-
Schools and Day Care Facilities	12 (10)
Public Utilities—Water/Sewer	1
Totals	**19** (21)

Source: Fresno County GIS
*Data in parentheses is from the City of Kerman

Figure E.2. City of Kerman's Critical Facilities

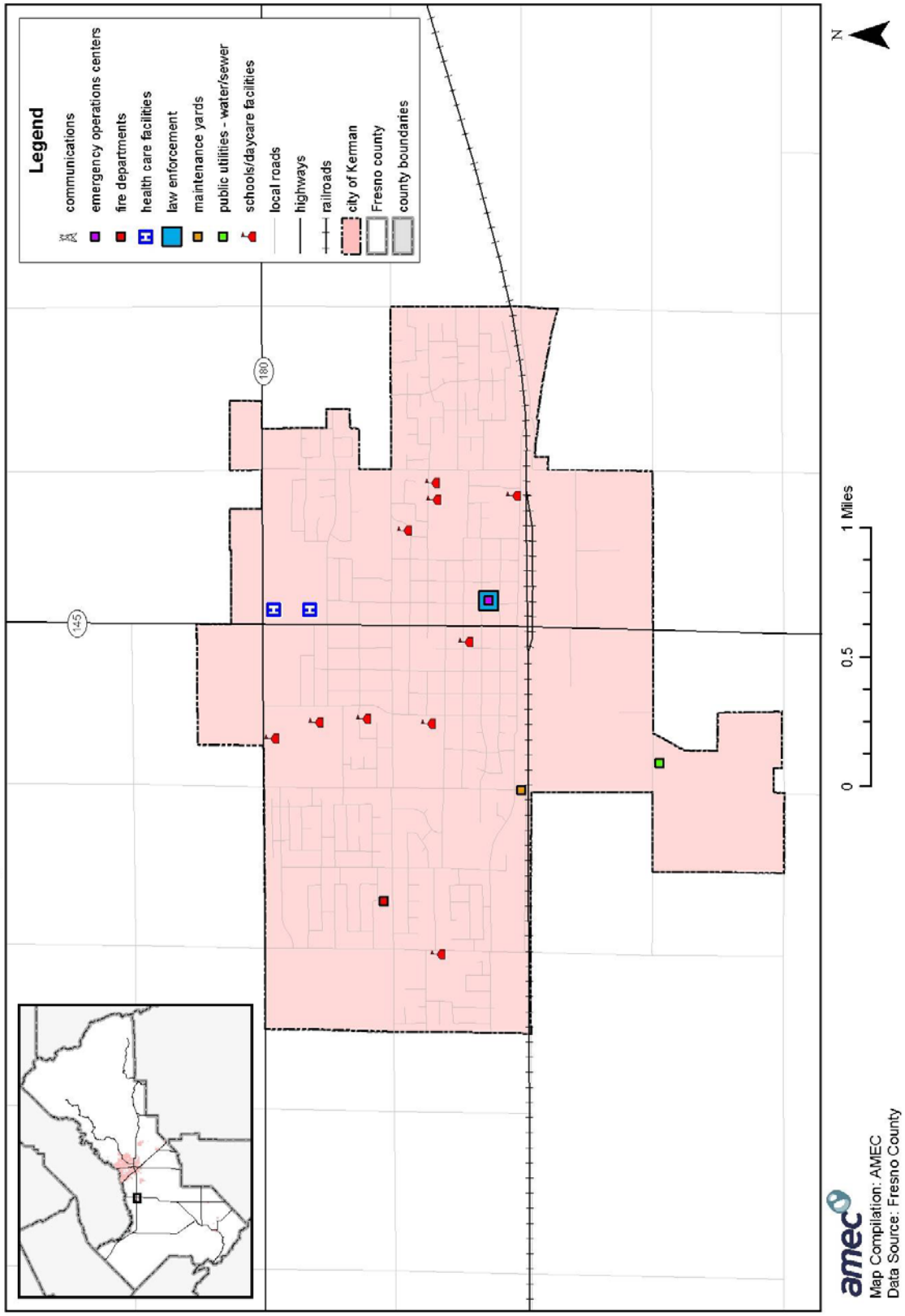


Table E.4 lists particular critical facilities and other community assets identified by Kerman's planning team as important to protect in the event of a disaster.

Table E.4. Specific Critical Facilities and Other Community Assets Identified by the City of Kerman's Planning Team

Name of Asset	Replacement Value ($)	Occupancy/ Capacity #	Hazard Specific Info./Comments
City Hall	3 million	n/a	
Police Station	1.2 million	n/a	Secondary emergency operations center
United Health Center	3.7 million	n/a	EOP medical center
Fire Station	6.4 million	n/a	Primary emergency operations center
Community Center	3.1 million	400	EOP gathering point

Economic Assets

Table E.5 identifies the City's largest employers, which are led by the Kerman Unified School District.

Table E.5. Major Kerman Employers

Name of Business	Product/Service	# of Employees
Kerman Unified School District	Education	425
Panoche Creek Packaging	Almonds	100
Sebastian	Communications	70
City of Kerman	Municipal Government	60
Helena Chemical	Chemical	50
Baker Commodities	Rendering Plant	35
H & J Chevrolet	Auto Sales	25
Hall Ag. Enterprise	Labor Contractor	40
Perko's Café	Restaurant	23
Kerman Ag. Resources	Agricultural Chemicals	27
Sun Empire Foods	Candy	15

Source: 2007 Kerman General Plan Update

Growth and Development Trends

Table E.6 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table E.6. City of Kerman's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
8,548	13,591	+59.00	2,461	3,830	+55.63

Source: California Department of Finance, www.dof.ca.gov/Research/

For the purposes of the 2007 Kerman General Plan Update, population projections were developed representing low and high estimates. In ten years (2017), the estimates forecast a low population estimate of 18,685 and a high population estimate of 23,300 people. By the year 2027, the estimates forecast a low population estimate of 26,613 and a high population estimate of 40,561 persons.

Land demand projections for 2017 and 2027 are based on the population projections and factors described in the 2007 Kerman General Plan Update. Table E.7 identifies a range of land demand acreages, based on low and high population projections, required for development and public uses by the years 2017 and 2027.

Table E.7. City of Kerman's Land Demand Projections (in acres)

Land Use Designation	2006 to 2017		2017 to 2027		Total	
	Low	High	Low	High	Low	High
Residential	360	634	818	1,666	1,178	2,300
Retail commercial / office	48	85	113	225	161	310
Industrial / Service commercial	39	69	91	181	130	250
Parks	34	52	65	121	99	173
Schools	18	18	80	80	98	98
Totals	**499**	**858**	**1,167**	**2,273**	**1,666**	**3,131**

Source: 2007 Kerman General Plan Update

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

E.3.2 Estimating Potential Losses

Table E.2 above shows Kerman's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are unreinforced masonry buildings and buildings built prior to the introduction of modern day building codes.

Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

Groundwater is the only source of drinking water in the City of Kerman. Water moving down gradient from the floodplains of the Sierra Nevada streams and rivers is the major source of groundwater recharge in this area. Over-application of imported irrigation water within the Fresno Irrigation District is another source of groundwater recharge. Rainfall provides only a minor percentage of total groundwater recharge in the area.

Earthquake

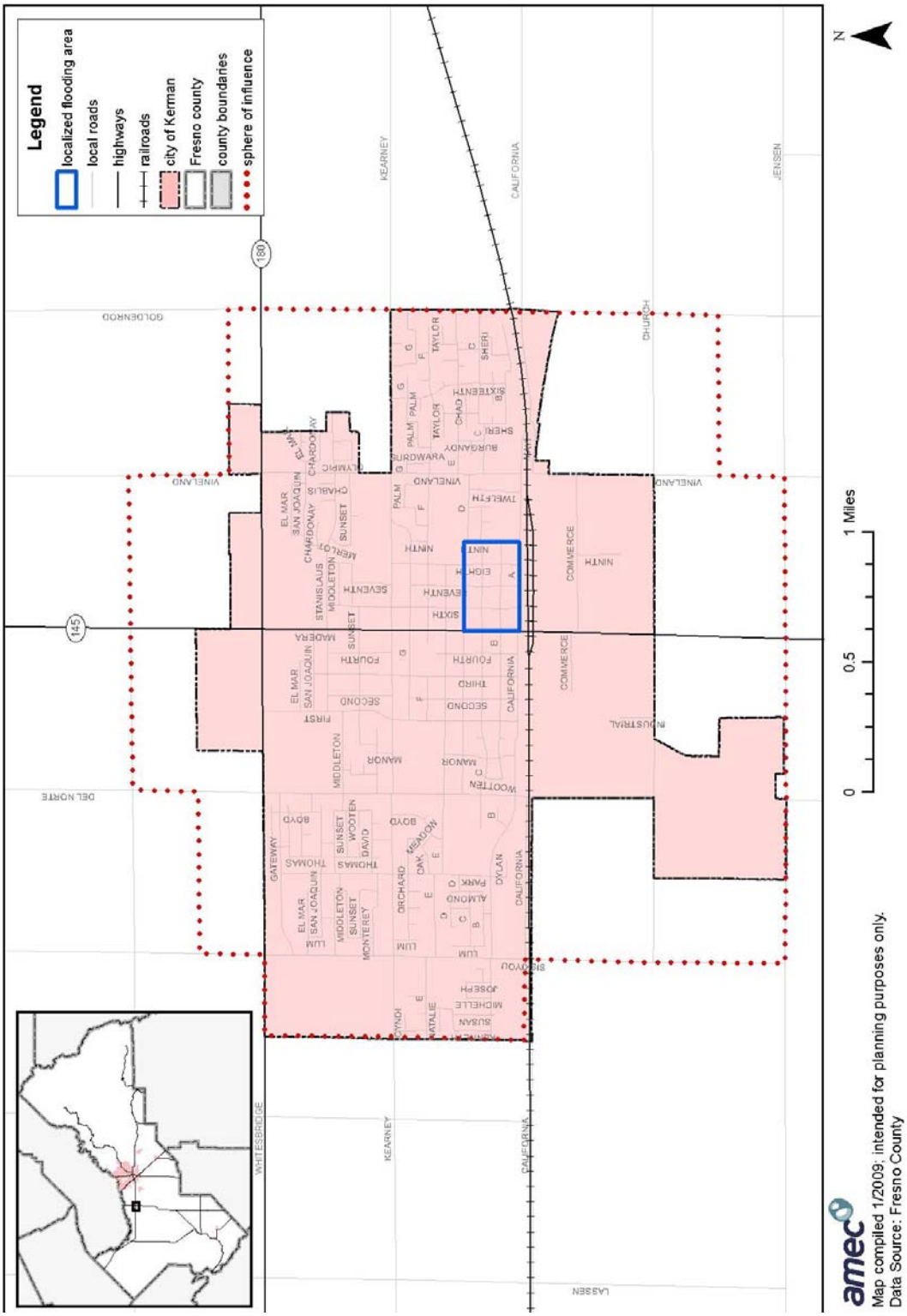
The City of Kerman is located in an area that is seismically active; however, the potential for dangerous seismic activity is slight. It is located in a seismic zone that is characterized by a relatively thin section of sedimentary rock overlying a granitic basement. Ground motion that could result from an earthquake would be high, but the distance to the faults that are the expected sources of the shaking is sufficiently great that the effects should be minimal.

Although Fresno County does not have any major faults within its boundaries, Kerman has been affected by earthquakes in the past. The most notable earthquake was the Coalinga earthquake in May 1983, which measured magnitude 6.7 on the Richter scale. Although no damage was reported in Kerman, the quake was strongly felt by local residents.

Flood

According to FEMA's Flood Insurance Study, no area within Kerman is subject to floodwaters from a 100-year storm. However, certain areas within the City are subject to localized flooding and ponding of stormwater. During rain events, flooding occurs in the area between Madera Ave and 9th St and between D St and California Ave within the southern section of the City of Kerman. The city has to sandbag intersections and low areas within this area or buildings will be inundated. The City has sandbagged 5 out of the last 10 years. The sandbagging has saved buildings from being flooded including a local Motel located on California Ave that sustained flood damage before the City started to sandbag the area. A medical center located across from the motel is also potentially affected. In total, 425 homes and businesses and an elementary school are potentially affected by localized flooding within the City. The value of these structures at risk to localized flooding is in excess of $42,000,000. Furthermore, new development, if not designed properly, can magnify drainage problems. New development must conform to standards and plans contained in the Kerman Stormwater Drainage Master Plan, which directs the location of new stormwater drainage lines, mains, and ponding facilities. Figure E.X illustrates the areas most vulnerable to localized flooding.

Figure E.2. City of Kerman's Area of Localized Flooding



Technological Hazards (Transportation Hazards/Hazardous Materials Release)

There are several uses of hazardous materials within the City that pose a threat to its citizens. These uses include industrial operations on the south side of the City, the state highways that carry large volumes of truck traffic, the railroad, and the wastewater treatment plant. Kerman has two state highways (State Routes 145 and 180) that carry a large amount of truck traffic. It is difficult to ascertain the number of trucks carrying hazardous waste. The American Avenue landfill lies about seven miles southwest of Kerman. Chemical Waste, Inc. operates a hazardous waste collection facility at Kettleman City, about 55 miles south of Kerman.

E.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into three sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities.

E.4.1 Regulatory Mitigation Capabilities

Table E.8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Kerman.

Table E.8. City of Kerman's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2007 Kerman General Plan Update
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, water conservation, wildfire)		
Building code	Yes	2007 California Building Standards Code
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program	Yes	Storm Drain Master Plan
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

2007 Kerman General Plan Update

The 2007 Kerman General Plan Update expresses the City's vision and expectations for the future. It is a development blueprint for the year 2027. The plan serves as a decision-making tool to guide future decisions on the physical development of Kerman to facilitate a well-planned community. Some of the plan elements (e.g., Land Use; Conservation, Open Space, Parks and Recreation; and Safety) have goals and policies that are directly or indirectly related to mitigation. The Safety and Conservation, Open Space, Parks and Recreation elements are the most relevant to hazard mitigation. As such, select goals and policies from these elements are extracted and included below.

Safety Element

The Safety Element is the primary vehicle for relating local safety planning to City land use decisions. Its main purpose is to reduce death, injuries, property damage, and the economic and social dislocation resulting from natural hazards.

Goals

- Prevent the loss of life and personal property due to natural and manmade hazards, including earthquakes, floods, and fires
- Safeguard the economic resources of the City from losses due to natural and manmade hazards, including earthquakes, floods, and fires
- Promote citizen awareness of the implications of natural and manmade hazards that exist in the region

Policies

Seismic and Geologic Safety
1. Policy: The City shall insure that all new and rehabilitated structures are constructed to meet adequate building standards.
2. Policy: The City shall review the State Mining and Geology Board's publications, which define Special Studies Zones for areas along fault lines.
3. Policy: The City of Kerman shall continue the abatement/rehabilitation of dangerous buildings as defined by the Uniform Housing Code.

Fire Safety
1. Policy: The City of Kerman shall coordinate with the North Central Fire District through Kerman's site plan review process and the State's environmental review process to insure that future development does not impose a burden on their services. North Central, with input and review from the City, should establish a 20-year Capital Improvement Plan (CIP) for potential fire station/equipment in the Kerman area. The City should continue to charge Development Impact Fees for new growth to accommodate the CIP.
2. Policy: The City of Kerman shall coordinate with North Central Fire District to provide prevention and public education to the residents to reduce the demand for fire protection services.
3. Policy: The City shall require that yards and lots be maintained free of weeds and debris.

Hazardous Land Use Relationships
1. Policy: Residential development in close proximity to industrial zones and the wastewater treatment plant shall be avoided. Development adjacent to the wastewater treatment plant shall be limited to industrial uses.
2. Policy: Residential land uses shall be limited adjacent to State Highway 145 and State Highway 180.
3. Policy: Businesses that use, produce, or generate any type of hazardous materials shall be conducted in a safe

manner.

Conservation, Open Space, Parks and Recreation Element

The conservation portion of this element includes the conservation, development, and utilization of natural resources, including water, forests, soils, rivers and other waters, wildlife, and other natural resources.

Goals

- Conserve, restore, and enhance significant natural, cultural, and historic resources in Kerman
- Create and preserve open space in the Kerman area to meet the needs of the community now and in the future

Policies

Water Quality and Conservation
1. Policy: Promote a community awareness program that will educate the community in water-saving methodologies at the home and the work place.
2. Policy: Require the use of native and drought-tolerant new landscaping in existing and future parks and medians.
3. Policy: Allow for adequate groundwater recharge by developing storm ponding and retention basins where feasible. In some areas these ponds or basins can be incorporated into a recreational area or used as wildlife habitat area.
4. Policy: The City should develop a secondary water source system ("purple pipe system") that can be incorporated into new development in order to use less potable water for the irrigation of parks, schools, and public landscaping.

Kerman Master Storm Drain Plan

In 1982, the City of Kerman developed a master storm drain plan that defined the existing storm drain facilities and provided a plan for the City of Kerman as it grew. Through annual updates, the plan has evolved into today's comprehensive plan of system pipelines, drainage basins, and pump stations. In some locations, the basins are used as parks in the dry season. As new development takes place, the developers are required to construct master drainage facilities defined by the plan that impact their area of construction.

E.4.2 Administrative/Technical Mitigation Capabilities

Table E.9 identifies the personnel responsible for activities related to mitigation and loss prevention in Kerman.

Table E.9. City of Kerman's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Consultant—Yambae & Horn
Planner/engineer/scientist with an understanding of natural hazards	Yes	
Personnel skilled in GIS	No	
Full-time building official	Yes	Planning and Development Services
Floodplain manager	No	
Emergency manager	Yes	Police Chief
Grant writer	Yes	California Consulting
Other personnel		
GIS Data—Land use		
GIS Data—Links to Assessor's data		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No	

E.4.3 Fiscal Mitigation Capabilities

Table E.10 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table E.10. City of Kerman's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	
Incur debt through private activities	
Withhold spending in hazard prone areas	

E.5 Mitigation Strategy

E.5.1 Mitigation Goals and Objectives

The City of Kerman adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

E.5.2 Mitigation Actions

The planning team for the City of Kerman identified the following mitigation action based on the risk assessment. Background information and information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule is included.

1. Install Warning Lights for the Intersection of State Route 145 and Highway 180

Issue/Background: State Routes 145 and 180 are the two main roads leading into the City of Kerman. These roads are heavily trafficked by personal autos and commercial trucks. Each section of road leading into the City passes through agricultural/rural areas where vehicles often travel at maximum speeds. During winter fog events, the traffic lights become obscured, and the vehicles are not warned of the approaching intersection with enough time to stop. If flashing warning lights were installed on these roadways before the intersection, they would give drivers an opportunity to slow down and stop before they reach the intersection. This would save lives and reduce human injury and property damage.

In 2007, there were 22 accidents at this intersection. Nine were injury accidents (seven people required an ambulance response). The nearest hospital is 20 miles away in the City of Fresno.

Other Alternatives: Reduced speeds on state highways and routes leading into the City, speed bumps, traffic control by police during fog events

Responsible Office: City of Kerman and the California Department of Transportation

Priority (High, Medium, Low): Medium

Cost Estimate: $35,000-50,000

Potential Funding: Possible assistance from the California Department of Transportation since they would maintain the lights

Benefits (Avoided Losses): It is estimated that flashing intersection warning lights would reduce accidents at this intersection by 20 percent. It is estimated that, per year, .5 lives would be saved per year (one life @ $3.1 million=$1.5 million), seven injuries requiring ambulance dispatch would be avoided (1 hospital visit @ $15,000=$105,000), and property damage would be reduced (20 accidents involving 40 vehicles, average $5,000 per vehicle=$200,000). The benefits would approximate $2 million vs. a cost of $50,000.

Schedule: 1-2 years

2. Construction of California Avenue Parallel Storm Drain Line

Issue/Background: When the City of Kerman constructed the first storm drain system in the early 1960s, a 20 inch storm drain line was installed in California Avenue to move the water that drained from the central part of Kerman to the main storm drain line that leads south to Church Avenue where the master storm drain basin was constructed. As Kerman grew so did the storm drain runoff and a master storm drain plan was developed in the early 1980s to allow storm drain impact fees to be collected on new growth and provide a plan to install the new infrastructure. The last section of the master planned storm drain system in the south part of Kerman is a parallel 30 inch storm drain line running west from 4th Street to 1st Street. Because this section of master planned SD has not been constructed, there is a potential for flooding in the drainage area feeding this part of the SD system. We have experienced continual problems through out the area draining to this section of the SD system and we are required to sandbag when significant rain events occur. The map (Attachment A below) delineates the area that drains to this section of the SD system.

Other Alternatives: No Action

Responsible Office: Public Works Director

Priority (High, Medium, Low): High

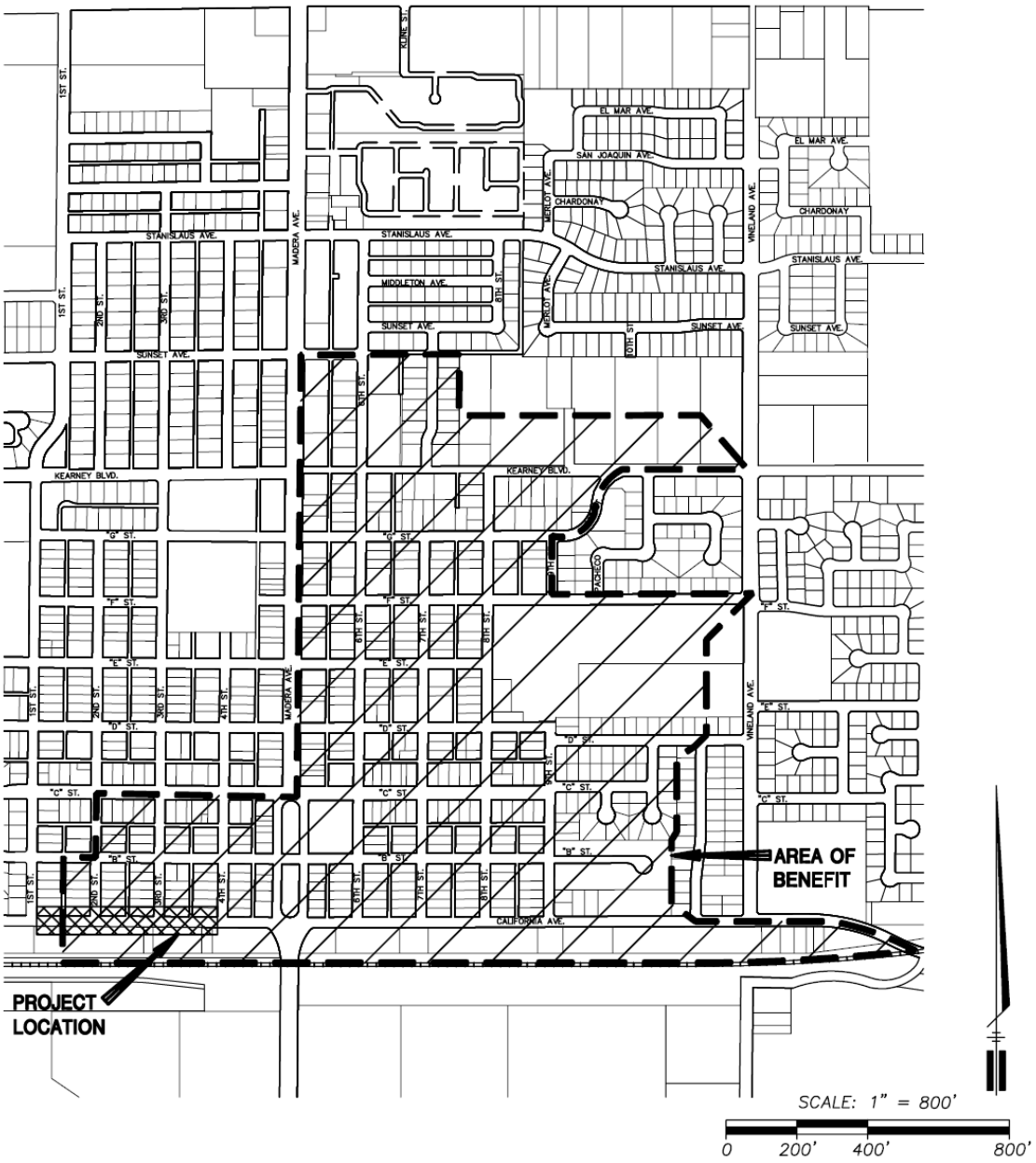
Cost Estimate: $140,000

Potential Funding: Possible assistance from the California Department of Transportation since they would maintain the lights

Benefits (Avoided Losses): Possible flooding to approximately 425 homes and businesses and one elementary campus valued in excess of $42,000,000

Schedule: Within 2-5 years, dependent on funding.

ATTACHMENT "A"



YAMABE & HORN ENGINEERING, INC. 1300 EAST SHAW AVE. SUITE 176 TEL (559) 244-3123 FRESNO, CA 93710 FAX (559) 244-3120	**Ref. & Rev.** REV REV REV REV REV	**CITY OF KERMAN** CALIFORNIA AVE. STORM DRAIN FIRST ST. TO FOURTH ST. AREA OF BENEFIT
		Dr. By: JJ Ch. By: GH Date: 12/09/08 YH Job No. 08-343 Sheet No. 1 of 1 Sheets

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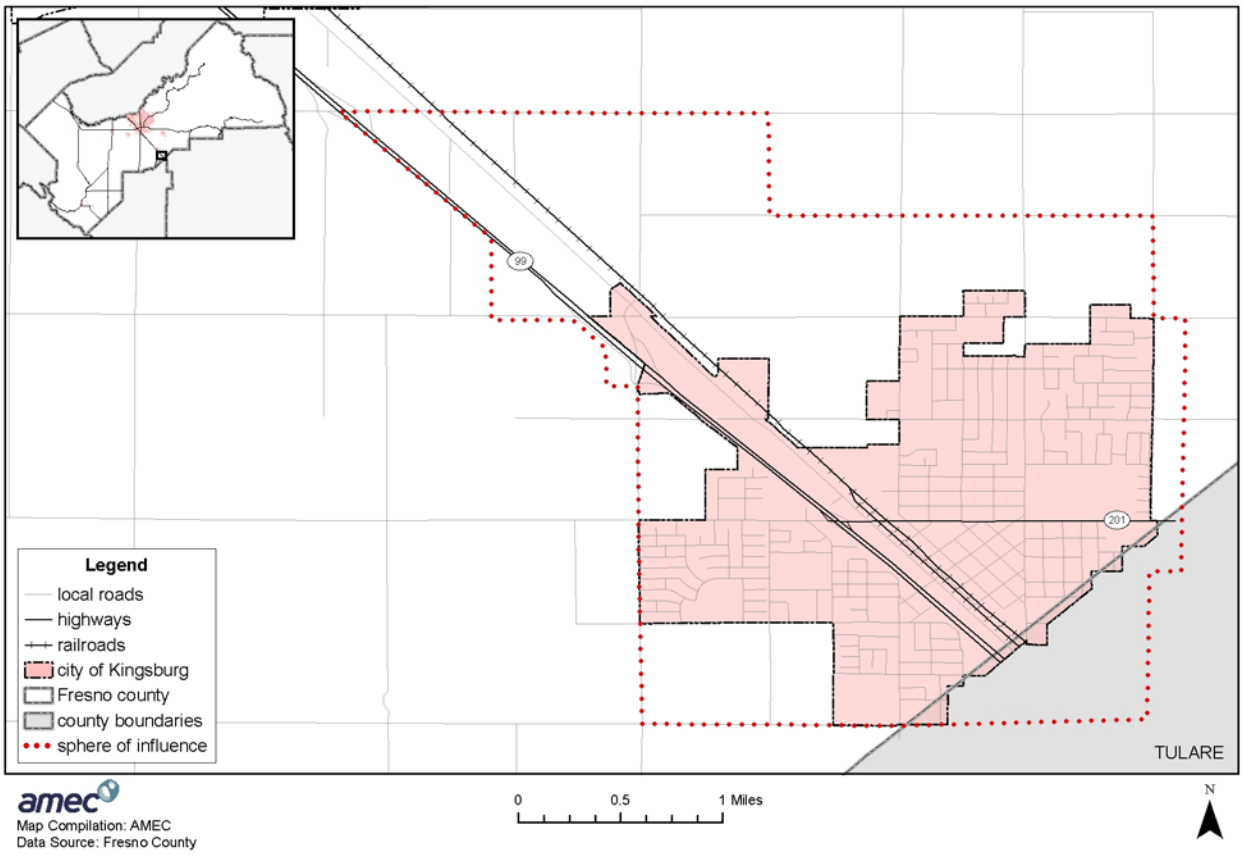
ANNEX F: CITY OF KINGSBURG

F.1 Community Profile

Figure F.1 displays a map and the location within Fresno County of the City of Kingsburg and its Sphere of Influence.

Figure F.1. The City of Kingsburg



F.1.1 Geography and Climate

The City of Kingsburg is a corporate city in Fresno County in the San Joaquin Valley of California. It is approximately four square miles in area and is 20 miles south of the County seat, the City Fresno. Kingsburg sits directly adjacent to Tulare County on its eastern and southern boundaries, and Kings County is one mile to the south. The Union Pacific Railroad and California State Highway 99 both run through the middle of the City. The Kings River, a major waterway that starts in the Sierra Nevada Mountains and runs through the lower part of the San Joaquin Valley, is close to the City's southern and eastern boundaries.

Kingsburg's climate can be described as Mediterranean. The summers are hot and dry, and winters are characterized by moderate temperatures and light precipitation. Temperatures and rainfall for Kingsburg are typical of that of the rest of Fresno County.

F.1.2 History

Kingsburg was established in the 1870s, when the now Union Pacific Railroad was laid through the heart of the San Joaquin Valley, and when cattle raising and wheat production were the principal economic activities. The City was incorporated in 1908 and is celebrating its centennial anniversary this year (2008). The first highway was built around 1912 and connected Kingsburg to Sanger to the north. By 1925, raisin production and packing had become the City's main industries. To this day, agriculture remains the primary industry for both Kingsburg and Fresno County.

F.1.3 Economy

Kingsburg is primarily a bedroom community. Development in the City is 72 percent residential, 20 percent commercial, and 8 percent industrial, which limits the sales and property tax base. Agriculture is the primary industry within and around Kingsburg. The largest employer is Del Monte Foods Plant, which has 1,350 employees. The City is in the process of annexing Sun Maid Growers, which has 700 employees, and Guardian Glass Industries. It has developed an industrial park on Golden State Boulevard and Stroud Avenue at Highway 99 and a 45-acre commercial park west of Highway 99 and north of Sierra Street. The City's downtown area, known as the "Swedish Village," has specialty shops, restaurants, and businesses.

F.1.4 Population

The population of Kingsburg was estimated at 11,234 in 2007.

F.2 Hazard Identification and Summary

Kingsburg's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Kingsburg (see Table F.1). In the context of the plan's planning area, there are no hazards that are unique to Kingsburg.

Table F.1. City of Kingsburg—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Limited	Limited	Low
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Catastrophic	Low
Drought	Occasional	Extensive	Critical	High
Earthquake	Occasional	Extensive	Critical	High
Flood	Occasional	Limited	Limited	Medium
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:	Unlikely	Extensive	Limited	Low
Extreme Cold/Freeze	Likely	Extensive	Limited	Low
Extreme Heat	Highly Likely	Extensive	Limited	Medium
Fog	Highly Likely	Extensive	Limited	Medium
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Low
Snow	Unlikely	Extensive	Limited	Low
Tornado	Occasional	Limited	Limited	Low
Soil Hazards:				
Erosion	Occasional	Significant	Limited	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Land Subsidence	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Extensive	Limited	Low
Wildfire	Unlikely	Limited	Negligible	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Technological hazards were not assessed in the same manner as the natural hazards, thus they are not included in the table above. Nonetheless, it is important to note that technological hazards (transportation hazards/hazardous materials release) are a concern in Kingsburg.

F.3 Vulnerability Assessment

The intent of this section is to assess Kingsburg's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

F.3.1 Assets at Risk

This section considers Kingsburg's assets at risk, including values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table F.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Kingsburg.

Table F.2. 2007 Roll Values for the City of Kingsburg by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	-	-	-	-	-	-	-
Commercial	161	48,955,130	17,357,189	55	9,247,367	216	75,559,686
Industrial	31	25,164,119	3,546,047	10	718,958	41	29,429,124
Open Space	-	-	-	-	-	-	-
Residential	3,196	406,142,575	147,340,158	106	8,666,386	3,302	562,149,119
Other	-	-	-	-	-	-	-
Total	**3,388**	**480,261,824**	**168,243,394**	**171**	**18,632,711**	**3,559**	**667,137,929**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Kingsburg from Fresno County GIS is provided in Table F.3 and mapped in Figure F.2.

Table F.3. City of Kingsburg's Critical Facilities

Critical Facilities Type	Number
Airports	-
Communications Centers	1
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	1
Health Care Facilities	2
Law Enforcement Facilities	1
Maintenance Yards	1
Residential Elderly Facilities	-
Schools and Day Care Facilities	13
Public Utilities—Water/Sewer	-
Totals	**20**

Source: Fresno County GIS

Figure F.2. City of Kingsburg's Critical Facilities

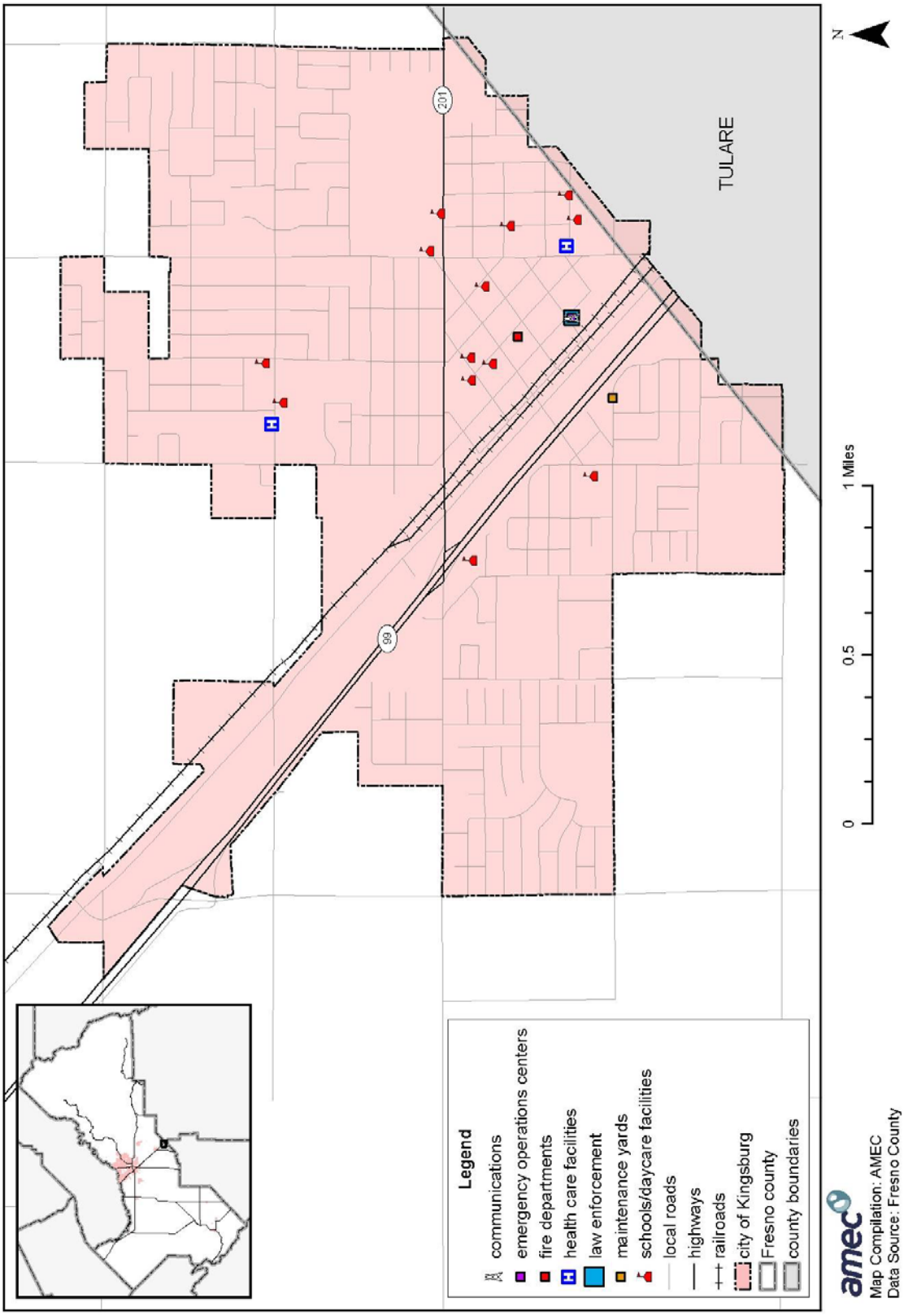


Table F.4 lists particular critical facilities and other community assets identified by Kingsburg's planning team as important to protect in the event of a disaster.

Table F.4. Specific Critical Facilities and Other Community Assets Identified by the City of Kingsburg's Planning Team

Name of Asset	Replacement Value ($)	Occupancy/ Capacity #	Hazard Specific Info.
City Hall	376,531	28	Unreinforced masonry
Fire Department—Downtown Station	2,224,747	n/a	Unsecured perimeter
Fire Department—Bethel Avenue Station	1,923,264	n/a	Unsecured perimeter
Police Department	2,285,821	n/a	Close proximity to railroad system
Kingsburg Elementary School District (five schools)	n/a	2,445	Some campuses do not have secured facilities
Kingsburg High School District (one main campus, one alternative education center)	n/a	1,279	Open campus

Growth and Development Trends

Table F.5 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table F.5. City of Kingsburg's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
9,231	11,234	+21.70	3,377	4,024	+19.16

Source: California Department of Finance, www.dof.ca.gov/Research/

Due to County boundaries on the east and south, all growth potential is in the west and north areas of the City. The City has developed a commercial/business park on the north side of Sierra Street in the northwest area of town. Also, there are two new industrial parks currently under construction on the north area of town on the west side of Simpson Street (Golden State Boulevard).

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

F.3.2 Estimating Potential Losses

Table F.2 above shows Kingsburg's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes.

Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

Groundwater is the source of domestic water supply for Kingsburg. The groundwater basin is recharged primarily by rainfall and infiltration, stormwater runoff, infiltration from irrigated ditch flows and seepage in the Kings River bottom, and water conservation recharge to natural sloughs in the nearby agricultural area. In October 2007, the City's water utility was operating at maximum peak performance due to drought conditions. Drought may also lead to agricultural losses in the surrounding area, which may impact the City economically.

Earthquake

Kingsburg is located in Seismic Hazard Zone 3. The nearest active earthquake faults are located more than 55 miles to the east in the Sierra Nevada range. Kingsburg has experienced several noticeable ground movement incidents, such as from the 1983 Coalinga earthquake and the 1989 Watsonville earthquake, but no local damage was sustained. The existence and extent of soil liquefaction hazards in the area of Kingsburg are unknown.

The planning team has identified approximately 36 unreinforced masonry buildings in the City. The majority of the unreinforced masonry buildings are downtown, which is very much a community asset. The downtown area, with its Swedish theme, is the community's major attraction. It is referred to as Historic Swedish Village. City Hall is the only critical facility that is an unreinforced masonry building.

Flood

Heavy rain can lead to problems with storm drainage and create localized flood problems. According to the City of Kingsburg Storm Drain Master Plan, there are several flooding problem areas in the City. These areas are primarily a result of undersized pipes where the runoff exceeds the pipe capacity even for minor storms, damaged curb and gutters where the flow lines have been disrupted due to raised gutters and other obstructions, or damaged drain pipes.

The majority of the damaged lines are downtown, where the storm drain pipes are some of the oldest in the system. The undersized lines are located along Kern Street near Roosevelt Elementary School and along Mariposa Street near Lincoln Elementary School.

The areas that have curb and gutter flow line damage are generally in the older residential areas, including the areas south and west of Kingsburg High School. The downtown areas along Washington, Lincoln, and Lewis streets also have damaged curbs and gutters.

Figure F.3 shows the existing storm drain system deficiencies, Figure F.4 depicts potential flooding from a 100-year storm, and Figure F.5 depicts potential flooding from a 10-year storm.

Figure F.3. Existing Storm Drain System Deficiencies: City of Kingsburg

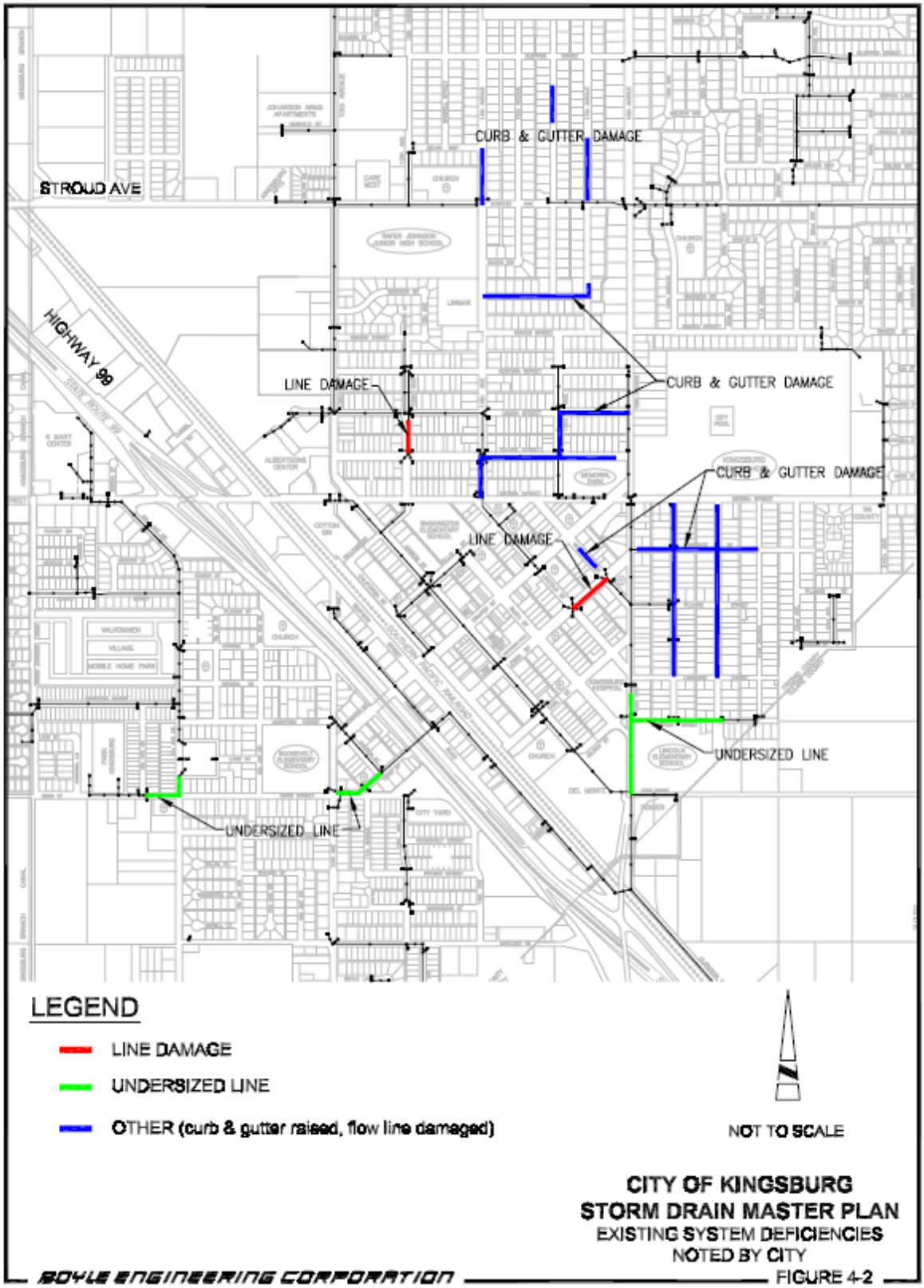


Figure F.4. Flooding in Kingsburg from a 100-Year Storm: City of Kingsburg

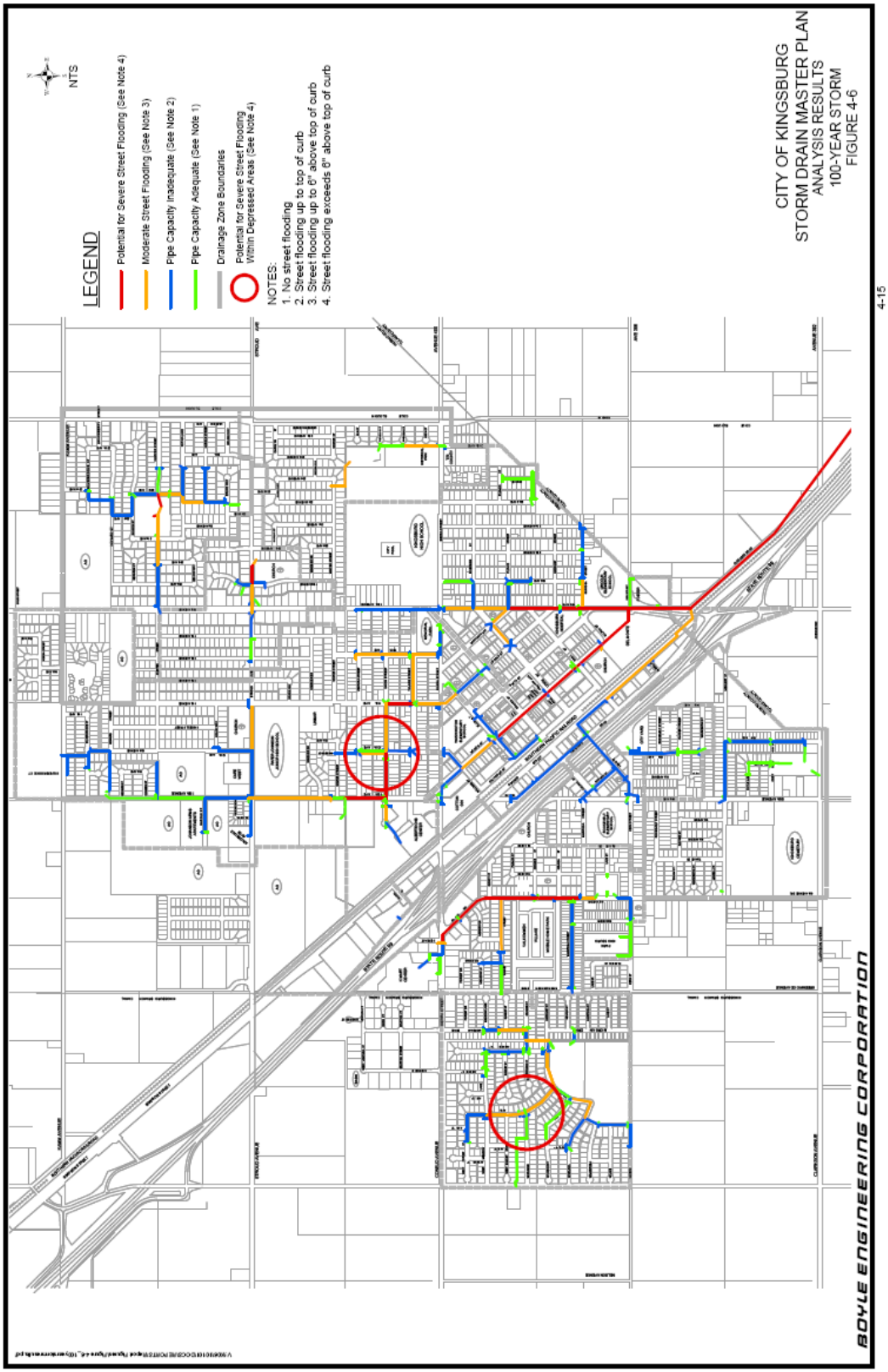
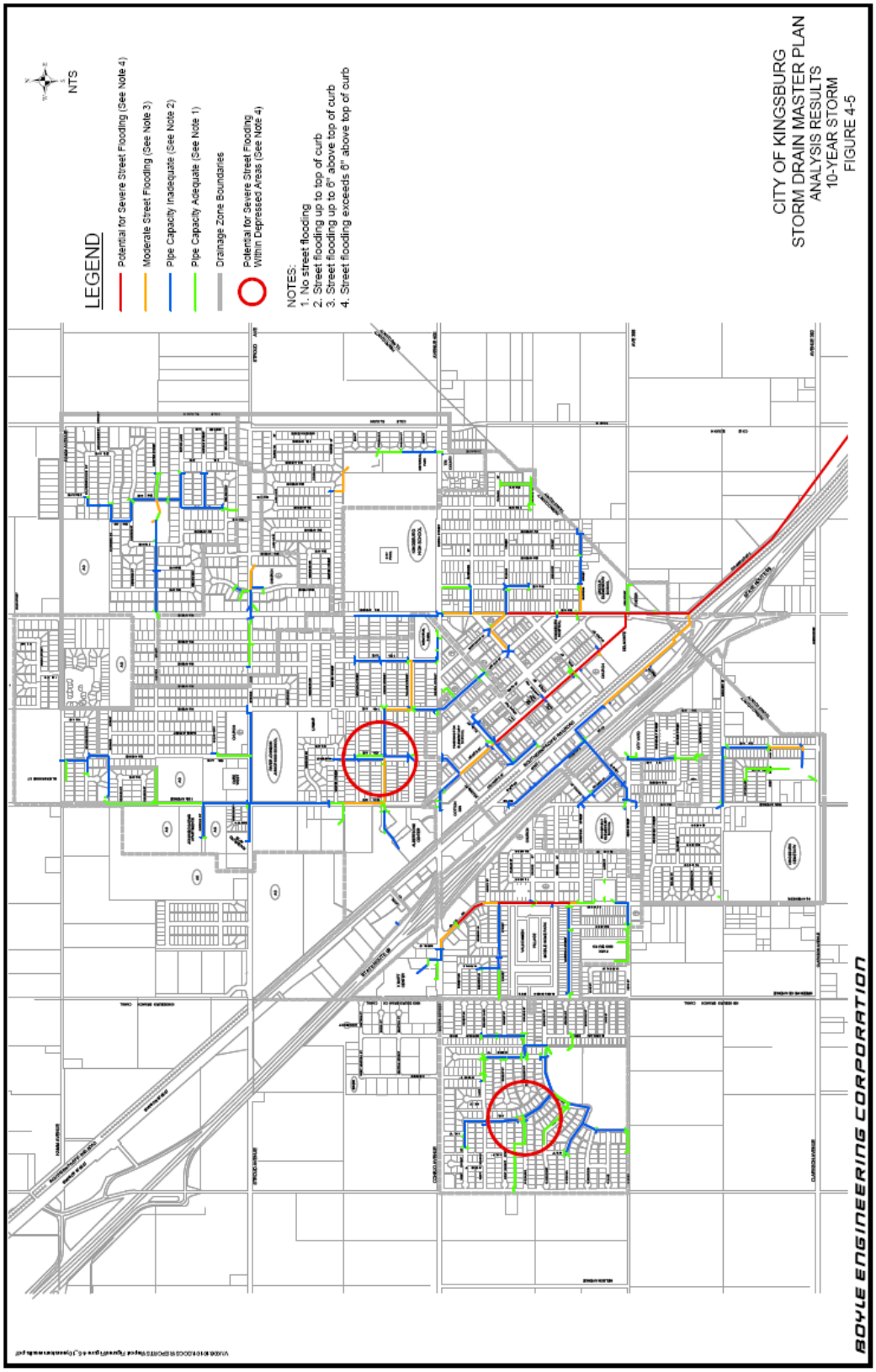


Figure F.5. Flooding in Kingsburg from a 10-Year Storm: City of Kingsburg



Prior to the construction of the Pine Flat Dam in the 1920s, flooding occurred in the Kings River area. However, today there is no flood hazard area mapped by FEMA in Kingsburg. The City does participate in the National Flood Insurance Program (NFIP). The City joined the program on November 30, 1983. NFIP insurance data indicates that as of November 30, 2007, there were two flood insurance policies in force in the City with $700,000 in coverage. Both policies are residential and in a B, C, or X zone. There have been no historical claims for flood losses and thus there were no repetitive or severe repetitive loss structures.

Severe Weather: Extreme Heat

The City does have a cooling station plan administered by the Community Services Department. The fire and police stations, city hall, and the senior center serve as cooling centers. Kingsburg has a high population of elderly residents that are vulnerable during extreme heat events.

Severe Weather: Fog

Severe fog events have contributed to multi-vehicle traffic accidents with multiple casualties along Highway 99 in Kingsburg. The most recent large events occurred in 1998 along Highway 99 and Avenue 384 (dense fog caused a chain-reaction accident involving 74 vehicles, killing two and injuring 51) and in 2000 along Highway 99, a major traffic artery in California, between Bethel and Mountain View avenues. The planning team reported that fatal accidents related to severe fog events occur in the area every year. About every five years, there is a major incident involving several vehicles. A similar event is highly likely to occur again in the future, especially with the expansion of Highway 99 from four to six lanes and the increase in highway usage.

These incidents require assistance from the City's emergency responders and also cause traffic to be diverted through the town, increasing the number of accidents there. Kingsburg does have a fog plan that involves constant replacement of signage and street striping to maintain visibility. The school districts implement a foggy day schedule when needed.

Other Hazards

Although ranked of lower planning significance relative to other hazards, the following information about agricultural hazards, dam failure, and transportation hazards/hazardous materials release should still be noted:

Agricultural Hazards

The lands surrounding Kingsburg (in Fresno, Kings, and Tulare counties) are all in agricultural production (dairy, citrus, grapes/raisins, and nuts). Crop losses in the surrounding area due to hazards have economic impacts in Kingsburg. Some of the primary businesses in Kingsburg are agricultural, including Del Monte and Sun Maid Raisin. Kingsburg's agriculturally based economy is vulnerable to freezes, heat waves, flooding, and insect infestations. A freeze in the winter of 2006 affected the citrus industry and the heat wave in the summer of 2006 affected the dairy and poultry industries.

Any time a hazard-related event results in reduced crop or product production, Kingsburg is negatively impacted by loss of revenue to major businesses. The associated unemployment affects the crime rate, housing market, local businesses, and the City's sales tax revenues.

Dam Failure

Kingsburg is in the mapped inundation area of Pine Flat Dam. Pine Flat Reservoir is located in the foothills of the Sierra Nevada Mountains, approximately 30 miles northeast of Kingsburg. The construction of the 429-foot Pine Flat Dam on the Kings River was completed in 1954. The project's primary purposes are flood control, irrigation, water conservation, and recreation. When completely full, Pine Flat Reservoir is 20 miles long, holds 1 million acre-feet of water, and covers 5,790 acres with 67 miles of shoreline. The upper Kings River is the main tributary that fills the reservoir. According to the Kings River Conservation District, "in the event of a major release from Pine Flat Dam, downstream flooding could occur over agricultural lands near the riverbanks and possibly within the Cities of Reedley and Kingsburg." The Kings River is located approximately one mile, at its closest, from Kingsburg's eastern, southeastern, and southern boundaries.

Technological Hazards (Transportation Hazards/Hazardous Materials Release)

California State Highway 99 and the Union Pacific Railroad both run through the heart of Kingsburg. With these two main transportation corridors comes the potential and history of major incidents involving loss of life and property.

Incidents such as those mentioned in the fog section above not only affect Highway 99, but also affect local streets and traffic due to detours through the City. Along with the potential for death and injuries from large-scale motor vehicle accidents, there is the potential for hazardous material spills or fires as numerous commercial transportation vehicles travel Highway 99 with various types and quantities of hazardous materials.

The Union Pacific Railroad is a strictly commercial freight transportation system. Large quantities and numerous types of hazardous materials are transported through Kingsburg by rail on a daily basis. In 1947, a collision occurred between a passenger train and a semi-truck hauling gasoline at the Union Pacific railroad crossing and Sierra Street in Kingsburg, killing four people and injuring 129. The rail line was closed for several days, but the specific closures and damage are no longer known. Warning devices have since been approved. However, due to the increased rail and vehicle traffic in the City, this type of accident may occur again in the future.

Of particular concern is the large number of liquefied petroleum gas vessels that are transported on the system. A derailment and fire, with large exploding liquefied petroleum gas vessels, could cause widespread damage to the City, as has happened in other communities across the country.

Large quantities of hazardous materials are used by the agricultural industry and thus travel through Kingsburg and are stored and used in the surrounding areas. Also, there is the potential

for hazardous materials releases from large industrial plants in Kingsburg, such as Guardian Glass and Del Monte.

F.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

F.4.1 Regulatory Mitigation Capabilities

Table F.6 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Kingsburg.

Table F.6. City of Kingsburg's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	Comprehensive General Plan for the Swedish Village of Kingsburg, 1992
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	Water Conservation Ordinance, 2003; Kingsburg Municipal Code 13.04.070
Building code	Yes	Version: 2001. Adopt 2007 California Code in January 2008
Fire department ISO rating	Yes	Rating: 5
Erosion or sediment control program	No	
Stormwater management program	Yes	City of Kingsburg Storm Drain Master Plan, 2005
Capital improvements plan	Yes	Five-year plan; updated annually
Economic development plan	Yes	
Local emergency operations plan	Yes	Emergency Operations Plan, May 1992
Other special plans	Yes	Water Master Plan, 2007 Urban Water Management Plan (possible adoption summer 2008) North Kingsburg Specific Plan, 2005 (addendum to general plan)
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

Comprehensive General Plan for the Swedish Village of Kingsburg, 1992

The Kingsburg General Plan reflects the City's long-range aspirations (15-20 years) of physical form and amenity and provides guidance for developmental regulations, such as zoning and subdivision ordinances. Two of the plans goals, in particular, support hazard mitigation. These goals and their policies are included below.

Goal 8: Seismic Hazards

Goals for achieving and maintaining safety from seismic events, include preventing serious injury, loss of life, serious damage to critical facilities involving large assemblies of people, and loss of continuity in providing services.

- The City will inventory all buildings which are unsound under conditions of "moderate" seismic activity; buildings having questionable structural resistance should be considered for either rehabilitation or demolition. Structures determined by the City's building official to be structurally unsound are to be reported to the owner and recorded with the County recorder to insure that future owners are made aware of hazardous conditions and risks.
- All new building construction shall conform to the latest seismic requirements of the Uniform Building Code as a minimum standard.
- The present building height limit of 50 feet shall be maintained, with a maximum of four stories. This policy should stay in force until such time that high rise construction is desired and capability for evacuation and fire fighting in upper stories is possible through the availability of appropriate equipment.
- Facilities necessary for emergency service should be capable of withstanding a maximum credible earthquake and remain operational to provide emergency response.
- Soil compaction tests, and geotechnical analysis of soil conditions and behavior under seismic conditions shall be required of all subdivisions and of all commercial, industrial and institutional structures over 6,000 square feet in area (or in the case of institutional structures, those which hold 100 or more people).
- The City should adopt an Earthquake Disaster Plan in coordination with Fresno County and local special districts. The plan should identify hazards that may occur as the result of an earthquake of major magnitude. The plan should be sufficiently broad in scope to include the designation of evacuation routes and means to coordinate all local government agencies in assisting local residents in the event of a major earthquake, large-scale fire or explosion, or hazardous chemical spill or release of hazardous airborne gas.
- All lines which are part of the domestic water distribution system should be looped to assure adequate pressure in the event of major fire, earthquake, or explosion. Adequate emergency standby power generation capability should be available at water wells to assure water availability in the event of a major power failure.

Goal 9: Public Safety Hazards

Goals for public safety seek to reduce loss of life or property due to crime, fire, earthquake, or other disasters or hazards, provide adequate medical and emergency services to reduce the effects of natural or manmade disasters, promote citizen awareness and preparedness for emergency/disaster situations or potential for the incidence of crime, and implement adequate interagency disaster planning.

- The City will continue to maintain and update emergency service plans, including plans for managing emergency operations, the handling of hazardous materials, and the rapid cleanup of hazardous materials spills.
- The City will continue to cooperate with the County of Fresno and other agencies in pre-disaster planning activities, such as evacuation required in the event of a serious spill of hazardous chemicals.
- The City will seek to reduce the risks and potential for hazards to the public through planning and zoning practices and regulations which avoid hazardous land use relationships and by the continued and timely adoption of new-edition building and fire codes.

The general plan's Hazard Management Element incorporates the Safety Element of the Fresno County General Plan by reference "to the extent that these original elements apply to the Kingsburg Planning area."

City of Kingsburg Storm Drain Master Plan, 2005

The primary purposes of the City of Kingsburg's Storm Drain Master Plan were to assess the existing storm drain system, determine system deficiencies, recommend cost-effective improvements to correct identified deficiencies, and identify facilities and costs for planned orderly expansion of the system to provide for planned future growth within the planning area (for purposes of flood control and groundwater recharge). The 2005 plan is an update to the 1982 plan. It considers drainage system improvements and development that has occurred since the previous plan and incorporates the latest growth plans envisioned by the City.

The current drainage system collects surface runoff in pipelines that drain to a series of retention basins located through the City. The plan includes recommendations for additional retention basins or improvements to provide the required capacity.

North Kingsburg Specific Plan, 2005

The North Kingsburg Specific Plan serves as the primary instrument of the City of Kingsburg for carrying out urban development proposals of the Comprehensive General Plan for the Swedish Village of Kingsburg as they apply in North Kingsburg, where future development in the City is focused. The plan addresses stormwater drainage as an issue associated with proposed growth and states that all surface water drainage facilities will be designed in conformance with the City of Kingsburg Storm Drain Master Plan.

Water Conservation Ordinance

City of Kingsburg Municipal Code 13.04.070 addresses water conservation (water waste). It specifies when watering is allowed for irrigating lawns, shrubs and trees (i.e., days and times or restrictions).

F.4.2 Administrative/Technical Mitigation Capabilities

Table F.7 identifies the personnel responsible for activities related to mitigation and loss prevention in Kingsburg.

Table F.7. City of Kingsburg's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Planning and Development Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	City Engineer and Building Official
Planner/engineer/scientist with an understanding of natural hazards	No	
Personnel skilled in GIS	Yes	Planning Department
Full time building official	Yes	Building Official
Floodplain manager	No	
Emergency manager	Yes	Police Chief or Fire Chief
Grant writer	Yes	Contract with outside consultant
Other personnel	No	
GIS Data—Land use		
GIS Data—Links to Assessor's data		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No	
Other		

F.4.3 Fiscal Mitigation Capabilities

Table F.8 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table F.8. City of Kingsburg's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	With voter approval
Fees for water, sewer, gas, or electric services	Yes	Water
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	With voter approval
Incur debt through special tax bonds	Yes	With voter approval
Incur debt through private activities	No	
Withhold spending in hazard prone areas	n/a	
Other	n/a	

F.4.4 Mitigation Outreach and Partnerships

The City of Kingsburg has an existing water responsible program and annual fire safety programs in schools and throughout the year at special community events.

The City of Kingsburg Fire Department recently agreed to an automatic aid agreement for fire and emergency medical services with the Fresno County Fire Protection District. They also have mutual aid agreements with Kings and Tulare county fire departments.

F.4.5 Other Mitigation Efforts

The City has implemented mitigation efforts in the past. Examples that were not covered elsewhere in this section include the following:

- The City has installed auxiliary power sources on three municipal water wells.
- The City's Building Department has standards on building elevations in reference to curbs and gutters based on past practice.
- The City has designated cooling centers and secondary sites if needed during a heat emergency. City Recreation Department staff would assist in staffing these sites, and the City would provide for water and other basic needs.
- The Kingsburg Police Department and the California Department of Transportation have a plan to divert traffic from Highway 99 in the event of fog-related traffic accidents.
- Kingsburg has a fog plan that involves constant replacement of signage and street striping to maintain visibility. The school districts implement a foggy day schedule when needed.
- The City requires, on average, pad elevation of 1 ½ feet above flow line of gutter in residential development, which prevents most flood damage.

F.5 Mitigation Strategy

The City of Kingsburg modified the goals and objectives developed by the Fresno County Hazard Mitigation Planning Committee to better fit the City's needs. The City of Kingsburg's mitigation goals and objectives are the following:

F.5.1 Mitigation Goals and Objectives

Goal 1: Provide Protection for People's Lives from All Hazards

Objective 1.1: Provide timely notification and direction to the public of imminent and potential hazards.

Objective 1.2: Protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters.

Objective 1.3: Improve community transportation corridors to allow for better evacuation routes for public and better access for emergency responders.

- **1.3.1**: Minimize issues associated with California State Highway 99 and the Union Pacific Railroad.

Goal 2: Improve Community and Agency Awareness about Hazards and Associated Vulnerabilities That Threaten Our Communities

Objective: 2.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, what is vulnerable, and recommended responses to identified hazards (i.e. both preparedness and response).

- **2.1.1**: Create/continue an outreach program, provide educational resources, and develop and provide training.

Goal 3: Improve the Community's Capability to Mitigate Hazards and Reduce Exposure to Hazard Related Losses

Objective 3.1: Reduce damage to property from an earthquake event.

- **3.1.1**: Adopt/maintain building codes to meet required earthquake standards.

Objective 3.2: Reduce flood and storm related losses.

- **3.2.1**: Provide for better collection of data related to severe weather events.
- **3.2.2**: Reduce localized flooding within the City's storm drain systems.
  - **3.2.2.1:** Implement better drainage to accommodate heavy rains that cause flooding.

Objective 3.3: Reduce hazards that adversely impact the agricultural industry.

- **3.3.1**: Promote and protect the viability of agriculture and further the County's economic development goals.
  - **3.3.1.1**: Control invasive species.
  - **3.3.1.2**: Identify and lessen freeze impacts.

Objective 3.4: Minimize the impact to the City due to reoccurring drought conditions that impact both ground water supply and agricultural industry.

3.4.1: Develop an integrated City water management plan and groundwater management plan for the City of Kingsburg.

Objective 3.5: Minimize the impact to vulnerable populations within the community that may be affected by severe weather-related events, such as long duration heat waves and hard freezes.

3.5.1: Develop community response plans, such as cooling centers, during heat waves.

3.5.2: Develop community response plans during hard freezes that damage plumbing and cause flooding.

Goal 4: Provide Protection for Critical Facilities, Utilities, and Services from Hazard Impacts

Goal 5: Maintain Coordination of Disaster Planning

Objective 5.1: Coordinate with changing DHS/FEMA needs.

5.1.1: National Incident Management System (NIMS)

5.1.2: Disaster Mitigation Act (DMA) planning

5.1.3: Emergency Operations plans

Objective 5.2: Coordinate with community plans.

5.2.1: General plans

5.2.2: Drought plans

5.2.3: Drainage plans

5.2.4: Intergovernmental agency disaster planning.

Objective 5.3: Maximize the use of shared resources between jurisdictions and special districts for mitigation/communication.

5.3.1: Develop Mutual/Automatic Aid agreements with adjacent jurisdictions and agencies.

Objective 5.4: Standardize systems among agencies to provide for better interoperability.

5.4.1: Standardize communication technology and language.

Goal 6: Maintain/Provide for FEMA Eligibility and Work to Position City Departments and Community Partners for Grant Funding

Objective 6.1: Provide City departments and other agencies with information regarding mitigation opportunities.

Objective 6.2: As part of plan implementation, review projects in this plan on an annual basis to be considered for annual FEMA PDM-C grant allocations or after a presidential disaster declaration in California for HMGP funding as well as for other local, state, and federal funding opportunities.

F.5.2 Mitigation Actions

The planning team for the City of Kingsburg identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Replace Storm Drains on Lewis and Washington Streets

Issue/Background: The 24- and 15-inch storm drain lines on Lewis and Washington streets, respectively, have collapsed, causing street flooding that is damaging the asphalt streets and threatens private property during rain events.

Other Alternatives: No action

Responsible Office: Kingsburg City Engineer

Priority (High, Medium, Low): High

Cost Estimate: $192,000

Potential Funding: FEMA Pre-Disaster Mitigation grants

Benefits (Avoided Losses): Elimination of street flooding will reduce water damage to the asphalt street (estimate replacement cost of $196,000) and possible damage to private property (homes, apartments, and professional offices).

Schedule: 12 months after funding secured

2. Enhance Traffic Diversion System

Install permanent illuminating message and directional signs, improve street stripping, and possibly widen the detour route, Simpson Street through the City of Kingsburg.

Issue/Background: California State Highway 99 runs through the center of Kingsburg. Historically, when major issues (i.e., major motor vehicle accidents) shut the highway down, traffic is detoured through the City of Kingsburg. The street that traffic is normally diverted onto is Simpson Street (Golden State Boulevard) from Mendocino Avenue at the south to either Bethel or Mt. View avenues on the north. Simpson Street is one of two main north/south arteries that run through Kingsburg.

Several times a year, a significant event occurs on Highway 99, and traffic is diverted onto Simpson Street, especially during the fog season. This diversion typically causes problems for the normal City traffic flow as well as the diverted traffic off of the highway. The City has taken measures to minimize the impact on local traffic by placing traffic signal lights at the two main east/west street arteries, Sierra and Draper streets. Assistance is needed to ensure the diverted

traffic has a clear and adequate detour through the City with minimal impact on the community and its public safety entities. With the current road conditions and signage on Simpson Street, detoured traffic often gets off course and confused. There are then thousands of Highway 99 vehicles driving around the City, which causes problems for both the routine traffic patterns and public safety. Local police must then deal with trying to keep diverted traffic on course and the problems associated with an influx of heavy traffic onto side streets that are not designed for the increased traffic load (i.e., additional motor vehicle accidents). Fire and ambulance services are also affected by slower responses due to the influx of traffic.

Other Alternatives: The City could divert highway traffic through County side streets to minimize the impact on the heavier population of Kingsburg. There are no County streets that are clearly marked or as easily accessible as Simpson Street.

Responsible Office: City of Kingsburg Public Works

Priority (High, Medium, Low): High

Cost Estimate: $154,780 (stripping cost: $40,000; four new electronic LED outdoor message signs: $114,780)

Potential Funding: California Office of Traffic Safety grants; other available grants

Benefits (Avoided Losses): This would greatly reduce the impact to major state corridor Highway 99, motor vehicle accidents, injuries, City of Kingsburg public safety, and traffic flows.

Schedule: Before the 2008/2009 winter fog season

3. Conduct Disaster Response Training

Train City elected officials, personnel, and other community entities in the National Incident Management System (NIMS), Standardized Emergency Management System (SEMS), and Incident Command System (ICS).

Issue/Background: On February 28, 2003, President Bush issued Homeland Security Presidential Directive-5, which called for development and implementation of a National Incident Management System. NIMS provides a consistent nationwide framework to enable all government, private sector, and nongovernmental organizations to work together during domestic incidents. NIMS is a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines.

The City of Kingsburg's public and private sectors have not completely fulfilled the requirements of HSPD-5. To be better prepared to respond to major events in and around the community, basic NIMS and ICS training is required. We will sponsor a NIMS/SEMS/ICS executive course for the City's elected officials and management staff. We will also provide a basic course in NIMS and ICS to both public and private sector personnel. Geographically,

Kingsburg is surrounded by unincorporated areas of three different counties: Fresno, Kings, and Tulare. This puts Kingsburg in the unique position of potentially having to work with three different local governments in the event of a disaster or major incident.

Other Alternatives: No action

Responsible Office: City of Kingsburg Fire Department

Priority (High, Medium, Low): High

Cost Estimate: $17,280 (executive course: $165/person with a minimum of 20; basic course: $233/person for up to 60)

Potential funding: U.S. Department of Homeland Security grants

Benefits (Avoided Losses): The community as a whole would be better prepared to respond to disasters or major events that occur in and around the City of Kingsburg.

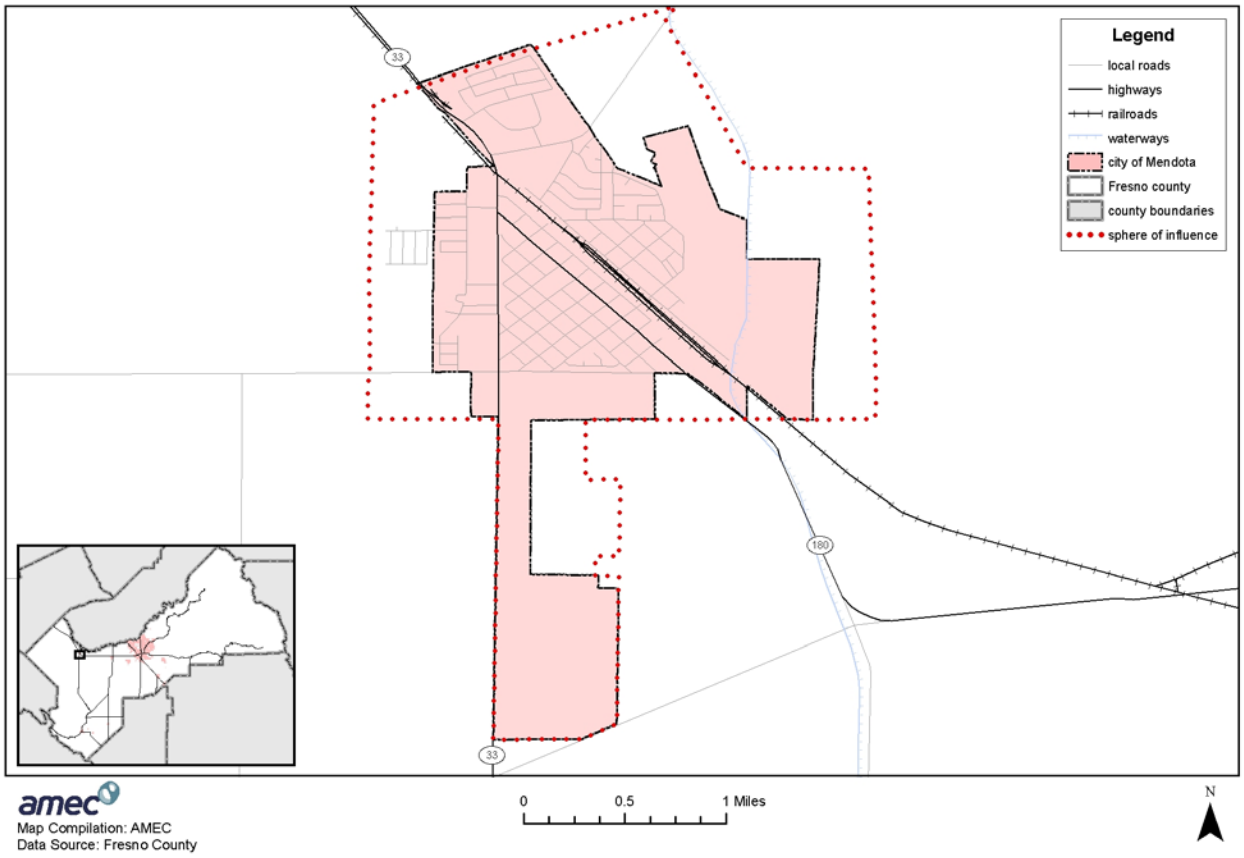
Schedule: Within the next six months (2008)

ANNEX G: CITY OF MENDOTA

G.1 Community Profile

Figure G.1 displays a map and the location within Fresno County of the City of Mendota and its Sphere of Influence.

Figure G.1. The City of Mendota



G.1.1 Geography and Climate

The City of Mendota sits in the central part of the San Joaquin Valley. The City is approximately 40.6 miles west of the City of Fresno, where California State Highway 180 and Highway 33 meet. While surrounded by thousands of acres of agricultural lands, the City of Mendota does have some neighbors. The City of Firebaugh lies eight miles to the north, and Kerman and San Joaquin are also nearby to the east and southeast, respectively.

The City of Mendota has a relatively flat terrain profile. Approximately 25-30 miles to the west is the Coast Range. In all other directions, the terrain is flat agricultural lands. Northeast of the

City is the conflux of the Mendota-Delta Canal, the Helm Canal, the San Joaquin River, and the Fresno Slough. These collect into the Mendota Pool Lake. This lake flows down the Fresno Slough. To the east is the 12,000 acre Mendota Wildlife Refuge for Pintail and Snow Geese species.

Mendota has high temperatures that range from 40-50°F in the winter and 100-110°F in the summer. The average rainfall is 11.94 inches per year.

G.1.2 History

In 1891, the Southern Pacific Railroad established a storage and switching facility at the site of present-day Mendota, allegedly to avoid the unruly town of Firebaugh. This service point was unusually large and well-equipped and included a roundhouse and repair facilities. In 1868, under governmental pressure, the Mendota Pool was built to facilitate ship passage on the river, but regulations were eventually changed, and the turntable gate was never used.

By 1900, a good-sized business district had grown around the train station. Development slowed abruptly in 1910 when the railroad discontinued use of the roundhouse. To make matters worse, the largest landowner sold off his holdings at about the same time, ending his support of the local economy.

For a time, a diatomite mine operated in the area. That industry, together with the increasing number of farm workers who resided in the town, brought pressure for municipal services, and Mendota incorporated in 1942.

In the 1950s, the State of California established the Mendota Wildlife Refuge, where, at the time, deer, elk, and migratory birds from Siberian breeding grounds would spend the winter. Although today the deer and elk are gone, the birds still migrate to the refuge for the winter. In 1964, the County established Mendota Pool Park at the site of the turntable gate, which includes an 85-acre park with launch ramp, playgrounds, and picnic areas.

G.1.3 Economy

The City of Mendota's economy is largely based on agriculture. Approximately 30 percent of the City's residents have jobs in agriculture. Approximately 29 percent work in the service sector, but much of this sector's business is based on the success of local agriculture. Currently, the City of Mendota is suffering from a 31.77 percent unemployment rate. The Bureau of Reclamation recently retired over 100,000 acres of farmland, which resulted in losses to the agricultural sector and some of its employees.

In 1999, the median household income was $23,705, and the per capita income was $6,967. Recently, the City Council and staff came together with Mendota Unified, West Hills College District, and Firebaugh and Golden Plains Unified to develop the Westside Institute of

Technology, which is anticipated to train the Mendota's next generation to move the City's economy away from agriculture and produce greater diversity for the economy's reliance.

G.1.4 Population

The total population for the City of Mendota was estimated at 9,426 in 2007. The population of Mendota is predominately Hispanic, at 94.65 percent of the total population. The people of Mendota, on average, are fairly young. Approximately 40 percent of the population is under 20 years old, and the next 40 percent is between 21 and 45 years of age. 23.16 percent of Mendota's population has graduated from high school, with 0.48 percent attaining a bachelor's degree or higher. 41.9 percent of the population lives below poverty.

G.2 Hazard Identification and Summary

Mendota's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Mendota (see Table G.1). In the context of the plan's planning area, there are no hazards that are unique to Mendota.

Table G.1. City of Mendota—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Limited	Critical	Medium
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Catastrophic	Medium
Drought	Likely	Extensive	Critical	High
Earthquake	Occasional	Extensive	Critical	High
Flood	Likely	Significant	Critical	High
Landslide	Unlikely	Limited	Limited	Low
Severe Weather:				
Extreme Cold/Freeze	Likely	Extensive	Negligible	Low
Extreme Heat	Highly Likely	Extensive	Limited	Medium
Fog	Likely	Extensive	Negligible	Low
Snow	Unlikely	Limited	Limited	Low
Tornado	Occasional	Limited	Limited	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Medium
Soil Hazards:				
Erosion	Occasional	Limited	Limited	Low
Expansive Soils	Highly Likely	Extensive	Limited	Low
Land Subsidence	Occasional	Significant	Limited	Low
Volcano	Unlikely	Limited	Limited	Low
Wildfire	Occasional	Limited	Limited	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

G.3 Vulnerability Assessment

The intent of this section is to assess Mendota's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

G.3.1 Assets at Risk

This section discusses Mendota's assets at risk, inlcuding values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table G.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Mendota.

Table G.2. 2007 Roll Values for the City of Mendota by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	-	-	-	2	4,474	2	4,474
Commercial	106	14,296,087	4,705,266	32	1,269,326	138	20,270,679
Industrial	21	22,299,992	2,981,928	7	524,613	28	25,806,533
Open Space	2	27,971	17,872	4	150,662	6	196,505
Residential	1,314	121,458,879	32,274,925	152	3,413,523	1,466	157,147,327
Other	1	13,494	1,424	-	-	1	14,918
Total	**1,444**	**158,096,423**	**39,981,415**	**197**	**5,362,598**	**1,641**	**203,440,436**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Mendota from Fresno County GIS is provided in Table G.3 and illustrated in Figure G.2.

Table G.3. City of Mendota's Critical Facilities

Critical Facilities Type	Number
Airports	1
Communications Centers	-
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	1
Health Care Facilities	1
Law Enforcement Facilities	-
Maintenance Yards	1
Residential Elderly Facilities	-
Schools and Day Care Facilities	10
Public Utilities—Water/Sewer	-
Totals	**15**

Source: Fresno County GIS

Figure G.2. City of Mendota's Critical Facilities

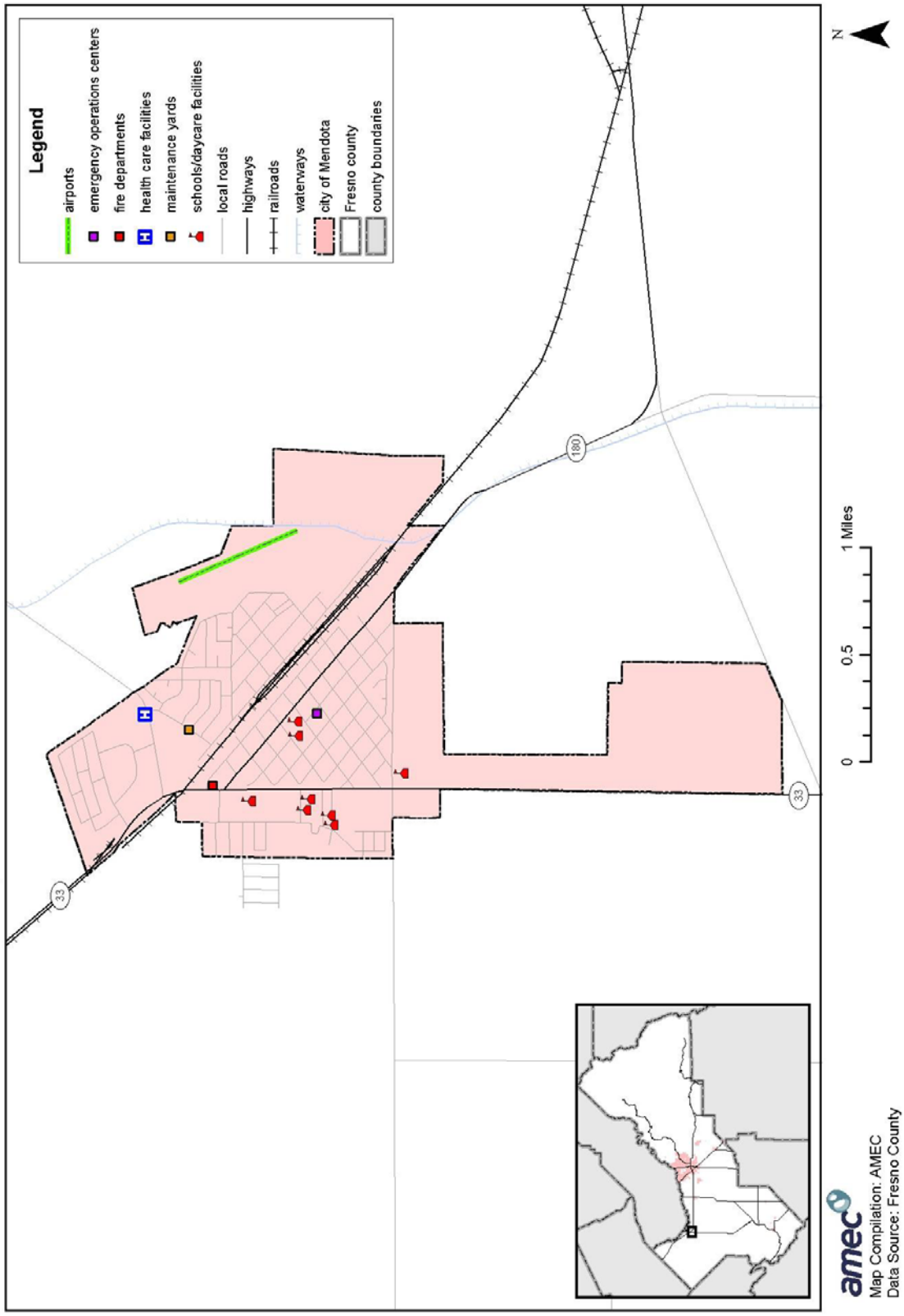


Table G.4 lists particular critical facilities and other community assets identified by Mendota's planning team as important to protect in the event of a disaster. It should be noted that information from the Fresno County GIS does not match this information provided by the City.

Table G.4. Specific Critical Facilities and Other Community Assets Identified by City of Mendota Planning Team

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info.
Water Treatment Plant	$8 million	4.5 MGD	Earthquake, manmade
Wastewater Treatment Plant	$5 million	1.24 MGD	Earthquake, flood, manmade
Sewer and Water System pipes	$30 million		Earthquake
Mendota Municipal Airport	$1 million		Earthquake, flood, manmade (accidents)
Natural Gas line at Water Treatment Plant	$50,000		Earthquake, fire
Mendota Wildlife Refuge	N/A		Flood, wildfire, manmade

Growth and Development Trends

Current growth trends are on three borders of the City. A new federal prison and Fresno County Library are to the south of the City in an area that will be annexed into the City limits, and new housing tracts are being built to the west and the north of the City.

Some of the growth has come in the form of infill commercial development as well. The only large and critical infrastructure development being planned for the City is an expansion of the wastewater treatment plant. New housing construction is going in as mid-range homes with on-site construction. Only 2 percent of the buildings constructed in the last year have been pre-manufactured, all belonging to the City.

Table G.5 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table G.5. City of Mendota's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
7,890	9,426	+1.95	1,878	2,193	+1.68

Source: California Department of Finance, www.dof.ca.gov/Research/

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

G.3.2 Estimating Potential Losses

Table G.2 above shows Mendota's total exposure to hazards in terms of population and the number and values of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures:

- There are currently 49 parcels in the 100- and 500-year floodplains in Mendota.
- The number of unreinforced masonry buildings is unknown.
- There are no hospitals built before 1973.

Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

Agricultural losses have cascading effects on the City of Mendota. The loss of crops from any hazard event results in loss productivity for farm owners, loss of jobs for farm workers, and loss of expendable income for use in stores. It also limits the City's revenue. In a small city like Mendota, there is even more interdependency than in larger cities, and what affects one sector affects them all. Local crops include cantaloupe, broccoli, lettuce, and alfalfa.

Dam Failure

Mendota is in the mapped inundation areas for the Friant and Pine Flat dams.

Drought

Mendota's water supply comes from groundwater and the Delta System. Due to provisions of the Endangered Species Act, the City may receive only 10 percent of their current supply through the Delta System when there are droughts in the future.

Earthquake

Mendota is located in Seismic Zone 3 but near the boundary of the more hazardous Seismic Zone 4, which covers the foothills to the west. The Ortigalita fault is located approximately 30 miles northwest of Mendota. It is considered active and is designated an Earthquake Hazard Zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994.

Mendota's planning team identified several important buildings that are vulnerable to seismic events and may be constructed of unreinforced masonry, which are particularly susceptible to earthquake shaking. These included the following:

- Water Treatment Plant
- Wastewater Treatment Plant
- Community Recreation and Public Works departments
- Old Mendota Library

Severe Weather: Extreme Heat

Heat is one of the greatest threats to the migrant farm workers and elderly. The temperatures in the City of Mendota rise to over 100°F, occasionally exceeding 105°F, each summer. During the summer of 2007, the City of Mendota was asked by the Fresno County Office of Emergency Services to make available its City Hall and Senior Center as a cooling shelter for the better part of a week. The City works with the Fresno County Office of Emergency Services during extreme heat events. There are no designated shelters, but the Mendota City Hall often serves as a cooling center. These events can also affect the City economically due to increased water usage.

Flood

According to the 2005 Flood Insurance Study, there are three basic areas of flooding in Mendota: along Belmont Avenue, the Hacienda Gardens area, and a ponded area west of Highway 33 and the railroad. There are no defined channels within the City limits of Mendota. Thus, the principal type of flooding in the City of Mendota area is sheetflow—broad, shallow, overland flooding, which is generally less than three feet deep and characterized by unpredictable flow paths.

The main source of flooding in Mendota is heavy rains in the hills west of the City, which run off into Panoche Creek. The City of Mendota lies at an approximate elevation of 175 feet. Terrain in the study area slopes gently from the southwest to the northeast. The drainage basin of Panoche Creek originates in the Diablo Range approximately 30 miles west of the City of Mendota. The creek flows through steep mountain canyons in well-defined channels to the California Aqueduct (around the foothill line). From there to Mendota, the land is relatively flat, and the channel steadily decreases in size and carrying capacity due to siltation and vegetable growth, until it ends at Belmont Avenue. During high creek flows, stormwater floods vast tracks of agricultural land and drain into Belmont Avenue. The planning team for Mendota agreed that, on average, flooding occurs on Belmont Avenue twice per year but is relatively minor. Drains become clogged with sedimentation from flood events. The City pays to remove this build-up annually. Nevertheless, a significant flood occurs every two to three years.

The planning team identified areas of localized stormwater flood problems. The drainage system for storm- and wastewater is an intricate system that spans across the entire City. There are only three pumps in the system, two that pump the water from one gutter under the school grounds to the gutters on the other side, and one to minimize the constant flooding across Highway 33 in

town. The rest of the system relies on gravity and was not designed to process typical stormwater loads. There are several points along the system that will pool water, as the slope is so minimal that the water does not move through the system quickly enough.

The Chowchilla Canal Bypass, constructed by the State of California, reduces flood potential in the Mendota-Firebaugh area. The bypass starts approximately five miles east (upstream) of the City of Mendota and can carry approximately 9,000 cfs of San Joaquin River floodwater around the two communities to return it to the river at a point where channel capacity is great enough to carry the flow. In the past, channelization of Panoche Creek and construction of levees (now removed) diverted additional floodwater east along Belmont Avenue toward the City and increased flood damage.

Previous flood events that impacted the City include the following:

- **October 1, 1976**—This flood damaged 15 homes and 12 businesses for an estimated $44,430 loss. Rains in the hills west of Mendota contributed to runoff in the Panoche-Silver Creek and water flooded into City limits. The flooding occurred along Belmont Avenue. Agricultural and infrastructure damage is unknown. According to a report from the American Red Cross, the organizations provided "canteen service" to about 300 people on the levee and sheltered 75 people at their church shelter.
- **1991**—Rains in the hills west of town caused massive flooding along Belmont Avenue and cut the high school off from the rest of the City. The flooding also limited the ability for Highway 180 traffic to pass through, which decreased potential business traffic in the City. Additional costs to the City were associated with temporary damns constructed by the Public Works Department.
- **1995**—Floodwaters filled streets and caused widespread damage.

According to FEMA's 2005 Flood Insurance Study, damaging floods also occurred in the area in April 1958 and January-February 1969. Details on these events follow:

- **April 1958**—In this flood, a discharge of 5,090 cfs was recorded on Panoche Creek. Flooding began approximately 10 miles west of the City of Mendota and spread in a fan shape to the northeast for 5 to 10 miles. Approximately 9,700 acres of agricultural land (mostly west of the City of Mendota) and some residential property in the southwest part of the City were flooded. Damage was estimated at $460,000. Up to five feet of floodwater remained in some areas for as many as 30 days. Crops were destroyed or production was severely reduced, extensive cleanup and restoration of agricultural land and improvements were required, streets and homes were damaged, and traffic was disrupted. Extensive flood fighting prevented flood damage that otherwise would have occurred.
- **January-February 1969**—The largest known discharge on Panoche Creek (5,400 cfs) was recorded in February 1969. Flooding began approximately 10 miles west of the City of Mendota and spread in a fan shape to the northeast for 5 to 10 miles. Approximately 18,400 acres, predominantly agricultural, were flooded. Damage approximated $1.8 million. Large

quantities of silt and debris were deposited on fields and orchards, and oil and gas pipelines were undermined. Residential damage in Mendota was minor due to flood fighting efforts.

- **February 1998**—Runoff from heavy rains in the hills west of Mendota caused a major flood. The drainage system, which was designed to handle 300 cfs, received 7,000 cfs causing three feet of water to flood and close Belmont Avenue. This event cut off the high school from the rest of City and severely limited the ability for traffic on Highway 180 to pass through. This event also caused business losses due to inability for most vehicles to access the City commercial area. The only recorded costs for the flood are from the Public Works Department: approximately $32,500 in labor and equipment was spent to fight and clean up the flood.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Mendota was created (see Figure G.3). Tables G.6-G.8 summarize the values at risk in the City's floodplain. Table G.6 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table G.7 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table G.8 shows loss estimates by flood.

Figure G.3. City of Mendota's 100- and 500-Year Floodplains

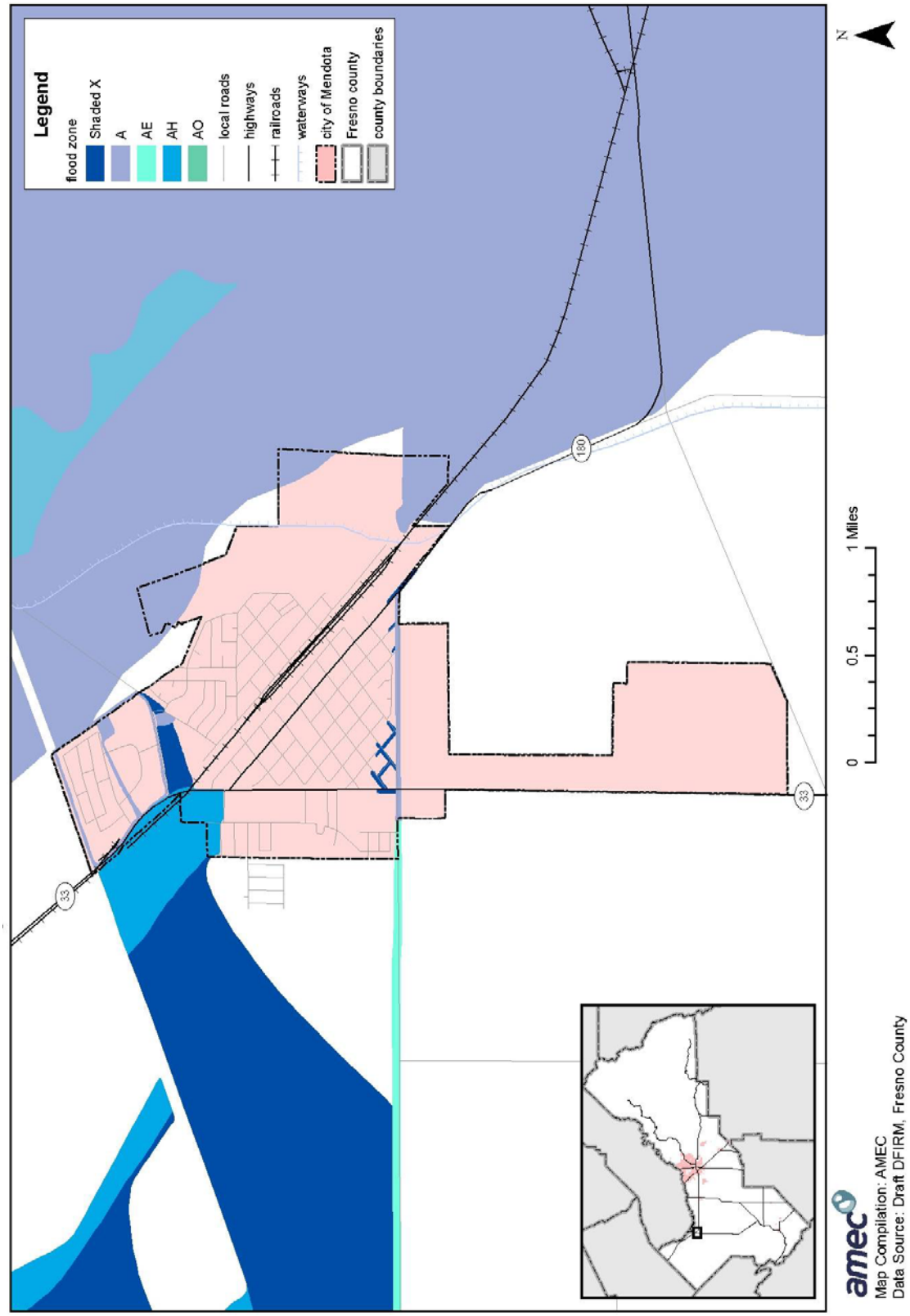


Table G.6. Count and Improved Value of Parcels in Floodplain by Zone—City of Mendota

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	1	-	-	-	-	-
Commercial	1	24,124	-	-	3	107,050
Industrial	1	562,346	-	-	-	-
Open Space	3	16,058	-	-	-	-
Residential	12	7,167,235	1	77,183	22	1,360,236
Total	**18**	**7,769,763**	**1**	**77,183**	**25**	**1,467,286**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	-	-	-	-	1	-
Commercial	-	-	-	-	135	13,867,302
Industrial	-	-	-	-	32	9,757,811
Open Space	-	-	-	-	6	44,029
Residential	-	-	5	85,995	1,427	112,719,406
Total	**-**	-	**5**	85,995	**1,601**	**136,388,548**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table G.7. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Mendota

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	1	-	-	-	1	-
Commercial	4	131,174	-	-	4	131,174
Industrial	1	562,346	-	-	1	562,346
Open Space	3	16,058	-	-	3	16,058
Residential	35	8,604,654	5	85,995	40	8,690,649
Total	**44**	**9,314,232**	**5**	**85,995**	**49**	**9,400,227**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table G.8. Fresno County Flood Loss Estimates—City of Mendota

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	44	9,314,232	4,657,116	13,971,348	2,794,270
500-Year Flood	5	85,995	42,998	128,993	25,799
Total Flood**	**49**	**9,400,227**	**4,700,114**	**14,100,341**	**2,820,068**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Mendota has assets at risk to the 100-year and greater floods. Forty-four improved parcels are within the 100-year floodplain for a total value of roughly $9 million. Five additional improved parcels valued at $85,995 fall within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $2.8 million in damage in the City of Mendota. The additional damage caused by a 500-year flood (.2 percent chance in any given year) is not significant.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Mendota joined the National Flood Insurance Program (NFIP) on September 1, 1981. NFIP insurance data indicates that as of November 30, 2007, there were 11 flood insurance policies in force in the City with $2,236,100 of coverage. All 11 policies were for single-family homes, 4 of which were in A zones (the remaining 7 were in B, C, and X zones).

There have been three historical claims for flood losses totaling $2,572; two were for residential properties, one was nonresidential. Information was not provided on the location (zones) of these claims or their pre- or post-FIRM status. There were no repetitive or severe repetitive loss structures.

Population at Risk

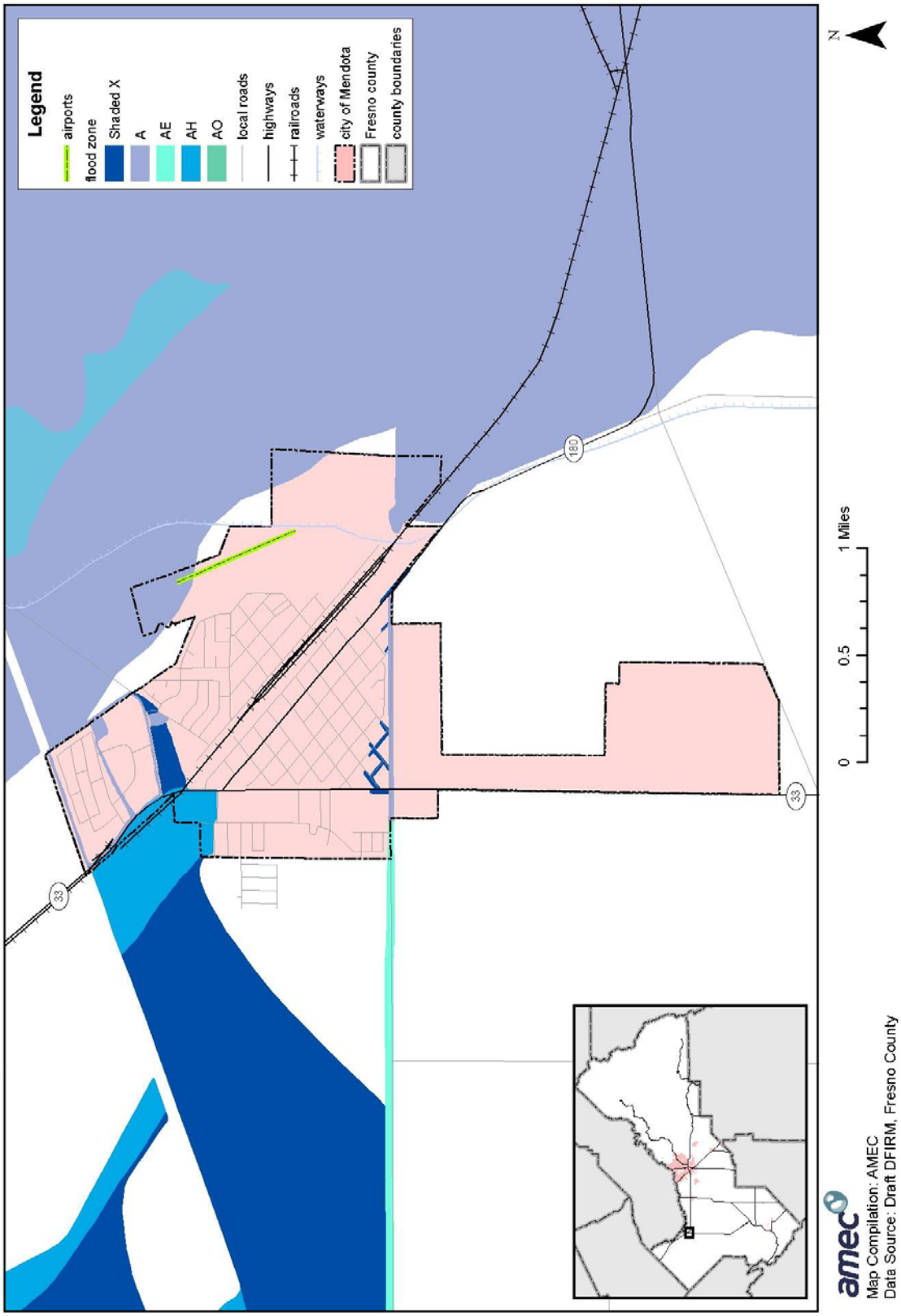
Based on information from HAZUS-MH MR3 (Census 2000) and the digital flood insurance rate map, the following are at risk to flooding in the City of Mendota:

- **100-year flood**—240 people
- **500-year flood**—81 people
- **Total flood**—321 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Figure G.4 illustrates the locations of critical facilities relative to the floodplain in the City of Mendota. According to data from Fresno County GIS and the digital flood insurance rate map, there is only one critical facility in Mendota's floodplains, which is an airport in the 100-year floodplain. While Mendota High School itself is not in the floodplain, it is on Belmont Avenue, where Panoche Creek runs during big winter storms. The water can get more than one foot deep as it goes past the high school and can cut off the school from the rest of town (as has happened in the past). Also of concern to the City is the Fresno County fire station (mapped in Figure G.2), which is on the edge of the flood zone.

Figure G.4. Critical Facilities in the 100- and 500-Year Floodplains: City of Mendota



Other Hazards

While of lower planning significance to the City relative to other hazards, the following information about expansive soils and wildfire should still be noted:

Soil Hazards: Expansive Soils

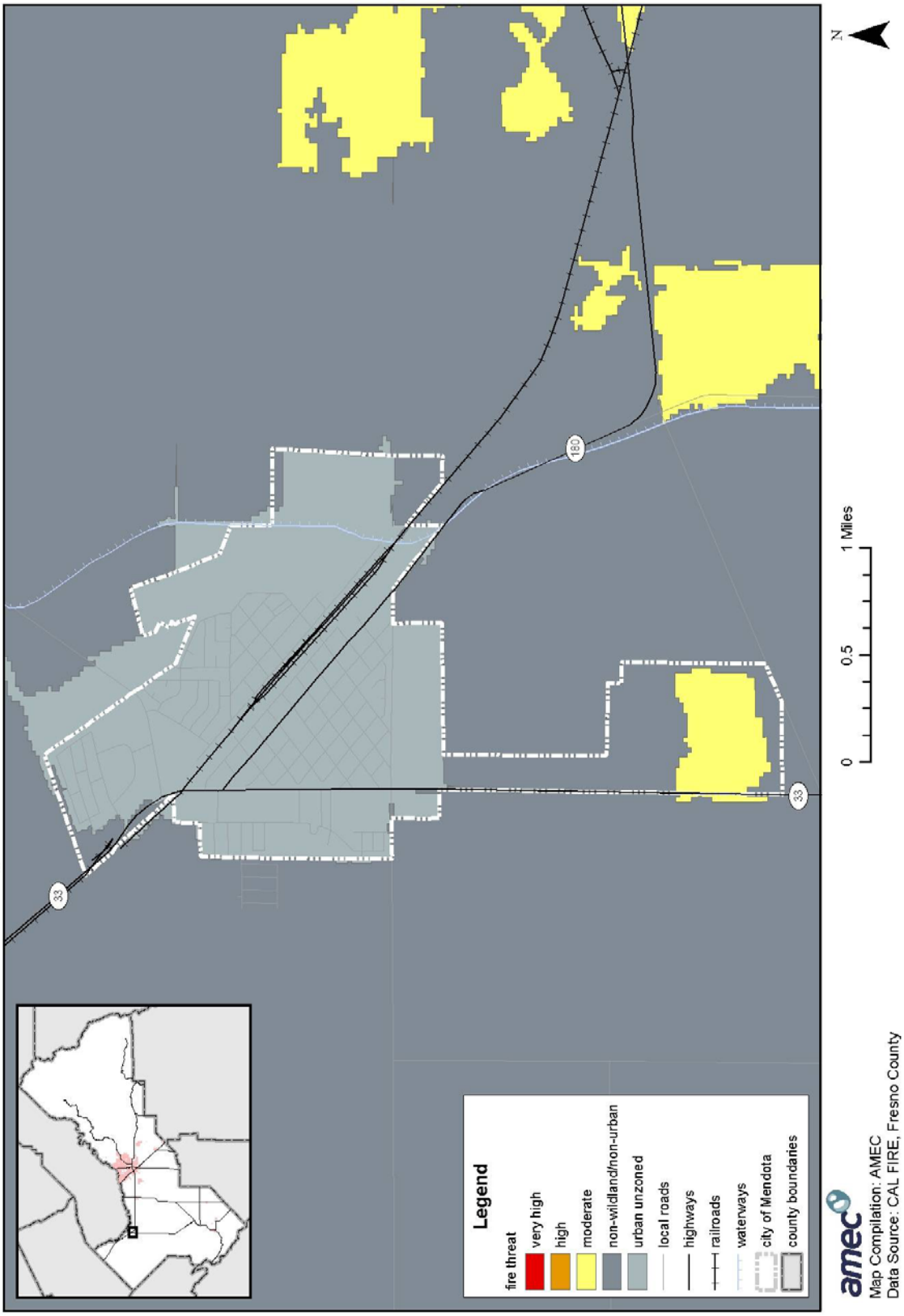
Expansive soils occur throughout the City. In new buildings, a soils report is required prior to building, and appropriate measures are incorporated to address the hazard. In older buildings, these soils cause problems for foundations.

Wildfire

There is some wildfire risk in the Fresno Slough due to weedy vegetation growth. The slough is surrounded by agriculture, and a wildfire could put water wells at risk. There may also be some wildfire risk at the Mendota Wildlife Refuge.

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Mendota was created (see Figure G.5). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Mendota.

Figure G.5. City of Mendota's Wildfire Threat



G.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

G.4.1 Regulatory Mitigation Capabilities

Table G.9 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Mendota.

Table G.9. City of Mendota's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	1991 (a current update, 2008, is being developed and will be adopted soon)
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	Water Conservation Ordinance
Building code	Yes	Version: 1997 Uniform Building Code (California Code 2002 may soon be adopted)
Fire department ISO rating	N/A	No local fire department; County provides fire protection services
Erosion or sediment control program	No	
Stormwater management program	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	2004
Other special plans	No	
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005
Elevation certificates	No	

City of Mendota General Plan

The City of Mendota General Plan is the official statement of the City regarding future growth and quality of development in the planning area. The current general plan was adopted in 1991 but is undergoing an update and is likely to be adopted in early to mid-2008. Policies contained in the plan's Land Use Element are designed to enhance Mendota's existing urban environment. Further, they seek to encourage new urban growth and development, provided that such growth

will have minimal adverse impacts upon the environment (which will mitigate hazards), among other things. It is intended to serve as a basis for local decision makers to determine development and land utilization patterns in the City.

Floodplain Management Ordinance

The purpose of the Floodplain Management Ordinance is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas. In order to accomplish this purpose, it includes methods and provisions to:

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

The ordinance applies to all areas of special flood hazards within the jurisdiction of the City of Mendota. Notably, it requires that a permit be obtained before construction or other development begins within any area of special flood hazard. It appoints the City manager as floodplain administrator to administer, implement, and enforce the ordinance by granting or denying development permits in accord with its provisions and describes the accompanying duties and responsibilities.

Water Conservation Ordinance

The Water Conservation Ordinance regulates the use of water supplied by the City of Mendota. It identifies requirements that apply at all times (e.g., limiting wasteful uses and the use of hoses without a positive pressure nozzle on the end) and defines three stages of water conservation and the use restrictions associated with each. During stage 1 water conservation, there is a voluntary conservation to limit water from May through September. Stage 2 involves a mandatory ban on water usage, such as limited times to wash vehicles, nonoperation of ornamental fountains, and limiting restaurants to only serve water when asked by customers. Stage 3 applies further limitations, including a ban on the times when vegetation may be irrigated and the prohibition of vehicle washings that are not in the immediate interests of public safety, health, and welfare, and the filling, refilling, or adding of water to swimming pools. Citations are used to enforce these regulations.

Emergency Operations Plan

The City of Mendota's Emergency Operations Plan was prepared to ensure the most effective and economic allocation of resources for the maximum benefit and protection of the community in time of emergency. It establishes the emergency organization, assigns tasks, specifies policies and general procedures, and provides for coordination of planning efforts among the City's emergency staff and service elements. The objective of the plan is to incorporate and coordinate City facilities and personnel in an efficient organization capable of responding to, and recovering from, any emergency.

G.4.2 Administrative/Technical Mitigation Capabilities

Table G.10 identifies the personnel responsible for activities related to mitigation and loss prevention in Mendota.

Table G.10. City of Mendota's Administrative and Technical Mitigation Capabilities

Personnel Resources	Department/Position
Planner/engineer with knowledge of land development/land management practices	Contracted by City Engineer
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Contracted by City Engineer
Planner/engineer/scientist with an understanding of natural hazards	Contracted by City Engineer
Full time building official	
Floodplain manager	City Manager
Emergency manager	City Manager
Grant writer	Multiple people fill this role (no official position, depends on the nature of the grant)
Other personnel	Multiple/varied (various positions constitute the Emergency Management Team in accordance with the Mendota Emergency Plan)
Warning systems/services (Reverse 9-11, outdoor warning signals)	Fresno County Office of Emergency Services (the County can provide assistance in this capacity)

As far as personnel resources, employees of the City of Mendota have diverse expertise, including engineering, risk management, and incident command. The City has an emergency operations plan (see above) that optimizes response to a disaster, and they have secured what technologies they can in regard to limiting the damage and risk from hazards, but they do not have GIS capabilities.

G.4.3 Fiscal Mitigation Capabilities

Table G.11 identifies financial tools or resources that the City could potentially use to help fund mitigation activities. There are currently no specific funding sources for hazard mitigation.

Table G.11. City of Mendota's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water and sewer
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	Can, but currently do not
Incur debt through special tax bonds	Yes	Can, but currently do not
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

One of the challenges to mitigation in Mendota involves fiscal capabilities. Mendota is a small city with an agriculturally based economy and high unemployment that suffers from one of the lowest revenues in the state. Execution of mitigation actions is limited due to this financial limitation.

G.4.4 Mitigation Outreach and Partnerships

Aside from the partnership to establish this multi-hazard mitigation plan with the County of Fresno, the City of Mendota is not engaged in many partnerships. The City has personnel trained in Incident Command and contracts with the Fresno County Sheriff's Department for public safety services. Additionally, the City conducts limited education on hazards with the exception of the issues of water usage and West Nile virus.

G.4.5 Other Mitigation Efforts

The City of Mendota has undertaken improvements to mitigate damage from flood, one of its most dramatic and regular hazard events. The City has installed a long running underground pipe along Belmont Avenue, one of the major floodways, in conjunction with the California Department of Transportation. The City has also built humps into the streets along this floodway to limit water flows entering residential streets and homes.

G.5 Mitigation Strategy

G.5.1 Mitigation Goals and Objectives

The City of Mendota adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

G.5.2 Mitigation Actions

The planning team for the City of Mendota identified the following mitigation action based on the risk assessment. Background information and information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Build a Stormwater Catch Basin

Issue/Background: Mendota has historically experienced flooding during the rainy season, which has resulted in damage of approximately $75,000 (for those events that documentation is available). A contributing factor is the flood flows from the Panoche-Silver Creek, which runs heavy annually and often spills over and down into the City. Adding to this is the lack of an adequate storm drain system to capture and channel the water.

Ideas for Implementation: The plan is to capture and channel the storm flows into a 40-acre detention basin. The system currently is not designed for the flows that come in from the Panoche-Silver Creek. The basin will allow for the collection of the excess water to keep water off of the streets and out of homes and to restrict the flow so that it stays within the capacity of the City's storm drain system.

Other Alternatives: No action

Responsible Office: City of Mendota

Priority (High, Medium, Low): Medium

Cost Estimate: $2.25 million for the full 40 acres

Potential Funding: Lobbying effort to Washington DC in January 2008 to advocate for this project and others

Benefits (Avoided Losses): Already, there has been approximately $75,000 in damage. If one looks at the figures, the costs are increasing over time. The last documented event consumed roughly half this amount. Extrapolating from this data, one can assume that within the next 10 years, the project will likely save over $100,000, and more over time.

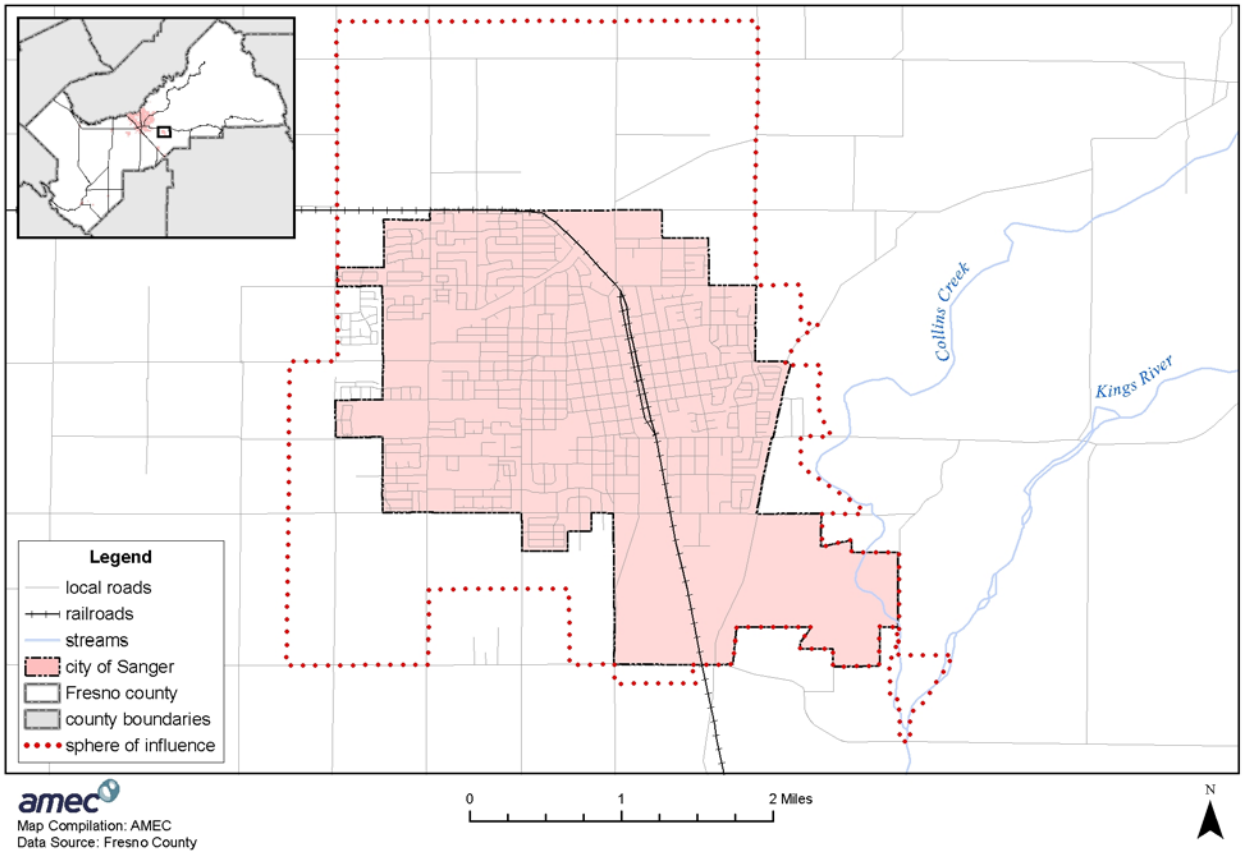
Schedule: Approximately 12 months from funding based on environmental work, excavation, etc.; likely 1st or 2nd quarter of 2009

ANNEX H: CITY OF SANGER

H.1 Community Profile

Figure H.1 displays a map and the location within Fresno County of the City of Sanger and its Sphere of Influence.

Figure H.1. The City of Sanger



H.1.1 Geography and Climate

The City of Sanger has a Central Valley desert climate. The land is generally flat with surface slope of five feet per mile. The City is located on an alluvial plain formed by the Kings River drainage system. Once largely an agricultural community, Sanger is currently undergoing residential development. Summers are hot and dry, and winters are cold and foggy. The annual average precipitation is 10.4 inches of precipitation.

H.1.2 History

The City of Sanger was founded in 1888 and incorporated in 1911. In 1926, the General Grant Tree was designated the nation's Christmas tree by U.S. President Calvin Coolidge and the U.S. Department of the Interior. In 1949, the City of Sanger was designated as the Nation's Christmas Tree City by the U.S. Postal Service, and 10 years later, the General Grant Tree was designated as a National Shrine by the U.S. Congress.

The City was named after Joseph Sanger Jr., who at the time was secretary and treasurer of the Railroad Yardmasters Association. He was never in Sanger but was told at an annual convention in San Francisco that Southern Pacific Railroad officials had named a town in Fresno County for him. At the time, the town was being surveyed.

The history of Sanger is housed in the Sanger Depot Museum, which is actually the Sanger Railroad Depot, once the hub of the town's growth. Built in 1887, the Sanger Railroad Depot sat beside the Southern Pacific Railroad that ran between Fresno and Porterville, California. Among the cargo that passed through this depot was grain, citrus, and lumber brought down from the mountains by Sanger's booming lumber operation. When Sanger's commerce no longer needed the Depot, it was discovered that the building was the oldest in Sanger. It was purchased by a local business family and donated to the Sanger Historical Society. The museum opened in December 1977.

H.1.3 Economy

Sanger offers the conveniences and services of a major city as well as the rural lifestyle prized by so many. Sanger is a full-service city located minutes from California's fifth largest and fastest growing urban center. Its award-winning school district is a magnet for families looking to combine educational excellence with smaller town amenities.

Sanger business development and job growth are robust. The Sanger Redevelopment Agency offers shovel-ready, pre-zoned industrial parcels ranging in size up to 20 acres at attractive prices and terms. Industrial residents come in all sizes, from Fortune 100 Weyerhaeuser to numerous small and midsize manufacturers and food processors. Sanger is strategically situated to take advantage of the California market and its nearly 38 million customers.

The five major employers for the City are Sanger Unified (903 employees), Walmart (400 employees), Weyerhaeuser (157 employees), Del Monte (150 employees), and ADCO (130 employees). The City has three high schools, nine elementary schools, three charter schools, and one community day school. Enrollment in 2006 was 9,160.

Sanger's location at the base of the Sierra Nevada mountain range provides limitless recreational opportunities. In less than an hour, residents can view the world's largest trees in Sequoia National Park. A few minutes more will bring you to the bottom of the deepest river gorge in the United States, Kings Canyon National Park, or to the powdery slopes of nearby ski resorts.

Numerous foothill parks, campgrounds, lakes, and streams provide families with ample choices for daytrips or extended vacations.

H.1.4 Population

The population of the City of Sanger was estimated at 23,289 in 2007. 82.2 percent of the population is Hispanic. The other remaining 17.8 percent are of other ethnicities. The largest population age group is the 5 to 19 year olds.

3.1 Hazard Identification and Summary

Sanger's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Sanger (see Table H.1). In the context of the plan's planning area, there are no hazards unique to Sanger.

Table H.1. City of Sanger—Hazard Summaries

Hazard	Probability of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Limited	Limited	Low
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Catastrophic	Medium
Drought	Likely	Extensive	Critical	High
Earthquake	Occasional	Extensive	Limited	Medium
Flood	Likely	Limited	Limited	High
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Cold/Freeze	Highly Likely	Extensive	Critical	Medium
Extreme Heat	Highly Likely	Extensive	Limited	Medium
Fog	Highly Likely	Extensive	Limited	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Low
Snow	Unlikely	Extensive	Limited	Low
Tornado	Occasional	Limited	Limited	Low
Soil Hazards:				
Erosion	Occasional	Significant	Limited	Low
Expansive Soils	Unlikely	Limited	Negligible	Low
Soil Liquefaction	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Extensive	Limited	Low
Wildfire	Unlikely	Limited	Negligible	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

H.3 Vulnerability Assessment

The intent of this section is to assess Sanger's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

H.3.1 Assets at Risk

This section considers Sanger's assets at risk, including values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table H.2 shows the 2007 roll values (e.g., the values at risk) broken out by property type for the City of Sanger.

Table H.2. 2007 Roll Values for the City of Sanger by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	4	276,386	752,231	1	118,710	5	1,147,327
Commercial	265	49,090,799	23,290,677	52	2,936,922	317	75,318,398
Industrial	85	79,759,165	10,489,826	26	5,074,745	111	95,323,736
Open Space	-	-	-	-	-	-	-
Residential	5,463	621,325,127	211,829,057	666	32,491,776	6,129	865,645,960
Other	1	46,382	23,186	-	-	1	69,568
Total	**5,818**	**750,497,859**	**246,384,977**	**745**	**40,622,153**	**6,563**	**1,037,504,989**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical

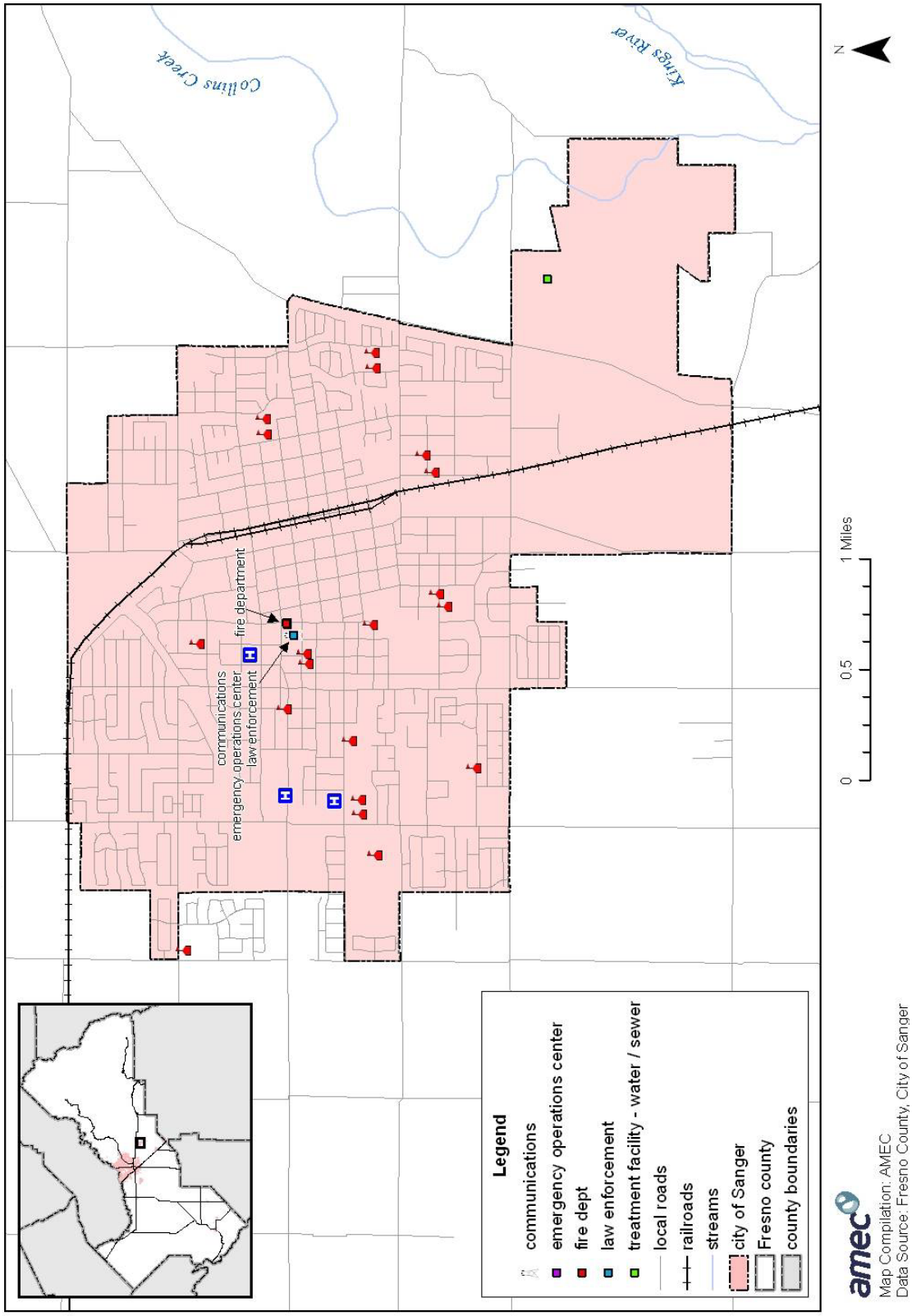
facilities in the City of Sanger from Fresno County GIS and the City of Sanger is provided in Table H.3 and illustrated in Figure H.2.

Table H.3. City of Sanger's Critical Facilities

Critical Facilities Type	Number
Airports	-
Communications Centers	1
Detention Centers	-
Emergency Command Centers	-
Emergency Operations Centers	1
Fire Departments	1
Health Care Facilities	3
Law Enforcement Facilities	1
Maintenance Yards	1
Residential Elderly Facilities	-
Schools and Day Care Facilities	19
Public Utilities—Water/Sewer	2
Totals	**29**

Source: Fresno County GIS, City of Sanger

Figure H.2. City of Sanger's Critical Facilities



The Police and Fire departments are not secured and fenced in. The City has sought grant funding in the past to fence these facilities but has not been successful thus far.

The City operates and maintains the wastewater collection system, a domestic wastewater treatment plant, and an industrial wastewater treatment plant within the City limits. All of the wastewater that flows from the City is collected and treated at the Sanger wastewater treatment plants. Stormwater in Sanger is piped to stormwater percolation basins and is not treated at the Sanger wastewater treatment plant.

Growth and Development Trends

The City of Sanger, once largely an agricultural community, is currently undergoing significant residential development. All areas of the City are growing. However, growth is anticipated to be focused on the north and northwest sides of town. The State Road 180 project on the north side of town is expected to spur the major building activity over the next 20 years as the City expands up to the northern limits of the existing Sphere of Influence. Paced growth is also expected to the west, with nominal growth in the south and east.

Table H.4 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Table H.4. City of Sanger's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
18,931	23,289	+23.02	5,420	6,527	+20.42

Source: California Department of Finance, www.dof.ca.gov/Research/

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

H.3.2 Estimating Potential Losses

Table H.2 above shows Sanger's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 263 parcels in the 100- and 500-year floodplains in the City of Sanger. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Dam Failure

The Pine Flat Dam, managed by the U.S. Army Corps of Engineers, is 16 miles northeast (upstream) of Sanger on the Kings River. Should it fail, a flood-tide would engulf the City in approximately one hour according to Corps inundation studies.

Drought

Groundwater is the sole water supply for the City. The Kings River recharges the groundwater, along with runoff from the foothills, which to date has been sufficient to meet the needs of the area. However, the groundwater storage level is decreasing at an alarming rate in the Sanger area and in the San Joaquin Valley.

In an effort to reduce the effects of a drought, the City has constructed wastewater percolation ponds to help recharge the groundwater basin. The City currently percolates approximately 1.7 million gallons per day of final effluent back into the groundwater basin. The City recently spent approximately $3.6 million to replace a number of old water pipelines that were leaking excessively. The City is an active member of several water conservation groups in the San Joaquin Valley. These groups are reviewing and establishing measures to reduce the declining groundwater basin. According to the Urban Water Management Plan (2005), during a declared water shortage, the City will implement a 25 percent voluntary rationing water conservation program to ensure that the groundwater table does not drop to a dangerous level.

Earthquake

There are unreinforced masonry buildings in the downtown area and east of Academy between 5th and 9th Streets and west of “K” Street. No count is available at this time. The electric and telephone companies are critical facilities located in the downtown area.

Flood

According to FEMA’s 2005 Flood Insurance Study (FIS), Sanger’s floodplains in general are residential, with some commercial development. Flooding in Sanger, which has flat terrain, is typically the result of local runoff from intense rainfall that exceeds the capacity of storm drainage facilities. There are no well-defined natural drainage channels that carry stormwater away from the City. Hence, the streets fill with water deep enough to impede traffic. Sanger’s only flood control structures are detention basins, several up to 20 feet deep that will fill and flood during a 100-year flood. Overflow from the Kings River has caused extensive damage to agricultural properties east and southeast of the City.

According to the FIS, the flood history of Sanger is not well documented, but flooding reportedly occurred in the area in 1950, 1958, 1967, and 1978. Details on some of these events follow:

- **November 1950**—The Kings River overflowed and drowned cattle and turkeys, damaged farm equipment, eroded agricultural land, and destroyed feed and grain.
- **March 1958**—Nearly two inches of rain in less than a day clogged storm sewers and caused flooding in central Sanger.
- **January 1969**—More than three inches of rain fell in a two-day period and flooded streets and intersections in the City. Overflow was deep enough to stall vehicles and severely disrupt traffic.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Sanger was created (see Figure H.3). Tables H.5-H.7 summarize the values at risk in the City's floodplain. Table H.5 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table H.6 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table H.7 shows loss estimates by flood.

Figure H.3. City of Sanger's 100- and 500-Year Floodplains

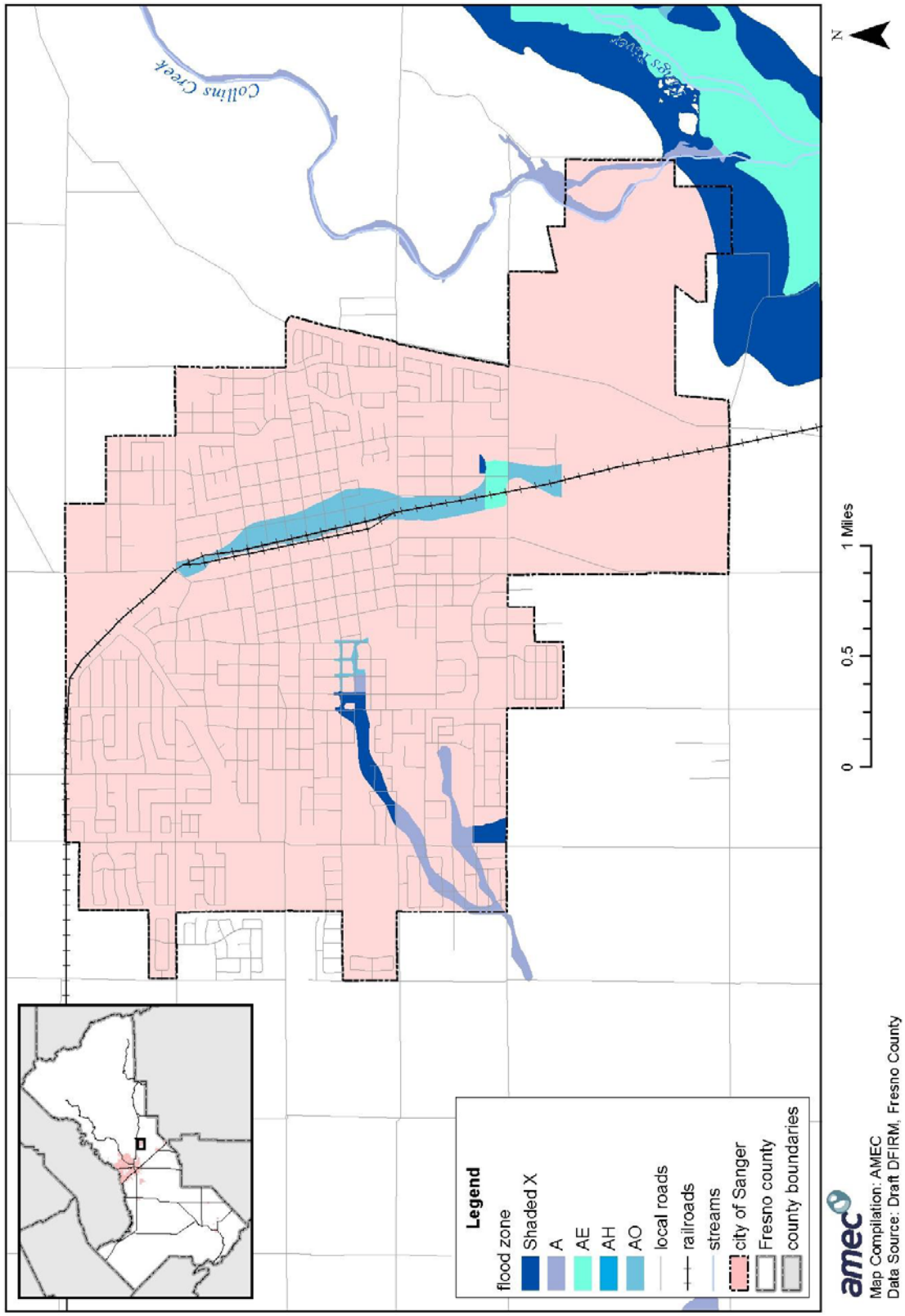


Table H.5. Count and Improved Value of Parcels in Floodplain by Zone—City of Sanger

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	-	-	-	-	-	-
Industrial	-	-	1	47,668	-	-
Open Space	-	-	-	-	-	-
Residential	75	13,708,378	6	370,741	-	-
Total	**75**	**13,708,378**	**7**	**418,409**	**-**	**-**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	-	-	-	-	6	382,238
Commercial	20	1,009,413	-	-	297	46,121,456
Industrial	12	7,027,205	-	-	98	34,707,892
Open Space	-	-	-	-	-	-
Residential	101	5,537,731	48	6,754,115	5,904	598,771,195
Total	**133**	**13,574,349**	**48**	**6,754,115**	**6,305**	**679,982,781**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table H.6. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Sanger

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	20	1,009,413	-	-	20	1,009,413
Industrial	13	7,074,873	-	-	13	7,074,873
Open Space	-	-	-	-	-	-
Residential	182	19,616,850	48	6,754,115	230	26,370,965
Total	**215**	**27,701,136**	**48**	**6,754,115**	**263**	**34,455,251**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table H.7. Fresno County Flood Loss Estimates—City of Sanger

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	215	27,701,136	13,850,568	41,551,704	8,310,341
500-Year Flood	48	6,754,115	3,377,058	10,131,173	2,026,235
Total Flood**	263	34,455,251	17,227,626	51,682,877	10,336,575

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Sanger has significant assets at risk to the 100-year and greater floods. 215 improved parcels are within the 100-year floodplain for a total value of roughly $28 million. An additional 48 improved parcels valued at $6.8 million fall within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly $8.3 million in damage in the City of Sanger and a .2 percent chance in any given year of a 500-year flood causing roughly $10 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Sanger joined the National Flood Insurance Program (NFIP) on December 1, 1982. NFIP insurance data indicates that as of November 30, 2007, there were 119 flood insurance policies in force in the City with $23,662,900 of coverage. Of the 119 policies, 96 were residential (90 for single-family homes) and 23 were nonresidential. 81 of the policies were in A zones (the remaining 38 were in B, C, and X zones).

There have been four historical claims for flood losses totaling $16,288.4; all were for residential properties; two were in A zones and two were in B, C, or X zones. Only one was for a post-FIRM structure. There were no repetitive or severe repetitive loss structures.

Population at Risk

Based on information from HAZUS-MH MR3 (Census 2000) and the digital flood insurance rate map, the following are at risk to flooding in the City of Sanger:

- **100-year flood**—759 people
- **500-year flood**—290 people
- **Total flood**—1,049 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. According to data from Fresno County GIS, the City of Sanger, and the digital flood insurance rate map, there are no critical facilities in Sanger's floodplains.

H.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

H.4.1 Regulatory Mitigation Capabilities

Table H.8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Sanger.

Table H.8. City of Sanger's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	City of Sanger 2005 General Plan, 2003
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	1995
Other special purpose ordinance (stormwater, water conservation, wildfire)	No	
Building code	Yes	Version: 2001
Fire department ISO rating	Yes	Rating: 4
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	City of Sanger Emergency Operations Plan, 2000
Other special plans		
Flood Insurance Study or other engineering study for streams	Yes	
Elevation certificates	Yes	

City of Sanger 2005 General Plan, 2003

The purpose of the 2005 City of Sanger General Plan is to guide growth, community change, and environmental conservation. It contains goals and policies that represent the community's vision for how it wants to grow and develop over time. These goals and policies assist City staff, the Planning Commission, and the City Council in making decisions about projects that affect the use of land. Two of the plan's elements that are largely related to hazard mitigation are the

Conservation Element and the Safety Element. Mitigation-related goals and policies of these elements are included below.

Conservation Element

Goal 1:	**Hydrology and Water Quality: Manage the City's water resources to provide for urban uses while protecting the environment.**
Policy 1:	Protect and preserve water resources in order to provide sufficient quantities of water that meet State quality standards to serve the domestic water demand for build-out of the General Plan.
Policy 2:	Protect and preserve watershed and recharge areas, including those critical for the replenishment of domestic water supplies.

Goal 3:	**Storm Drainage: Collect and convey storm water in a manner that least inconveniences the public, reduces or prevents potential water-related damage, and protects the environment.**
Policy 1:	Maintain a reliable source of revenue to fund citywide storm drainage improvements, including replacement, repair, or relocation of storm drain facilities.
Policy 2:	Encourage the use of natural storm water drainage systems in a manner that preserves and enhances natural features and consider recreational opportunities and aesthetics in the design of storm water detention/retention and conveyance facilities.
Policy 3:	Improve the quality of runoff from urban and suburban development through use of appropriate and feasible mitigation measures or best management practices. Examine the impact of proposed urban developments with regard to water quality and effects on drainage courses.

Goal 4:	**Geology and Soils: Preserve and enhance unique geologic features and soils for future generations to use and enjoy.**
Policy 1:	Identify and protect geologic resources within the City limits.
Policy 2:	Coordinate the management of mineral resources adjacent to the planning area, working with mining operators, and County and state departments.
Policy 3:	Provide for the preservation of soil resources through the creation of an agricultural greenbelt. Conserve soil resources, particularly to provide a continuing base for agricultural productivity and the City's economy by working with agricultural interests to develop practices that minimize the impacts of tilling and grading on soil erosion.

Safety Element

Policies of this element reduce the risk of death, injuries, property damage, and economic and social dislocation resulting from hazards such as fires, floods, earthquakes, and other hazards. Goals and policies facilitate decision making for minimizing potential safety risks. In 1974, Sanger adopted the *Five County Seismic Safety Element for the General Plans of Fresno, Kings, Madera, Mariposa, and Tulare Counties and their Respective Incorporated Cities*.

Goal 1:	**Protect the public health, safety, and welfare and minimize the damage to structures, property, and infrastructure as a result of geologic and flood hazards.**
Policy 1:	Evaluate proposed projects and land use policy decisions based on the environmental hazards identified in this element. Low intensity/occupancy uses (such as agricultural production, recreational uses, or wildlife habitat preservation) shall be preferred in hazard areas.
Policy 2:	Utilize FEMA Flood Insurance Rate Maps to determine the general location of flooding hazard areas when reviewing development proposals. The City shall maintain FIRM maps to reflect currently available information on the Planning Area.
Policy 3:	Continue to maintain the City's Emergency Operations Plan to ensure the safety of residents and to prevent damage to the built and natural environment.

Municipal Code Chapter 14 Buildings and Building Services, 1998

This ordinance adopts the building code of the City and lists the building conditions that must be met for the building inspector to authorize final connection of utility services and certificate of occupancy.

Municipal Code Chapter 26 Emergency Services, 1997

This ordinance provides for the preparation and carrying out of plans for the protection of people and property within the City in the event of an emergency, the direction of the emergency organization established by the code, and the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private people. The ordinance establishes the City's disaster council and designates the membership of the council. Membership includes the mayor (chairperson), the director of emergency services (vice-chairperson), the assistant director of emergency services, and other people as provided for in the City's current emergency plan. The council's powers include the development of emergency and mutual aid plans and agreements and the ordinances and resolutions to implement them.

Municipal Code Chapter 34 Floods, 1995

The purpose of the flood ordinance is to promote health and safety and prevent public and private losses due to flooding in identified flood hazard areas. It designates the city manager as the floodplain administrator.

Urban Water Management Plan, 2005

The Urban Water Management Plan describes the vulnerability of the City's water supply. It plans for measures taken for four stages of water shortage and includes projected water supply and demand comparisons through 2025. The plan also describes actions for flood, earthquake, and other types of catastrophes.

Emergency Operations Plan, 2000

The City of Sanger prepared the Emergency Operations Plan in an effort to ensure the most effective and efficient use of all resources, material, and staff for the maximum benefit and protection of the Sanger community. The plan is designed to facilitate coordination and management of information and resources amongst City agencies and affected populations to effectively respond to a hazard event.

H.4.2 Administrative/Technical Mitigation Capabilities

Table H.9 identifies the personnel responsible for activities related to mitigation and loss prevention in Sanger.

Table H.9. City of Sanger's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Development Services/ Senior Planner	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Development Services	
Planner/engineer/scientist with an understanding of natural hazards	No		
Personnel skilled in GIS	No		
Full-time building official	Yes	Development Services	
Floodplain manager	Yes	City Manager's Office	
Emergency manager	Yes	City Manager's Office	
Grant writer	Yes	City Lobbyist	
Other personnel	No		
Warning systems/services	Yes		Connect CTY

H.4.3 Fiscal Mitigation Capabilities

Table H.10 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table H.10. City of Sanger's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water, wastewater
Impact fees for new development	Yes	
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

H.4.4 Mitigation Outreach and Partnerships

The Sanger Fire Department provides education programs on fire safety, cardiopulmonary resuscitation (CPR) training, and conducts other tours and presentations.

The City promotes water conservation by distributing public information through bill inserts, brochures, community speakers, paid advertising, and many special events every year. City water bills show gallons used per billing period for the last billing period compared to the same period

the previous year. The City continues to work with the Sanger Unified School District to promote water conservation and to educate students about these issues.

The City has formally joined the Upper Kings Water Forum, a multi-agency effort to integrate the region's water management plans and coordinated the development of the Urban Water Management Plan with the Sanger Chamber of Commerce, County of Fresno, Department of Health Services, Consolidated Irrigation District, and other public agencies.

H.4.5 Other Mitigation Efforts

The City of Sanger has identified areas prone to flooding and made improvements to reduce it.

Sanger has implemented Connect CTY to provide City officials with the ability to communicate with all residents regarding time-sensitive and public safety matters, such as unforeseen events or emergencies. The Connect CTY service allows officials to record, send, and track personalized voice messages to thousands of residents, businesses, and local agencies in just minutes, through a single phone call.

The City sets up warming centers during extreme cold/freeze events and cooling centers during extreme heat events.

H.5 Mitigation Strategy

H.5.1 Mitigation Goals and Objectives

The City of Sanger adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

H.5.2 Mitigation Actions

The planning team for the City of Sanger identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Establish Post-Disaster Action Plan for City Continuity of Operations Plan

Issue/Background: Establish a post-disaster action plan to be part of the City's Disaster Plan that will include the following elements:

- Procedures for public information
- Post-disaster damage assessment
- Grant writing
- Code enforcement

- Redundant operations

The plan will also include annexes from local businesses and large employers to improve economic and employment recovery. The plan will also identify a mechanism for the City to help businesses not involved with post-disaster planning to be incorporated into the City's plan.

Other Alternatives: No action

Responsible Office: City of Sanger Fire Department, Deputy Fire Chief

Priority (High, Medium, Low): High

Cost Estimate: $125,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-planning. A City and local business post-disaster plan will reduce the impact of a disaster to the local economy and employment.

Schedule: 1-4 years, dependent on funding

2. Install Battery Back-Up Systems at Traffic Signals in the City of Sanger on Major Transportation Routes

Issue/Background: Keeping the traffic signals in operation during power outages will enhance safety, mobility, efficiency, and transportation productivity.

Other Alternatives: No action

Responsible Office: City of Sanger Public Works Department

Priority (High, Medium, Low): High

Cost Estimate: $50,000

Potential Funding: None at this time

Benefits (Avoided Losses): The project goal is to install battery back-up systems at critical intersections within the City, which will reduce demands and increase response time of emergency services by keeping routes open and free from congestion and traffic collisions.

Schedule: 1-2 years, dependent on funding

3. Add Potable Water Storage Capacity (500,000 Gallon above Ground Tank) to the City of Sanger's Water System

Issue/Background: The City needs a measure of reliability should sources fail or when unusual conditions impose higher demands than anticipated. Firefighters need quick access to large volumes of water to control and put out fires. While more water is generally better, the minimum water volumes and flow rates are recommended by the National Fire Protection Association.

The City continues to manage potable water demands through the effective use of conservation programs and reclaimed water. In addition, the City informs the community periodically on the status of the available water supply and the need to conserve.

Minimum volume and flow rates for adequate fire protection are calculated for each community. Local fire companies survey the number, type, construction material, contents, and proximity of structures in a community. The minimum water supply is calculated from the cubic feet of each structure, its occupancy hazard classification, and its construction classification.

Sanger may have enough water to provide fire protection, but the water must be applied quickly to control a fire. The rate at which water flows to a fire is controlled by the capacity of the pipes, hydrants, and water pressure. The flow rate per water "stream" should be at least 500 gallons per minute and sustained for at least 60 minutes to control a fire. Large structures require more than one water stream, requiring more water. If structures are close together, the risk of a fire spreading increases, so higher minimum flow rates are recommended. The values increase by 1.5 times if structures are closer than 50 feet apart.

The City recently spent approximately $3.6 million in grants to replace a number of smaller old water pipelines that were leaking excessively. This included upgrades to the distribution system to aid in fire protection requirements. Fire hydrants are generally spaced no more than 300 feet apart.

The City has two aboveground water storage tanks with a total capacity of 140,000 gallons. More are required. One fire line flowing at the minimum flow rate would deplete storage, at maximum capacity, in just over 4.5 hours; two lines—2.3 hours; three lines—1.5 hours. It is typical to have multiple fire lines on a commercial fire, not to mention master stream lines flowing from aerial devices (ladder trucks).

Like many communities, the City of Sanger experienced a rapid rate of growth. The City has increased public safety personnel and equipment and enhanced waste disposal and sewer capabilities. However, due to budget concerns, only one well was developed to manage the increased water demand. In 1979, the average residual water pressure in the City was 50 pounds per square inch (PSI). Today, that average pressure is 30 PSI.

Groundwater storage levels are decreasing at an alarming rate in the Sanger area and in the San Joaquin Valley. In an effort to reduce the effects of a drought, the City has constructed wastewater percolation ponds to help recharge the groundwater basin. The City currently percolates approximately 1.7 million gallons per day of final effluent back into the groundwater basin.

Other Alternatives: Drill more wells

Responsible Office: City of Sanger Public Works Department, Director

Priority (High, Medium, Low): High

Cost Estimate: $5,000,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve water capacity necessary during large fires, severe drought conditions, and power outages. This will help businesses that use large amounts of water, including the many packing houses within the City limits, stay in production.

Schedule: Within one year or sooner, dependent on funding

4. Provide Backup Power to City Pumps/Wells

Issue/Background: The City needs to ensure that its water distribution system can meet minimum fire flow and quality standards during emergency conditions.

Protecting public health is the primary goal when considering the community's drinking water system. The water distribution system must be pressurized to 20 pounds per square inch at all times to minimize cross-connection contamination concerns. The City's total capacity of water storage is 140,000 gallons. In the event of a fire, this storage is quickly depleted as fire flows can reach 6,000 gallons a minute and more. This was the case in October of 2005 during a large commercial fire in the City of Sanger. Water storage was quickly depleted as engines from Sanger, Selma, Reedley, Fresno, and the Fresno County fire departments tapped into the water distribution system and deployed their lines pumping an estimated 12,000 gallons per minute. With storage gone, City pumps were pushed to their limits while providing water to combat the blaze. Citizens throughout the City found it difficult doing the dishes much less taking a shower. If a power outage had occurred, more businesses may have been lost, and the City's source of potable water completely lost.

Other Alternatives: Building multiple elevated potable water storage tanks

Responsible Office: City of Sanger Public Works Department, Director

Priority (High, Medium, Low): High

Cost Estimate: $200,000 per well, maximum $1.2 million

Potential Funding: Grants

Benefits (Avoided Losses): Ensures water is available to protect public health and minimize damage to property due to fires; keeps water-dependent businesses operating

Schedule: 1-4 years, dependent on funding

5. Implement a Flood Awareness Program for the Public

Issue/Background: The City needs a program to educate flood-prone property owners and the citizens of Sanger about the flood threat and how best to prepare, mitigate, and insure their properties.

Other Alternatives: No action

Responsible Office: City of Sanger Fire Department, Deputy Fire Chief

Priority (High, Medium, Low): Medium

Cost Estimate: $5,000/year

Potential Funding: General fund, grants

Benefits (Avoided Losses): This will prevent the loss of human life and economic and property losses.

Schedule: Long-term, program implementation within two years, dependent on funding

6. Improve City's Floodplain Management Program and Apply to Community Rating System

Issue/Background: Seek Community Rating System (CRS) classification improvements within the capabilities of City programs, including adoption and administration of FEMA-approved ordinances and flood insurance rate maps.

Other Alternatives: No action

Responsible Office: City of Sanger Fire Department, Deputy Fire Chief

Priority (High, Medium, Low): Medium

Cost Estimate: $75,000

Potential Funding: General fund, grants

Benefits (Avoided Losses): Participation in the CRS and improvements outlined by the system will translate into improved flood mitigation and reduced flood insurance rates for local citizens. Ultimately, it will prevent the loss of human life and economic and property losses.

Schedule: 1-3 years, dependent on funding

7. Replace Old Drainage System to Prevent Flooding

Issue/Background: During heavy rains, water threatens the homes in this area. The proposed project will replace an old drainage system called in and out or siphon drainage. Basically, water is routed under the road at intersections through a small pipe and then exits from a grated opening and is channeled to a larger drain inlet. Leaves accumulate under the grate, plugging the opening and making it necessary to remove the grate; this creates an unsafe situation. The City places barricades over the openings. However, from time to time, the barricades are removed by unauthorized personnel. Also, leaves that accumulate under the street begin to decompose and emit methane gas. The fire department responds to several calls per year for reports of this odor.

Other Alternatives: No action

Responsible Office: City of Sanger Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: $220,000

Potential Funding: General fund, grants

Benefits (Avoided Losses): This project will keep homes from flooding. The new drain inlets are much safer for the public and pets. Fire department time will be better spent when not responding to calls related to odors from decomposing leaves.

Schedule: Funding dependent

8. Provide Fire Department Office Security

Issue/Background: Each day, the Fire Department is visited by many people for various reasons: ambulance billing, code enforcement issues, report retrieval, fireworks applications, site plan review, etc. For the most part, no conflict takes place. However, from time to time, irate people show up who are upset about imposed fees, citations, or services rendered. Maintaining accurate, effective access control is critical to protecting Fire Department personnel and equipment.

Other Alternatives: No action

Responsible Office: City of Sanger, Fire Chief

Priority (High, Medium, Low): Medium

Cost Estimate: $100,000

Potential Funding: General fund, enterprise fund, grants

Benefits (Avoided Losses): The proposed project will provide Fire Department office security, protecting personnel and equipment from potentially dangerous visitors.

Schedule: Funding dependent

9. Provide Compound Security for Police and Fire Departments

Issue/Background: The Sanger Police and Fire departments are located in close proximity of each other. Both departments are subject to uncontrolled foot traffic. Maintaining accurate, effective access control is critical to protecting the compound.

Other Alternatives: No action

Responsible Office: City of Sanger, Police Chief and Fire Chief

Priority (High, Medium, Low): Medium

Cost Estimate: $350,000

Benefits (Avoided Losses): The proposed project will provide a good perimeter security system protecting police vehicles as they are a common target for vandalism and theft of the police radios. In addition, the system will protect fire and EMS equipment from unauthorized personnel, again, from theft and vandalism. Access to the Fire Department is a concern. When firefighters respond to incidents, apparatus doors are slow to close, allowing ample time for a hidden person to make access to the inside of the station.

Potential Funding: General fund, enterprise fund, grants

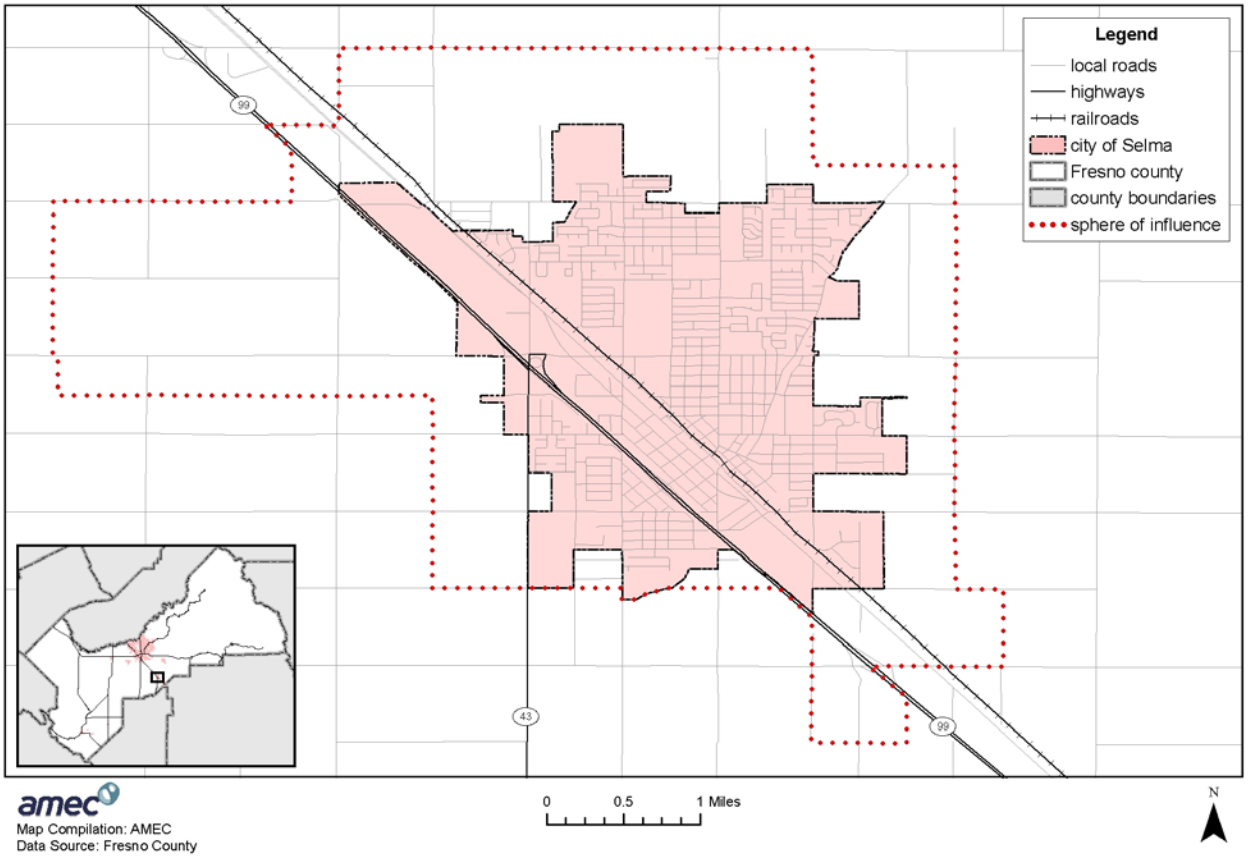
Schedule: Funding dependent

ANNEX I: CITY OF SELMA

I.1 Community Profile

Figure I.1 displays a map and the location within Fresno County of the City of Selma and its Sphere of Influence.

Figure I.1. The City of Selma



I.1.1 Geography and Climate

The City of Selma is located in the central San Joaquin Valley in Fresno County. It is 19 miles south of the City of Fresno at the crossroads of State Highways 99 and 43. A major, busy railroad line runs diagonally through the City and parallel to State Highway 99. Neighboring communities include Kingsburg (5 miles south), Fowler (8 miles northwest), and Reedley (12 miles northeast). The landscape is flat and is about 20 miles west of the Sierra Nevada Mountains.

The climate is mild year round with average summer daytime highs in the 90s and winter daytime lows in the 40s. The summer months are very dry, while the winter months get the most rainfall and moisture. Selma's average yearly rainfall is approximately 11.2 inches.

I.1.2 History

Selma was founded in 1893 as an incorporated, agricultural-based city because of the area's mild and temperate climate and the presence of a Southern Pacific Railroad line.

I.1.3 Economy

Much of the area's economy is agriculturally based. The City of Selma is known as the Raisin Capital of the World because the area has numerous vineyards that produce raisins and supporting packing companies. Other local produce includes tree fruits such as peaches. The retail industry in the City of Selma is growing. The leaders in retail sales include large car dealerships, building material and farming implement establishments, and other types of general retailers. The retail sales increase is due to population growth, Selma's incorporation into the Fresno metropolitan area, and the volume of people that pass through the City on its major highways.

I.1.4 Population

The population was estimated at 23,194 in 2007 with a population density of 5,394 people per square mile and is growing around a +3.7 percent pace. The ethnic diversity of Selma is 43.9 percent Caucasian, 46.1 percent Other, 4.5 percent Multiple, 3.2 percent Asian, 1.6 percent American Indian and Alaska Native, and .8 percent African American. 71.8 percent of the population is of Hispanic or Latino ethnicity. The average household size is 3.5 people per household, and 22.7 percent of the residents are at or below the poverty level.

I.2 Hazard Identification and Summary

Selma's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Selma (see Table I.1). In the context of the plan's planning area, there are no hazards that are unique to Selma.

Table I.1. City of Selma—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Limited	Critical	Medium
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Catastrophic	Low
Drought	Occasional	Extensive	Critical	High
Earthquake	Occasional	Extensive	Limited	Medium
Flood	Occasional	Limited	Negligible	Medium
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Heat	Highly Likely	Extensive	Critical	Medium
Extreme Cold/Freeze	Likely	Extensive	Critical	Medium
Fog	Highly Likely	Significant	Critical	Medium
Snow	Unlikely	Extensive	Limited	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Medium
Tornado	Occasional	Extensive	Limited	Low
Soil Hazards:				
Expansive Soils	Unlikely	Limited	Negligible	Low
Soil Erosion	Occasional	Significant	Limited	Low
Land Subsidence	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Limited	Limited	Low
Wildfire	Unlikely	Limited	Negligible	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Significance (subjective):
Low, Medium, High

Technological hazards were not assessed in the same manner as the natural hazards, thus they are not included in the table above. Nonetheless, it is important to note that technological hazards (transportation hazards/hazardous materials release) are a concern for Selma.

I.3 Vulnerability Assessment

The intent of this section is to assess Selma's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

I.3.1 Assets at Risk

This section considers Selma's assets at risk, including values at risk; critical facilities and infrastructure; historic, cultural, and natural resources; and growth and development trends.

Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2007. This data should only be used as a guideline to overall values in the City, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that 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 loss. Table I.2 shows the 2007 roll values (e.g., the values at risk) broken down by property type for the City of Selma.

Table I.2. 2007 Roll Values for the City of Selma by Property Type

Property Type	Units Improved	Total Improved Value ($)	Total Improved Land Value ($)	Units Unimproved	Total Unimproved Land Value ($)	Grand Totals	
						Units	Value ($)
Agriculture	2	137,467	168,979	1	33,474	3	339,920
Commercial	329	117,510,412	40,667,800	49	5,948,673	378	164,126,885
Industrial	89	24,073,855	7,393,893	29	1,608,313	118	33,076,061
Open Space	1	2,562	5,681	-	-	1	8,243
Residential	5,027	523,485,868	181,678,609	390	11,937,358	5,417	717,101,835
Other	-	-	-	-	-	-	-
Total	**5,448**	**665,210,164**	**229,914,962**	**469**	**19,527,818**	**5,917**	**914,652,944**

Source: 2007 Certified Roll Values, Fresno County Assessor's Office

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Selma from Fresno County GIS is provided in Table I.3 and mapped in Figure I.2. This is the information that was used for mapping and analysis purposes. It should be noted that the City had different data, which is indicated in parentheses in the table. (City data was not used for analysis since it was not available in GIS format.)

Table I.3. City of Selma's Critical Facilities

Critical Facilities Type	Number*
Airports	0
Communications Centers	1
Detention Centers	0
Emergency Command Centers	0
Emergency Operations Centers	1
Fire Departments	4 (3)
Health Care Facilities	4
Law Enforcement Facilities	2 (1)
Maintenance Yards	1
Residential Elderly Facilities	1
Schools and Day Care Facilities	21
Public Utilities—Water/Sewer	0
Totals	**35** (33)

Source: Fresno County GIS
*Data in parentheses is from the City of Selma

Figure I.2. City of Selma's Critical Facilities

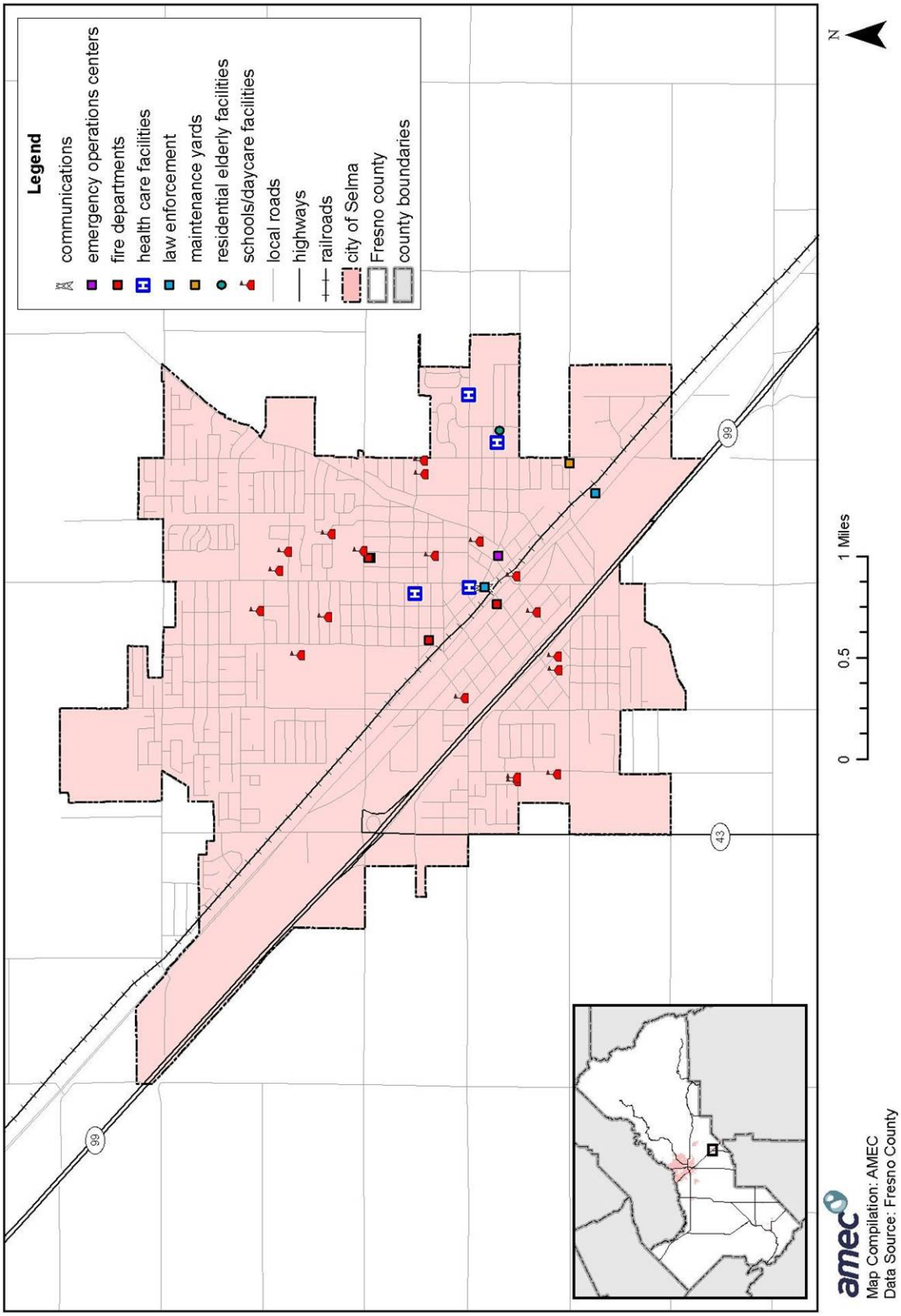


Table I.4 lists particular critical facilities and other community assets identified by Selma's planning team as important to protect in the event of a disaster.

Table I.4. Specific Critical Facilities and Other Community Assets Identified by City of Selma Planning Team

Name of Asset	Replacement Value ($)	Occupancy/ Capacity #	Hazard Specific Info
Police Department	1,292,675	37	Located next to a railroad track, which is parallel to a gas line also.
Fire Station 54 and Fire Administration	649,610	4 on duty 30 total	
Fire Station 53	489,537	4 on duty	Located within half a block of a railroad track and a gas line.
Selma Community Hospital	45,000,000	500	Hazardous materials located within
City Hall	1,312,986	74 seated/159 standing	Located within a block of a railroad track and a gas line
City Hall Annex	584,246	16	
Senior Center	854,004	232	
Public Works Yard	1,107,582	16	Hazardous materials located within

The City has four major medical facilities: Selma Community Hospital has 57 beds (including a 12 bed emergency wing), Kaiser Permanente Medical Clinical has an outpatient treatment facility, Bethel Lutheran Home has 87 beds, and Selma Convalescent Home has 34 beds.

Historic, Cultural, and Natural Resources

There are no registered state or federal historical sites in the City, although Pioneer Village is a historically based village where many community events are held. The City of Selma has some environmentally sensitive areas, which include Rockwell Pond and the Young Ponding area.

Growth and Development Trends

Selma is growing at a rapid pace and is likely to continue this trend for many years. Figure I.3 shows the location of new development in the City. Table I.5 illustrates how the City has grown in terms of population and number of housing units between 2000 and 2007.

Figure I.3. Proposed and Conceptual Development in the City of Selma

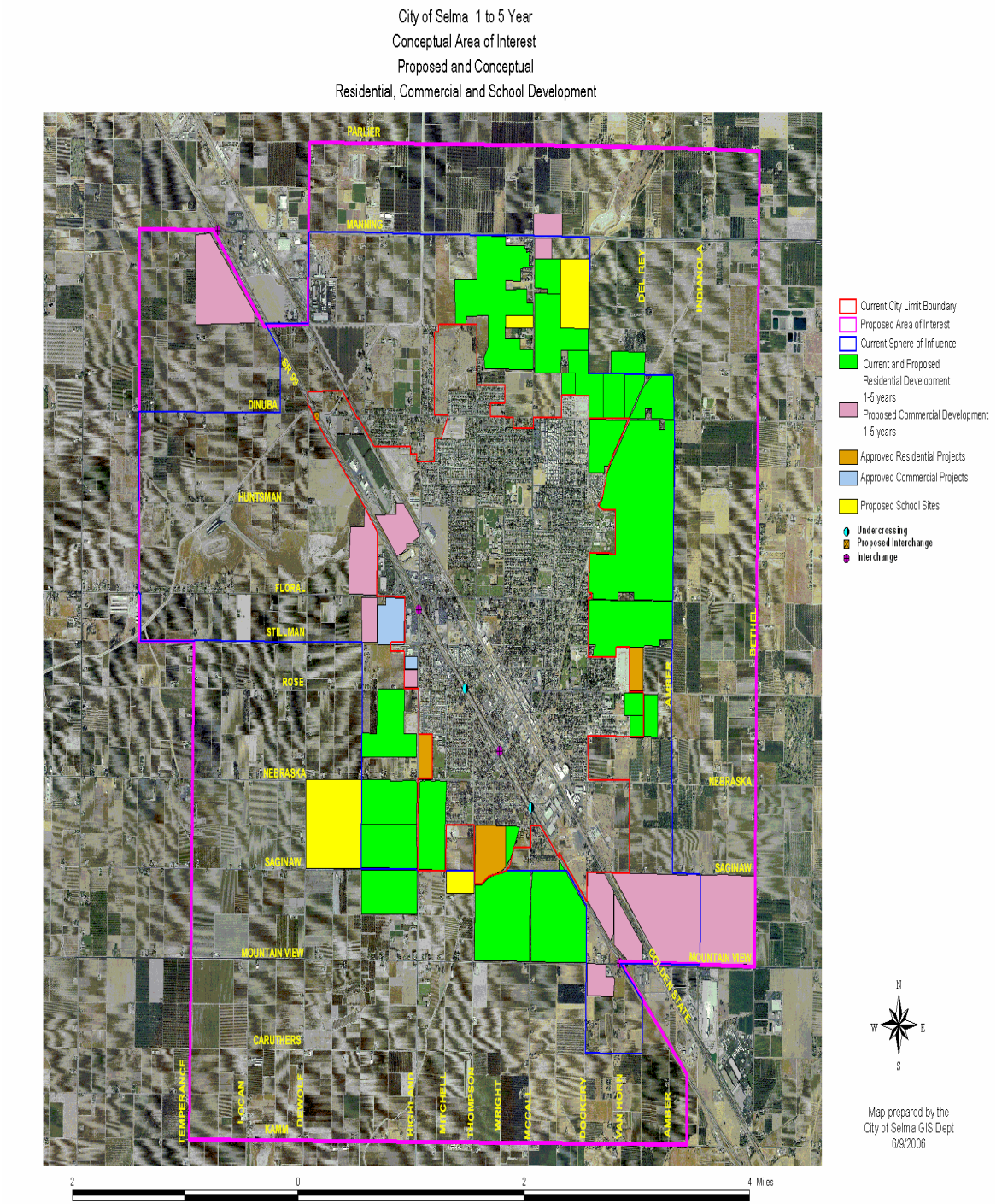


Table I.5. City of Selma's Change in Population and Housing Units, 2000-2007

2000 Population	2007 Population Estimate	Estimated Percent Change 2000-2007	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2000-2007
19,444	23,194	+19.29	5,815	6,787	+16.72

Source: California Department of Finance, www.dof.ca.gov/Research/

The City is planning to build a new, combined fire and police headquarters and improve the former fire stations to accommodate more employees within the next six to seven years. Currently, there are no manufactured housing developments in Selma and there are no planned housing developments that would be located in specified flood hazard areas or in areas with unstable soil. One possible development of concern may be the Tutelian Commercial Project that is located adjacent to the Rockwell Pond, which accepts stormwater runoff from the City. However, the grading and drainage plan will mitigate any localized flooding issues or other issues associated with Rockwell Pond.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

I.3.2 Estimating Potential Losses

Table I.2 above shows Selma's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures:

- There are currently 18 parcels in the floodplain in the City,
- There are an estimated 15-25 unreinforced masonry buildings (nonresidential) in the City, and
- The Selma Community Hospital was originally built in 1962, and the original building is still used today (in addition to multiple expansions and improvements).

Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

Although there is not much agriculture in the City limits, the surrounding areas are mostly agricultural land. The City of Selma is greatly affected by any agricultural hazard, because the economy is greatly based on this industry. Besides the obvious extreme weather hazards, such as drought, flood and heavy rains, and extreme heat, other agricultural hazards could be a major

impact on Selma. Hazards such as pests on certain crops could be a major issue for the economy. Past pests on crops have cost millions of dollars in damage and have included the glassy-winged sharpshooter, olive fruit fly, and red imported fire ant. Other hazards from agriculture itself include air pollution, water shortages, and hazardous materials spills.

Fresno County is one of the top counties in the nation in poor air quality. Often, citizens of the County have a higher chance of having respiratory problems, including asthma in children, than others in the United States. Each year, air quality is responsible for crop losses. Water shortages are becoming a problem in the area, and crop irrigation, which is necessary to support the industry and thus the economy, adds to the problem. Agricultural sites that store hazardous materials that are close to the City could affect the City directly in the event of a spill or explosion.

Drought

Drought would mostly affect the economy of Selma by limiting water resources available for the agricultural sector and human consumption. The agricultural sector would need more irrigated water than normal, which would come from an already limited reservoir and a lower water table. Low water levels and water conservation for the area are already an issue, so a drought could impact Selma and its economy greatly.

Previous droughts happened between 1987 and1992, which was statewide, and 1998-2004 (more of a dryspell than an actual drought). In 2007, there was an attempt to have a local state of emergency declared because of water supply shortages, especially for local farmers. There was also concern for an increase in West Nile virus because the breeding grounds were moving to urban areas with water due to the dry conditions in the rural areas.

Earthquake

The City of Selma is located in Seismic Zone 3. The planning team identified 15 to 25 unreinforced masonry buildings in town, primarily retail buildings in downtown. Specifically, the team identified City Hall and the Police Department as critical facilities that may be vulnerable to seismic events. Although from a historical perspective, the potential for secondary hazards caused by earthquakes have been considered minimal and rare in the Selma area, the potential for liquefaction and ground settlement instabilities are not well known.

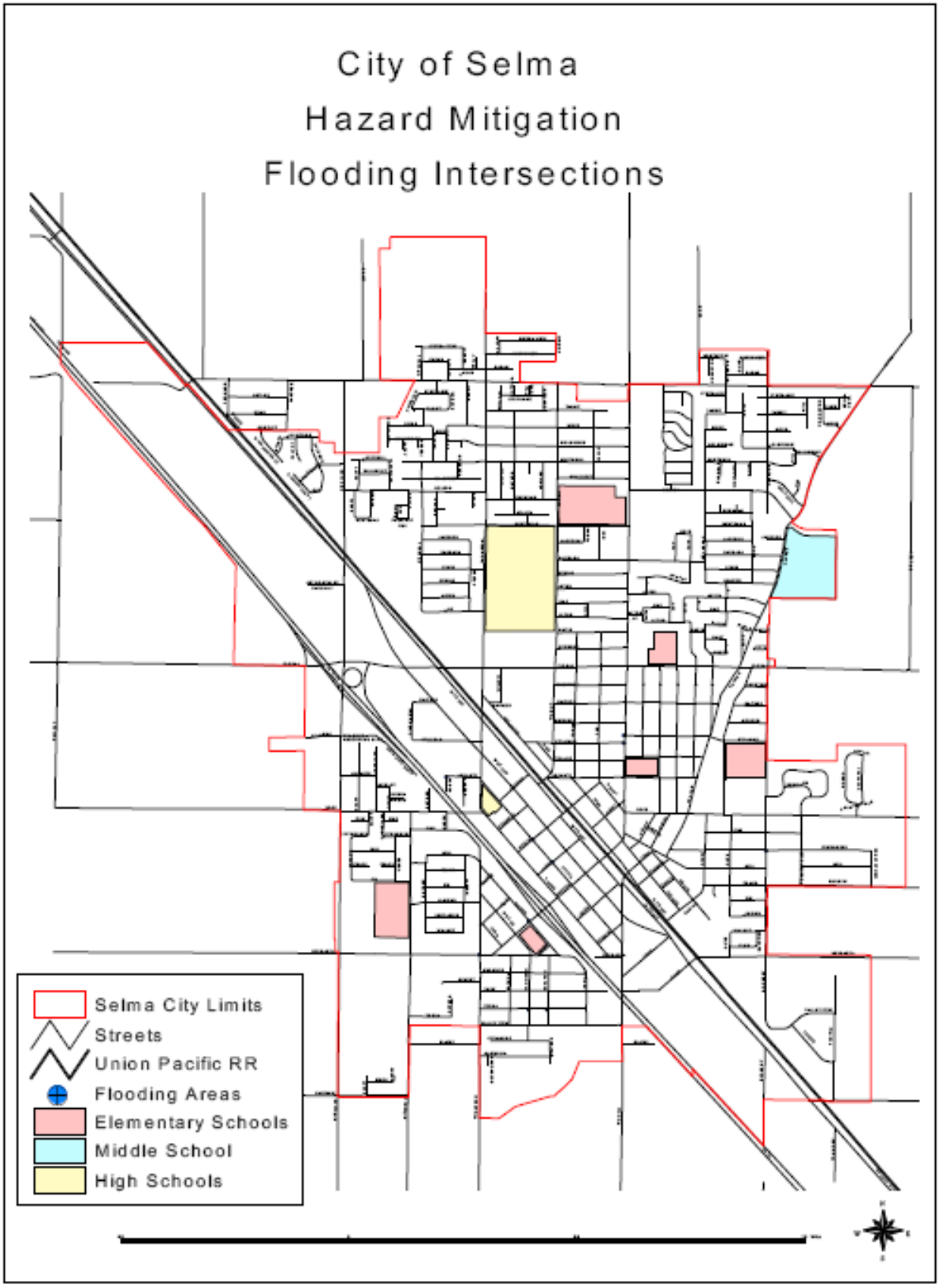
There has been some minimal structural damage in the past from earthquakes, in particular the 1983 Coalinga earthquake, which was felt in Selma. The damage done to an unreinforced masonry building was absorbed by the building’s owner.

Flood

Selma has not historically been subject to significant flooding. The mapped flood hazard area for a 100-year event is one small area in the northwest part of the City. However, there is often

localized flooding during heavy rain events due to the sheer amount of precipitation and the limited capacity of storm drainage system facilities or failed operation of storm drain pumps. The City of Selma has recently updated their stormwater master plan. The stormwater drainage system will serve to offset increased stormwater runoff resulting from the increase in impervious surfaces imposed by new development. The City of Selma has become good at preparing and responding to heavy rain and storm events. Areas of localized flooding are illustrated in Figure I.4.

Figure I.4. City of Selma Hazard Mitigation Flooding Intersections



According to FEMA's 2005 Flood Insurance Study (FIS), the flood history of Selma is not well documented, but flooding reportedly occurred in the area in 1950, 1958, 1967, 1969, and 1978. In March 1958, nearly two inches of rain in less than a day clogged storm sewers and caused flooding in the central part of the City. In other floods, water has entered basements, sewer lines have backed up, and water has ponded in commercial and residential areas. Streets, lawns, and basements have been damaged; traffic has been disrupted; businesses have closed temporarily; and flood fighting has been necessary. Flooding has generally been short in duration (ponded areas being exceptions) and most damage has been considered minor.

More recently there has been major damage and some localized flooding from storms:

- **May 2005**—This event had damage of a ditch almost overflowing and localized street flooding.
- **January 2006**—The January storm caused much damage to homes and businesses in Selma because of heavy rain.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Selma was created (see Figure I.5). Tables I.6-I.8 summarize the values at risk in the City's floodplain. Table I.6 is a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by flood zone and property type. Table I.7 summarizes the information in the first table by the 100-year flood, 500-year flood, and total flood (100-year and 500-year floods combined). And, Table I.8 shows loss estimates by flood.

Figure I.5. City of Selma's Floodplains

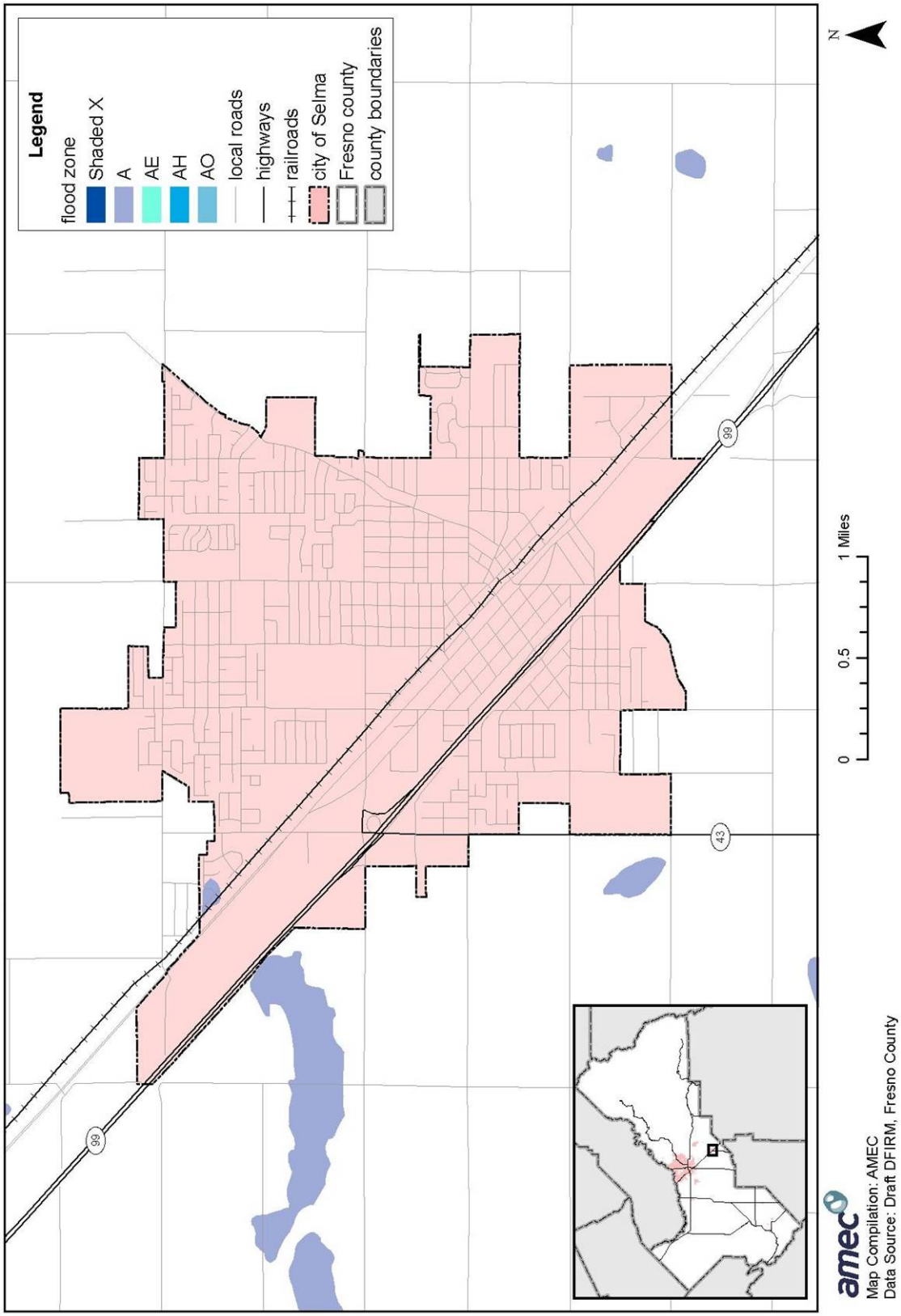


Table I.6. Count and Improved Value of Parcels in Floodplain by Zone—City of Selma

Property Type	Zone A # of Parcels	Zone A Improved Value ($)	Zone AE # of Parcels	Zone AE Improved Value ($)	Zone AH # of Parcels	Zone AH Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	-	-	-	-	-	-
Industrial	-	-	-	-	-	-
Open Space	-	-	-	-	-	-
Residential	18	2,436,768	-	-	-	-
Total	**18**	**2,436,768**	**-**	**-**	**-**	**-**

Property Type	Zone AO # of Parcels	Zone AO Improved Value ($)	Shaded Zone X # of Parcels	Shaded Zone X Improved Value ($)	Zone X # of Parcels	Zone X Improved Value ($)
Agriculture	-	-	-	-	3	137,467
Commercial	-	-	-	-	396	115,443,290
Industrial	-	-	-	-	122	20,075,955
Open Space	-	-	-	-	1	2,562
Residential	-	-	-	-	5,405	520,613,660
Total	**-**	**-**	**-**	**-**	**5,927**	**656,272,934**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA

Table I.7. Count and Improved Value of Parcels in Floodplain by Type of Flood—City of Selma

Property Type	Total 100-Year Flood* # of Parcels	Total 100-Year Flood* Improved Value ($)	Total 500-Year Flood # of Parcels	Total 500-Year Flood Improved Value ($)	Total Flood** # of Parcels	Total Flood** Improved Value ($)
Agriculture	-	-	-	-	-	-
Commercial	-	-	-	-	-	-
Industrial	-	-	-	-	-	-
Open Space	-	-	-	-	-	-
Residential	18	2,436,768	-	-	18	2,436,768
Total	**18**	**2,436,768**	**-**	**-**	**18**	**2,436,768**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes Zones A, AE, AH, and AO
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table I.8. Fresno County Flood Loss Estimates—City of Selma

	# of Parcels	Improved Value ($)	Estimated Contents Value ($)	Total Value ($)	Loss Estimate ($)
100-Year Flood	18	2,436,768	1,218,384	3,655,152	731,030
500-Year Flood	-	-	-	-	-
Total Flood**	**18**	**2,436,768**	**1,218,384**	**3,655,152**	**731,030**

Sources: 2007 Certified Roll Values, Fresno County Assessor's Office; Digital Flood Insurance Rate Map Fresno County, California and Incorporated Areas, 2007, FEMA
*Includes 500-year and 100-year flood data
**Includes Shaded Zone X (500-year) and all 100-year flood zones

Based on this analysis, the City of Selma does have assets at risk to the 100-year flood. 18 improved parcels are located in the 100-year flood hazard area for a total value of roughly $2.4 million (there are no additional improved parcels in the 500-year floodplain).

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year (or 500-year flood) flood causing roughly $731,030 in damage in the City of Selma.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Selma has a flood insurance rate map but is not currently participating in the National Flood Insurance Program.

Population at Risk

Based on information from HAZUS-MH MR3 (Census 2000) and the digital flood insurance rate map, the following are at risk to flooding in the City of Selma:

- **100-year flood**—3 people
- **500-year flood**—0 people
- **Total flood**—3 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. According to data from Fresno County GIS and the digital flood insurance rate map, there are no critical facilities in Selma's flood hazard area.

Severe Weather: Extreme Cold/Freeze

The City of Selma experiences freezes that mostly affect the agricultural economy of Selma. Extreme cold also increases the energy demand, poses a threat to human health, and can cause damage to underground water piping throughout the City.

Past freezes occurred in, 1990, 1991, 1998, and 2007. Warming centers were opened up for many of these freezes to help the public.

- **1991 and 1990**—These freezes caused catastrophic damage to the crops in the San Joaquin Valley and received presidential disaster declarations.
- **December 1998**—A freeze, accompanied by black ice and snow, caused numerous vehicle accidents in the area and required response from Selma's public safety services. The freeze

was also devastating to the valley's agricultural sector and resulted in a presidential disaster declaration.

- **January 11-17, 2007**—This freeze, which received a presidential disaster declaration, had a huge economic impact on the City of Selma and many human service resources were used throughout the rest of the year. Impacts included crop damage and unemployment.

Severe Weather: Extreme Heat

Extreme heat events are primarily an issue of human health in Selma, particularly for the homeless, senior citizens, agricultural workers, people with decreased health status, and lower income citizens. Along with the extreme heat comes worsened air quality for the Central Valley region, which increases the chances of respiratory emergencies. Other major impacts of extreme heat events are agricultural losses, which affect the local economy in Selma, and increased water and energy demand, which results in increased operating costs.

The City operates cooling centers and uses the Connect CTY, a computerized telephone and e-mail notification system, to notify people of the issue and locations of the centers. The City also provides a transit system that can take citizens to the cooling centers. Summer temperatures in Selma can exceed 105°F and usually occur for a few days in a row, which is when cooling centers are opened. The Senior Center keeps a list of older adults to check up on, which is very helpful during this type of emergency as well as others.

Cooling centers were opened for extreme heat in Selma in 2007 and 2005. Other extreme heat years include 2003, 2002, and 1999. In mid-July 2006, a stretch of days with 100°F plus temperatures damaged crops, especially tomatoes, tree fruit, and grapes. It also led to a sharp increase in the number of mosquitoes infected with West Nile virus in the valley.

Severe Weather: Fog

Fog is a yearly occurrence around Selma and is a hazard that the City of Selma has learned to respond to. The City itself has fog that reduces visibility and can cause vehicle accidents. In addition, Selma's public safety personnel often have to respond to major accidents on the highways around Selma. This drains the local resources away from the City.

To try to combat this issue, the Selma Unified School system is on a "foggy day" schedule, which entails starting school later in the morning after a fog has lifted. Also, the California Highway Patrol and California Department of Transportation work together on public education, press releases, pace cars, and signs for safer highway driving.

Some major accidents in the area attributed to fog include the following:

- **November 26, 1989**—21 vehicle pileup on Highway 99 near Selma, 14 people injured
- **January 23, 1990**—60+ vehicle pileup on Highway 99 north of Selma, five deaths

- **February 7, 1991**—Multiple vehicle pileup on Highway 99 between Selma and Fresno, three deaths, 30 people injured
- **January 1994**—56 vehicle pileup on Highway 99 near Selma, two deaths, 42 people injured
- **November 1998**—74 vehicle pileup on Highway 99, two deaths, 51 people injured
- **November 2000**—Small private plane crash, 1 death, 1 critically injured person
- **February 2002**—87 vehicle pileup on Highway 99 near Selma, three deaths, 51 people injured
- **November 2007**—102 vehicle pileup on Northbound Highway 99, two deaths, over 30 people injured

Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind

There has been major damage and some localized flooding from storms during February 1992, February 1998, April 1999, May 2005, and January and March of 2006, (see also Flood section above).

- **February 1992**—The City of Selma's ambulance resources were used to respond to four accidents in a chain-reaction on Highway 99 due to heavy rain and hail. There were 12 vehicles involved in these near Fowler with only minor injuries to 12 people and no deaths.
- **February 1998**—A storm downed trees and power lines, damaged cars and homes, and caused power outages.
- **April 1999**—A week of cold, wet, and windy weather with hail caused some crop damage in the area.
- **May 2005**—A ditch almost overflowed, localized street flooding was reported, and houses were struck by lightning.
- **January 2006**—Heavy rains caused much of the damage to homes and businesses.
- **March 2006**—Extreme winds caused much of the damage, especially to a mobile home park.

Other Hazards

Although of lower planning significance relative to other hazards, the following information about dam failure and transportation hazards/hazardous materials release should still be noted:

Dam Failure

According to the City's 1991 Safety Element, information from the U.S. Army Corps of Engineers, California Office of Emergency Services, and Fresno County indicated that Selma would be in extreme danger in the event of a complete dam failure at Pine Flat Dam at a time that the facility is at full capacity. This would be a worst case scenario and Selma would be located in the center of a floodway approximately 17 miles wide and 8 to 10 feet deep within three hours of the failure. No projections of a lesser extent have been made for this hazard and there has not been a reported past event of dam failure at Pine Flat Dam.

Technological Hazards (Transportation Hazards/Hazardous Materials Release)

Two major transportation arteries of statewide significance traverse Selma—a main line of the Southern Pacific Railroad and State Highway 99. These routes are both heavily used and are frequently used to transport hazardous materials that could represent a risk to the community if involved in a transportation accident. Land uses along the transportation routes are diverse. Of specific concern is the Police Department, which is located just a few feet from the railroad line and is the old train depot. One of the two fire stations is located one street way. Other areas of concern related to train derailment include the buried pipes and utilities that run along the tracks, poor crossings, and grade separation. Another transportation hazard is a small, two runway, privately owned airport located two miles northwest of Selma that provides service to private planes.

The planning team identified two plane crashes and two major transportation-related hazardous materials spills in the past:

- **January 1991**—Three big trucks, one loaded with toxic chemicals, collided on Highway 99 in Selma. This collision caused an explosion that closed down the highway and killed two people and injured a third. A nearby elementary school was closed the day after the accident.
- **October 1996**—A freight train carrying household paint, batteries, compressed gas cylinders, and pesticides derailed north of Selma spilling 100 gallons of diesel fuel. There were no injuries; five area residents were evacuated.
- **November 2000**—A plane crash at the Selma Airport resulted in one death and critically injured one person.
- **January 2008**—A single plane crash on the edge of the City limits resulted in one death.

I.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

I.4.1 Regulatory Mitigation Capabilities

Table I.9 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Selma.

Table I.9. City of Selma's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	1997, currently being updated
Zoning ordinance	Yes	March 2008, currently being updated
Subdivision ordinance	No	
Site plan review requirements	Yes	Title XI, chapter 20.1
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildfire)	Yes	Water conservation ordinance adopted but cannot enforce Title VIII, chapter 9
Building code	Yes	2007 California Building Standards Code
Fire department ISO rating	Yes	Rating: 5
Erosion or sediment control program	No	
Storm water management program	Yes	Title IX, chapter 9 Sometimes cannot keep up with the large volumes that come with winter storms, especially if electricity is lost.
Capital improvements plan	Yes	Title IX
Economic development plan	Yes	2003
Local emergency management plan	Yes	1989 (draft), currently being updated
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005
Elevation certificates	No	

City of Selma General Plan, 1997

The City of Selma's General Plan guides the City's development and growth. The Safety, Conservation and Open Space, and Safety, Public Services, and Facilities elements contain goals and policies related to mitigation. These mitigation-related goals and policies are included below.

Safety Element

The Safety Element was adopted to provide for the protection of residents of the Selma community from natural and manmade hazards. It identifies a range of hazards to life and property to which the City and its residents are subject. The goals for protection of life and property are common to each hazard and are, therefore, presented as the overall goals of the Safety Element.

Goals

- To prevent loss of life and serious injury, resulting from natural or manmade hazards, to the residents of the City of Selma.
- To prevent serious structural damage to critical facilities and structures where large numbers of people are expected to congregate at one time.
- To ensure the continuity of vital services to the Selma area in case of disaster.
- To provide a leadership role in education on public safety.

Hazard Specific Objectives and Policies

Seismic Safety Objectives

- Identify risks to the City of Selma from seismic hazards.
- Establish and maintain a plan to minimize identified risks from seismic hazards.
- Establish and maintain a plan for responding to seismic disaster and for the provision of emergency services.
- To adopt a Seismic Impact Transportation Plan reflecting primary and secondary disaster access routes and designating appropriate evacuation routes.

Seismic Safety Policies

- The Safety Element shall be reviewed and updated periodically. Upon adoption of the Interim Safety Element, the City should review and update the plan within one year and every five years thereafter.
- The City shall develop and adopt an Emergency Operations Plan which shall include action plans in the event of an earthquake disaster. Emergency evacuation routes should be included in the plan.
- The City shall maintain and continue to update, with the County of Fresno and other agencies, an Emergency Services Plan. Included in the plan should be:
  - Provision for control and direction of emergency operations.
  - Provision for continuity of governmental services.
  - Program to coordinate the repair and restoration of essential systems and services.
  - Coordination of emergency operations with other jurisdictions,
- The City should establish an inspection program to identify and inventory all existing unreinforced masonry structures in the City.
- The City should implement a program to abate all identified dangerous buildings.
- Emergency communication centers, fire stations, and other emergency service or critical facilities should be examined to determine earthquake resistance. A program to mitigate deficient facilities should be established.
- Emergency procedures should be identified for public and private utility districts.
- Primary and secondary hazards from seismic activity should be evaluated in all environmental assessment and reporting processes.
- The list of critical facilities for the City of Selma in Appendix D of the Summary and Policy Recommendations of the Five County Seismic Report, shall be reviewed and updated.
- Critical facilities shall be designed to the standards established by the Uniform Building Code for such facilities. Critical facilities means essential facilities as provided in the Uniform Building Code.
- The City shall continue to adopt current issues of the Uniform Building Code and implement the seismic design standards provided by the Code.

- Seismic safety information should be made available to the general public. School districts and agencies related to aged, handicapped, and seismically susceptible industries should be encouraged to develop education programs for seismic awareness.
- The Technical Report of the Five County Seismic Study should be made available to planning projects in the City of Selma.
- The Seismic Impact Transportation Plan designates the following disaster transportation routes.

Geological Safety Objectives

- To provide a safe environment for building construction through knowledge and understanding of soil and land resources.

Geological Safety Policies

- Detailed mapping and analysis of identified areas of geologic hazard shall be provided. Areas identified with a "severe" rating for allowable soil pressures or high corrosivity soil characteristics should be mapped for City staff use in new development project consideration.
- Continue to enforce the Uniform Building Code in all matters related to soil preparation and foundation requirements.

Flood Safety Objectives

- Minimize the hazards of localized sheet flooding resulting from prolonged rainfall and stormwater runoff.
- Promote and become instrumental in coordinating the inclusion of a dam failure component to a regional disaster plan.

Flood Safety Policies

- The City of Selma shall evaluate territories within its sphere of influence to identify areas of potential localized flood hazards.
- In areas identified as being potentially subject to flooding, where the exact area and depth of flooding is uncertain, the applicant or developer of an annexation or development proposal shall be responsible for the preparation of a civil engineering report evaluating the flooding potential.
- The City of Selma shall continue to implement and administer the Master Plan for Storm Drainage as a means of offsetting increased storm water runoff from urbanization.
- The City of Selma shall seek and petition the County of Fresno, Council of Fresno County Governments, and other agencies and cities impacted by potential dam failure to participate in the completion of a disaster plan dealing with dam failure.
- The City shall prepare a local emergency evacuation plan responding to the complete failure of Pine Flat Dam at peak capacity. The evacuation plan shall be coordinated with other responsible and impacted jurisdictions.

Transportation Safety Objectives

- To maintain a responsive City staff trained in hazardous materials incidents.
- To maintain a safe relationship between major transportation routes and urban land uses.
- To provide for land use safety in areas influenced by airports.

Transportation Safety Policies

- The City shall consider the impacts of potential transportation hazards upon adjacent land uses when considering proposals for new or changed urban uses.
- New public use buildings, such as, schools and hospitals, should be located a minimum of 1,000 feet from mainline rail or freeway routes.
- The City shall continue to staff, train, and equip an emergency response team to respond and coordinate public safety activities. The Selma Fire Department is designated as the City's emergency response team for hazardous materials incidents.
- The City shall continue to implement the airport land use plan for the Selma Aerodome.
- New public use buildings should not be located within the flight path or approach zone of airports.

Hazardous Materials Safety Objectives

- To reduce and control the effects of hazardous wastes so as to promote the public health and welfare of the Selma community.

Hazardous Materials Safety Policies

- To coordinate and cooperate with other local, state, and federal agencies with expertise and responsibility for all aspects of hazardous wastes.
- To educate the public on the subject of hazardous wastes.
- To ensure that disaster planning for the City of Selma includes policies appropriate to problems associated with hazardous wastes.

Conservation and Open Space Element

This element provides guidance through policies, plans, and programs on the location and design of open space in the community and in the conservation and usage of natural resources.

Goals

- Protect the environment.
- Provide for the usage of natural resources without causing their premature depletion.
- Preserve prime agricultural land.
- Preserve groundwater quality and reduce overdraft conditions.
- Eliminate potential for soil erosion or degradation of its agricultural productivity.
- Limit potential threats to human health and property, which may result from natural environmental hazards.

Policies

- Areas with high erosion potential or soil instability which cannot be mitigated shall be designated for open space land uses.
- Channel and slope modification shall be discouraged where they increase the rate of surface runoff and increase the potential for erosion.
- The City shall endeavor to mitigate, to the fullest extent possible, activities which will exacerbate groundwater overdraft.
- To the fullest degree possible, prime agricultural land shall be preserved for agricultural uses only.
- Maintain Rockwell Pond as both a resource management area (water recharge) and community open space.
- Require correction of local stormwater ponding conditions prior to development in such areas, either through off-site improvements provided by land developers, or through community storm drain facility capital improvement projects.
- Require soil studies in localized areas known to have expansive or unstable soils.

Safety, Public Services, and Facilities Element

Goals

- Reduce the threat to persons and property resulting from natural and manmade hazards including fire, crime, and flooding.
- Provide a safe and sanitary physical environment.
- Undertake required improvements of the sewer and storm drainage systems.

Policies

- Capital improvements shall be undertaken to eliminate existing flooding problems.
- The adopted Urbanizing Area Master Plan for Storm Drainage shall be utilized to determine adequate facilities for new development.
- All new developments shall be required to have community sewer, water, and stormwater systems.

Water Conservation Ordinance

The purpose of the Water Conservation Ordinance of the City of Selma is to minimize outdoor water use, control unnecessary water consumption, and to conserve water in landscaping to preserve the available potable water supply of the City. It prohibits waste of water as defined in the ordinance, sets water conservation stages for outdoor water use, and establishes design criteria for water conservation in landscaping.

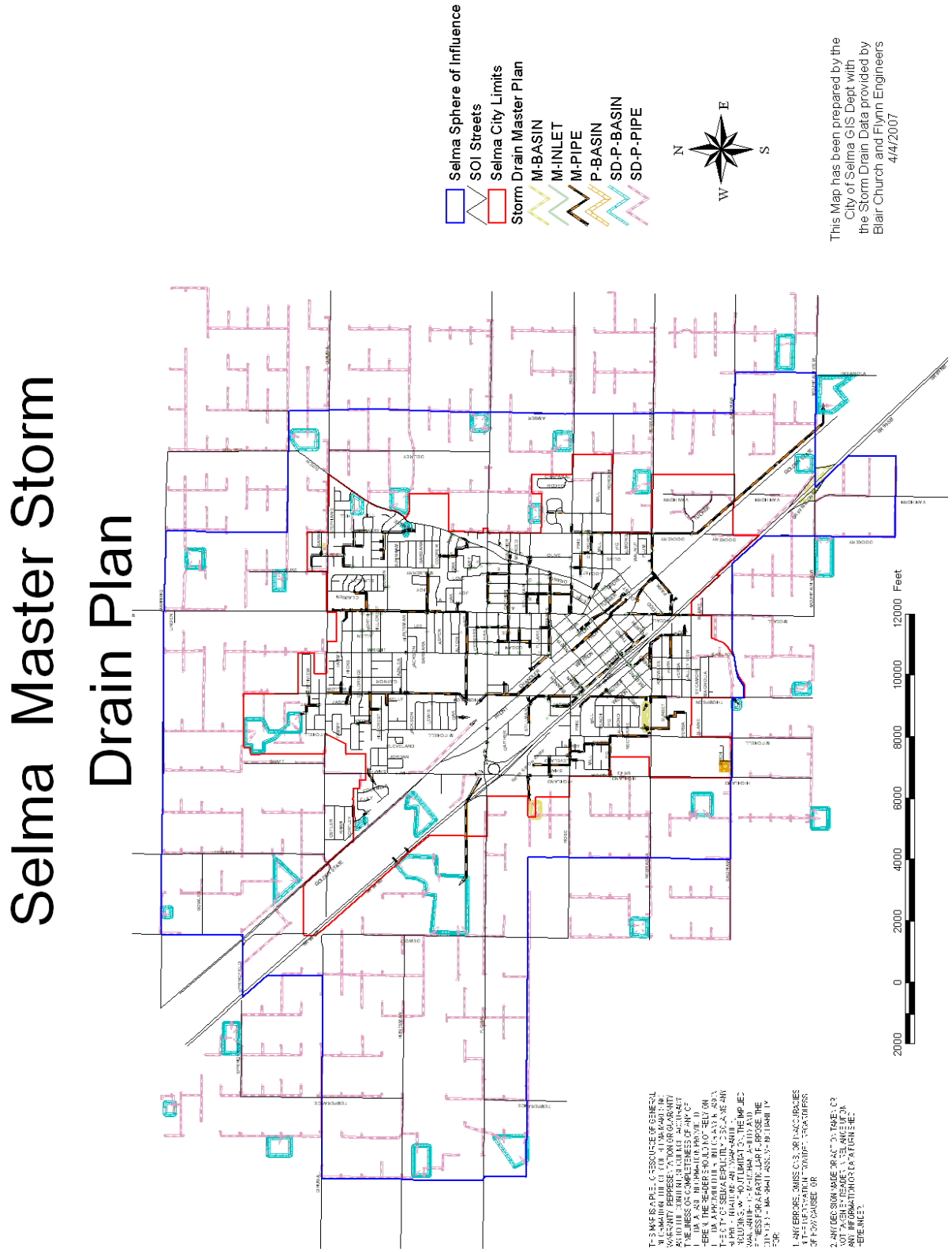
City of Selma Emergency Operations Plan, 1989 (Draft)

The City of Selma Emergency Operations Plan Emergency provides guidance for City response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The Basic Plan provides an overview of operational concepts, identifies components of the City Emergency Management Organization, and describes the overall responsibilities of federal, state, County, and City entities. Response and recovery functions, as well as specific guidelines for accomplishing these functions, are contained in the Functional Annexes.

City of Selma Storm Drain Master Plan

The City of Selma has as storm drain master plan to address localized flooding issue. The plan is illustrated in Figure I.6.

Figure I.6. City of Selma Storm Drain Master Plan



I.4.2 Administrative/Technical Mitigation Capabilities

Table I.10 identifies the personnel responsible for activities related to mitigation and loss prevention in Selma.

Table I.10. City of Selma's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Yes	Community Development Department	Currently hiring senior and principle planners
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Yes	Public Works Department/Engineer	
Planner/Engineer/Scientist with an understanding of natural hazards	Yes	Public Works Department/Engineer	
Personnel skilled in GIS	Yes	GIS Coordinator	
Full time building official	Yes	Community Development Department	
Floodplain Manager	No		No need
Emergency Manager	Yes	Fire and Police Departments	Low staffing
Grant writer	Yes	Administrative Analyst	
Other personnel	Yes		Multiple roles are covered by city staff
Warning Systems/Services (Reverse 9-11, outdoor warning signals)	Yes	Connect CTY	

In Selma, the public is served by a seven department City government, which includes full-time Fire and Police departments. The City is also served by supporting groups of reserve firefighters and "volunteers in policing" that can be used in emergencies or major events. The Selma Fire Department provides ambulance services for the City and outside the City limits, encompassing a total of 150 square miles.

I.4.3 Fiscal Mitigation Capabilities

Table I.11 identifies financial tools or resources that the City could potentially use to help fund mitigation activities. There are currently no specific funding sources for hazard mitigation.

Table I.11. City of Selma's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Used for street infrastructure
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	No	Private or other agencies/governments
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

I.4.4 Mitigation Outreach and Partnerships

The Selma Fire Department provides fire safety education and overall fire prevention. The City of Selma is also developing a public disaster preparedness program that should be functional within the next three to four years.

Existing strengths in the City of Selma are that community and local businesses are very generous in meeting the needs and/or volunteering themselves for community outreach programs and events.

I.4.5 Other Mitigation Efforts

The City of Selma is involved in some targeted mitigation efforts, these include the following:

- The City of Selma is currently working on its Disaster Management Plan, education and implementation of the plan throughout City government, and an educational outreach program for the citizens of Selma. This is estimated to take three to four years.
- The City of Selma is working on getting a new police and fire headquarters building, which will move the police leadership team away from the railroad tracks, which will hopefully mitigate the impacts that some of the manmade hazards could have on police response resources. Construction is expected to begin within the next six to seven years.
- Pending funding, the City of Selma is hoping to buy portable generator pumps to be used at strategic locations within the City to pump stormwater during a citywide power failure. This would prevent street and intersection flooding during winter storms.
- The City of Selma is requiring new housing developments to put in better stormwater systems than what was previously required to minimize localized street flooding in those areas.

I.5 Mitigation Strategy

I.5.1 Mitigation Goals and Objectives

The City of Selma adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

I.5.2 Mitigation Actions

The planning team for the City of Selma identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Institute a Disaster Preparedness Education Program for the Public

Issue/Background: The public of Selma does not have any City-issued disaster preparedness education. Any knowledge they possess is from other sources, such as federal and state government agencies. Special populations targeted for this education are non-English speaking residents, senior citizens, and citizens living at or below the poverty level.

Other Alternatives: Adding a smaller disaster preparedness education program onto the already strong fire prevention program

Responsible Office: City of Selma Fire and Police departments

Priority (High, Medium, Low): High

Cost Estimate: $5,000 per year

Potential Funding: The program will be kicked off by an Americorps volunteer (which will not cost the City, monetarily), and the actual program will be funded by donations and some budgeted money from the City of Selma.

Benefits (Avoided Losses): By educating the public in disaster preparedness, the citizens will be better prepared during an actual disaster. This individual preparedness will help save lives and property. This also removes some of the constraints on the City's emergency services, enabling them to do more for residents in the event of a disaster.

Schedule: Within two years (2008-2010)

2. Install Back-up Power for Storm Drain Pumps

Issue/Background: Most of the City of Selma's storm drain pumps do not have back-up power sources. This causes localized flooding when there is heavy rain and power outages, which tend

to go hand and hand during major storms. To alleviate this problem, the City can make use of portable generators for the pumping stations.

Other Alternatives: No action

Responsible Office: City of Selma Public Works Department

Priority (High, Medium, Low): High

Cost Estimate: $27,540 per generator; the cost of three generators would be $82,620 (not including fees and taxes)

Potential Funding: City budget, grants

Benefits (Avoided Losses): By having back-up power sources, the storm drain pumps will be able to operate, to avoid localized flooding, in the event of a power failure. This could prevent property damage, including damage to cars parked on the streets. Damage costs could range greatly, but an estimate is $2,000-$3,000 per storm without power.

Schedule: Within 3-4 years

3. Construct New Police and Fire Department Headquarters

Issue/Background: Besides needing to update space and facilities for both departments, the police station is located directly next to the railroad line that runs through the City (it is actually the old train depot). There is also a pressurized natural gas line that runs along the tracks by the police station that is considered a hazard.

Other Alternatives: No action

Responsible Office: City of Selma Police and Fire departments

Priority (High, Medium, Low): High

Cost Estimate: $12 million

Potential Funding: City of Selma safety sales tax and budget

Benefits (Avoided Losses): Moving the police station away from the railroad line will reduce the impacts of a disaster, which could partially or completely destroy 50 percent of the City's emergency services response capabilities. It would also reduce the threat posed to the City's dispatch communications, which dispatches both police and fire services.

Schedule: Within the next 10 years (2008-2010)

4. Construct a Railroad Crossing Underpass

Issue/Background: A railroad line runs through the City of Selma, splitting it into two. If a train derailed or had to stop in the City, the City would be cut in half, and emergency services would be confined to one side, or would have to drive miles out of the City and back to respond to the other side. This is especially a problem for the western side of the City, which only has one fire station. Also, the City has had past problems and deaths from vehicles and people getting stuck on the tracks at crossings.

Other Alternatives: No action

Responsible Office: City of Selma Planning and Building Department

Priority (High, Medium, Low): Low

Cost Estimate: $5 million

Potential Funding: City budget and grants (e.g., railroad safety grants)

Benefits (Avoided Losses): By having an underpass for vehicles below the railroad line, response times would be reduced, and public safety would be enhanced. Also, an underpass at one of the current crossings would mean that vehicles would cross under the tracks and not over, removing the possibility that a vehicle could get stuck on the tracks, endangering the lives of its passengers as well as those on the train.

Schedule: Within 10 years (2008-2018)

5. Sheridan Street Pump Station

Issue/Background: There is often localized flooding throughout the City of Selma during large storms. The area that is particularly affected is downtown from Young St. to Highway 99, which starts at Rose Ave. and continues to Second St. (please refer to the localized flooding map included in this project description). There are major intersections and areas that flood during storms with intense rains. This occurs because during a rain event storm water in this area flows into an underground storm drain system that ends up at a pumping station on Sheridan Street. This drainage system does not currently have sufficient capacity to handle maximum storm flows. By not having enough capacity, this creates clogging and backflow in the area which causes major localized flooding, including surrounding citizens' properties. This project will increase storm drain pipeline size so that it can carry the storm water run off from a major storm event and will increase the pump size at pumping stations to handle those increased flows.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which project will be implemented: The City of Selma Stormwater Master Plan

Responsible Office: Public Works

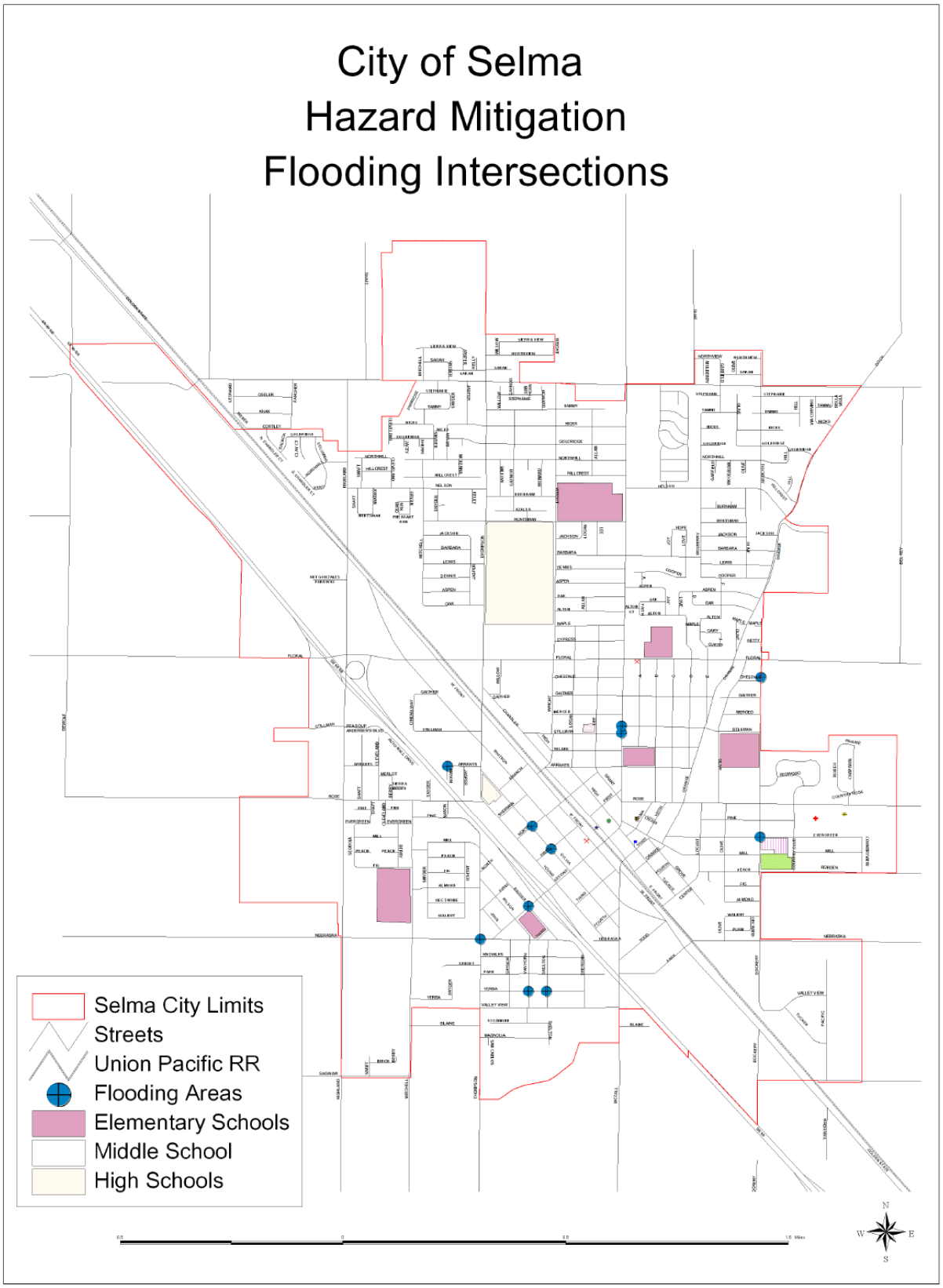
Priority (High, Medium, Low): High

Cost Estimate: $3,150,000 total possible, which is comprised of $150,000 for a pump upgrade and up to $3 million in pipe upgrades

Potential funding: City Budget, HMGP

Benefits (avoided Losses): The city can decrease damage caused by localized flooding during every single heavy rain storm. The average potential monetary loss could reach $6000 per heavy rain storm which could equal out to more than $30,000 per year in damages. If an extremely heavy rain were to occur more than the average amount of rain, the extent and cost of damages would be much greater and could reach an upwards to $585,000 because 35 buildings (mostly homes) have flooding potential damage (up to $15,000 per building) and another possible $60,000 in other property damages. Examples of possible yearly damages include citizens' vehicles parked in the streets and on properties, vehicles trying to get through the flooded areas, and other private property. These estimates also do not take into account the large amount of resources used in attempting to stop this localized flooding that could be used in other problems during these storms.

Schedule: Within 5-8 years

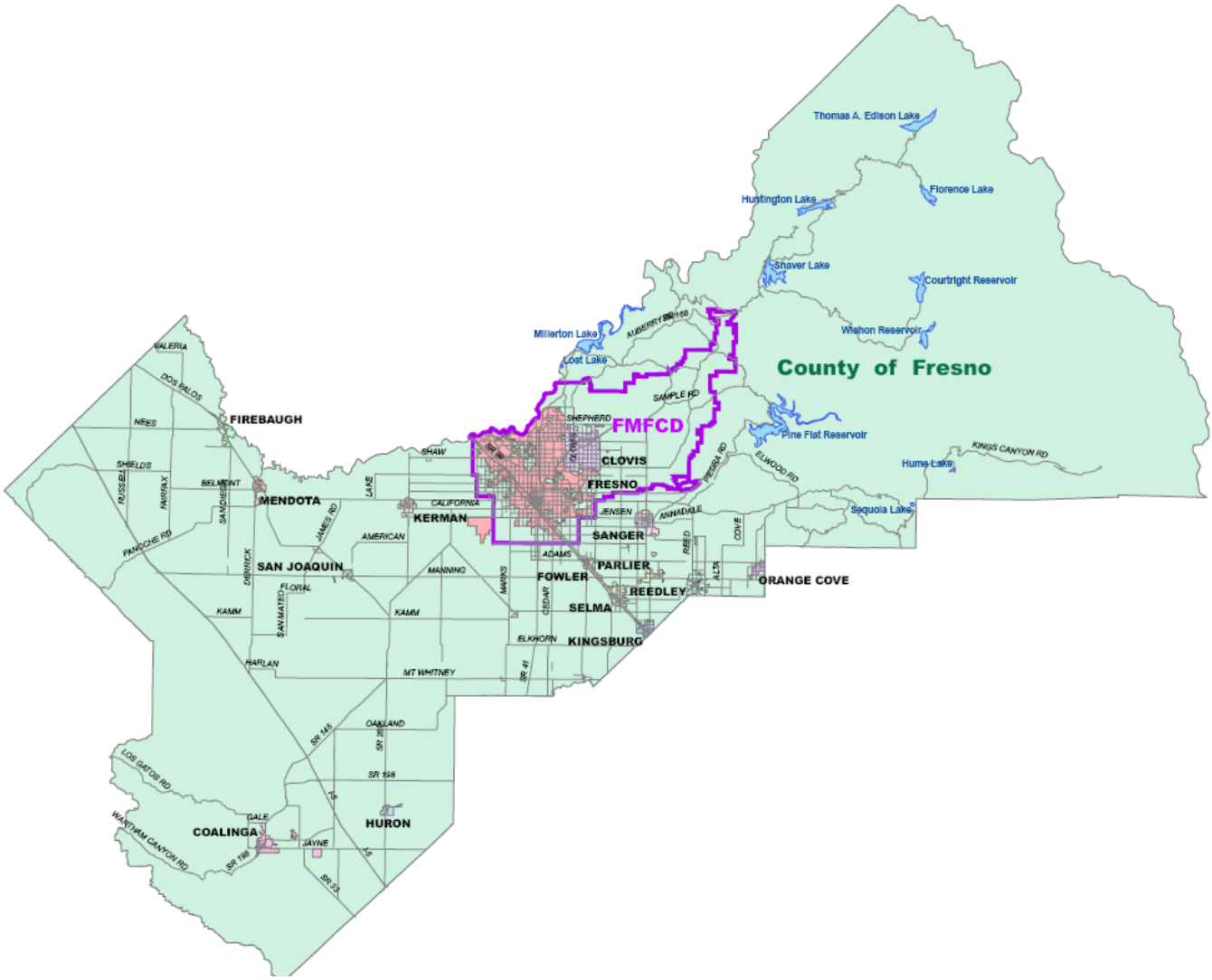

City of Selma
Hazard Mitigation
Flooding Intersections
Selma City Limits
Streets
Union Pacific RR
Flooding Areas
Elementary Schools
Middle School
High Schools
N
W
E
S

ANNEX J: FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

J.1 Community Profile

The Fresno County Metropolitan Flood Control District service area is illustrated in Figure J.1.

Figure J.1. Fresno County Metropolitan Flood Control District's Service Area



Source: Fresno County Metropolitan Flood Control District, www.fresnofloodcontrol.org/

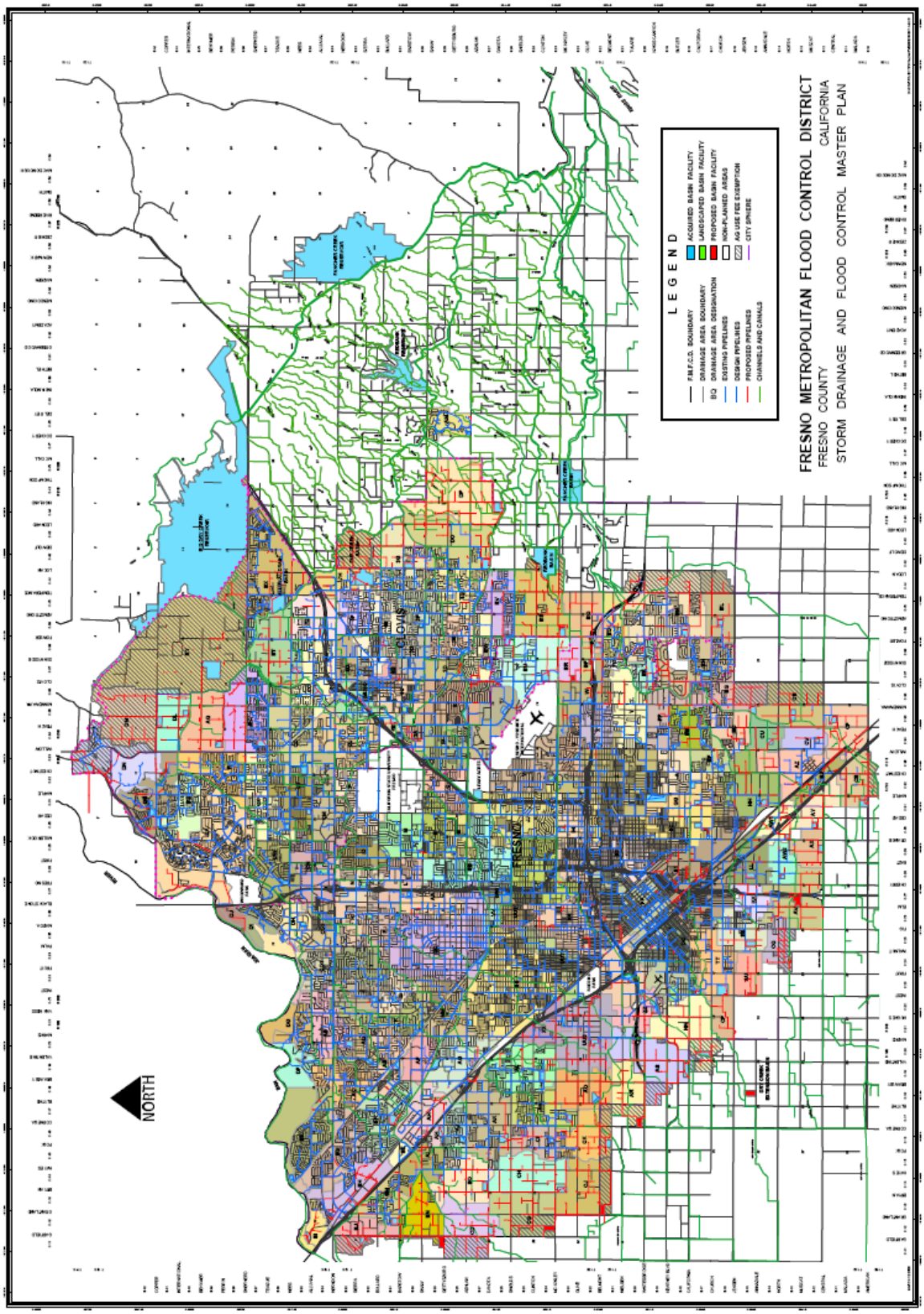
Until June 5, 1956, the responsibility for stormwater management and related functions was vested individually in the Cities of Fresno and Clovis and the County of Fresno. Fresno Metropolitan Flood Control District (District) is a “special act” district, created by the electorate to provide fully coordinated and comprehensive stormwater management and related services on a regional basis through a quasi-joint powers relationship among the Cities of Fresno and Clovis and the County of Fresno.

The District is located in the fertile San Joaquin Valley in the central part of California, about halfway between San Francisco and Los Angeles. The terrain in the Fresno area is relatively flat, with a sharp rise to the foothills of the Sierra Nevada Mountains about 15 miles eastward.

The climate in the Fresno area is sunny and dry in the summer and cool and wet in the winter months. Midsummer temperatures can occasionally top 100°F, but low humidity and gentle breezes help to make the high temperature more bearable. The mean July temperature is 82°F (mean high 99°F). Although temperatures drop below 32°F at times, the mean low temperature in the winter is 37°F degrees. Precipitation usually begins in October and ends in April, averaging 10.6 inches.

The District is authorized to control stormwater within an urban and rural foothill watershed of approximately 400 square miles known as the Fresno County Stream Group. The watershed extends eastward into the Sierra Nevada to an elevation of approximately 4,500 feet above sea level. The District service area includes most of the Fresno-Clovis metropolitan area (excluding the community of Easton) and unincorporated lands to the east and northeast. Figure J.1 displays the District’s service area and Figure J.2 displays the District’s Master Plan Map.

Figure J.2. Fresno Metropolitan Flood Control District's Master Plan Map



Before 1956, stormwater management generally consisted of independent, site-specific actions intended only to alleviate individual problem locations, failing to create comprehensive solutions. In response to the rapidly increasing number of stormwater management problems and the inability of the three independent jurisdictions to provide an effective, coordinated solution, a citizens' committee formed to explore alternatives.

The result of the citizens' efforts was draft legislation creating a "special act" district designed to mandate a quasi-joint powers relationship among the Cities and County, which would provide the desired stormwater management service. The act is know as the Fresno Metropolitan Flood Control District Act of 1955 and was signed into law on May 13, 1955. The District Act became law on September 17, 1955, subject to voter approval. On June 5, 1956, the District Act was ratified by a five-to-one majority vote (32,030 voting in favor, 5,974 voting in opposition) and was established as Chapter 73 of the California Water Code appendix.

The mission of the District is to provide the approximately 700,000 citizens living within its boundaries the ability to control and manage the water resources of the area; to prevent damage, injury, and inconvenience; to conserve such waters for local, domestic, and agricultural use; and to maximize the public use and benefit of the District's programs and infrastructure.

The District works to address stormwater and related water resource problems and needs, while seeking to prevent the creation of new problems. The District strives to achieve these goals within the reasonable time and economic parameters established through collective community discussion and decision making as entrusted to the District's seven-member Board of Directors. As a service agency, it is the District's responsibility to respond to the community's needs for technical information, resource conservation, and facility construction, operation, and maintenance.

3.1 Hazard Identification and Summary

The District's planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table J.1).

Table J.1. Fresno Metropolitan Flood Control District—Hazard Summaries

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Unlikely	Limited	Limited	Low
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Unlikely	Extensive	Critical	High
Drought	Occasional	Extensive	Critical	Medium
Earthquake	Occasional	Extensive	Critical	Medium
Flood	Occasional	Significant	Critical	High
Landslide	Unlikely	Limited	Negligible	Low
Severe Weather:				
Extreme Cold/Freeze	Occasional	Extensive	Negligible	Low
Extreme Heat	Highly Likely	Extensive	Negligible	Low
Fog	Highly Likely	Extensive	Negligible	Low
Snow	Unlikely	Extensive	Limited	Low
Tornado	Occasional	Limited	Critical	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Medium
Soil Hazards:				
Erosion	Unlikely	Limited	Negligible	Low
Expansive Soils	Occasional	Limited	Negligible	Low
Land Subsidence	Occasional	Extensive	Negligible	Low
Volcano	Unlikely	Extensive	Critical	Low
Wildfire	Occasional	Limited	Limited	Low

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

J.3 Vulnerability Assessment

The intent of this section is to assess the District's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

J.3.1 Assets at Risk

This section considers the District's assets at risk, specifically critical facilities and infrastructure, natural resources, and growth and development trends.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Table J.2 lists particular critical facilities and other community assets identified by the District's planning team as important to protect in the event of a disaster. The District's physical assets consist of the flood control and local drainage structures and real property, the operations center, and equipment.

Table J.2. Specific Critical Facilities and Other Community Assets Identified by the Fresno Metropolitan Flood Control District's Planning Team

Name of Asset	Replacement Value ($)	Occupancy/ Capacity #	Comments
Redbank-Fancher Creeks Flood Control Project	100,000,000	n/a	Provides protection from 200-year, 30 day rainfall event
Local Stormwater Drainage System (152 basins in various stages of completion, 68 pump stations and approximately 600 miles of pipeline)	236,000,000	n/a	2-year pipeline collection system and 6-inch, 10 day basin capacity
Fresno Metropolitan Flood Control District Operations Center	11,000,000	78 employees	

Natural Resources

Several state or federally listed species may be found within the District boundary. These are identified, along with other species of concern found in the District, in Table J.3.

Table J.3. Species of Concern in the Fresno Metropolitan Flood Control District

Common Name	Scientific Name	Federal Status	State Status
American (=pine) marten	*Martes Americana*		
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Endangered
Boggs Lake hedge-hyssop	*Gratiola heterosepala*		Endangered
Burrowing owl	*Athene cunicularia*		
California horned lark	*Eremophila alpestris actia*		
California linderiella	*Linderiella occindentalis*		
California tiger salamander	*Ambystoma californiense*	Proposed Threatened	
Dry Creek cliff strider bug	*Oravalia pege*		
Elongate copper-moss	*Mielichhoferia elongate*		
Foothill yellow- legged frog	*Rana boylii*		
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	Endangered	Endangered
Golden eagle	*Aquila chrysaetos*		
Great gray owl	*Strix nebulosa*		Endangered

Common Name	Scientific Name	Federal Status	State Status
Greene's tuctoria	*Tuctoria greenei*	Endangered	Rare
Hairy orcutt grass	*Orcuttia pilosa*	Endangered	Endangered
Hardhead	*Mylopharodon conocephalus*		
Hartweg's golden sunburst	*Pseudobahia behiifolia*	Endangered	Endangered
Keck's checkerbloom	*Sidalcea keckii*	Endangered	
Kings River buckwheat	*Eriogonum nudum var. regirivum*		
Madera linanthus	*Linanthus serrulatus*		
Mariposa pussypaws	*Calyptridium pulchellum*	Threatened	
Midvalley fairy shrimp	*Branchinecta mesovallensis*		
Molestan blister beetle	*Lytta molesta*		
Orange lupine	*Lupinus citrinus var. citrinus*		
Osprey	*Pandion haliaetus*		
Oval-leaved viburnum	*Viburnum ellipticum*		
Prairie falcon	*Falco mexicanus*		
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	Threatened	Endangered
San Joaquin kit fox	*Vulpes macrotis mutica*	Endangered	Threatened
San Joaquin pocket mouse	*Perognathus inornatus inornatus*		
San Joaquin Valley orcutt grass	*Orcuttia inaequalis*	Threatened	Endangered
Sanford's arrowhead	*Sagittaria sanfordii*		
Sierra Nevada red fox	*Vulpes vulpes necator*		Threatened
Spiny-sepaled button-celery	*Eryugium spinosepalum*		
Spotted bat	*Euderma maculatum*		
Succulent owl's-clover	*Castilleja campestris ssp. Succulenta*	Threatened	Endangered
Tree-anemone	*Carpenteria californica*		Threatened
Tricolored blackbird	*Agelaius tricolor*		
Valley elderberry longhorned beetle	*Desmocerus californicus dimorphus*	Threatened	
Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened	
Vernal pool tadpole shrimp	*Lepidurus packardi*	Endangered	
Western mastiff bat	*Eumops perotis californicus*		
Western pond turtle	*Emys (=Clemmys) marmorata*		
Western spadefoot	*Spea (=Scaphiopus) hammondii*		
Western yellow- billed cuckoo	*Coccyzus americanus occidentalis*	Candidate	Endangered
Willow flycatcher	*Empidonax traillii*		Endangered
Yosemite lewisia	*Lewisia disepala*		

Source: Fresno Metropolitan Flood Control District Services Plan, 2004

Sensitive habitats in the District include the following:

- Central Valley drainage hardhead/squawfish stream
- Great Valley mixed riparian forest
- Northern basalt flow vernal pool
- Northern claypan vernal pool
- Northern hardpan vernal pool
- Sycamore alluvial woodland

Growth and Development Trends

The Fresno Metropolitan Flood Control District completes technical studies and updates its master plan in conjunction with the growth patterns within its 400-square-mile service area. The District meets with the local Building Industry Association and planning departments to ensure knowledge of growth and development trends.

J.3.2 Estimating Potential Losses

Table J.2 above shows the Fresno Metropolitan Flood Control District's critical facilities and assets that could be exposed to hazards. Specific losses for the Cities of Fresno and Clovis and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Dam Failure

The Fresno Metropolitan Flood Control District has three earthen dams (Big Dry Creek, Fancher Creek, and Redbank Creek) that are identified in the Fresno County Operational Area Dam Failure Evacuation Plan. The dams are maintained regularly for rodent and vegetation control and inspected regularly for operational integrity and security. They are also inspected annually by the U.S. Army Corp of Engineers and the California Department of Water Resources Division of Safety of Dams.

Drought

The Fresno Metropolitan Flood Control District has nearly 300 acres of irrigated and landscaped basins that could be impacted in a prolonged drought.

Earthquake

The seismic hazard within the Fresno Metropolitan Flood Control District's service area is relatively low compared to many other parts of California. However, the area is considered to have a moderate risk of earthquake damage due to the presence of major fault systems to the west, south, and east and due to the large population and number of buildings, critical facilities, and infrastructure and other development that could be vulnerable to more severe ground shaking.

Flood

The Fresno Metropolitan Flood Control District's operation center is located outside of the 100-year floodplain and therefore should not be susceptible to damage in a large flood event. The Redbank-Fancher Creeks Flood Control Project and local stormwater drainage system could sustain damage during a large flood event due to debris accumulation and high stormwater flows.

Severe Weather: Heavy Rain/Thunderstorm/Hail

Heavy rain, thunderstorm activity, and hail are usually of such duration that they have no adverse impact on the District's Redbank-Fancher Creeks Flood Control Project. However, the local stormwater drainage system, which is designed to accept the peak flow rate of runoff from a two-year intensity storm event (a storm which has a 50 percent probability of occurring in any given year) could be impacted. When storm events occur that exceed the two-year intensity, ponding occurs in the streets until the pipeline system can remove the water. If the storm is sufficiently intense to generate more water than the street can store, the water will continue to rise until it reaches a topographic outlet where it can escape down gradient. This escape route is a feature of the major storm routing system. There are multiple areas within the District's service area that were developed before the District was formed and therefore lack the major storm routing system. These areas could be susceptible to damage from heavy rain, thunderstorm, and hail.

J.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into four sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation outreach and partnerships.

J.4.1 Regulatory Mitigation Capabilities

Table J.4 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table J.4. Fresno Metropolitan Flood Control District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	District Services Plan, 2004 (also, see general plans for Cities of Clovis and Fresno and Fresno County)
Zoning ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Subdivision ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Site plan review requirements	Yes	Cities of Clovis and Fresno, Fresno County
Growth management ordinance	Yes/No	City of Fresno
Floodplain ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Other special purpose ordinance (storm water, water conservation, wildfire)	Yes	Cities of Clovis and Fresno, Fresno County
Building code	Yes	2001 California Building Code
Erosion or sediment control program	Yes	Cities of Clovis and Fresno, Fresno County
Storm water management program	Yes	Storm Drainage and Flood Control Master Plan
Capital improvements plan	Yes	Cities of Clovis and Fresno, Fresno County
Economic development plan	Yes	Cities of Clovis and Fresno, Fresno County
Local emergency operations plan	Yes	Cities of Clovis and Fresno, Fresno County
Other special plans	Yes	Strategic Plan
Flood Insurance Study or other engineering study for streams	Yes	2005

As indicated above, the District has several plans and programs that guide hazard mitigation. Some of these are described in more detail below.

District Services Plan, 2004

The District Services Plan presents District goals, program objectives, current program descriptions, and implementation strategies. Comprehensive program descriptions provide reference and orientation information for District staff, Board members, and the public.

Fresno County Flood Control District Strategic Plan

The Fresno County Flood Control District Strategic Plan is a brief document that includes the District's mission and vision statements and other guiding principles. The following goals are outlined in the plan:

- Timely provision of needed services through fair and equitable financing
- Prevention of future drainage/flooding problems
- Operations and maintenance programs that ensure public safety and community aesthetics
- Conservation of storm and other surface water to preserve groundwater and environmental resources
- Augmentation of public open space and recreation resources through joint use of District facilities
- Support of economic development within the Fresno/Clovis area

- Achievement of program goals through close coordination with the County and the Cities of Fresno and Clovis

District Programs

Flood Control Program

The flood control program relates to the control, containment, and safe disposal of stormwater that flows onto the valley floor from the eastern streams. It consists of a system of facilities and operations that is currently composed of eight major flood control facilities and many related streams and channels. The District is the local sponsor of the U.S. Army Corps of Engineers' Redbank-Fancher Creeks Flood Control Project, which consists of five of the flood control system's major facilities. The District is responsible for construction cost sharing, land acquisition, operation, and maintenance related to the project. It is also responsible for construction, operation, and maintenance of additional, nonfederal flood control facilities required to control the stream group, and for floodplain management. The eight major structural elements of the flood control system are Big Dry Creek Dam and Reservoir, Fancher Creek Dam and Reservoir, Redbank Creek Dam and Reservoir, Pup Creek Detention Basin, Alluvial Drain Detention Basin, Redbank Creek Detention Basin, Fancher Creek Detention Basin, and Big Dry Creek Detention Basin.

Rural Streams Program

The District has implemented a rural streams program to preserve, restore, and maintain rural stream channels and to complete any additional facilities necessary to safely convey storm flows through the rural area and the downstream urban area. It includes activities to secure and maintain drainage amenities necessary for rural lands within the watershed.

Local Stormwater Drainage Program

The District's local drainage program relates to the collection and safe disposal of stormwater runoff generated within the urban and rural watersheds or "drainage areas." The District's local stormwater drainage system consists of storm drains, detention and retention basins, and pump stations. The system is designed to retain and infiltrate as much stormwater and urban runoff as possible.

Other Programs

Other District programs include a stormwater quality program, water conservation program, recreation program, and wildlife management program.

J.4.2 Administrative/Technical Mitigation Capabilities

Table J.4 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table J.4. Fresno Metropolitan Flood Control District's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/ No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Engineering Department	Various positions
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Engineering, Operations, and Environmental Departments	Various positions
Planner/engineer/scientist with an understanding of natural hazards	Yes	Engineering and Operations Departments	Various positions
Personnel skilled in GIS	Yes	GIS Technician	Two positions
Full-time building official	No		
Floodplain manager	No		Advisory agency
Emergency manager	Yes	Operations Department	Various positions
Grant writer	Yes	Administration/Staff Analyst	Three staff members can work as grant writers
Other personnel	Yes	Administration, Engineering, Facilities Departments	Various support and maintenance positions
GIS Data—Land use	No		
GIS Data—Links to Assessor's data	No		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

Board of Directors

A seven member Board of Directors governs the District. The Fresno City Council appoints four members, the Fresno County Board of Supervisors appoints two members, and the Clovis City Council appoints one member. Each director serves a four-year term and may be reappointed for consecutive terms. The Board must approve the District budget, fees, and assessments; direct matters of policy and enact ordinances; and perform other responsibilities authorized and required by the Fresno Metropolitan Flood Control District Act of 1955.

J.4.3 Fiscal Mitigation Capabilities

Table J.5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table J.5. Fresno Metropolitan Flood Control District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	Included in our yearly budget
Authority to levy taxes for specific purposes	Yes	We have voter approved authority to tax properties within our boundaries that receive benefits from our services up to $.20/$100 assessed valuation
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Yes	New development pays their proportional share of the storm drain system
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	Yes	Limited by Proposition 218 and a 2/3 vote of the property owners within the boundaries of the bond
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	
Other	Yes	Grants, contributions, rents, service fees, and donations

The financing program of the District includes five major categories of revenues. These include general property tax, assessments, bonds, fees and service charges, and grants and contributions. In addition to these, the District receives minor miscellaneous revenues such as rents and leases, interest, and gifts. The general authority to receive or collect such revenues is set forth in the District's enabling legislation, other state legislation under which the District is an eligible participant, and through joint powers relationships in which the District participates.

Economic Development Reserve

In October of 1999, the Board of Directors established an annual economic development reserve for the purpose of accelerating funding of storm drainage infrastructure to support job-creating developments in the community. This policy allows up to 50 percent of the District's annual budget reserve to be allocated as an economic development reserve.

These funds may be used at the direction of the Board to support construction of master plan storm drainage facilities to service high priority economic development projects. Projects are considered on a first come, first served basis, and each project must:

- Create additional leverage toward construction of master plan facilities by drawing additional public or private monies,
- Effect construction of critical elements of the drainage system, and
- Serve an economically targeted industry or area.

J.4.4 Mitigation Outreach and Partnerships

As part of the rural streams program, the District has developed and distributed public information materials to increase public awareness and understanding of various issues, including stream and habitat values, flood water conveyance, water quality, and the adverse effects of human activities.

The District partners with the Fresno Irrigation District and the Cities of Fresno and Clovis, which provide for dry season delivery of imported surface water into many of the District's local stormwater drainage retention basins.

J.5 Mitigation Strategy

J.5.1 Mitigation Goals and Objectives

The Fresno Metropolitan Flood Control District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

J.5.2 Mitigation Actions

The planning team for the Fresno Metropolitan Flood Control District identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Construct Control Structures and Flood Channel for Mud Creek Flows between the Gould and Fresno Canals

Issue/Background: Currently, floodwater from Mud Creek flows uncontrolled into the Fresno Irrigation District's (FID) Gould Canal. This water is then conveyed into the urban area via the canal. There are minimal controls on this water, and there is a potential for severe flooding to occur. The flood flows from Mud Creek are sheet flows that enter the canal over a very wide area. This project would require the construction of two different control structures and a conveyance channel. The project would reduce the amount of water flowing downstream in the Gould Canal and direct it to the Fresno Canal a short distance away. A connecting channel would be built between the two canals to convey the flows. The Fresno Canal has enough capacity to convey the flood flows to the District's Fancher Creek detention basin, where the water can be stored and released at a controlled rate into the FID canal system once capacity is available.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: $1,698,000

Potential Funding: Fresno Metropolitan Flood Control District Assessment Tax Fund

Benefits (Avoided Losses): The project would provide reduction of flooding that currently occurs in the rural and urban areas.

Schedule: Five years

2. Construct Improvements to the Vernon Drain Between the Gould and Fresno Canals

Issue/Background: Currently, floodwater from the Vernon Drain and upland areas flows uncontrolled into the Fresno Irrigation District's (FID) Gould Canal. This water is then conveyed into the urban area via this canal. There are minimal controls on this water and there is a potential for severe flooding to occur. The flood water enters the Gould Canal over a very large area between Mud Creek and the Vernon Drain. This project would require the construction of a control structure and improvements to the Vernon Drain channel from the Gould Canal to the Fresno Canal. The project would reduce the amount of water flowing downstream in the Gould Canal and direct it to the Fresno Canal a short distance away. The Fresno Canal has sufficient capacity to convey the flood flows to the District's Fancher Creek detention basin, where the water can be stored and released at a controlled rate into the FID canal system once capacity is available.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: $1,094,000

Potential Funding: Fresno Metropolitan Flood Control District Assessment Tax Fund

Benefits (Avoided Losses): The project would provide reduction of flooding that currently occurs in the rural and urban areas.

Schedule: 5-10 years

3. Provide for Local Stormwater Drainage System Infrastructure

Issue/Background: Drainage service for new development is funded through development fees paid upon approval of the development. Ideally, drainage services are provided concurrent with construction of the development project. However, system construction may occasionally be delayed due to insufficient fee revenue to fund all facilities required by a development project.

The provision of service can also be delayed by the lack of street improvements necessary to convey runoff from the development to the collection points. Unless the developer or the District can advance funds to cover the necessary facilities or street improvements, the developer must provide temporary on-site storage of the project's runoff until permanent service is available.

There are also areas within the District that were developed before the District was established in 1956. Some of these areas are still without permanent drainage service due to the lack of development fee revenue.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: $100,000-2,000,000 per project

Potential Funding: Pre-Paid Drainage Assessment Funds and Fresno Metropolitan Flood Control District General Fund

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage.

Schedule: Ongoing

4. Retain 200-Year Flood Control Protection

Issue/Background: There are currently 200-year flood control facilities (dams, detention basins, and bypass structures) east of the metropolitan area. As development occurs upstream of those facilities, the level of protection will diminish. The study and subsequent construction of additional flood control facilities (detention basins and bypass structures) upstream of new development will continue the 200-year protection level.

Other Alternatives: Compromise 200-year protection level

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: $50,000,000

Potential Funding: Fresno Metropolitan Flood Control District Assessment Tax Fund, mitigation grants

Benefits (Avoided Losses): Retain current 200-year flood protection level

Schedule: 5-10 years

5. Retrofit Areas with Surface Outlets to Protect Existing Structures

Issue/Background: The District was not formed until 1956, and portions of the community were not annexed to the District immediately. There are a number of areas that were developed in low lying areas that are prone to flooding when large storms occur. Current standards establish the finished floors of structures be elevated above the surface outlet of an area. This project would retrofit areas with surface outlets to protect existing structures.

Other Alternatives: Purchase repetitively flooded structures

Responsible Office: City of Fresno and Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: $10,000-250,000 each

Potential Funding: City of Fresno, Fresno Metropolitan Flood Control District General Fund, mitigation grants

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage

Schedule: Five years

6. Install Back-up Generators for Pump Only Facilities

Issue/Background: The Fresno Metropolitan Flood Control District was not formed until 1956, and portions of the community relied on pump only stations for protection from floods. If there was a power outage in these areas during a storm event, the streets would become impassable and potential structure damage would occur.

Other Alternatives: Purchase repetitively flooded structures

Responsible Office: City of Fresno and Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Low

Cost Estimate: $50,000 per site; there are four such sites (WW, VV, MM, and AB2)

Potential Funding: Fresno Metropolitan Flood Control District General Fund, mitigation grants

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage

Schedule: Five years

ANNEX K: LOWER SAN JOAQUIN LEVEE DISTRICT

K.1 District Profile

The Lower San Joaquin Levee District (the District) was created by the state legislature in 1955. The purpose of the District is to operate and maintain levees, bypasses, channels, control structures, and other facilities in connection with the Lower San Joaquin River Flood Control Project and provide protection to the people and the property of the District.

A brief history of the San Joaquin River helps clarify the District's purpose: The San Joaquin River and its tributaries have historically caused flood problems that have been a threat to life and property. Flooding problems have been lessened, but not eliminated, through activities of federal, state, and local governments and the sacrifices and efforts of affected landowners.

Completion and operation of the Friant Dam in 1947 reduced flow volumes, but contributed to a major sedimentation problem in the river. Sedimentation has reduced the river's flow capacity and increased the potential for flooding and erosion problems as well as vegetation encroachment, which further accelerates channel constriction. Years of planning, engineering, and public hearings resulted in the approval of the Lower San Joaquin River Flood Control Project plan.

The project was designed and constructed by the California Department of Water Resources between 1959 and 1967. The project's purpose is to provide flood protection along the San Joaquin River and tributaries in Merced, Madera, and Fresno counties. The plan covers 108 river miles, contains 191.4 miles of levees, and protects over 300,000 acres. The project is a series of bypasses built to collect San Joaquin flood flows, as well as floodwater from the Kings River System. The bypasses divert flows around stretches of the San Joaquin where constrictions impair its capacity. The District, in accordance with its agreement with the State Reclamation Board, is obligated to maintain not only the bypasses, but the channel of the San Joaquin River within the project, in a condition where the channel will carry flood flows in accordance with the maximum benefits for flood protection.

The District boundaries were based on historical data as to areas subject to actual flooding and/or receiving benefit from the project related to the designed capacity of the bypass system. The boundaries were established along existing section lines, roads, canals, drains or other permanent lines that were reasonably close to the probable floodplain.

Figure K.1 depicts the San Joaquin River System and the waterway channels that make up the natural and manmade system. Channel topography relates the manner in which flows are directed. Reservoir capacities are important in that flood releases are made when those capacities are at risk, affecting the channels' rated capacities; Figure K.2 depicts the reservoirs and water courses that contribute flows into the flood project; Figures K.3-K.5 display the levee units that

make up the flood project (each unit is depicted by a number and its length (levee mile)); and Figure K.6 shows the project levees, channels, structures, and appurtenances that make up the flood project (channel rated capacities are also shown).

Figure K.1. San Joaquin River System

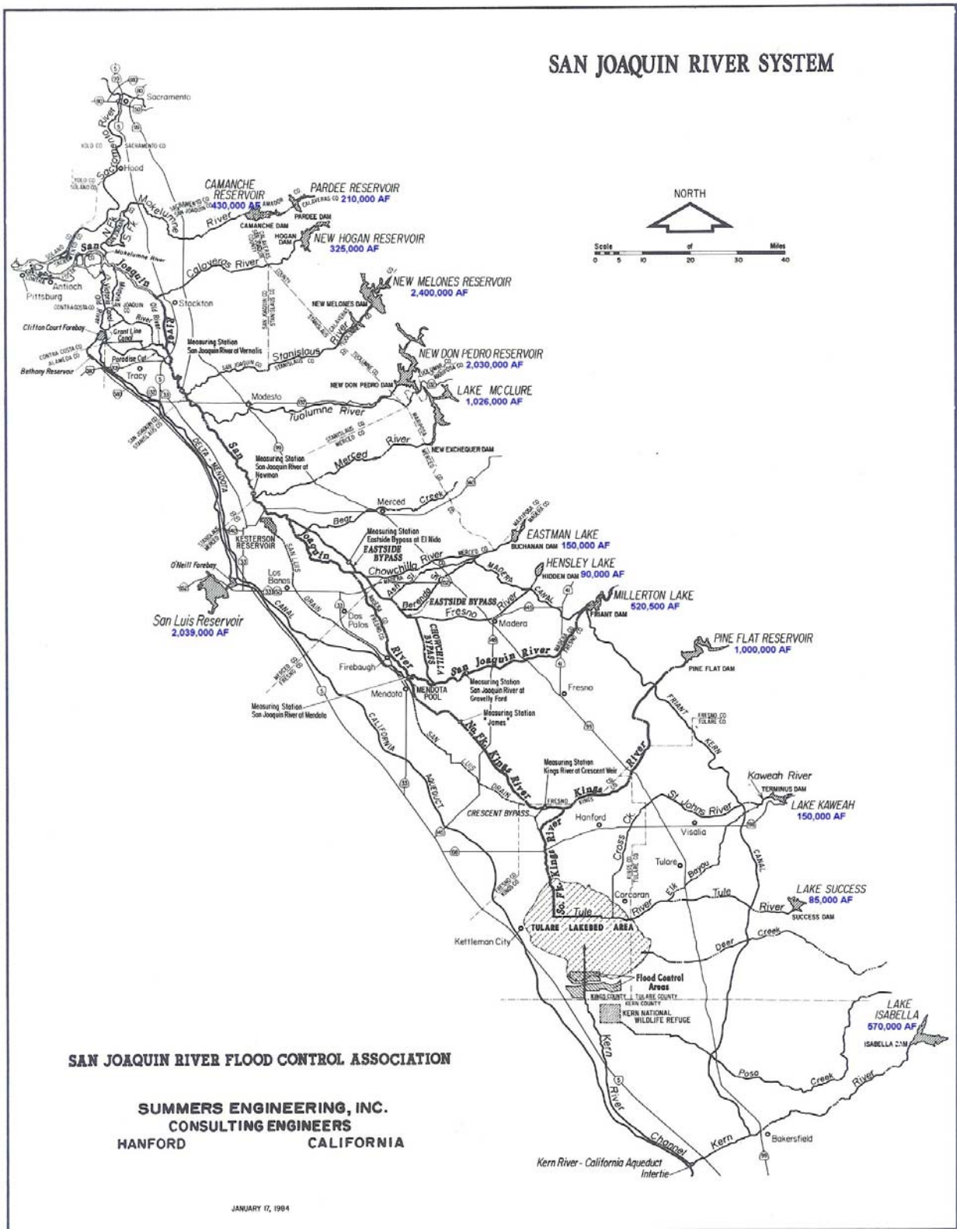


Figure K.2. Project Contributory Streams

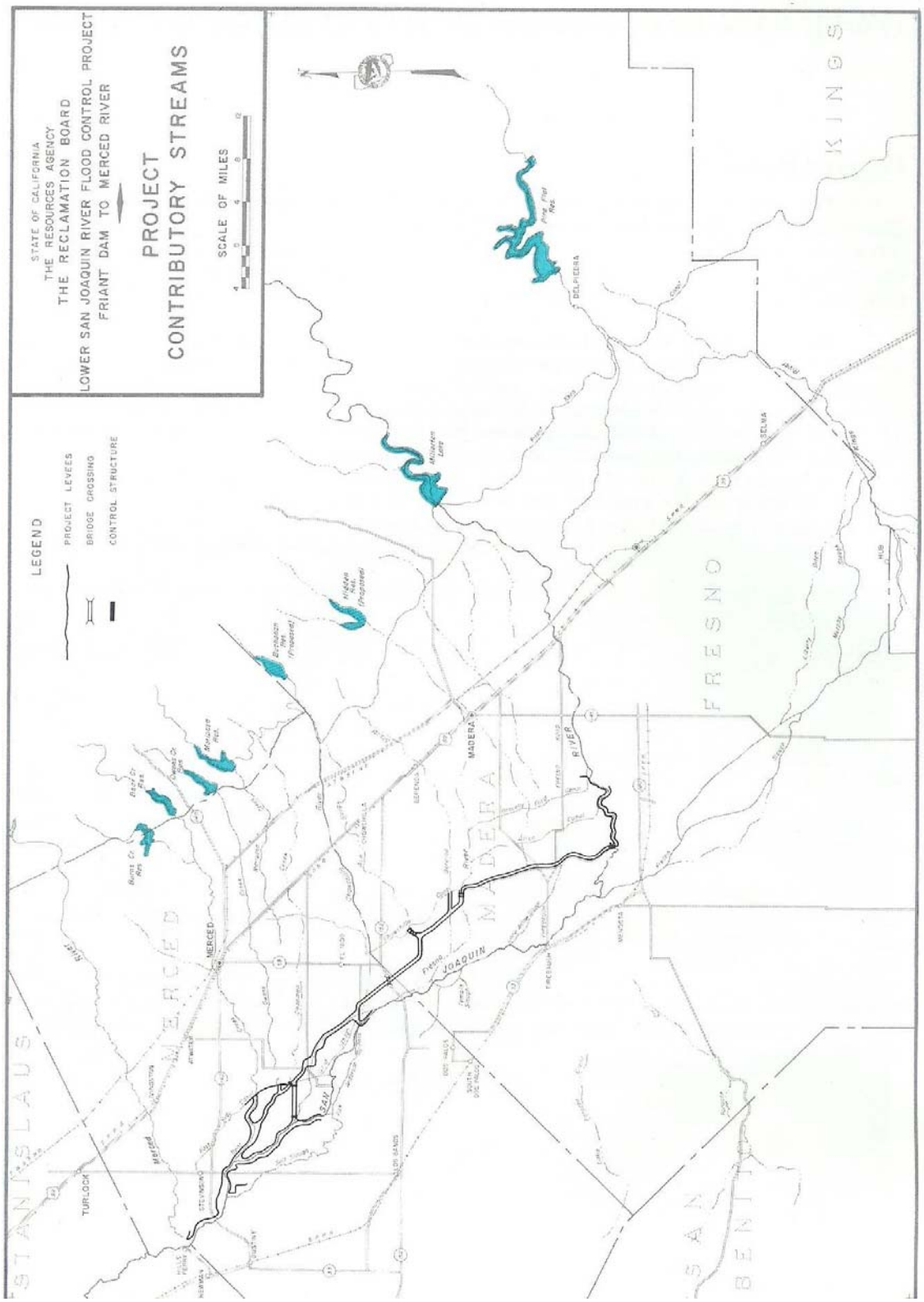


Figure K.3. Project Map—Northern Portion

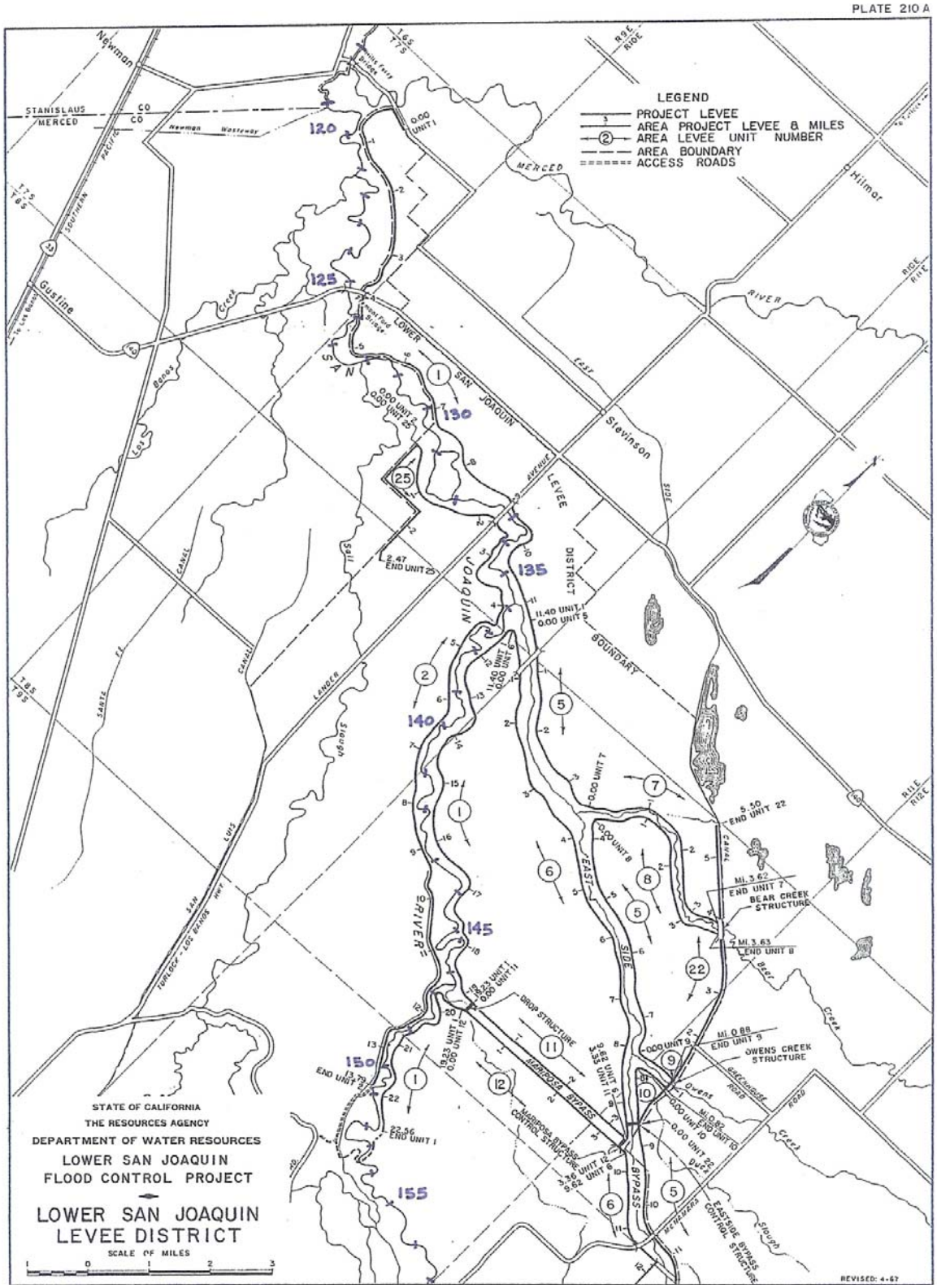


Figure K.4. Project Map B—Central Portion

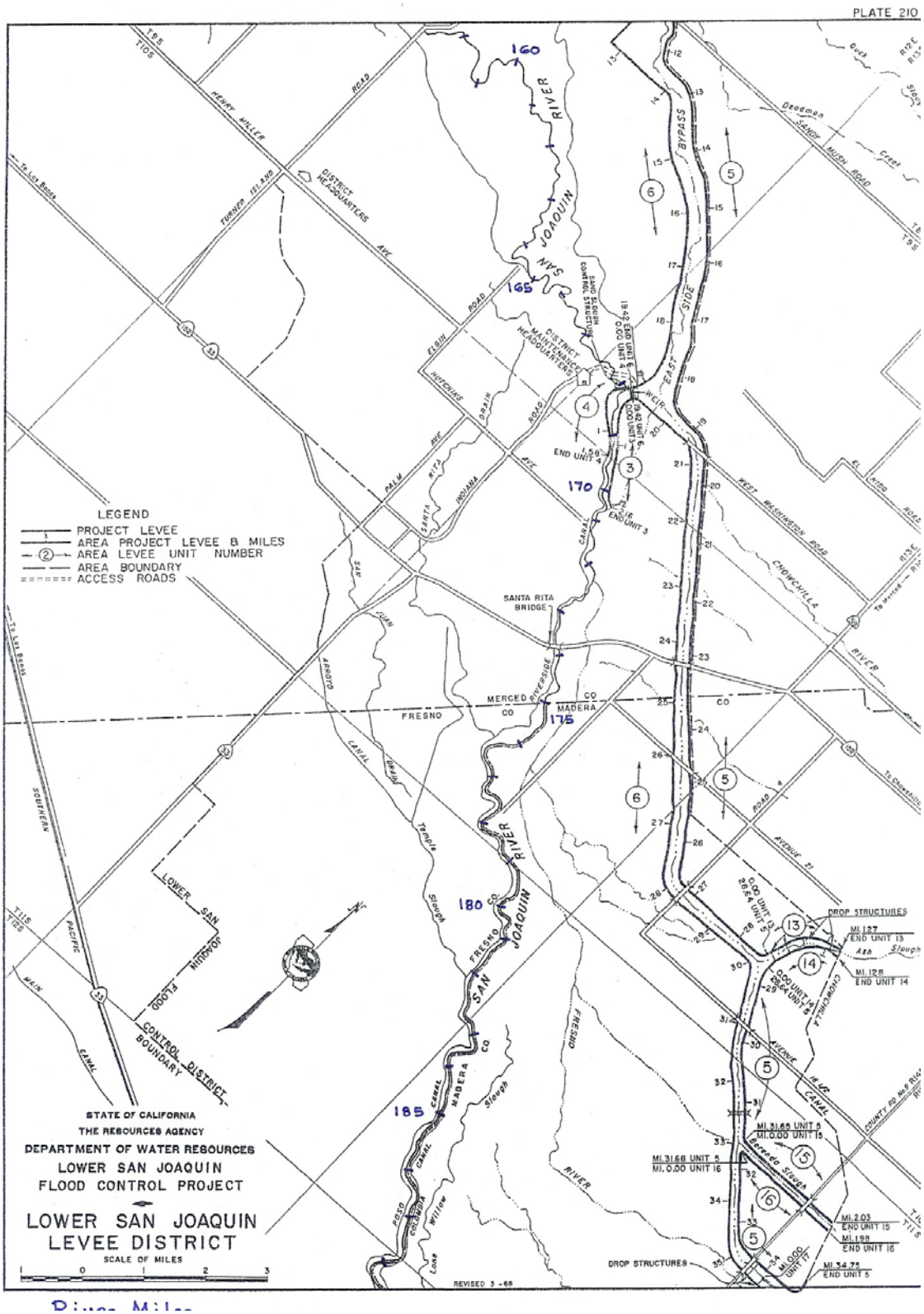


Figure K.5. Project Map—Southern Portion

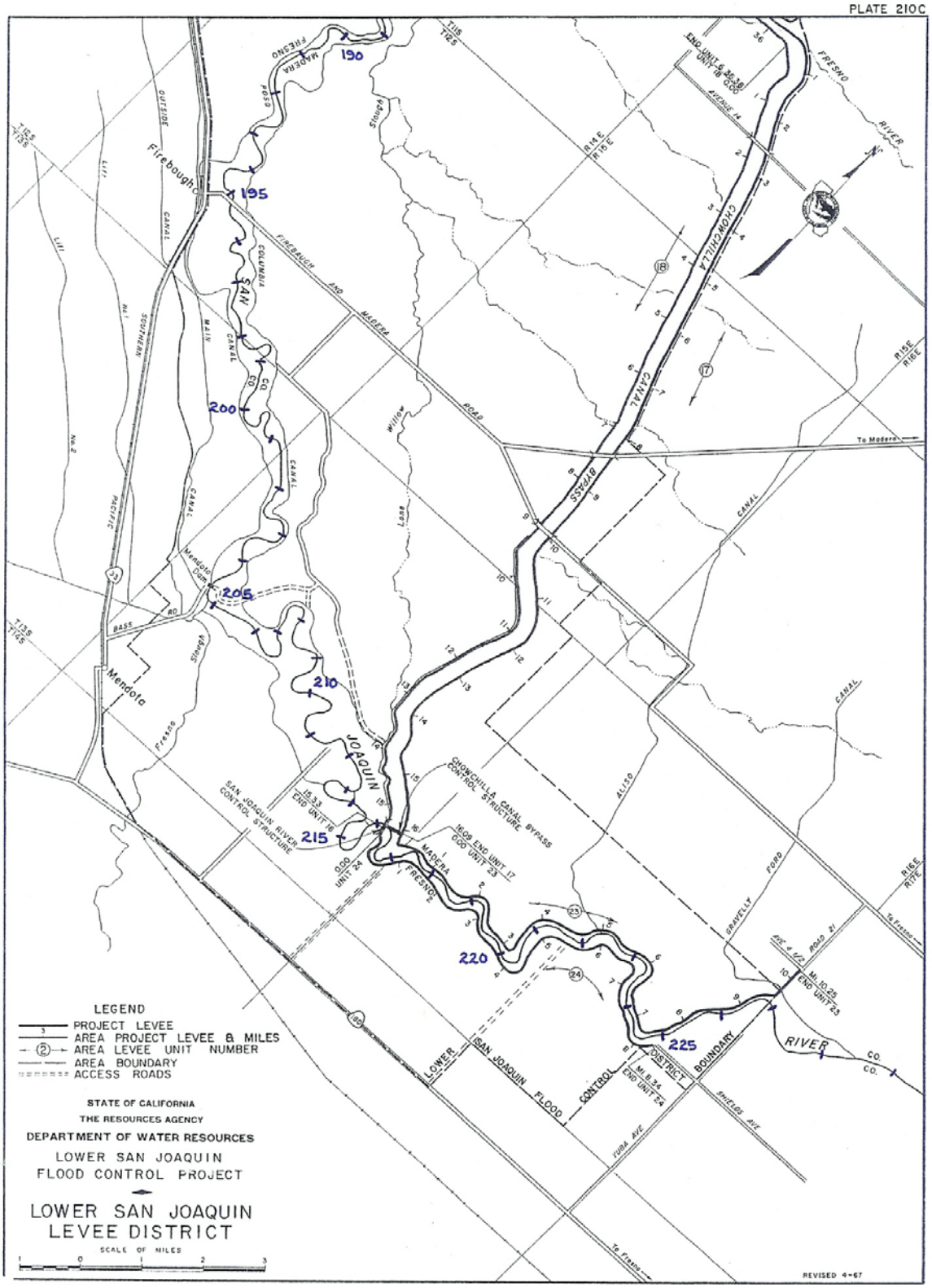
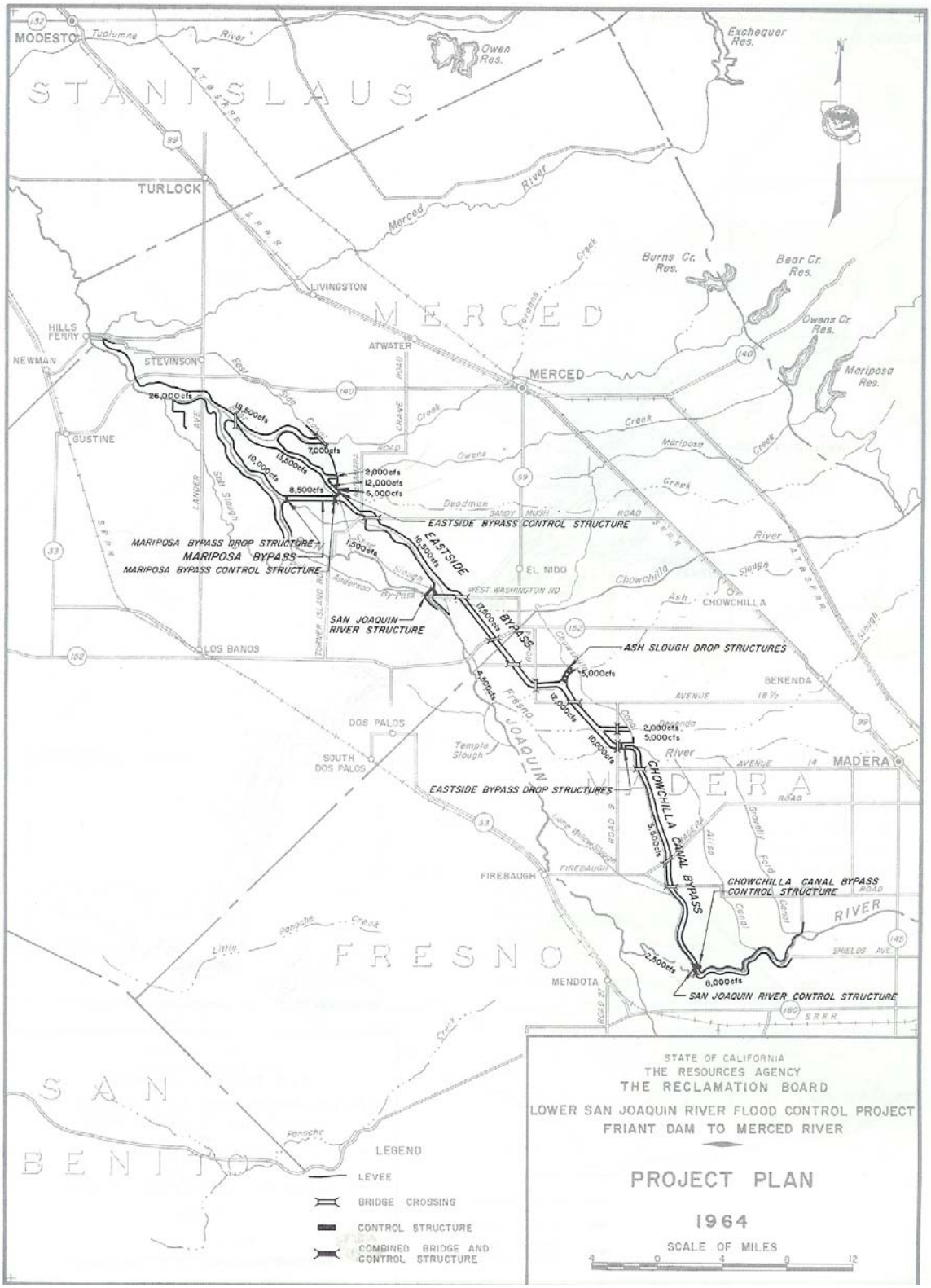


Figure K.6. Project Plan



K.2 Hazard Identification and Summary

The District's planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table K.1).

Table K.1. Lower San Joaquin Levee District—Hazard Summaries

Hazard	Probability of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	n/a	n/a	n/a	n/a
Avalanche	n/a	n/a	n/a	n/a
Dam Failure	Unlikely	Extensive	Catastrophic	High
Drought	Likely	Extensive	Critical	High
Earthquake	n/a	n/a	n/a	n/a
Flood	Likely	Extensive	Critical	High
Landslide	n/a	n/a	n/a	n/a
Severe Weather:				
Extreme Cold/Freeze	n/a	n/a	n/a	n/a
Extreme Heat	n/a	n/a	n/a	n/a
Fog	n/a	n/a	n/a	n/a
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Critical	Medium
Snow (was Winter Storm)	n/a	n/a	n/a	n/a
Tornado	n/a	n/a	n/a	n/a
Soil Hazards:				
Erosion	Highly Likely	Significant	Critical	High
Expansive Soils	n/a	n/a	n/a	n/a
Land Subsidence	n/a	n/a	n/a	n/a
Volcano	n/a	n/a	n/a	n/a
Wildfire	n/a	n/a	n/a	n/a

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

K.3 Vulnerability Assessment

The intent of this section is to assess the District's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability

Assessment in the main plan. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

K.3.1 Assets at Risk

This section considers the District's assets at risk, which include real property; levees, structures, and appurtenances that make up the flood project; and other equipment and automobiles used in District operations (see Table K.2). It should be noted that the real property and flood project is owned entirely by the State of California. The District has ownership of a 3.5-acre parcel and various equipment and automobiles that are used for operation and maintenance of the flood project.

Table K.2. Specific Critical Facilities and Other Community Assets Identified by the Lower San Joaquin Levee District's Planning Team

Name of Asset	Replacement Value ($)	Hazard Specific Info.
Property: Flood Project	3,721,080	Flood, Erosion, Drought
Equipment	492,345	Flood
Automobiles	342,800	Flood

K.3.2 Estimating Potential Losses

Flood

Flood is clearly the hazard of greatest concern to the District. The California Department of Water Resources defines the flood season as November 15 to June 15. In the early part of the season, the San Joaquin Valley is in danger of flood from rain-flood runoff. In the latter part of the season, there is danger of flooding from snowmelt runoff. Heavy rains and thunderstorms occur annually and increase the risk of damaging floods occurring within District boundaries.

Every three to four years, on average, flood flows in the District (along San Joaquin, Kings, Fresno, Chowchilla rivers and numerous streams) exceed the design level of protection of the levees. These events result in infrastructure damage (e.g., to the levees themselves); property damage throughout the district in agricultural, rural, and urban areas; and crop damage. For more information about flooding in the District, see Section K.1 District Profile.

While there is no history of past occurrences, a failure of one or more upstream dams could cause significant flooding and be catastrophic in nature to the District and surrounding areas.

Other Hazards

Related to flooding, erosion along the banks of the channels is also a concern of the District. Ongoing maintenance is required to mitigate the effects of erosion caused by high waters.

Drought conditions can also cause problems, as dry, cracking soil can compromise the integrity of the levee system.

K.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

K.4.1 Regulatory Mitigation Capabilities

Table K.3 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table K.3. Lower San Joaquin Levee District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	No	
Zoning ordinance	No	
Subdivision ordinance	No	
Site plan review requirements	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildfire)	No	
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	Yes	Operation and maintenance manual
Storm water management program	No	
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	Yes	Operation and maintenance manual
Other special plans	No	
Flood Insurance Study or other engineering study for streams	No	
Elevation certificates	No	

The District's primary capability is the Lower San Joaquin River Flood Control Project, which is described in more detail in Section K.1 District Profile. The District's operations and maintenance rules are as follows:

- No encroachment or trespass, which will adversely affect the efficient operation or maintenance of the project works, shall be permitted upon the rights of way for the protective facilities.
- No improvement, excavation or construction shall be permitted within the limits of the project right of way, nor shall any change be made in any features of the works without prior determination by the State Reclamation Board that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice and to the design criteria of the project.
- The California Department of Water Resources (DWR) makes semiannual inspections of all features of the project and reports its findings to the District and the State Reclamation Board. The inspection objectives are to determine if proper maintenance items are being adhered to (i.e., that all brush, trees, and wild growth, other than sod, are removed from the levee crown and slopes; that all burrowing animals have been exterminated; that an active channel maintenance program is being carried out; that all bridges and control structures of the project are in good conditions and working order). Following the inspection findings a joint field inspection is made with the District and the DWR to review and discuss the report.
- The channel as defined for this project is that area lying along the waterway between the waterward toe of one levee and the waterward toe of the opposite levee. In cross sections this includes the drainage channel and banks, and the area from the top of the bank to the toe of the levee which is called the berm or floodway.
- The channels consist of natural drainage channels and bypass channels constructed as part of this project. These channels extend along and adjacent to the San Joaquin River from the Merced River to Mendota Dam, and from the junction of the Chowchilla Canal Bypass to Gravelly Ford. The river reach from Mendota Dam to the Chowchilla Canal Bypass is not part of the project facilities.
- Inspections by the District shall be made to be certain that the channel floodway is clear of debris, weeds, and wild growth; the capacity of the channel or floodway is not being reduced by the formation of shoals.
- The channels of-the project shall be maintained and kept clear of regrowth of vegetation. This is necessary as regrowth of vegetation will change the flood flow characteristics of the project channels. The purpose of channel maintenance is to insure that the channel is kept in as good a condition as when the project was constructed. A regular program of channel maintenance shall be instituted by the District. Tree and brush growth in the channel shall be cleared and removed along with any debris that may be present. A strip of brush and small trees may be retained, through application to the State Reclamation Board, on the floodplain within 10 feet of the levee on the waterward side where necessary to prevent erosion and wavewash. Suitable riprap material shall be placed to repair existing slope protection or in other locations found to be critical trouble points to stabilize the channel alignment and preserve the general uniformity of the bank lines.

Additionally, federal and state regulations require that all flood projects undergo an inspection of facilities every 90 days. Two of these inspections are done by the DWR (in the fall and spring), and two are done by the District (in the winter and summer). All inspections are done to specific standards developed by the U.S. Army Corps of Engineers and the DWR. Inspections result in ratings of either "compliant" or "noncompliant." Records by DWR that show the District has maintained their flood facility to "compliant" standards. DWR publishes an annual report on such inspections.

K.4.2 Administrative/Technical Mitigation Capabilities

Table K.4 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table K.4. Lower San Joaquin Levee District's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		
Planner/engineer/scientist with an understanding of natural hazards	Yes	Summers Engineers	Consultant
Personnel skilled in GIS	Yes		
Full time building official	No		
Floodplain manager	No		
Emergency manager	Yes	Manager	Personnel
Grant writer	No		
Other personnel	Yes	Supt, Foreman	Personnel
GIS Data—Land use	No		
GIS Data—Links to Assessor's data	No		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

The District is governed by a seven-member Board of Directors and appointments are by the Board of Supervisors of the appropriate counties. The District operates with an unpaid Board, minimal staff, no investment in real property, and only the absolute necessities in equipment. The philosophy of the District Board is to provide the best flood protection with minimal funds. District personnel are given flood-fight methods training, per the DWR/U.S. Army Corps of Engineers standards, every three years (length of time is determined by employee turnover).

K.4.3 Fiscal Mitigation Capabilities

Table K.5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table K.5. Lower San Joaquin Levee District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	No	
Authority to levy taxes for specific purposes	Yes	Annual operations and maintenance budget assessments
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	No	
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

From 1963 to 1978, all lands within the District were assessed a tax for maintenance. This was through the assessor offices of the three counties. The tax was a flat rate based on assessed valuation, land only. After the voter approval of Proposition 13 in 1978, all tax assessments were eliminated. This resulted in substantial decreases in District income to funds amounting to half the District's average annual budget for routine maintenance. To continue financing the maintenance and operation costs of this service, a benefit assessment was implemented. The assessment is in proportion to the benefit received as it relates to each parcel's ability to be put into use and its size. (Use refers to the use of the land, e.g., swamp and overflow, pasture, row crops and permanent crops, residential, commercial, or industrial. Each land use is given a weighted factor for determining the assessment charged to that parcel.)

K.4.4 Mitigation Outreach and Partnerships

Cooperation from local agencies (districts, counties), landowners, the DWR, and the U.S. Army Corps of Engineers is essential in the flood-fight activities needed to operate and maintain the flood facilities during an event. Needed manpower for patrolling and/or flood fighting is a cooperative effort from stakeholders (those who have a vested interest in maintaining levee stability for flood protection).

K.4.5 Other Mitigation Efforts

Annual maintenance activity includes vegetation control (herbicide, handwork), rodent control, fence/gate repairs, erosion repairs, levee roadway graveling, levee slope repairs, channel repairs, livestock grazing monitoring, and structure inspections (operation-electronic). During high water periods, the District patrols the levees.

K.5 Mitigation Strategy

K.5.1 Mitigation Goals and Objectives

The Lower San Joaquin Levee District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

K.5.2 Mitigation Actions

The planning team for the Lower San Joaquin Levee District identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Institute a Dredging Management Program for the Purpose of Flood Damage Reduction

Issue/Background: At any given point, channel flood stage is determined, in part, by the size and shape of the cross-sectional area of the floodway channel. Impediments that can affect the floodway cross-sectional area create undesirable conditions. Typically, in the San Joaquin River, in-channel shoaling results when the channel flow is unable to transport the amount of material being carried by the current (capacity), or the size of the transported material exceeds the ability of the current to move it (competency). When either of these conditions exists, transported sediment is deposited by the river and accumulation begins to occur. This will eventually build-up to the point that it diminishes the channel depth and restricts the passage and/or reduces flow capacity of the river. This accumulation slows flow velocity, contributing to longer durations of exposure of levees to erosion and saturation, affecting levee foundation issues. These in-channel sediment deposits can also cause overbank flooding to occur more frequently.

Dredging to remove sediment deposits can reduce the frequency of overbank topping and shorten flow durations, which will minimize levee foundation integrity issues. It should be noted that while dredging can temporarily restore channel capacity, it does not change the pre-existing conditions that caused the sediment to be deposited in the first place. In fact, dredging re-creates those original conditions, resulting in continued sediment deposition at that location. This will continue to occur as long as an upstream sediment source exists (particularly erosion-prone banks and lands). Consequently, dredging must be repeated regularly to maintain the effectiveness of reducing flood stages.

Regulatory agencies with responsibilities to maintain ecosystem values in river environments can prevent and/or hinder program attempts to manage this sediment accumulation. The environmental effects of removing this sediment may require more mitigation for habitat losses than the District can provide. There are land and water rights that will need to be addressed

before a viable program can be implemented, which will take time. These time constraints result in increased risk of loss of life and property in a future disaster.

A comprehensive approach to all the issues pertaining to river sediment accumulation that incorporates habitat and flood values needs to be developed, with a focus on protecting life and property. This can be accomplished through committed efforts of responsible agencies along with adequate funding. This would have to be an ongoing process as the river system will continue to deposit sediment.

Other Alternatives: Constructing a new setback levee would allow the river sediment processes to remain in the main channel. This would address channel capacity requirements by increasing the cross-sectional area of the channel for flood flows. The associated costs (land acquisitions, water rights, levee construction, levee removal, etc.) would be higher than a suitable dredging management program.

Responsible Office: Lower San Joaquin Levee District

Priority (High, Medium, Low): High

Cost Estimate: $2.5 million/mile (106 miles of river)

Potential Funding: FEMA mitigation grants

Benefits (Avoided Losses): Flood damage in Mendota and Firebaugh will be avoided. Damage to viable agricultural crops that will affect economies in surrounding communities and statewide markets will also be avoided.

Schedule: Annually, when river channel is seasonally dry (June-October), depending on river reach

2. Institute an Invasive Vegetation Management Program for the Purpose of Flood Damage Reduction

Issue/Background: At any given point, channel flood stage is determined, in part, by the size and shape of the cross-sectional area of the floodway channel. Impediments that can affect the floodway cross-sectional area create undesirable conditions. Unmanaged invasive vegetation is an impediment within the San Joaquin River that can reduce the ability of the channel to pass the designed flood flows, thus reducing flow velocity and increasing the water stage elevation. Proper management of vegetative growth is essential in lessening flood damage.

The impact of vegetation on the flow carrying capacity of the San Joaquin River depends on the location, density, height, and vegetation type as well as the depth, velocity, and timing of the flood flows. Unmanaged vegetation within the river's main channel causes drag, or a resistance to flow. Dense vegetation located throughout the river channel is likely to cause significant resistance and increase flow stage, whereas a narrow band of trees and shrubs parallel to the

channel may have little impact on the channel's ability to carry flood flows. However, even acceptable woody trees and shrubs that have rigid stems will attempt to resist flows and may become uprooted and add to the debris carried by the flood flows.

Vegetation along levees needs to be removed or otherwise managed as part of routine flood management system maintenance. This practice can prevent trees from becoming established that may harm the integrity of the levee and facilitates visual inspection of the levee. Managing vegetation requires knowledge of the river system relative to acceptable retention of certain vegetation. A vegetated buffer zone between the main channel and the levee can benefit the reliability of the flood management system by protecting the levee without significantly impacting stage or flow capacity.

Unfortunately, regulatory agencies with responsibilities to maintain ecosystem values in river environments can prevent and/or hinder program attempts to manage this vegetation. Unmanaged vegetation can become habitat for species listed under the endangered species acts. The environmental effects of removing this vegetation may require more mitigation than the District can provide. The result is increased risk of loss of life and property in a future disaster.

A comprehensive approach to all the issues pertaining to habitat and flood values needs to be developed, with a focus on protecting life and property. This can be accomplished through committed efforts of responsible agencies along with adequate funding. This would have to be an ongoing process, as the river system will continue to develop vegetative growth.

Other Alternatives: Constructing a new setback levee would allow vegetation to remain in the main channel by increasing the cross-sectional area of the channel for flood flows. The associated costs (land acquisitions, water rights, levee construction, levee removal, etc.) would be higher than a suitable vegetative management program.

Responsible Office: Lower San Joaquin Levee District

Priority (High, Medium, Low): High

Cost Estimate: $500,000–10 million

Benefits (Avoided Losses): Flood damage in Mendota and Firebaugh will be avoided. Damage to viable agricultural crops that will affect economies in surrounding communities and statewide markets will also be avoided. It would also create a balanced aquatic habitat ecosystem that can support environmental values along with flood management.

Potential Funding: FEMA mitigation grants

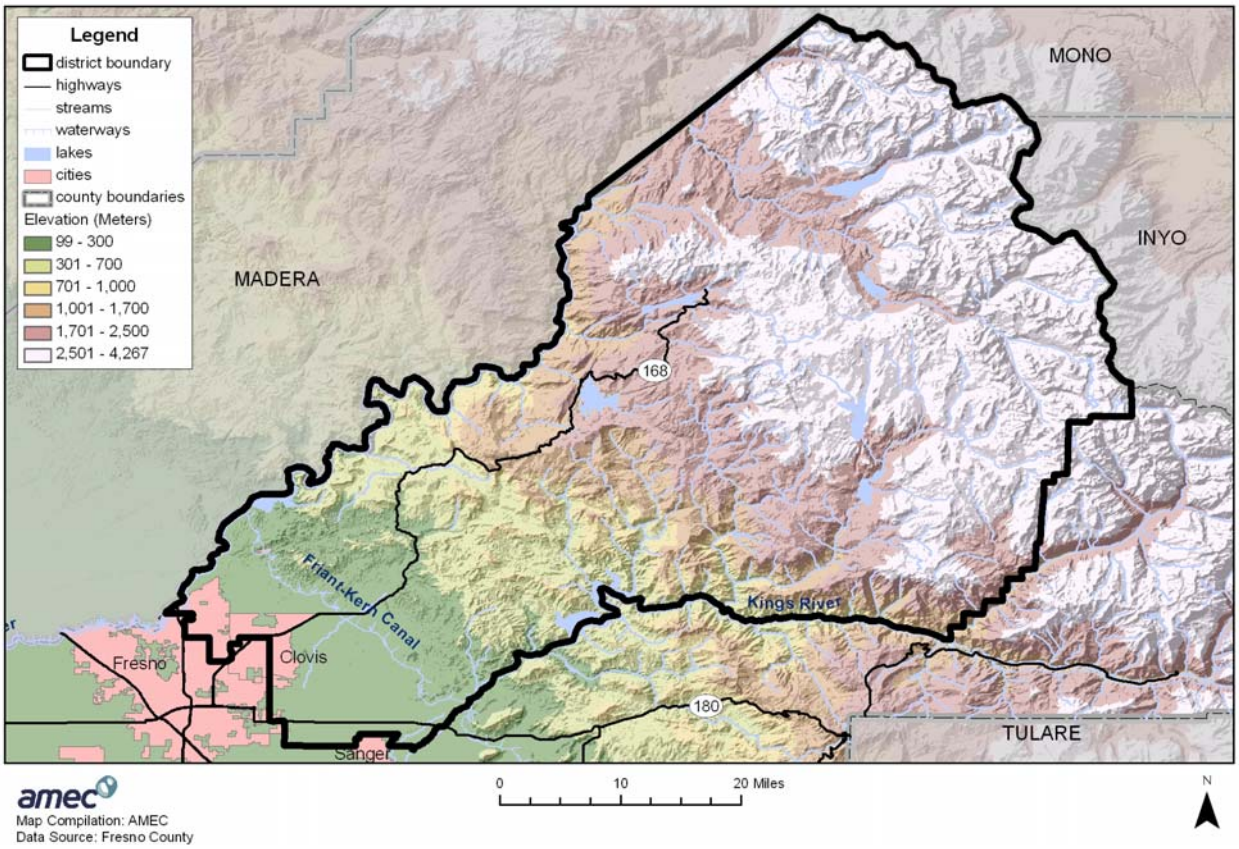
Schedule: Annually, November to April (conditions permitting)

ANNEX L: SIERRA RESOURCE CONSERVATION DISTRICT

L.1 District Profile

The Sierra Resource Conservation District (SRCD or the District) has partnered with the Highway 168 Fire Safe Council in the development of this annex. For more information about the Council, see Section L.4.4 Mitigation Outreach and Partnerships. Figure L.1 shows the area covered by the two entities.

Figure L.1. Sierra Resource Conservation District/Highway 168 Fire Safe Council



According to the Sierra Resource Conservation District Long Range Plan 2003-2080, the primary purposes of the SRCD (as legislated by the state) are to secure the adoption of conservation practices including but not limited to farm, range, open space, urban development, wildlife, recreation, watershed, water quality, and woodland and to save the basic resources, soil, water, and air of the state from unreasonable and economically preventable waste and destruction. Its mission is to take available technical, financial, and educational resources, whatever their source and focus, or coordinate them at the local level, to meet the present and future natural resource needs of the local land user.

Formed in 1957, the SRCD encompasses 1,179,173 acres and over 1,843 square miles in eastern Fresno County (almost one-third of the total acreage of Fresno County). The District is bounded on the north by the San Joaquin River, on the south by the Kings River, and on the east by the Fresno County line and extends west into the fertile valley areas near Clovis and the northern part of the City of Fresno. Approximately 1,000 square miles of the District are public lands, which includes portions of several wilderness areas, McKinley Grove, and portions of the Sierra National Forest, Squaw Leap Recreational Area, and Millerton State Park. There are three Indian rancherias within the district.

Approximately 10 percent of the District is on the valley floor with heavy urbanization, production agriculture, and a few public lands. The terrain here is predominately flat. As one heads east, the terrain changes to rolling foothills that cover 20 percent of the District, and the land is predominately eastside range intermixed with urban residential to the 4,000-foot elevation. Continuing east, the remaining 70 percent of the District extends to the 14,000-foot elevation and is timberland intermixed with rural residential.

The rapid rise in elevation from 2,000 feet to 5,000 feet creates steep valleys, rapid runoffs, and associated soil movements. Rapid water runoff from the upper watershed portions of the District has under certain conditions caused downstream flooding on both the San Joaquin and Kings rivers. It can be sunny on the valley floor on the west side of the District and snowing on the east side.

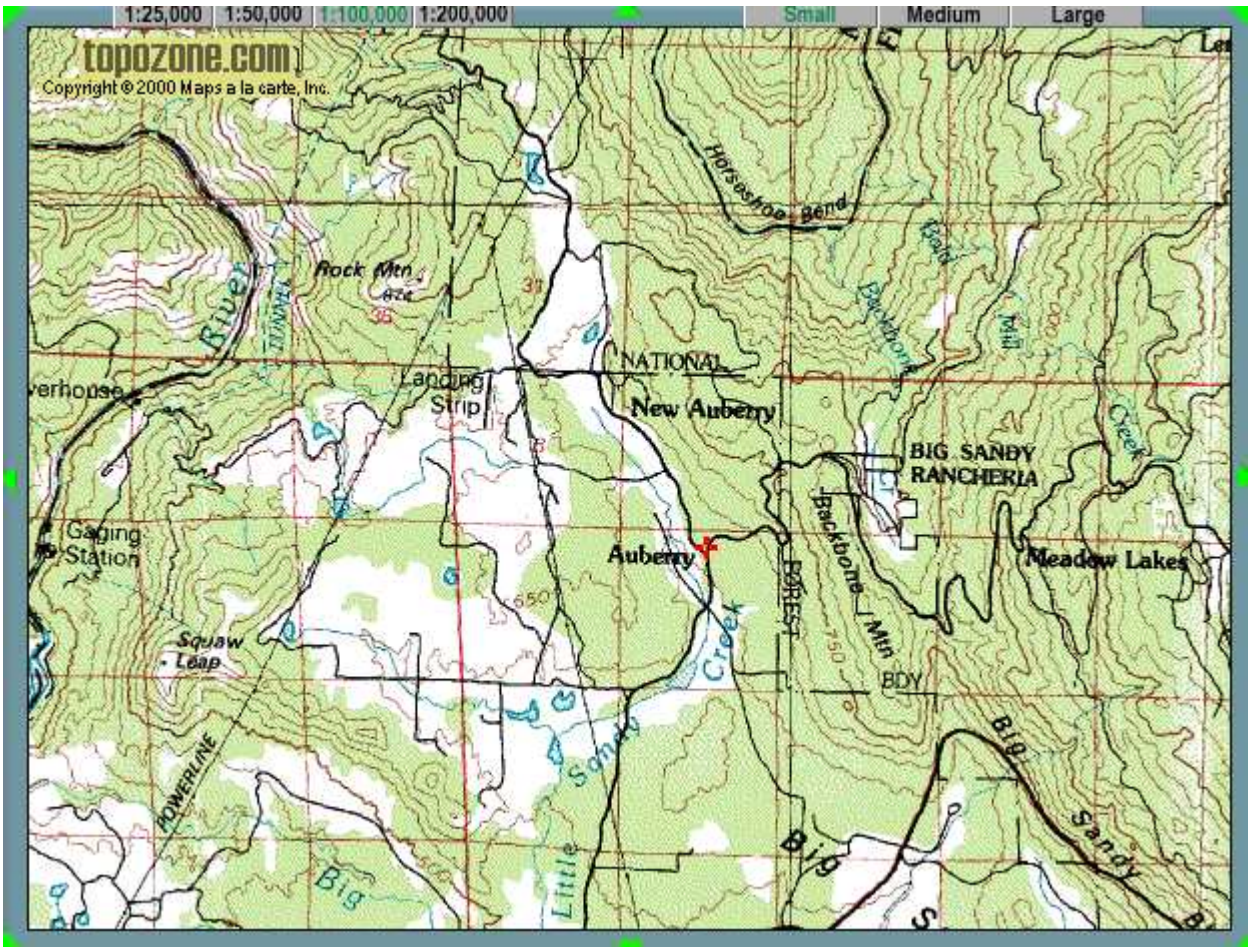
Vegetation types run full spectrum from sensitive citrus fruit and nut orchards, specialty crops on the valley floor, open eastside rangeland, extensive oak woodlands and brush in the foothills, and heavily forested mountains and alpine areas above timberline. The forested lands are abundant with wildlife. Summer range for some wildlife species like deer is on public lands, but the winter range is on predominately private lands in the foothill zone.

Fresno County is the largest agricultural production County in California and the nation. There are about 2,272 farms in the District. Primary agricultural products include oranges, strawberries, nuts, grapes, olives, Asian market crops, truck garden crops, cattle, dairy products, and honey. Timber and rangeland also contribute to the District's economy.

Valuable recreation areas in the District include the Sierra Heritage Scenic Byway and the Sierra Summit Ski Area. High country packing, camping, hiking, water sports, boating, horseback riding, skiing, and bicycling are a few of the activities enjoyed in the District.

Figure L.2 shows the area's topography, providing a sense of the watershed values.

Figure L.2. Topographic Map of Sierra Resource Conservation District



Source: Topozone, www.topozone.com

3.1 Hazard Identification and Summary

The SRCD's planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table L.1).

Table L.1. SRCD—Hazard Summaries

Hazard	Probability of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards	Likely	Significant	Limited	Medium
Avalanche	Occasional	Limited	Limited	Low
Dam Failure (see Flood section)	Occasional	Significant	Critical	Medium
Drought	Occasional	Extensive	Critical	Medium
Earthquake	Unlikely	Extensive	Limited	Low
Flood	Occasional	Limited	Critical	Medium
Landslide	Occasional	Limited	Limited	Low
Severe Weather:				
Extreme Cold/Freeze	Likely	Extensive	Limited	Medium
Extreme Heat	Likely	Significant	Limited	Low
Fog	Unlikely	Extensive	Negligible	Low
Heavy Rain/ Thunderstorm/Hail/ Lightning/Wind	Highly Likely	Extensive	Limited	Low
Snow (was Winter Storm)	Highly Likely	Significant	Critical	High
Tornado	Unlikely	Limited	Negligible	Low
Soil Hazards:				
Erosion	Likely	Significant	Critical	Medium
Expansive Soils	Unlikely	Limited	Negligible	Low
Land Subsidence	Unlikely	Limited	Negligible	Low
Volcano	Unlikely	Extensive	Critical	Low
Wildfire	Highly Likely	Extensive	Catastrophic	High

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely—Near 100% probability in next year
Likely—Between 10 and 100% probability in next year or at least one chance in ten years
Occasional—Between 1 and 10% probability in next year or at least one chance in next 100 years
Unlikely—Less than 1% probability in next 100 years

Spatial Extent:
Limited—Less than 10% of planning area
Significant—10-50% of planning area
Extensive—50-100% of planning area

Potential Magnitude:
Catastrophic—More than 50% of area affected
Critical—25 to 50%
Limited—10 to 25%
Negligible—Less than 10%

Significance (subjective):
Low, Medium, High

Technological hazards were not assessed in the same manner as the natural hazards, thus they are not included in the table above. Nonetheless, it is important to note that technological hazards (transportation hazards/hazardous materials release) are a concern for the SRCD.

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

L.3 Vulnerability Assessment

The intent of this section is to assess the District's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

L.3.1 Assets at Risk

This section considers the District's assets at risk. Table L.2 lists District assets, including natural resources, identified by representatives from the SRCD as important to protect in the event of a disaster.

Table L.2. SRCD—Critical Facilities and Other District Assets

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info
Forest timber	Billions	n/a	Timber belt subject to devastating wildfires; stand replacing fires destroy this critical resource and jobs
Wildland ecosystems	Billions or priceless	n/a	Loss of critical ecosystems destroyed by unnatural wildfire events
Endangered and threatened species	Priceless	n/a	Wildfire threatens 172 listed threatened and endangered species in eastern Fresno County
Powerhouses and associated facilities, including the community of Big Creek	100 million to billions	16 power facilities, 120 employees, 260 residents	Wildfire or floods could destroy one or more facilities during a major event
Watershed and water quality of upper San Joaquin and Kings Rivers	Hundreds of millions	n/a	Wildfire and to a lesser extent flooding threaten water quality and availability along with other watershed values
Wish-I-Ah Care Center (live-in nursing home for mentally challenged)	5 million	100+	This facility is only hospital like facility within District boundaries
Sierra High School	70 million	800 students 50 staff	School is also primary emergency operations for District surrounded by wildland susceptible to fire
Auberry Elementary	20 million	300 students	Surrounded by wildland susceptible to fire
Sierra Elementary	20 million	300 students	Surrounded by wildland susceptible to fire
Big Creek Elementary	12 million	150 students	Surrounded by wildland susceptible to fire
21 dams (large and small)	100 million to 1 billion	n/a	Subject to damage or failure during flood events
Foothill Middle School	30 million	300 students	Surrounded by wildland susceptible to fire, alternate operations evacuation center
Highway 168 In eastern Fresno County	1-200 million depending on damage	Primary and in some cases only route for over 15,000 residents and up to 25,000 summer visitors	Subject to frequent (multiple times yearly) closers due to primarily wildfire and semiannually due to slides and rock fall during major storm events.
Shaver Lake sewage treatment plant	50 million	5 employees	At risk for both wildfire and flood
18 fire stations	3 million each	4 employees each	Most at risk of wildfire damage or loss
Auberry sheriff's substation	$500,000	10 deputies	At risk of wildfire loss
8 U.S. Forest Service offices/facilities	$400,000 to 15 million	12 to 40 employees per facility	All at risk from wildfire some at risk from flood
Unknown # of wooden bridges (~200)	$500,000-?		All at risk of wildfire damage and loss

Growth and Development Trends

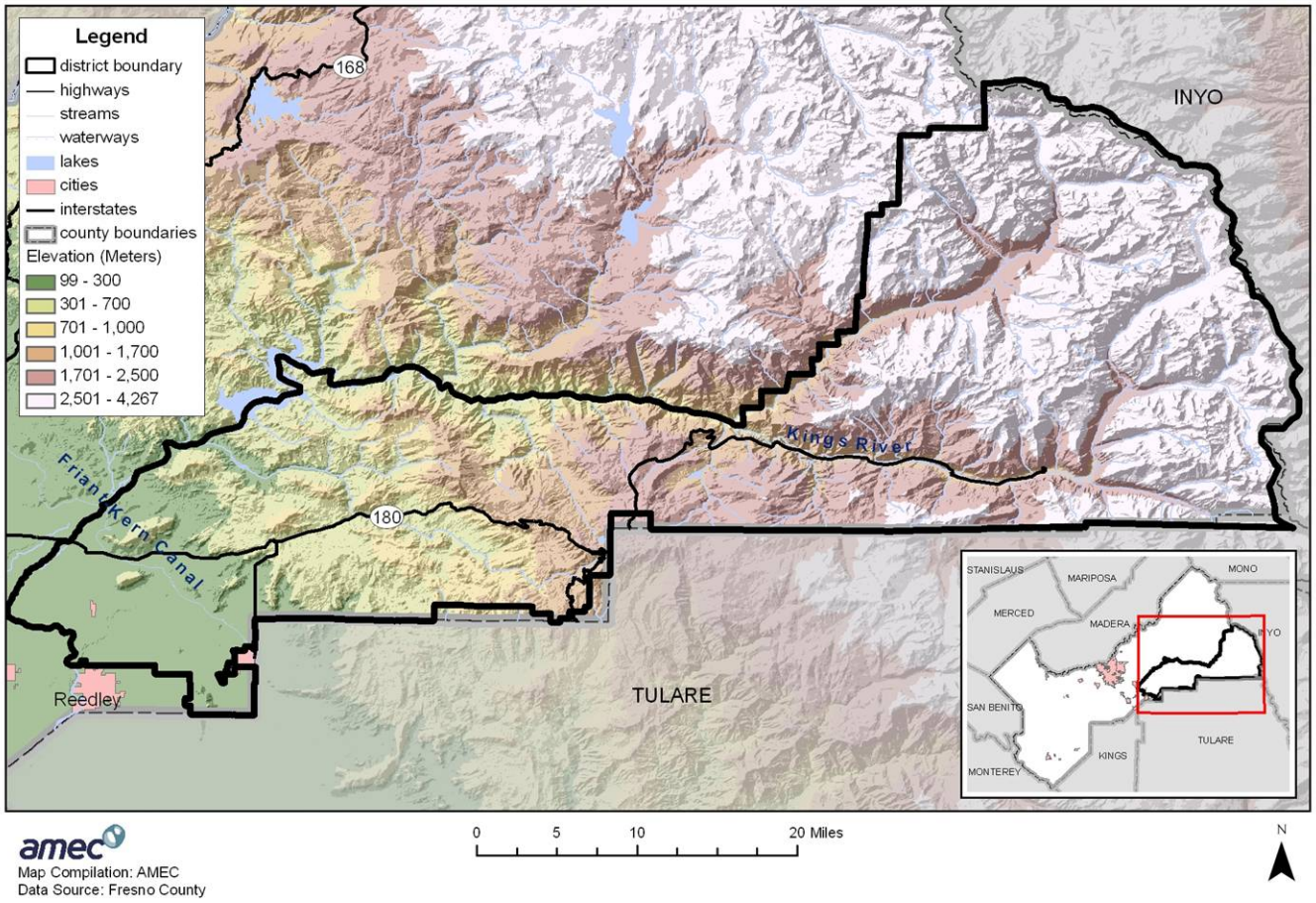
Population growth within the SRCD is widespread but not uniform. The areas closest to the largest cities and communities are growing fastest and have higher housing densities. The foothill areas are growing the next fastest, with most of the growth in widely scattered single family homes within a very high fire hazard environment. The mountainous region is the third fastest growing area in the District. Only the limited availability of private land and some issues with water availability are limiting growth in the mountain areas. Many new homes and cabins are built each year, especially along the mountainous portion of the Highway 168 corridor and near the community of Shaver Lake. Approximately 70 percent of new construction in the mountain area is second homes.

Growth within the SRCD on the valley floor is primarily in the form of subdivisions along primary transport corridors. The City of Fresno is the hub of jobs and retail. Growth is spreading outward from that hub. In general, new growth is not being permitted in flood zones, so most flooding in these areas has been minor and primarily due to rain events exceeding the capacities of the flood control drainage infrastructure. There are levees and irrigation canals within the lower elevation portions of the District. Historically, there have not been flooding problems related to these structures, but they are aging (some are over 100 years old). A flood event from the failure of one of these structures could cause widespread damage depending on the location of the break.

The foothill and mountain areas continue to grow and add complexity to the wildland fire issues within the District. Currently, there is no serious effort to control growth in these areas. Projections are for population within these areas to more than double in the next 10 years. Due to the widely scattered housing in this part of the District, the wildfire problem is more one of wildland-urban intermix rather than the more easily defined wildland-urban interface. This greatly increases the probability of wildland fire starts, and the complexity of protecting homes is multiplied many times over that of protecting more concentrated populations. The probability of major losses of homes and property in these areas is very high.

The SRCD is currently in the process of consolidating with the Navelencia Resource Conservation District (Navelencia RCD). The Navelencia RCD encompasses 781,075 acres (1,222 square miles), approximately one fifth of Fresno County's total acreage. The Navelencia RCD is bounded on the north and west by the Kings River, on the south by the Fresno-Tulare county line and the Sequoia National Park boundary, and on the east by the Fresno-Inyo and Fresno-Mono county lines (See Figure L.3). This largely agricultural area is rural with an estimated population between 30,000 and 50,000 people. Together, the two RCDs will cover 3,065 square miles.

Figure L.3. Navelencia Resource Conservation District



L.3.2 Estimating Potential Losses

Agricultural Hazards

Agricultural land and rangeland are primary elements of the SRCD and are vital to the economy and important to consider when addressing issues related to groundwater, watersheds, and wildfire. Most of the agricultural hazards in the District are weather related (e.g., freeze, hail, wind, rain (flood), drought. Other hazards include insects and disease.

Drought

The canals and irrigation districts on the valley floor provide agricultural water during the dry summer months. Their boundaries and practices can affect the SRCD conservation efforts. A number of flood control districts and groundwater recharge basins are within the District's boundaries. Groundwater issues are a recurring theme on private lands within the District and are specifically addressed in the Fresno County General Plan. In the foothills, most residents get water from wells, but groundwater is not overly abundant.

Crop losses and reduced plantings have occurred during past droughts. Generally, irrigation and ground pumping were used to offset the impacts of past droughts. Both of these alternatives are becoming less reliable as surface water is diverted to other uses, and groundwater is already being overpumped, leading to lower underground water levels.

Extreme Cold/Freeze

Of particular concern to the District is the vulnerability of citrus orchards in the western part of the District to extreme cold/freeze events. This vulnerability will increase when the District consolidates with the Navelencia Resource Conservation District (see discussion under Growth and Development below).

Flood

The District has two primary watersheds: the San Joaquin River and the Kings River watersheds, which greatly affect the foothills and valley floor. Multiple dams on the San Joaquin and Kings rivers provide hydroelectricity, recreation, and flood control.

Flooding and soil erosion due to heavy rains and snow runoff have been a historical problem. Abundant snowfall in the mountains combined with rain and steep terrain can mean rapid runoff and flooding. In the foothills, many streams are seasonal. Water flow can be high in peak runoff periods with historical downstream flooding. Much of the area on the valley floor is subject to flooding and ponding from the San Joaquin and Kings rivers and from several lesser watershed drainages. Severe thunderstorms and heavy rain in the summer also cause flooding.

Major past flood events are described below:

- **December 1955**—A rain on snow event caused local and downstream flooding. It occurred on the western side of the Sierras and eastern Fresno County, affecting the entire valley region. An unknown number of homes were damaged, and roads, bridges, and some dam facilities were destroyed or damaged. School and road closures resulted.
- **January 1997**—A regionwide high elevation rain on snow event caused local flooding and downstream valleywide flooding. Homes and a trailer park flooded, but numbers and values are unknown. Bridges, roads, and other infrastructure near waterways washed out. The event caused hundreds of millions in damage in the valley. In the District, fisheries and wildlife were impacted. Damage occurred to much of the flood control/dam system on the San Joaquin River as water threatened to overtop the dams. Spillway gates were opened to prevent that occurrence. This created flooding to about a dozen mobile homes and resulted in the evacuation of approximately 500 people. In the aftermath of the event, debris and mud had to be cleared from structures, roads, and facilities throughout the District. Many culverts failed, washing out roads, and the approach to one major bridge in the District on the San Joaquin River connecting Fresno and Madera County was washed away, closing that vital route for over a month. Washouts, mudslides, plugged culverts, and rockfalls along roads required months of work to clean up and correct. Some secondary mountain roads on the

Sierra National Forest have never been repaired due to the cost. Exact costs are not available, but costs to infrastructure repairs within the District were easily in the tens of millions. Value of damage to habitat and fisheries within the District were never quantified, and costs to mitigate damage to the environment are also not available. In most cases, the environment was left to recover on its own due to lack of available funds.

- **July 2006**—A flash flood from thunderstorms in drainages above the north end of Huntington Lake caused flooding in Huntington Lake, Rancheria Creek, Kaiser Pass Road, and Eastwood Powerhouse. The powerhouse was inundated, the primary road washed out, and boat docks damaged at an estimated cost of $200,000. An estimated $250,000 in damage to private boats occurred. The event resulted in loss of power output for three weeks, closure of the primary summer road, closure of Huntington Lake to recreation for one week, and approximately $350,000 in damage. Clean-up costs were $150,000, and search and rescue costs were $25,000. Four people were injured. Insured losses were $100,000. No federal or state disaster relief was received for this event.

Based on these past events, major rain on snow events occur every 10-15 years. The primary impacts from flooding within the district include loss of fisheries and wildlife habitat; damage to roads, hydroelectric facilities, dams, bridges; and some flooding of homes. Winter road closures could require large scale evacuations and create difficulties in providing emergency services to areas cut off by flooding. There are quite a few communities that are at the end of one primary access road. In the winter, secondary or emergency roads are usually impassable. If the primary road is closed by a flood, it is likely that secondary roads will also be impacted as well. If the repair time is extended, emergency services may be required to protect the population until repairs can be made.

Snow

In January 2005, a major winter snowstorm caused regionwide closure of roads and loss of power for up to three weeks in three communities. The impacts occurred in eastern Fresno County above 4,000 feet in elevation. Damage included the following:

- Eight injuries from storm and poor road conditions
- Estimated $3.5 million in damage to trees falling on homes and other structures
- Estimated $2.5 million in damage to power distribution grid
- $250,000 to open and repair road system
- 10,000-15,000 merchantable trees damaged or killed
- $250,000 in miscellaneous damage from heavy snow and falling trees
- All businesses closed and without power, estimated $500,000 in loss of business and product or inventory
- $3 million in insured losses
- Schools closed for over two weeks

Similar storms are highly likely to occur in the future.

Erosion

With the population moving to the foothills, road and home construction is increasing. The popularity of horses and family livestock with families new to the area, combined with the zoning practice of "parceling" is contributing to an increase in soil erosion and compromising wildlife habitats and native animal populations. Soil erosion due to heavy rains and snow runoff is also a problem.

Wildfire

All communities within the District are listed on the National Fire Plan's "Communities at Risk" list. Over one hundred years of aggressive fire suppression under the national fire suppression policy has rendered wildlands severely overgrown. Much of the private land in the foothills area is in the wildland-urban interface with increasing residential development on steep terrain in the brush on highly erodible soils. According to the Highway 168 Fire Safe Council Community Wildfire Protection Plan, the following areas of the District were prioritized for projects because of their dense population, values at risk, and fuel availability: Burrough Valley of Tollhouse, Peterson Road Subdivision, Dogwood Subdivision, Routt Mill Road, Big Sandy Rancheria, Beal fuel break, and Sugarloaf fuel break.

As more people move into the area and impacts from recreational demands increase, there will be more human-caused wildfire starts each year. And, the increased number of widely scattered homes within the District adds greatly to the danger, complexity, and cost of fighting these fires.

Currently, many of the communities in the District are limited to one route access and egress in the event of a major wildfire. Historically, these routes are closed during major events, stranding many people, including visitors, away from their families and homes. So far there has been no loss of life attributed to the limited evacuation routes, but it is likely only a matter of time before people are cut off and trapped by a major fire event.

Low intensity natural fires kept Sierra forest from becoming overgrown. Forest overgrowth due to the efficiency of modern firefighting techniques, and to society's current election to limit forest thinning and harvesting, is a serious problem. If wildfire does not impact the forest first, native insects will eventually kill millions of trees. Explosions in insect populations usually start during a drought, when the lack of water combined with too many trees per acre render the trees to weak to fight off the insect attacks. Without a change in management practices on public lands, there is little hope of avoiding a kill off of trees similar to the kill off experienced by the Los Padres and Angeles national forests.

Major past wildfires are described below:

- **1933**—The Tollhouse fire started when a local resident was cutting, stacking, and burning brush in late August along Lodge Road. The fire burned across fields and grazing lands and encircled the Town of Tollhouse, which at that time was a large and important hub for the

timber industry in eastern Fresno County. The Town of Tollhouse was evacuated for safety. The fire burned portions of the flume that carried logs and boards from Shaver Lake to the valley floor. The fire raced up the hill and burned into Jose Basin and over Burrough Mountain into Blue Canyon, burning very hot and destroying conifers. The once abundant conifers that grew on the slopes did not grow back; the hill is barren of good timber. It is mostly brush now. Stables of mules and horses were scared and had to be controlled by handlers.

- **1987—**A number of large wildfires in eastern Fresno County caused over $1 million in damage to roads, bridges, and other improvements and over $1 million in damage to resources. Suppression costs were estimated at another $1 million.
- **1989**—A wildfire burned 21,000 acres near the Town of Auberry. It started near the Fresno and Madera county line on the Fresno side of the San Joaquin River. It was never determined what caused the fire; arson was suspected. The fire raced up the canyon skirting Powerhouse Road in Auberry, traveling midslope behind the settlement of Jose Basin. Fingers of the fire touched New Auberry and the Town of Auberry. The fire burned across the front of Bald Mountain into Mile High and threatened Meadow Lakes and all the homes in its path. An all out assault by air and ground stopped the fire at Sugarloaf Road at 3,800 feet in elevation. This fire caused an enormous amount of stress on local residents and businesses. Roads were blocked, people did not know if they had homes to return to, and pets were a big concern.
- **1994**—A large wildfire burned 9,000 acres near the Town of Big Creek and resulted in the evacuation of the entire community of Big Creek (for one and a half weeks) and portions of Lakeshore community at Huntington Lake. Damage was estimated at $2 million to roads and miscellaneous improvements in the national forest and $500,000 to the power grid. The estimated cost to recover the forest was $200 million. Mudslides due to fire caused $500,000 in damage. Scenic values and wildlife were also compromised. Firefighting costs approximated $50 million. Tourism losses due to damage are still a problem in the affected area. Annual losses to local businesses are estimated at $10,000.

These are only examples of events in eastern Fresno County. Similar events are expected to occur every three to five years.

Other Hazards

While of lower planning significance to the District relative to other hazards, the following information about avalanche and hazardous materials release should still be noted:

Avalanche

During an extreme snow year in 1927, two avalanches hit Camp 72 within five hours of each other and killed 13 people. Camp 72 was a work camp associated with the Big Creek Hydroelectric Project located north of modern day Shaver Lake and west of the Town of Big Creek. The avalanches destroyed the majority of two-story wooden structures in the camp and caused $200,000 in damage (1927 dollars). Phone lines, tunneling equipment, and work rail lines were also damaged or destroyed. The damage also delayed work on the Big Creek project.

Deforestation in the area was a contributor to the avalanche. An avalanche in the same location today would likely have limited impact due to the regrowth of the timber.

Today, the likely impact of an avalanche would be quite limited. Backcountry skiers and snowmobilers are most at risk. If they are caught in a backcountry avalanche and someone is not on hand to dig them out, the situation is likely to be fatal. Sierra Summit Ski Resort monitors and controls the avalanche danger within the recreation area.

There are areas along Highway 168 and the few secondary routes open in the winter that could be hit by avalanche; however, there is very little history of avalanches in these areas. If a person is not caught in an avalanche, then the only likely impact would be from road closures and damage to above ground facilities such as power lines. A long-term road closure and loss of power could strand some small communities, such as Lakeshore at Huntington Lake and Sierra Summit Ski Resort, for extended lengths of time. This could require emergency evacuations or delivery of emergency supplies by snowmobiles or aircraft.

Technological Hazards (Hazardous Materials Release)

The SRCD is vulnerable to transportation-related hazardous materials releases because only one road serves the communities of Shaver Lake, Big Creek, and Huntington Lake. The road is steep, narrow, and winding. There is a seven-mile stretch of Highway 168 that is very vulnerable to road closure due to accidents, wildfires, or bad weather. No safe alternate routes for this section exist. Closures cut off 700 homes and 400 square miles of the Sierra National Forest open to the public.

On July 26, 2002, Highway 168 closed for two days due to a gas tanker spill during peak summer use season and cut off more than 700 residences and stranded 7,000-10,000 summer visitors to the area. The driver was injured, and direct access to the hospital was not available. The accident damaged the roadbed and culvert, and underground power lines needed to be relocated. The 10,000-gallon spill caused environmental damage to streams and surrounding timber—one-half acre of timber was lost. It caused economic losses to businesses, and people were unable to get to or from work. Most direct losses were covered by the truck company's insurance.

L.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

L.4.1 Regulatory Mitigation Capabilities

Table L.3 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SRCD.

Table L.3. SRCD's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	See Fresno County
Zoning ordinance	Yes	See Fresno County
Subdivision ordinance	Yes	See Fresno County
Site plan review requirements	Yes	See Fresno County
Growth management ordinance	No	
Floodplain ordinance	Yes	See Fresno County
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	See Fresno County
Building code	Yes	Version: Fresno County Building Code (2001 California Building Code)
Erosion or sediment control program	Yes	See Fresno County
Storm water management program	No	
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	No	
Other special plans	Yes	SRCD Long Range Plan 2003-2008; Community Wildfire Protection Plan prepared by Highway 168 Fire Safe Council
Flood Insurance Study or other engineering study for streams	Yes	See Fresno County

Sierra Resource Conservation District Long Range Plan 2003-2008

The Sierra Resource Conservation District Long Range Plan 2003-2008 describes the physical setting of the District, the history of the organization, and data and personnel resources; identifies the critical issues of the District; and develops a program of action and an annual summary report. This plan identifies several critical issues that must be addressed if the natural resource base for sustained use is to be maintained. These issues include soil erosion, watershed/wetlands, agriculture and rangeland, vegetative management, wildlife habitat, environmental education, and air quality.

Highway 168 Fire Safe Council Community Wildfire Protection Plan

The Highway 168 Fire Safe Council Community Wildfire Protection Plan (CWPP) summarizes wildfire dangers and issues on a community by community basis within the Council's area of influence. The CWPP also catalogs community wildfire protection needs and identifies corrective action and community projects that will mitigate some of the problems.

L.4.2 Administrative/Technical Mitigation Capabilities

The SRCD has no paid staff and relies entirely on volunteers. The Board of Directors (currently six members) is appointed by the County Supervisor of District 5 from private land owners and other conservation-conscious citizens from the District who often have expertise in a variety of natural resource fields. Each director serves for four-year terms. Additional nonvoting associate directors are also appointed. The District works closely with the Natural Resource Conservation Service as well as many other local, state, and federal agencies.

Volunteers are an important strength in the District. The community is very aware of the wildfire issues in particular, and many within the community are motivated to help by donating time and talent to improve the conditions. Volunteers especially enjoy the educational aspects of teaching wildland fire safety to help prevent fire starts and educating homeowners on how to maintain their property to reduce the hazards from wildfire. Landowners are also generally ready to allow fuel breaks across their property in support of community fuel breaks, providing opportunities to lessen the impact from any fires that do start.

L.4.3 Fiscal Mitigation Capabilities

The SRCD is eligible for various wildfire, watershed, and community development grants from County, state, and federal agencies and programs. There is no taxing authority by agreement at the time of establishment. The District does not have a designated funding source for mitigation but seeks to implement multi-objective projects that incorporate mitigation activities and considerations.

L.4.4 Mitigation Outreach and Partnerships

Highway 168 Fire Safe Council

The Highway 168 Fire Council is a critical partner for the SRCD and served as a primary partner in the development of this annex. It is a volunteer-based nonprofit organization that was formed as one of currently over 150 local chapters of the California Fire Safe Council. The Highway 168 Fire Safe Council was founded in 1997 by local volunteers, businesses, and agency representatives to reduce the risk of wildfire damage to improvements and natural resources within its area of influence. Using education, project grants, and grassroots action, the Council continues to be the primary resource for local efforts to live safely with fire and reduce community risks within the wildland-urban intermix. The Council has successfully administered over $1.5 million in community project grants to build wildfire fuel breaks and educate the community on living safely in a fire-prone ecosystem. These projects have been credited with saving over a dozen homes and millions in firefighting costs to date.

The Council's area of influence resides entirely within the boundaries of the SRCD, with which the Council has a formal memorandum of understanding to partner on the Fresno County Multi-

Hazard Mitigation Plan. Specifically, the Council represents the portion of the San Joaquin River watershed in eastern Fresno County from the community of Friant in the west to the headwaters of the San Joaquin River in the east.

The Highway 168 Fire Council has one part-time paid staff member that acts as project coordinator (grant specific) to supplement the predominantly volunteer efforts of the group. Volunteers include wildfire prevention and suppression experts and prescribed burn and fuel break construction experts. California Department of Forestry and Fire Protection and the U.S. Forest Service provide additional technical assistance and resources. Currently, all hazard mitigation planning and review is being performed by volunteers.

The Council has developed education materials for distribution and conducts various wildland fire education programs throughout the year at schools, town hall meetings, homeowners associations, and at the annual Fire Safe Festival. They also contribute two wildfire educational pieces a month for publication in local newspapers and have developed a serial story of a fictitious local major fire. The Council maintains a storefront office that provides fire safety information and has a library of wildfire education publications and films.

Highway 168 Fire Safe Council
PO Box 639, Prather CA 93651
Patricia Gallegos (project coordinator) (559) 855-3144
Richard Bagley (Council president) (559) 841-3194

Other Outreach and Partnerships

The SRCD has working relationships with several federal, state, and County agencies and private landowners. Historically, the District has worked with conservation agency partners like the Natural Resources Conservation Service to provide technical assistance, cost-share programs to encourage use of conservation practices on agricultural and rangeland, and educational activities. Over the years, the SRCD has been active in conservation partnerships on a variety of field projects with other agencies, including the California Department of Forestry and Fire Protection, the U.S. Forest Service, the California Department of Fish and Game, and the University of California Cooperative Extension. A number of conservation plans have been developed and implemented on private lands.

The District also works with other agencies on wildfire-related matters. Working with professional fire experts from the U.S. Forest Service and California Department of Forestry and Fire Protection helps ensure that the District's work complements state and federal work and is up to standard for controlling wildfires.

The following lists the resource groups and governmental agencies that are partnered with the SRCD to address resource issues within the District:

- Natural Resource Conservation Service
- California Department of Conservation
- California Association of Resource Conservation Districts
- National Association of Conservation Districts
- California Resources Agency
- Yosemite/Sequoia Resource Conservation and Development
- San Joaquin Valley Resource Conservation and Development
- Fresno County Resource Advisory Council
- Sierra/San Joaquin Noxious Weed Alliance
- Millerton Area Watershed Coalition
- Highway 168 Fire Safe Council
- Sierra and Sequoia National Forests
- Fresno County Board of Supervisors
- The Foothill Conservancy
- Back Country Horsemen of California
- San Joaquin River Trail Council
- SAMS Coalition
- Sierra Club
- Save Our Streams

The District supports youth workshops, the Envirothon, and adult stewardship training programs. The District has sponsored Fresno County's Resource Conservation District Day, a "Living among the Oaks" landowner workshop, and a Rangeland Water Quality workshop series.

L.4.5. Other Mitigation Efforts

The SRCD, in partnership with the Highway 168 Fire Safe Council, has completed 11 fuel break projects. Three other fuel break projects are in various stages of completion. All projects were funded through various federal, state, and County grants along with the donation of thousands of hours of volunteer time. The fuel break projects are only possible with the cooperation of private property owners, so partnerships with landholders are absolute necessities.

Already, two of the fuel break projects have helped stop the spread of major fires:

- The Peterson fire started on Peterson Road, one-half mile downslope and downwind from the community on Cressman's Road, where a shaded fuel break project had been completed only two months prior. The fire quickly became a major wind- and slope-driven crown fire with flame lengths of over 250 feet. As explained by on-site firefighters, there was no way they were going to stop that fire, and there were close to one hundred homes in the path the fire was expected to take in its first day alone. When the flame front hit the "Cressman" fuel break, it was cut off from its ability to spread through the tree tops as a crown fire. It immediately "went to ground" with a flame length of only one to two feet, and firefighters

were able to stop its spread at the road running through the middle of the fuel break. All homes were saved, only minor injuries were reported, and the fire was controlled within one burn period instead of the expected multi-period fire. It was estimated that at least two dozen homes with a replacement value of over $10 million were saved by this fuel break. Using best case estimations, an additional 2,000 acres of timberland would have burned over two additional burn periods. Additional suppression costs would likely have exceeded $2 million. Not a bad return on a $50,000 fuel break grant from California Department of Forestry and Fire Protection, and lots of volunteer time.

- In the second incident, a major fire burning up a very steep slope was imminently threatening 20 homes with 50 more in its path. Working from the safety of the "Beal" fuel break, which was still under construction at the time, firefighters were able to stop the fire before it could reach the homes. Property loss prevention was estimated at $1-2 million and suppression cost savings at $250,000 to $500,000. And, an estimated 1,000 acres of pine and brush woodland were saved. This project was funded by an $80,000 Proposition 40 watershed protection grant.

The District has been active in vegetation management projects, including prescribed burns, to reduce fuel loads and fire risk. Additionally, the District has taken a leadership role in the development of voluntary Oak Woodland Guidelines for Fresno County and Rangeland Water Quality Guidelines.

L.5 Mitigation Strategy

L.5.1 Mitigation Goals and Objectives

The Sierra Resource Conservation District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

L.5.2 Mitigation Actions

The planning team for the SRCD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

1. Improve Alternate Emergency Access Roads

Issue/Background: The communities of Shaver Lake, Big Creek, and Lakeshore (Huntington Lake) and 250,000 acres of the Sierra National Forest open to public use are accessed by only one main transportation route, Highway 168. This highway has a history of being closed from three days to a week almost every year because of wildfires. It also has a history of closures for up to three weeks at a time about once every five years due to vehicle accidents and washouts. Lesser closures of one-three days happen almost every two years. Two- to six-hour temporary closures happen an average of twice per month. During all of these closures, emergency

responders, including ambulances, must seek alternate routes to reach emergency sites or transport patients to medical care.

In many cases, the only alternate routes into or out of the area are narrow mountain back roads, which residents and visitors (thousands on busy summer day) are using to evacuate, reach stranded family members or pets, get into the area for recreation, or get home or to work. This can create a traffic jam and stop all traffic on these alternate routes. The following can make traffic problems worse: when two large vehicles meet on a narrow section of road, an accident occurs, or a vehicle breaks down at a choke point. Traffic could cause a second emergency/disaster if (for example) a vehicle went off road and caused a wildfire. At the very least, it is unsafe and impairs the movement of emergency equipment and personnel. In some cases, the back roads cannot handle large vehicles, such as buses and structure protection fire trucks, even when there is no traffic.

With relatively low expense, improvements could be made to these back roads, located primarily in the Sierra National Forest, that would allow for the reasonable flow of public traffic and access for emergency vehicles. Two roads, one east and one west of Highway 168 would need to be improved to cover the high probability of both 168 and one of the alternate routes being closed by a major wildfire, which most experts agree is inevitable.

Other Alternatives: Close all side roads to all but emergency traffic, stranding thousands and requiring evacuation centers and large numbers of emergency personnel to reach stranded residents and transport them to safe locations. Buses and other large vehicles would not be able to reach the cut-off area.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Sierra National Forest

Priority (High, Medium, Low): High

Cost Estimate: $1 million

Potential Funding: Alternate funding unknown

Benefits (Avoided Losses):

- More than 20 lives saved
- 20 or more incidents of reduced injury due to prompt emergency response, estimated savings $500,000
- More than 100 homes saved with a value of over $40 million
- Reduced fire suppression costs of $20-100 million
- Reduced losses to natural resources and ecosystems, estimated value $600 million
- Savings of $20-100 million in forest and habitat restoration
- Reduced damage to infrastructure $4 million

- Reduced need for emergency response and fewer emergency responders required, estimated savings $500,000-$1 million
- Reduced need to set up evacuation centers and reduced cost to operate centers when needed

Schedule: Two years, April-November

2. Conduct Community Fuel Break Construction and Maintenance on a Landscape Scale

Issue/Background: There is a high occurrence of wildland fires in rural areas of eastern Fresno County and a heavy urban intermix of homes and businesses in very high and extreme fire danger zones. All communities in the foothill and mountain region of eastern Fresno County were included on the National Fire Plan's list of Communities at Risk.

Historically, community fuel breaks have proven to be the most effective pre-fire treatment available for lessening the impact of wildfires. These fuel breaks have proven themselves time and again in stopping the spread of even major fire events and saving lives, homes, businesses, resources, ecosystems, and suppression costs. In two recent local examples, fuel breaks were credited with saving dozens of homes, hundreds of acres, and millions of dollars in losses and suppression costs.

Current fuel break projects are effective, but due to lack of sufficient funding, there are large gaps in the system that need to be addressed before maximum benefit can be realized. Due to re-growth after 5 to 6 years, unmaintained fuel breaks start to lose some of their effectiveness, and after 10 to12 years, unmaintained fuel breaks need to be reconstructed. Relatively inexpensive treatments with herbicides or other methods can maintain these important community projects indefinitely.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Sierra National Forest

Priority (High, Medium, Low): High

Cost Estimate: $2.5 million for new construction, $200,000 annually to maintain system

Potential Funding: Grants from other sources to complete proposed landscape-scale system of community fuel breaks, in-kind volunteer labor

Benefits (Avoided Losses):

Over 20 years:

- More than 10 lives saved
- More than 500 homes saved with a value of over $200 million
- Reduced fire suppression costs of $100-500 million
- Reduced losses to natural resources and ecosystems, estimate value $3 billion

- Savings of $100-500 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated $20 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings $5-10 million

Schedule: 10 years, as weather permits each year

3. Create a Fuel Break Along Highway 168

Issue/Background: Several communities and half a million acres of heavy recreation use land are served by the two-lane state Highway 168 in eastern Fresno County, which offers the only year-round access and egress from the area. During peak-use periods, the area served by this highway may hold close to 20,000 people on a weekend day. A ten-mile stretch of the highway has a history of closures due to emergencies (wildfires, washouts) and transportation accidents, closing the area for access by emergency responders (including ambulances) and repair crews. Closures along this portion of highway prevent evacuation from the area and access by delivery vehicles (food). They also prevent people from reaching work or homes. Any evacuation centers set up above the closure may require aircraft to bring in supplies.

Other Alternatives: Develop safe alternate year-round road to service the area.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: $450,000

Potential Funding: $50,000–From alternate grant opportunities

Benefits (Avoided Losses):

A fuel break will limit the spread of wildfires caused by vehicle accidents and malfunctions from spreading into residential areas and business districts on this portion of the highway. A fuel break along the corridor will reduce the frequency and duration of closures. Also, a fuel break along this corridor will serve as a line of defense providing a place for fire crews to safely make a stand against major wildfires in the San Joaquin River drainage area that threaten the community of Shaver Lake.

- More than 5 lives saved
- 20 or more incidents of reduced injury due to prompt emergency response, estimated savings $500,000
- More than 50 homes saved with a value of over $20 million
- Reduced fire suppression costs of $10-50 million
- Reduced losses to natural resources and ecosystems, estimated value $300 million

- Savings of $10-50 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings $2 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings $500,000-$1 million
- Reduced need to set up evacuation centers and reduced cost to operate centers

It will also have the benefit of lessening traffic hazards and closures due to weather-related tree falls blocking the highway.

Schedule: Three years, April-November

4. Implement a Neighborhood Chipper Program

Issue/Background: Rural areas in the County are subject to high incidence of wildfires. In the areas where natural growth is other than grass (i.e., brush and trees), the fire hazard and intensity are much higher. Improvements (i.e., structures, infrastructure) in these areas are subject to damage and destruction on an annual basis. The larger the fire, the more significant the loss potential. Often, the fires originate from the improvements or from operations associated with the improvements.

Emergency responders must spend far more time defensively protecting improvements that do not have adequate clearance of flammable vegetation, which delays them from directly attacking the main fire. This typically results in a larger more destructive fire than would otherwise have occurred.

Even with state laws, clearances are often not maintained to an adequate distance to protect improvements or prevent fires that originate at the improvement from spreading to the wildlands. Currently, a very short season for hazard-reduction burning is the only viable option for elimination of the flammable material. Most of the year (10 months), this is not an option. Providing on-site chipping of the material removed by the party responsible for the improvement, (homeowner, business, agency etc.) has been shown to be an effective way to encourage proper clearances are maintained, thus reducing fire damage, frequency, and size.

Operation of a small crew in year one requires the purchase of a commercial quality chipper, necessary supplies, and insurance as well as provision of labor expenses. Supplies, insurance, maintenance, and labor expenses are also required for each additional year.

Other Alternatives:

- More aggressive enforcement of clearance regulations would work in some cases. In many instances, the minimum requirements are inadequate to protect the improvement or the surrounding wildlands.

- Development of alternate disposal options within the areas in jeopardy. Composting, biomass generation, and other options for utilization or disposal of the material have been exhaustively explored and so far rejected as economically unviable.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: $120,000 first year, $70,000 each additional year

Potential Funding: In-kind matching (labor, etc.), $20,000 annually

Benefits (Avoided Losses):

- More than two lives saved
- More than 25 homes or business saved with a value of over $10 million
- Reduced fire suppression costs of $5-20 million
- Reduced losses to natural resources and ecosystems, estimated value $50 million
- Savings of 1-5 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings greater than $10 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings $50-500,000 annually

Schedule: Year round as weather and funding permit

5. Conduct Prescribed Fires

Issue/Background: Historical natural fire regimes have been disrupted, which has led to ever increasing fuel loadings and disruptions of natural processes, changing the natural mix of vegetation. This increased fuel loading poses a severe threat to the communities of eastern Fresno County. In many cases, the lack of fire in a given area has lead to the suppression (or extinction) of endangered species and the introduction and spread of invasive non-native species. In addition to extreme threat to life and property that modern wildfires pose, they also destroy ecosystems that had once been able to survive the occasional natural fire. The careful reintroduction of fire to the landscape through prescribed burning offers the only environmentally sound method of addressing all these issues in one cost-effective treatment.

Other Alternatives: The reduction of the fire hazard can be addressed through other expensive projects, but only prescribed fire addresses the role that fire naturally played in maintaining healthy, less fire hazardous ecosystems.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: $100,000 annually

Potential Funding: Funding from burn program funds on national forest lands, vegetation management program funds through the California Department of Forestry and Fire Protection for private lands

Benefits (Avoided Losses):

- More than one life saved
- Suppression of nonnative invasive species, estimated savings $5 million
- More than 10 homes saved with a value of over $2 million
- Reduced fire suppression costs of $2-5 million
- Reduced losses to natural resources and ecosystems, estimated value $30 million
- Savings of 5-25 million in forest and habitat restoration
- Reduced damage to infrastructure $500,000
- Restoration of natural systems and native species, estimated value $15 million

Schedule: Annually, April-December, as weather and air quality dictates

6. Establish a System of Fire Pumper/Tanker Fill Stations and Water Storage

Issue/Background: Water is a scarce commodity in many portions of rural Fresno County. During fires (wildland and structure), the nearest available water source can be more than a half hour away, requiring an hour or more turnaround time to return to fires with a load of water. Fires could be stopped or kept smaller if the turnaround times could be reduced. During drought years, when wildfires are at their worst, potential locations for water sources are scarcest.

There are many locations with available water that can be accessed if pre-arranged agreements are in place and/or road work is done to allow trucks to access the source. Other locations have undeveloped year-round spring or creek access that would only require some basic development and installation of a hydrant or storage tank to make them usable. In some cases, property owners are willing to provide well water to maintain a fire storage tank. Maps of all available fill locations would further increase the effectiveness of current equipment and staff.

Responsible Office: California Department of Forestry and Fire Protection, U.S. Forest Service

Priority (High, Medium, Low): High

Cost Estimate: $500,000 construction, $25,000 annual maintenance

Potential Funding: Grants

Benefits (Avoided Losses):

- More than five lives saved
- 20 fewer serious injuries
- More than 50 homes saved with a value of over $20 million
- Reduced fire suppression costs of $10-50 million
- Reduced losses to natural resources and ecosystems, estimated value $300 million
- Savings of 10-50 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings $2 million

Schedule: Five years, May-November each year

7. Implement a Public Fire Prevention, Survival, and Mitigation Education Program

Issue/Background: Each year, more people move into the wildland-urban intermix, and communities expand, which increases Fresno County's wildland-urban interface. Wildfire threats to homes and communities in these areas increase every year, which taxes the abilities of fire agencies to protect them. Also, fire occurrences increase as fires that originate from human encroachment spread into the surrounding wildlands. Ignorance of the hazards associated with living in these extreme fire hazard locations and prevention measures needed to prevent the accidental start of fires and increase individual and structural survivability during a fire event is ever increasing.

Programs, literature, and outreach for new residents and children have proven effective. There is also a great need to develop and distribute emergency evacuation plans, including how to stay informed, what to do, and alternate evacuation routes.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, California Department of Forestry and Fire Protection, Sierra National Forest

Priority (High, Medium, Low): Medium

Cost Estimate: $20,000 annually

Potential Funding: Agency fire prevention budgets (currently inadequate and shrinking)

Benefits (Avoided Losses):

- Fewer wildfires
- More than 20 lives saved
- More than 50 homes saved with a value of over $20 million
- Reduced fire suppression costs of 5-10 million
- Reduced losses to natural resources and ecosystems, estimated value $50 million
- Savings of $1-25 million in forest and habitat restoration

- Reduced damage to infrastructure, estimated savings $500,000
- Reduced need for emergency response and fewer emergency responders required, estimated savings $50-$300,000

Schedule: Annually, April-October

8. Strengthen Dam Failure/Flood Planning, Coordination, and Training

Issue/Background: Dam failure and flood planning are done as required by law. However, due to lack of funding, most of this knowledge and planning are kept at the top levels. Mid- and lower-level first responders are not part of coordination planning and do not receive significant training in procedures, key downstream hazard locations, access routes, alternate evacuation routes, and where to set up roadblocks. While the probability of a dam failure is low, the potential impact is extreme. Flooding from the inability to control water during extreme weather events is much more likely, and response procedures are similar.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Fresno County Sheriff's Office, Madera County Sheriff's Office

Priority (High, Medium, Low): Medium

Cost Estimate: $25,000

Potential Funding: Grants

Benefits (Avoided Losses):

Tremendous amounts of time will be saved and safety for first responders will be greatly enhanced.

- 10 lives saved (including first responders)
- 50 injuries avoided
- Savings from dispatching too many personnel to wrong locations or lost equipment estimated at $100,000

Schedule: 1-3 years

9. Strengthen Non-Native Noxious Weed Control Efforts

Issue/Background: The incursion of noxious weeds into California has been a concern for many years, however, in the rural and mountain regions of the County, the populations of various California Department of Food and Agriculture "A" and "B" rated weeds are still at a point that control and in some cases eradication is possible. These weeds typically alter the water cycle and increase the threat of wildfire in the foothill and mountains. The threat of these noxious weeds has been termed by one noted weed scientist as "a disaster in slow motion."

While work is in progress on this threat, funding is very short. The Fresno County Department of Agriculture (FCDA) and the SRCD are currently partnering with landowners and other agencies to combat the spread of selected weeds, but the threat continues to grow as new weeds are introduced and less common weed populations remain undetected.

Education of landowners, agencies, and utilities is a daunting task that must be done to stem the tide of invasive weeds. Agriculture, ecosystems, waterways, and wildlife habitat are in jeopardy because of this often overlooked threat.

Control and detection of noxious weeds is very expensive and time consuming for a single agency to undertake. The FCDA has attempted to fulfill underfunded mandated control responsibilities.

Other Alternatives: None

Responsible Office: Fresno County Department of Agriculture, California Department of Food and Agriculture

Priority (High, Medium, Low): Medium

Cost Estimate: $2-5 million per year for detection and control, $200,000 per year for education and workshops for 5-10 years

Potential Funding: Limited funding has been secured from the California Department of Food and Agriculture, watershed grants, Resource Advisory Council, and the U.S. Forest Service.

Benefits (Avoided Losses): Estimates of reduced agricultural production currently run into several millions of dollars each year for the County. Current control and education costs approximate $150,000. Destruction of habitat, ecosystems, and waterways has not been established. Estimated benefits of noxious weed control may be in the hundreds of millions of dollars per year for the County.

Schedule: Work is ongoing as funding is available. Future, reliable funding would ensure that the weeds present now are controlled and future infestations would be detected and eradicated.

10. Create an Integrated Regional Water Management Plan for Eastern Fresno County

Issue/Background: With the increased development and growth of the rural foothill and mountain regions of eastern Fresno County, fractured rock groundwater availability and sustainability has come into question. Inadequate information is currently used by the County to make policy decisions about development. While water-short areas are known, no current hard scientific data is available or integrated into the Fresno County General Plan. An integrated regional water management plan is needed to avoid water shortages (greatly diminished production to dry wells) during the next drought period because of over development. Little scientific data is available for planning policy or decision making.

Because of increased development in the foothill/mountain areas, a multi-year drought will deplete available groundwater (only water source) to these communities/developments, potentially leading to little or no water for single family dwellings and businesses. A plan will identify water-short areas and provide information for inclusion in the Fresno County General Plan.

Other Alternatives:

1) Continue with "best guess" planning and risk whole community groundwater depletion from drought conditions
2) Formulate water-restrictive rules and a system of compliance
3) Put a water meter on every private well and institute a "pay for use" program (great local resistance)
4) Institute County community water systems (may be difficult to provide for 5-10 acre parcels)

Responsible Office: Fresno County (various departments)

Priority (High, Medium, Low): Medium (drought conditions commonly occur every five to seven years and last three to seven years)

Cost Estimate: As much as $10 million and as little as $500,000

Potential Funding: Government grants may be available for a portion of this plan. More grant monies are available if an integrated regional water management plan is place.

Benefits (Avoided Losses): By identifying and developing policies for land growth development, groundwater losses and infrastructure construction that could cost in the hundreds of millions of dollars could be avoided.

Schedule: As soon as possible to allow the County planning departments to make reasonable, long-term information available to the Fresno County Board of Supervisors for wise land-use decision making.

11. Conduct a Fractured Rock Groundwater Capacity Study for Eastern Fresno County

Issue/Background: With the increased development and growth in the rural foothill and mountain regions of eastern Fresno County, fractured rock groundwater availability and sustainability has come into question. Inadequate information is currently used by the County to make policy decisions about development. While water-short areas are known, little current scientific data is available or integrated into the Fresno County General Plan. A scientifically comprehensive fractured rock groundwater capacity study is needed to accurately map potential hard-rock water carrying capacity in order to make prudent decisions for sustainable future development.

The SRCD has submitted a grant proposal to the California Department of Water Resources for the California State University at Fresno California Water Institute to begin preliminary steps, with partner Lawrence/Berkley Labs, to conduct comprehensive mapping of rock fractures in eastern Fresno County. The result of this proposed study/mapping will be a necessary and vitally important component of an integrated regional water management plan (see action #10).

Other Alternatives: Use available "best guess" for integrated regional water management plan

Responsible Office: Sierra Resource Conservation District, California State University at Fresno California Water Institute, Fresno County (various departments)

Priority (High, Medium, Low): Medium (drought conditions commonly occur every five to seven years and last three to seven years)

Cost Estimate: As much as $5 million over five years

Potential Funding: Government grants may be available for a portion of this plan. More grant monies are available if an integrated regional water management plan is place.

Benefits (Avoided Losses): State-of-the-art underground mapping technology would be used to determine availability of sustainable water, thus avoiding overdevelopment of the land beyond capacity. By determining sustainable capacities of the fractured rock water-bearing substrate, good planning for sustainable future developments would enhance the overall effects on the population and quality of life.

Schedule: As soon as possible to allow the County planning departments to make reasonable, long-term information available to the Fresno County Board of Supervisors for wise land-use decision making.

APPENDIX A: ADOPTION RESOLUTIONS

Note to Reviewers: When this plan has been reviewed and approved pending adoption by FEMA Region IX, the adoption resolutions will be signed by the participating jurisdictions and added to this appendix. A model resolution is provided below:

Resolution # _____

Adopting the Fresno County Multi-Hazard Mitigation Plan

Whereas, (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, (Name of Government/District/Organization) fully participated in the FEMA-prescribed mitigation planning process to prepare this multi-hazard mitigation plan; and

Whereas, the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the Fresno County Multi-Hazard Mitigation Plan ( ) and approved it ( ) contingent upon this official adoption of the participating governing body;

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the Fresno County Multi-Hazard Mitigation Plan as an official plan; and

Be it resolved that the (Name of Government/District/Organization) adopts the Fresno County Multi-Hazard Mitigation Plan by reference into the safety element of their general plan in accordance with the requirements of AB 2140, and

Be it further resolved, (Name of Government/District/Organization) will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000 and to establish conformance with the requirements of AB 2140.

Passed:_____
(date)

_____
Certifying Official

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Amphibians							
Rana aurora draytonii	California red-legged frog	Pools/ponds/slow streams/marshes	Inner Coast Range, located primarily in wetlands and streams in coastal drainages of California, mostly extirpated from valley floor and Sierra Nevada foothills	Threatened	None	Yes	
Ambystoma californiense*	California tiger salamander	Annual grasslands and grassy understory of valley-foothill hardwood habitats in central and northern California, vernal pools and other seasonal water sources	Western slope of Sierra Nevada, San Joaquin Valley floor and inner Coast Range	Threatened	None	Yes	
Rana boylii	Foothill yellow-legged frog	Valley and foothill hardwood forests, mixed conifer and coastal scrub, wet meadows; riffles in streams, pools, ponds, slow streams	Western slope of Sierra Nevada	None	None	Yes	
Batrachoseps regius	Kings River slender salamander			None	None		

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Hydromantes platycephalus	Mount Lyell salamander	Massive rock areas in mixed conifer, red fir, lodgepole and subalpine habitats; seeps, deep rock fissures or under slabs of exfoliating granite	High Sierra Nevada	None	None	Yes	
Rana muscosa	Sierra Madre (=mountain) yellow-legged frog	Montane coniferous forests; riparian, subalpine and wet meadows; riffles in streams, pools, ponds, slow streams	Western slope of Sierra Nevada	Endangered	None		
Rana sierrae	Sierra Nevada yellow-legged frog			Candidate	None	Yes	
Spea hammondii	Western spadefoot toad	Wetlands and grasslands; near vernal pools	Western slope of Sierra Nevada, San Joaquin Valley floor and inner Coast Range	None	None	Yes	
Bufo canorus	Yosemite toad	Wet meadows and subalpine coniferous forests; seasonal ponds	Wet meadows in the central high Sierra Nevada	Candidate	None	Yes	
Birds							
Haliaeetus leucocephalus	Bald eagle	Lakes, rivers, streams; large trees	Western slope of Sierra Nevada and San Joaquin Valley floor	Delisted	Endangered		
Riparia riparia	Bank swallow	River and stream cliff banks; fine textured soil	San Joaquin Valley floor	None	Threatened		
Athene cunicularia	Burrowing owl	Open annual grassland, open shrub; burrows	San Joaquin Valley floor	None	None	Yes	
Gymnogyps californianus	California condor			Endangered	Endangered		
Eremophila alpestris actia	California horned lark	Valley and foothill grassland	San Joaquin Valley floor	None	None	Yes	

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Accipiter cooperii	Cooper's hawk	Valley and foothill grassland, oak woodland, lower coniferous forests	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Aquila chrysaetos	Golden eagle	Valley and foothill grasslands, open woodland	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Strix nebulosa	Great gray owl	Old growth red fir, mixed conifer forest, lodgepole pine forest; associated with wet meadows	High Sierra Nevada	None	Endangered		
Toxostoma lecontei	Le Conte's thrasher			None	None	Yes	
Lanius ludovicianus	Loggerhead shrike			None	None	Yes	
Asio otus	Long-eared owl	Riparian forest, oak woodland; dense stands of trees	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Falco columbarius	Merlin	Valley and foothill grassland	San Joaquin Valley floor, inner Coast Range and low Sierra Nevada foothills	None	None	Yes	
Charadrius montanus	Mountain plover	Annual grassland and agricultural fields	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Accipiter gentilis	Northern goshawk	Lower and upper coniferous forests; dense forest	Western slope of Sierra Nevada and high Sierra Nevada	None	None	Yes	
Circus cyaneus	Northern harrier	Valley and foothill grassland, marshes and swamps, meadows	San Joaquin Valley floor	None	None	Yes	
Pandion haliaetus	Osprey	Open bodies of water, lakes, and rivers	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Falco mexicanus	Prairie falcon	Valley and foothill grasslands; cliff nester	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Asio flammeus	Short-eared owl	Valley and foothill grassland	San Joaquin Valley floor	None	None	Yes	
Martes americana sierrae	Sierra marten			None	None		
Buteo swainsoni	Swainson's hawk	Riparian forest, oak woodland, agricultural fields and pastures	San Joaquin Valley floor	None	Threatened		
Agelaius tricolor	Tricolored blackbird	Marshes, freshwater emergent wetland, blackberry thickets, tules and cattails	San Joaquin Valley floor	None	None	Yes	
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	Riparian forest; dense forest, multi-canopied riparian "jungle"	San Joaquin Valley floor	Candidate	Endangered		
Plegadis chihi	White-faced ibis	Fresh emergent wetland, wet meadows, flooded agricultural fields and pastures	San Joaquin Valley floor	None	None	Yes	
Empidonax traillii	Willow flycatcher			None	Endangered		
Dendroica petechia brewsteri	Yellow warbler	Riparian habitat	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None	Yes	
Xanthocephalus xanthocephalus	Yellow-headed blackbird			None	None	Yes	
Fish							
Central Valley Drainage Hardhead/ Squawfish Stream	Central Valley Drainage Hardhead/Squawfish Stream			None	None		
Oncorhynchus mykiss	Central Valley steelhead	Cold headwaters, creeks, rivers, and lakes	San Joaquin Valley floor	Threatened	None		
Mylopharodon conocephalus	Hardhead			None	None	Yes	

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Oncorhynchus (=Salmo) clarkii henshawi	Lahontan cutthroat trout	Cold headwaters, creeks, rivers, and lakes	San Joaquin Valley floor	Threatened	None		
Oncorhynchus (=Salmo) clarkii seleniris	Paiute cutthroat trout	Gravel bottomed creeks and small riversand lakes; anadromous in many coastal streams	Western slope of Sierra Nevada and San Joaquin Valley floor	Threatened	None		
Habitats							
Big Tree Forest	Big Tree Forest			None	None		
Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh			None	None		
Great Valley Mesquite Scrub	Great Valley Mesquite Scrub			None	None		
Great Valley Mixed Riparian Forest	Great Valley Mixed Riparian Forest			None	None		
Monvero Residual Dunes	Monvero Residual Dunes			None	None		
Northern Basalt Flow Vernal Pool	Northern Basalt Flow Vernal Pool			None	None		
Northern Claypan Vernal Pool	Northern Claypan Vernal Pool			None	None		
Northern Hardpan Vernal Pool	Northern Hardpan Vernal Pool			None	None		
Northern Vernal Pool	Northern Vernal Pool			None	None		
Sycamore Alluvial Woodland	Sycamore Alluvial Woodland			None	None		
Valley Needlegrass Grassland	Valley Needlegrass Grassland			None	None		
Valley Sink Scrub	Valley Sink Scrub			None	None		
Invertebrates							
Chrysis tularensis	Cuckoo wasp			None	None		
Calicina dimorphica	Harvestman			None	None		
Calicina macula	Harvestman			None	None		
Calasellus longus	Isopod			None	None		
Efferia antiochi	Antioch efferian robberfly			None	None		
Linderiella occidentalis	California linderiella			None	None		
Aegialia concinna	Ciervo aegilian scarab beetle	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Oravelia pege	Dry Creek cliff strider bug	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		
Lytta hoppingi	Hopping's blister beetle	Not available at this time	San Joaquin Valley floor, inhabits the foothills at the southern end of the Central Valley	None	None		
Metapogon hurdi	Hurd's metapogon robberfly			None	None		
Parapsyche extensa	King's Creek parapsyche caddisfly			None	None		
Branchinecta mesovallensis	Midvalley fairy shrimp			None	None		
Lytta molesta	Molestan blister beetle	Flowers and foliage of various plants ingrassland	San Joaquin Valley floor	None	None		
Talanites moodyae	Moody's gnaphosid spider			None	None		
Lytta morrisoni	Morrison's blister beetle	Flowers and foliage of various plants	San Joaquin Valley floor	None	None		
Calicina piedra	Piedra harvestman			None	None		
Eucerceris ruficeps	Redheaded sphecid wasp	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		
Coelus gracilis	San Joaquin dune beetle	Not available at this time	San Joaquin Valley floor	None	None		
Calicina mesaensis	Table Mountain harvestman			None	None		
Ammonitella yatesii	Tight coin (=Yates' snail)	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	Elderberry plants; riparian habitat	San Joaquin Valley floor	Threatened	None		
Branchinecta lynchi*	Vernal pool fairy shrimp	Vernal pools and other seasonal ponds	San Joaquin Valley floor	Threatened	None		
Lepidurus packardi*	Vernal pool tadpole shrimp	Vernal pools, and other seasonal ponds	San Joaquin Valley floor	Endangered	None		

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Hydroporus hirsutus	Wooly hydroporus diving beetle	Not available at this time	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		
Mammals							
Taxidea taxus	American badger	Valley and foothill grassland; friable soils and prey base	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Gulo gulo	California wolverine			None	Threatened		
Dipodomys nitratoides exilis*	Fresno kangaroo rat	Desert alkali scrub; friable soils	San Joaquin Valley floor, alkali sink communities of western Fresno County	Endangered	Endangered		
Myotis thysanodes	Fringed myotis bat	Roosts in caves, mines, tunnels, buildings, and other manmade structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None		
Dipodomys ingens	Giant kangaroo rat	Open grassland, sparse vegetation; fine soils	San Joaquin Valley floor	Endangered	Endangered		
Lasiurus cinereus	Hoary bat			None	None	Yes	
Myotis evotis	Long-eared myotis bat	Roosts in caves, mines, tunnels, buildings, trees, and other manmade structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None		
Myotis volans	Long-legged myotis bat	Roosts in caves, mines, tunnels, buildings, and other manmade structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None		
Ochotona princeps albata	Mt. Whitney pika			None	None		

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Ammospermophilus nelsoni	Nelson's antelope squirrel	Valley and foothill grasslands; dry sparsely vegetated areas	San Joaquin Valley Floor	None	Threatened		
Martes pennanti (pacifica) DPS	Pacific fisher	Lower and upper coniferous forests	Western slope of Sierra Nevada and high Sierra Nevada	Candidate	None	Yes	
Antrozous pallidus	Pallid bat	Roosts in caves, mines, and manmade structures	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Vulpes macrotis mutica	San Joaquin kit fox	Valley grasslands, agricultural fields	San Joaquin Valley Floor and inner Coast Range	Endangered	Threatened		
Perognathus inornatus inornatus	San Joaquin pocket mouse	Dry open grassland, scrub areas; fine textured soils between 350 feet and 650 feet in elevation	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		
Dipodomys nitratoides brevinasus	Short-nosed kangaroo rat	Arid often alkaline, plains with sparse growth of grass or low shrubs	San Joaquin Valley floor and inner Coast Range	None	None	Yes	
Ovis canadensis sierrae (=californiana)	Sierra Nevada (=California) bighorn sheep	High elevations of Sierra Nevada mountains	High Sierra Nevada	Endangered	Endangered		
Vulpes vulpes necator	Sierra Nevada red fox	High elevations of Sierra Nevada mountains, upper coniferous forest, alpine scrub, subalpine conifer, montane riparian	High Sierra Nevada, above 7,000 feet	None	Threatened		

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Euderma maculatum	Spotted bat	Roosts in caves, mines, tunnels, buildings and other manmade structures; caves	Western slope of Sierra Nevlida, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	Open grassland, sparse vegetation; fine soils	San Joaquin Valley floor, alkali sink communities of western Fresno County	Endangered	Endangered	Yes	
Corynorhinus townsendii	Townsend's big-eared bat			None	None	Yes	
Onychomys torridus tularensis	Tulare grasshopper mouse	Hot arid valleys and scrub deserts	San Joaquin Valley floor	None	None	Yes	
Eumops perotis californicus	Western mastiff bat	Roosts in structures, trees, cliffs, tunnels, and caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Lasiurus blossevillii	Western red bat			None	None		
Myotis ciliolabrum	Western small-footed myotis bat	Roosts in caves, mines, tunnels, buildings and other manmade structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None		
Ochotona princeps muiri	Yosemite pika			None	None		
Myotis yumanensis	Yuma myotis bat	Roosts in caves, mines, tunnels, buildings and other man-made structures; caves	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None		
Plants							
Streptanthus gracilis	Alpine jewel-flower			None	None		1B.3
Glyceria grandis	American manna grass			None	None		2.3
Ribes menziesii var. ixoderme	Aromatic canyon gooseberry			None	None		1B.2
Helodium blandowii	Blandow's bog moss			None	None		2.3

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Arabis bodiensis	Bodie Hills rock cress	Alpine boulder and rock field, Great Basin scrub, Pinyon and juniper woodland, subalpine coniferous	Western slope of Sierra Nevada and high Sierra Nevada	None	None		1B.3
Gratiola heterosepala	Boggs Lake hedge-hyssop	Marshes and samps (lake margins), vernal pools/clay	Western slope of Sierra Nevada and San Joaquin Valley floor	None	Endangered		1B.2
Trifolium bolanderi	Bolander's (=parasol) clover	Lower coniferous forest, meadows, upper coniferous forest; mesic	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.2
Bruchia bolanderi	Bolander's bruchia			None	None		2.2
Atriplex depressa	Brittlescale	Chenopod scrub, playas, valley and foothill grassland; alkaline clay	San Joaquin Valley floor	None	None		1B.2
Meesia uliginosa	Broad-nerved hump moss			None	None		2.2
Caulanthus californicus	California jewel-flower	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland; sandy	Western slope of Sierra Nevada and San Joaquin Valley floor	Endangered	Endangered		1B.1
Imperata brevifolia	California satintail			None	None		2.1
Tropidocarpum capparideum	Caper-fruited tropidocarpum			None	None		1B.1
Lewisia congdonii	Congdon's lewisia	Chaparral, cismontane woodland, lowermontane coniferous forest, upper montane coniferous forest/granitic, mesic	Western slope of Sierra Nevada	None	Rare		1B.3
Downingia pusilla	Dwarf downingia			None	None		2.2
Eriogonum eastwoodianum	Eastwood's buckwheat			None	None		1B.3
Mielichhoferia elongata	Elongate copper moss			None	None		2.2
Ivesia campestris	Field ivesia			None	None		1B.2
Utricularia intermedia	Flat-leaved bladderwort			None	None		2.2

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Tuctoria greenei	Greene's tuctoria	Vernal pools	San Joaquin Valley floor	Endangered	Rare		1B.1
Viola pinetorum ssp. grisea	Grey-leaved violet			None	None		1B.3
Orcuttia pilosa*	Hairy Orcutt grass			Endangered	Endangered		
Erigeron aequifolius	Hall's daisy	Broadleafed upland forest, lower and uppermontane coniferous forest, pinyon and juniper woodland, rocky	Western slope of Sierra Nevada	None	None		1B.3
Deinandra halliana	Hall's tarplant			None	None		1B.1
Pseudobahia bahiifolia	Hartweg's golden sunburst	Cismontane woodland, valley and foothill grassland; clay	Western slope of Sierra Nevada and San Joaquin Valley floor	Endangered	Endangered		1B.1
Atriplex cordulata	Heartscale	Chenopod scrub, meadows, valley and foothill grassland (sandy)/saline or alkaline	San Joaquin Valley floor	None	None		1B.2
Chorizanthe biloba var. immemora	Hernandez (=San Benito) spineflower	Chaparral, cismontane woodland	Western slope of Sierra Nevada	None	None		1B.2
Cordylanthus mollis ssp. hispidus	Hispid bird's-beak			None	None		1B.1
Eriastrum hooveri	Hoover's eriastrum	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland	Western slope of Sierra Nevada and San Joaquin Valley Floor	Delisted	None		4.2
Malacothamnus aboriginum	Indian Valley bush-mallow	Chaparral, cismontane woodland/rocky	Western slope of Sierra Nevada	None	None		1B.2
Mimulus norrisii	Kaweah monkeyflower	Chaparral, cismontane woodland/carbonate, rocky	Western slope of Sierra Nevada	None	None		1B.3

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Sidalcea keckii*	Keck's checkerbloom (=checker-mallow)	Cismontane woodland, valley and foothill grassland; serpentine	Western slope of Sierra Nevada and San Joaquin Valley floor	Endangered	None		1B.1
Erigeron inornatus var. keilii	Keil's daisy	Lower montane coniferous forest, meadows	Western slope of Sierra Nevada	None	None		1B.3
Eriogonum nudum var. regirivum	Kings River buckwheat	Cismontane woodland	Western slope of Sierra Nevada, known only from Kings River Canyon	None	None		1B.2
Caulanthus coulteri var. lemmonii	Lemmon's jewelflower			None	None		1B.2
Atriplex minuscula	Lesser saltscale	Chenopod scrub, playas, valley and foothill grassland; alkaline, sandy	San Joaquin Valley floor	None	None		1B.1
Poa lettermanii	Letterman's blue grass			None	None		2.3
Atriplex vallicola	Lost Hills crownscale	Chenopod scrub, playas, valley and foothill grassland; alkaline	Inner Coast Range and San Joaquin Valleyfloor	None	None		1B.2
Leptosiphon serrulatus	Madera leptosiphon			None	None		1B.2
Petrophyton caespitosum ssp. acuminatum	Marble rockmat			None	None		1B.3
Calyptridium pulchellum	Mariposa pussypaws	Cismontane woodland (sandy)	Western slope of Sierra Nevada and high Sierra Nevada	Threatened	None		1B.1
Botrychium minganense	Mingan moonwort			None	None		2.2
Eriogonum ovalifolium var. monarchense	Monarch buckwheat			None	None		1B.3
Gilia yorkii	Monarch gilia			None	None		1B.2
Heterotheca monarchensis	Monarch golden-aster			None	None		1B.3
Camissonia sierrae ssp. alticola	Mono Hot Springs evening-primrose	Upper montane coniferous forest (graveland sand pans)	Western slope of Sierra Nevada and high Sierra Nevada	None	None		1B.2
Carex limosa	Mud sedge			None	None		2.2

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Carlquistia muirii	Muir's tarplant			None	None		1B.3
Layia munzii	Munz's tidy-tips	Chenopod scrub, valley and foothill grassland (alkaline clay)	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.2
Lupinus citrinus var. citrinus	Orange lupine	Chaparral, cismontane woodland, lower montane coniferous forest/granitic	Western slope of Sierra Nevada	None	None		1B.2
Viburnum ellipticum	Oval-leaved viburnum			None	None		2.3
Sphagnum strictum	Pale peat moss			None	None		2.3
Layia heterotricha	Pale-yellow layia	Cismontane woodland, pinyon and juniper woodland, valley and foothill grassland; alkaline or clay	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.1
Cordylanthus palmatus	Palmate-bracted bird's-beak	Chenopod scrub, valley and foothill grassland, alkaline	Western slope of Sierra Nevada and San Joaquin Valley Floor	Endangered	Endangered		1B.1
Lepidium jaredii ssp. album	Panoche pepper-grass	Valley and foothill grassland (alluvial fans,washes)	San Joaquin Valley floor	None	None		1B.2
Sphenopholis obtusata	Prairie wedge grass			None	None		2.2
Astragalus ravenii	Raven's milk-vetch	Alpine boulder and rock field, upper montane coniferous forest/gravelly	Western slope of Sierra Nevada and high Sierra Nevada	None	None		1B
Layia discoidea	Rayless layia	Chaparral, cismontane woodland, lower montane coniferous forest/serpentine, talus and alluvial terraces	Western slope of Sierra Nevada	None	None		1B.1

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Delphinium recurvatum	Recurved larkspur	Chenopod scrub, cismontane woodland, valley and foothill grassland, vernal pools/alkaline	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.2
Potamogeton robbinsii	Robbins' pondweed			None	None		2.3
California macrophylla	Round-leaved filaree			None	None		1B.1
Camissonia benitensis	San Benito evening-primrose	Chaparral, cismontane woodland/serpentine alluvium, clay or gravelly	Western slope of Sierra Nevada and San Joaquin Valley floor, known only from the New Irdia area	Threatened	None		1B.1
Fritillaria viridea	San Benito fritillary			None	None		1B.2
Pseudobahia peirsonii	San Joaquin adobe sunburst	Cismontane woodland, valley and foothill grassland; adobe	Western slope of Sierra Nevada and San Joaquin Valley floor	Threatened	Endangered		1B.1
Atriplex joaquiniana	San Joaquin spearscale			None	None		1B.2
Orcuttia inaequalis*	San Joaquin Valley Orcutt grass	Vernal pools	San Joaquin Valley floor	Threatened	Endangered		1B.1
Monolopia congdonii (=Lembertia congdonii)	San Joaquin woollythreads			Endangered	None		1B.2
Sagittaria sanfordii	Sanford's arrowhead	Marshes and swamps (assorted shallow fresh water)	San Joaquin Valley floor	None	None		1B.2
Elymus scribneri	Scribner's wheat grass			None	None		2.3
Hackelia sharsmithii	Sharsmith's stickseed			None	None		2.3
Schizymenium shevockii	Shevock's copper moss			None	None		1B.2
Navarretia nigelliformis ssp. radians	Shining navarretia	Cismontane woodland, valley and foothill grassland, vernal pools	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.2
Hulsea brevifolia	Short-leaved hulsea			None	None		1B.2
Madia radiata	Showy madia	Cismontane woodland, valley and foothill grassland	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.1

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Draba sierrae	Sierra draba			None	None		1B.3
Botrychium lineare	Slender moonwort			Candidate	None		1B.3
Mimulus gracilipes	Slender-stalked monkeyflower			None	None		1B.2
Myurella julacea	Small mousetail moss			None	None		2.3
Eryngium spinosepalum	Spiny-sepaled button-celery	Valley and foothill grassland, vernal pools	Western slope of Sierra Nevada and San Joaquin Valley floor	None	None		1B.2
Epilobium howellii	Subalpine fireweed	Meadows, subalpine coniferous forest/mesic	High Sierra Nevada	None	None		1B.3
Atriplex subtilis	Subtle orache			None	None		1B.2
Castilleja campestris ssp. succulenta	Succulent (=fleshy) owl's-clover	Vernal pools	San Joaquin Valley floor	Threatened	Endangered		1B.2
Draba incrassata	Sweetwater Mountains draba			None	None		1B.3
Draba praealta	Tall draba			None	None		2.3
Streptanthus fenestratus	Tehipite Valley jewel-flower	Lower montane coniferous forest, upper montane coniferous forest	Western slope of Sierra Nevada	None	None		1B.3
Eriogonum temblorense	Temblor buckwheat			None	None		1B.2
Meesia triquetra	Three-ranked hump moss			None	None		4.2
Carex tompkinsii	Tompkins' sedge	Chaparral, cismontane woodland, lower coniferous forest, upper montane coniferous forest/sometimes granitic	Western slope of Sierra Nevada and high Sierra Nevada	None	Rare		4.3
Carpenteria californica	Tree-anemone	Chaparral, cismontane woodland/granitic	Western slope of Sierra Nevada and high Sierra Nevada	None	Threatened		1B.2
Pohlia tundrae	Tundra thread moss			None	None		2.3
Delphinium inopinum	Unexpected larkspur	Upper montane coniferous forest (rocky)	Western slope of Sierra Nevada and high Sierra Nevada	None	None		4.3
Botrychium montanum	Western goblin			None	None		2.1

Scientific Name	Common Name	Habitat Requirements	Habitat Distribution in Fresno County	Federal Status	California Status	CDF&G Species of Concern	CNPS
Ivesia unguiculata	Yosemite ivesia	Meadows, subalpine coniferous forest, upper montane coniferous	Western slope of Sierra Nevada and high Sierra Nevada	None	None		4.2
Lewisia disepala	Yosemite lewisia			None	None		1B.2
Reptiles							
Gambelia (=Croataphytus) sila	Blunt-nosed leopard lizard	Sparsely vegetated scrub and grassland; sandy washes	San Joaquin Valley floor and inner Coast Range	Endangered	Endangered		
Phrynosoma coronatum (frontale population)	Coast (California) horned lizard	Valley foothill hardwood, annual grassland; lugs, rocks, sandy	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Thamnophis gigas	Giant garter snake	Marshes and slow moving creeks, sloughs and irrigation canals	San Joaquin Valley floor	Threatened	Threatened		
Masticophis flagellum ruddocki	San Joaquin whipsnake (=coachwhip)	Grass, scrub chaparral, and pasture habitats; arid open	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Anniella pulchra pulchra	Silvery legless lizard	Valley foothill and chaparral; moist substrate, leaf litter, sandy soil	Western slope of Sierra Nevada, inner Coast Range and San Joaquin Valley floor	None	None	Yes	
Thamnophis hammondii	Two-striped garter snake			None	None	Yes	
Actinemys marmorata	Western pond turtle	Ponds, slow moving creeks, sloughs, rivers, and irrigation canals	San Joaquin Valley floor, Sierra Nevada foothills and inner Coast Range	None	None	Yes	

Source: Fresno County General Plan

APPENDIX C: MITIGATION STRATEGY

Categories of Mitigation Measures Considered

The following categories are based on the Community Rating System. To accommodate other hazards, multi-hazard examples were added:

Prevention

- Planning and zoning
- Open space preservation
- Land development regulations
- Stormwater management
- Fuels management

Property Protection

- Firewise construction
- Defensible space/fuels modification
- Water supply
- Flood protection

Natural Resource Protection

- Erosion and sediment control
- Wetlands protection
- Threatened and endangered species protection
- Fuels management

Emergency Services

- Warning and evacuation
- Communications
- Critical facilities protection
- Lifeline utilities protection
- Health and safety maintenance

Structural Projects

- Detention/retention structures
- Sediment basins/low-head weirs
- Channel modifications
- Culvert resizing/replacement/maintenance
- Floodwalls

Public Information

- Hazard maps
- Outreach programs (mailings, media, web, speakers bureau)
- Education program (children/adults)

Alternative Mitigation Measures per Category

Prevention

Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open space preservation
- Land development regulations
  - Subdivision regulations
  - Floodplain development regulations
- Stormwater management
- Fuels management, fire breaks
- Building codes
  - Firewise construction
- (also see Property Protection)

Emergency Services

Emergency services protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (floods, tornadoes, ice storms, hail storms, dam failures)
  - NOAA weather radio all hazards
  - Sirens
  - Reverse 911

- Evacuation and sheltering
- Communications
- Emergency planning
  - Activating the emergency operations room (emergency management)
  - Closing streets or bridges (police or public works)
  - Shutting off power to threatened areas (utility company)
  - Holding children at school/releasing children from school (school district)
  - Passing out sand and sandbags (public works)
  - Ordering an evacuation (mayor)
  - Opening evacuation shelters (red cross)
  - Monitoring water levels (engineering)
  - Security and other protection measures (police)
- Monitoring of conditions (dams)
- Critical facilities protection (buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)
  - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
  - Lifeline utilities protection
  - Health and safety maintenance

Property Protection

Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- Retrofitting/disaster proofing
  - Floods
    - Wet/dry floodproofing (barriers, shields, backflow valves)
    - Relocation
    - Acquisition
  - Tornadoes
    - Safe rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - Drought
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (tamarisk/salt cedar)
    - Water restrictions/water saver sprinklers/appliances

    - Grazing on CRP lands (no overgrazing—see noxious weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses
  - Earthquakes
    - Removing masonry overhangs, bracing other parts
    - Tying down appliances, water heaters, bookcases and fragile furniture so they will not fall over during a quake.
    - Installing flexible utility connections that will not break during shaking (pipelines, too)
  - Wildland fire
    - Replacing building components with fireproof materials (roofing, screening)
    - Creating "defensible space"
    - Installing spark arrestors
    - Fuels modification
  - Noxious weeds/insects
    - Mowing
    - Spraying
    - Replacement planting
    - Stop overgrazing
    - Introduce natural predators
- Insurance

Natural Resource Protection

Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- Storage of floodwaters
- Absorption of flood energy
- Reduction in flood scour
- Infiltration that absorbs overland flood flow
- Groundwater recharge
- Removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Erosion and sediment control
- Wetlands protection
- Riparian area/habitat protection

- Threatened and endangered species protection
- Fuels management
- Set-back regulations/buffers
- Best management practices—Best management practices ("BMPs") are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project's design to permanently address nonpoint source pollutants. There are three general categories of BMPs:
  - Avoidance—Setting construction projects back from the stream.
  - Reduction—Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
  - Cleanse—Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained
- Dumping regulations
- Water use restrictions
- Weather modification
- Landscape management

Structural Projects

Structural projects have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they "stop" flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- Detention/retention structures
- Erosion and sediment control
- Basins/low-head weirs
- Channel modifications
- Culvert resizing/replacement/maintenance
- Levees and floodwalls
- Fencing (for snow, sand, wind)
- Drainage system maintenance
- Reservoirs (for flood control, water storage, recreation, agriculture)
- Diversions
- Storm sewers

Public Information

A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- Hazard maps and data
- Outreach projects (mailings, media, web, speakers bureau)
- Library resources
- Real estate disclosure
- Environmental education
- Technical assistance

Mitigation Alternative Selection Criteria

The following criteria were used to select and prioritize proposed mitigation measures:

STAPLE/E

- **Social**—Does the measure treat people fairly? (different groups, different generations)
- **Technical**—Will it work? (Does it solve the problem? Is it feasible?)
- **Administrative**—Do you have the capacity to implement and manage project?
- **Political**—Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?
- **Legal**—Does your organization have the authority to implement? Is it legal? Are there liability implications?

- **Economic**—Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- **Environmental**—Does it comply with environmental regulations?

Sustainable Disaster Recovery

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement
- Community participation

Smart Growth Principles

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design

Other

- Does measure address area with highest risk?
- Does measure protect …
  - The largest # of people exposed to risk?
  - The largest # of buildings?
  - The largest # of jobs?
  - The largest tax income?
  - The largest average annual loss potential?
  - The area impacted most frequently?
  - Critical infrastructure (access, power, water, gas, telecommunications)?
- What is timing of available funding?
- What is visibility of project?
- Community credibility

Fresno County Local Hazard Mitigation Plan
Mitigation Actions List
Initial Prioritization Process
HMPC #5
3/5/08

Mitigation Action Title	Score
Emergency Services Actions	
Enhance/Build Emergency Operations Centers	66*
Develop Mass Notification Systems for Community Alerting	64*
Increase Protection of Designated Critical Facilities	46*
Develop Emergency Transportation Capabilities	22
Develop/Enhance Emergency Access and Evacuation Routes	21*
Develop/Enhance Mass Disposal Options for Animal Carcasses	16
Obtain County-wide Storm Ready Designation	13
Provide OES/Emergency Services Training for Designated County/City Staff	12*
Provide for Animal Sheltering during Emergencies	8*
Provide Transportation Services to Cooling/Warming Centers	7
Develop Evacuation Procedures for Live Stock	3
Flood Actions	
Evaluate/Implement Floodplain Management Program: Certified Floodplain Manager, CRS, Public Outreach, Flood Ordinance Revisions, etc.	43*
Develop Stormwater Drainage Management Plans - all Jurisdictions	37*
Evaluate Integrity of Bridges	23
Evaluate Critical Failure Points along Kings & San Joaquin Rivers	21
Aquatic Invasive Species Control (Conveyance concerns)	20*
Pursue Certification of Certifiable Levees	19
Evaluate Need for New Storage Facilities	16*
San Joaquin River: Maintain Channel Integrity	15*
Enhance Drainage Capabilities	15*
Develop County-wide System for Stream Gauges	12
San Joaquin River: Increase Capacity of Control Structures	12*
Develop Program for Inspecting and Certifying Private Dams (Revise Ordinances for property owners)	4
Agricultural Actions	
Upgrade Monitoring Equipment for Freeze Events	25
Control Beaver Population	14*
Continued West Nile Monitoring & Control	10
Coyote Control/Management	8*
Wild Pig Control/Management	6*
Non-Native Animal Species/Plant Species	3
Wildfire Actions	
Establish Fuel Breaks	43*
Update and Enhance County GIS Layers for Wildfire Response Purposes	33
Promote Public Outreach/Awareness for Defensible Space/Construction Standards	26*
Maintenance of Fuel Breaks	24*

Mitigation Action Title	Score
Develop Tanker Filling Stations/Water Storage Facilities	22*
Create Neighborhood Chipper Programs	14*
Evaluate County Weed Program Priorities	12
Evaluate Need for Prescribed Burns (Air District Restrictions)	7*
Address Sign Requirements	7
Utilize New Technology to Enhance Fire Protection Capabilities	6
Evaluate Need to Retrofit Public Facilities in Wildfire Prone Areas	4
Earthquake Actions	
Provide Utility Redundancy	14
Enhance Public Outreach	12*
Seismic Assessment of Critical Facilities	11*
Seismic Retrofitting	7*
Inspection of Vulnerable Facilities	2*
Seismic Mapping	0
Drought Actions	
Develop Integrated Regional Water Management Plan	32*
Develop County-wide Drought Contingency Plan	28
Develop Groundwater Recharge Capabilities	20
Create Limitations in areas of inadequate water supply	20
Removal of Non-native Invasive Plant Species	17
Conduct Fractured Rock Groundwater Study	14*
Encourage Drought Resistant Plants	10
Evaluate/Develop use of Reclaimed Water	9
Promote Water Conservation Education	4
Fog/Dust Actions	
Driver Education	20
Evaluate Diversion Areas in Fog Prone Areas	7
Hazardous Materials Release Actions	
Public Education	21*
Mass Notification	5*

* indicates that mitigation action identified was addressed to some extent in the final Mitigation Action Strategy portion of the LHMP.

APPENDIX D: REFERENCES

2001 Fresno County Regional Housing Needs Allocation Plan. Council of Fresno County Governments. 2001. www.fresnocog.org/.

2006 Fresno County Agricultural Crop and Livestock Report. County of Fresno Department of Agriculture. 2006. www.co.fresno.ca.us/4010/reports/crop06/Retrospect%20-I-X_2006.pdf.

2007 Fresno County Regional Housing Needs Allocation Plan. Draft. Council of Fresno County Governments. 2007. www.fresnocog.org/.

American Community Survey. U.S. Census Bureau. 2006. www.census.gov/acs/www/.

California Department of Conservation Farmland. Mapping and Monitoring Program. www.conservation.ca.gov/dlrp/fmmp/.

California Department of Parks and Recreation Office of Historic Preservation. http://ohp.parks.ca.gov/.

California Department of Water Resources. www.water.ca.gov/.

California Employment Development Department. www.edd.ca.gov/.

California Geological Survey. www.conservation.ca.gov/CGS/.

California Governor's Office of Emergency Services. www.oes.ca.gov/.

California Natural Diversity Data Base. www.dfg.ca.gov/biogeodata/cnddb/.

California Volcanoes and Volcanics. U.S. Geological Survey, Cascades Volcano Observatory. http://vulcan.wr.usgs.gov/Volcanoes/California/.

California West Nile Virus Web Site. www.westnile.ca.gov/.

Census 2000. U.S. Census Bureau. www.census.gov/.

Certified Roll Values. Fresno County Assessor's Office. 2007.

Cities/Counties Ranked by Size, Numeric, and Percent Change. State of California Department of Finance. 2006. www.dof.ca.gov/HTML/DEMOGRAP/ReportsPapers/ReportsPapers.php.

City of Clovis. www.ci.clovis.ca.us/.

City of Coalinga. www.coalinga.com/.

City of Fresno. www.fresno.gov/.

City of Kerman. www.cityofkerman.net/.

City of Kingsburg. www.cityofkingsburg-ca.gov/.

City of Mendota. www.thecityofmendota.com/.

City of Sanger. www.ci.sanger.ca.us/.

City of Selma. www.cityofselma.com/.

Communities at Risk. California Fire Alliance. www.cafirealliance.org/communities_at_risk/.

Community Rating System. Federal Emergency Management Agency National Flood Insurance Program. www.fema.gov/business/nfip/crs.shtm.

Council of Fresno County Governments. www.fresnocog.org/.

County of Fresno Heat Emergency Contingency Plan. Draft. Fresno County Community Health. 2007. www.fresnohumanservices.org/CommunityHealth/.

Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies. Federal Emergency Management Agency. FEMA 386-3. 2003. www.fema.gov/plan/mit planning/howto3.shtm.

Disease Maps 2007. U.S. Geological Survey. http://diseasemaps.usgs.gov/.

The Enhanced Fujita Scale. National Oceanic and Atmospheric Administration Storm Prediction Center. 2007. www.spc.noaa.gov/efscale/.

Economic Development Corporation Fresno County. www.fresnoedc.com/.

Digital Flood Insurance Rate Maps, Fresno County. Draft. Federal Emergency Management Agency. 2007.

Federal Endangered and Threatened Species that Occur In or May Be Affected by Projects in [Fresno County]. U.S. Fish and Wildlife Service Sacramento Office. 2008. www.fws.gov/sacramento/.

Fire Hazard Severity Zones DRAFT, 9-2007, Very High zones in LRA. California Department of Forestry and Fire Protection Fire and Resource Assessment Program. 2007. http://frap.fire.ca.gov/.

Five Views: An Ethnic Historic Site Survey for California. 1988. www.nps.gov/history/history/online_books/5views/5views.htm.

The Flood Insurance Study for the County of Fresno. Federal Emergency Management Agency. 2005.

Fresno County. www.co.fresno.ca.us/.

Fresno County Department of Community Health. www.fresnohumanservices.org/CommunityHealth/.

Fresno County General Plan. 2000. www.co.fresno.ca.us/4510/4360/General_Plan/general_plan.htm.

Fresno County Local Agency Formation Commission. www.fresnolafco.org/.

Fresno County Operational Area Master Emergency Services Plan. Fresno County Office of Emergency Services. 2004.

Fresno County Operational Area Dam Failure Evacuation Plan. Fresno County Operational Area Master Emergency Services Plan. Fresno County Office of Emergency Services. 2003.

Fresno County Ordinance Code. LexisNexis Municipal Codes. 2007. http://municipalcodes.lexisnexis.com/codes/fresno/.

Fresno County Zoning Ordinance. Department of Public Works and Planning Development Services Division. 2008. www.co.fresno.ca.us/4510/4360/devsrvcs.htm.

Fresno History. Fresno Convention and Visitor's Bureau. www.fresnocvb.org/about/history.asp.

Fresno-Kings Unit Prefire Management Plan. California Department of Forestry and Fire Protection. 2005.

Fresno Metropolitan Flood Control District. www.fresnofloodcontrol.org/.

Future Eruptions in California's Long Valley Area—What's Likely? U.S. Geological Survey. Fact Sheet 073-97. 1997. http://pubs.usgs.gov/fs/fs073-97/.

Getting Started: Building Support for Mitigation Planning. Federal Emergency Management Agency. FEMA 386-1. 2002. www.fema.gov/plan/mitplanning/howto1.shtm.

Golden Gate Weather Services. http://ggweather.com/.

The Great Pandemic: The United States in 1918-1919. U.S. Department of Health and Human Services. http://1918.pandemicflu.gov/your_state/california.htm.

Hazard Mitigation Planning and Hazard Mitigation Grant Program. Federal Register. Interim Final Rule. February 26, 2002. www.fema.gov/plan/mitplanning/interim_final_rules.shtm.

HAZUS-MH MR3. Federal Emergency Management Agency. 2007. www.fema.gov/plan/prevent/hazus/index.shtm.

Highway 168 Fire Safe Council Community Wildfire Protection Plan. Revised. Highway 168 Fire Safe Council. August 2006.

Historic American Buildings Survey. National Park Service. www.nps.gov/history/hdp/habs/.

Historic American Engineering Record. National Park Service. www.nps.gov/history/hdp/haer/.

Influenza. World Health Organization Epidemic and Pandemic Alert and Response. www.who.int/csr/disease/influenza/en/.

Integrating Manmade Hazards into Mitigation Planning. Federal Emergency Management Agency. FEMA 386-7. 2003. www.fema.gov/plan/mitplanning/howto7.shtm.

Introduction to Hazard Mitigation. Federal Emergency Management Agency. FEMA IS-393.A. 2006. http://training.fema.gov/EMIWeb/IS/is393A.asp.

Kings River Conservation District. www.krcd.org/.

Multi-Hazard Identification and Risk Assessment. Federal Emergency Management Agency. 1997. www.fema.gov/library/index.jsp

National Flood Insurance Program. Federal Emergency Management Agency. www.fema.gov/about/programs/nfip/index.shtm.

National Register Information System. www.nr.nps.gov/.

National Response Center. www.nrc.uscg.mil/.

National Weather Service Forecast Office, San Joaquin Valley/Hanford, California. www.wrh.noaa.gov/hnx/.

Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities. National Institute of Building Science Multi-Hazard Mitigation Council. 2005. www.nibs.org/MMC/mmcactiv5.html.

The Online Tornado FAQ. National Oceanic and Atmospheric Administration Storm Prediction Center. www.spc.noaa.gov/faq/tornado/.

PandemicFlu.gov. U.S. Department of Health and Human Services. www.pandemicflu.gov/.

Population and Housing Estimates for Cities, Counties and the State, 2001-2007, with 2000 Benchmark. State of California Department of Finance. 2007. www.dof.ca.gov/HTML/DEMOGRAP/ReportsPapers/ReportsPapers.php.

Population, Housing Units, Area, and Density: 2000 (GCT-PH1). U.S. Census Bureau. 2000. www.census.gov/.

Population Projections for California and Its Counties 2000-2050, by Age, Gender and Race/Ethnicity. State of California Department of Finance. 2007. www.dof.ca.gov/HTML/DEMOGRAP/ReportsPapers/ReportsPapers.php.

Probabilistic Seismic Hazard Assessment for the State of California. California Geological Survey. Open-File Report 96-08. 1996. www.consrv.ca.gov/CGS/rghm/psha/ofr9608/Pages/index.aspx.

Robert T. Stafford Disaster Relief and Emergency Act. Public Law 93-288, as amended, 42 U.S.C. 5121-5207. June 2007. www.fema.gov/pdf/about/stafford_act.pdf.

Sierra Resource Conservation District. www.sierrarcd.com/.

Social Science Data Analysis Network. www.censusscope.org/.

Social Vulnerability Index. University of South Carolina Hazards and Vulnerability Research Institute. 2000. www.cas.sc.edu/geog/hrl/sovi.html.

Spatial Hazard Events and Losses Database for the United States. University of South Carolina Hazards Research Lab. www.cas.sc.edu/geog/hrl/SHELDUS.html.

State of California Department of Conservation Farmland Mapping and Monitoring Program. www.conservation.ca.gov/.

State of California Multi-Hazard Mitigation Plan. California Governor's Office of Emergency Services. 2007. www.hazardmitigation.oes.ca.gov/.

Storm Events Database. National Climatic Data Center. www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms.

Thompson, E. Paving Paradise: A New Perspective on California Farmland Conversion. American Farmland Trust. 2007. www.farmland.org/programs/states/ca/.

Understanding Your Risks: Identifying Hazards and Estimating Losses. Federal Emergency Management Agency. FEMA 386-2. 2001. www.fema.gov/plan/mitplanning/howto2.shtm.

U.S. Drought Monitor. University of Nebraska-Lincoln National Drought Mitigation Center. http://drought.unl.edu/dm/.

Western Regional Climate Center. www.wrcc.dri.edu/.

APPENDIX E: PLANNING PROCESS

JURISDICTIONAL ANNEX INFORMATION PACKET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Contents

1. California Office of Emergency Services Information Sheet for Local Hazard Mitigation Plan Development
2. Letter of Intent to Develop a Local Hazard Mitigation Plan
3. Jurisdictional Annex Requirements and Outline
4. Examples of Mitigation Actions and STAPLEE Prioritization Criteria
5. Supplemental Review Crosswalk - For California Local Governments Participating In Multi-Jurisdictional Plans

For more information on this project, contact:

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INFORMATION SHEET FOR LOCAL HAZARD MITIGATION PLAN DEVELOPMENT
August 2005

"Hazard Identification, Vulnerability Analysis and the Development & Implementation of Mitigation Strategies, are the essential, Hazard Mitigation Planning Activities, that will Save Lives, Preserve Property, Protect the Environment and Reduce Costs, during Times of Disaster."

Hazard mitigation is defined by the Interim Final Rule "As any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards." - The primary purpose of mitigation planning is to systematically identify policies, actions, and tools that can be used to implement those actions. Mitigation planning has four steps: organizing resources, assessing risks, developing a mitigation plan, and implementing the plan and monitoring progress.

DISASTER MITIGATION ACT OF 2000 (DMA 2000) BACKGROUND:

This section of the OES website concerns development of Local Hazard Mitigation Plans (LHMP) in accordance with the requirements of Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S.C. 5165, enacted under § 104 the **Disaster Mitigation Act of 2000**, (DMA 2000). The DMA 2000, P.L, 106-390, provides new and revitalized approaches to pre-disaster mitigation planning. See the text of the DMA2000.pdf, below.

The DMA 2000 was implemented by the following Interim Final Rules (IFRs) issued on February 26, 2002 and another on October 1, 2002.

http://www.fema.gov/fima/ifrs.shtm

From the February 26th IFR, the following definition of a Local Government is included:

"Local government is any county, municipality, city, town, township, public authority, **school district, special district**, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity."

All local governments must prepare a Single Jurisdiction Plan (SJP), or participate in the development of a Multi-Jurisdictional Plan (MJP) to be eligible to receive Hazard Mitigation Grant Program (HMGP) project grants for disasters declared after **November 1, 2004**. Also affected will be future mitigation project funding awarded through the Flood Mitigation Assistance (FMA) program, the Pre-Disaster Mitigation (PDM) grant programs, and the U.S. Small Business Administration's (SBA) low-interest, pre-disaster, small business loan program.

Plans completed and approved after November 1, 2004 will restore a local jurisdiction's eligibility for the above mentioned programs.

It should be noted that local governments **without** LHMPs are still currently eligible to receive Post-Disaster, Public Assistance (PA) program grants.

FEMA has published a 3-page Table, to better clarify eligibility issues, as the Nov. 1 planning deadline approaches. This table describes the affect of having or not having State & local hazard mitigation plans on PDM, HMGP, and Public Assistance (categories C-G) grant eligibility.

041020 Eligibility for Mitigation Grants.doc

LETTERS OF INTENT FOR LOCAL GOVERNMENTS:

OES is asking ALL local governments to sign & return the Letter of Intent (LOI) to help the State meet responsibilities to coordinate and to have a point of contact from your county, city or special district, and to ensure that all CA city/local governments **are completely aware** of these requirements, before a disaster occurs.

If you are already preparing a plan, then completing the LOI form will help the State mitigation planning program keep your jurisdiction informed and provide guidance and technical assistance. The LOI will also give your county, city or special district recognition for being aware of and participating in the local hazard mitigation planning program.

Letters to all counties and cities in California have been sent out. Letters to all California **Special Districts** will be sent out in the future; however Special Districts are encouraged to complete their LOI at this time.

County's Letter of Intent & Enclosures

Sample_County_LOI_cover.doc

Encl-1-County_LOI.doc

Letter of Intent for Cities and Special Districts

Sample_City_SD_Other_LOI_cover.doc

Encl-1-City_Special_Districts_Other_LOI.doc

Once a community has decided to write a LHMP, reading the review & approval process information should give them a view of their objective, and help them to get pointed in the right direction.

LHMP REVIEW & APPROVAL PROCESS INFORMATION:

LHMP REVIEW & APPROVAL PROCESS.doc

CROSSWALKS FOR LOCAL PLAN REVIEW & APPROVAL:

The LHMP review "crosswalk" attached below contains a listing of the complete content requirements for Local Hazard Mitigation Plans. The crosswalk helps to ensure that the plans are complete, and provides a listed location in the plan, where reviewers are able to find the required information. The ***FEMA-OES LHMP Review Crosswalk*** would be used by a community completing a Single Jurisdiction Plan (SJP), or would be completed by the "lead" agency or jurisdiction of a Multi-Jurisdictional Plan (MJP). Jurisdictions completing a SJP will complete the crosswalk from the single jurisdiction's perspective. Lead agencies or jurisdictions completing the crosswalk for a MJP, will complete the crosswalk from the perspective of the "overall" planning area (including all jurisdictions).

FEMA-OES_LHMP_Review_Crosswalk.doc

The ***OES MJP Supplemental Crosswalk*** is designed as a "tool" to be used by the lead agency or jurisdiction of a Multi-Jurisdictional, Hazard Mitigation Plan (MJP). The requirements listed in the supplemental crosswalk emphasize those "individual" requirements that need to be completed by **each participating jurisdiction** of a MJP. In the initial phases of plan development, a copy of the supplemental crosswalk should be distributed to each participating jurisdiction as a work plan or project guide.

OES_MJP_Supplemental_Crosswalk.doc

After collecting a completed ***OES_MJP_Supplemental_Crosswalk*** from each jurisdiction participating in the MJP, The lead jurisdiction will then complete and submit for OES/FEMA review, a ***Supplemental Crosswalk Summary for MJPs***form, which verifies completion of each individual requirement, by each participating jurisdiction in the MJP.

Supplemental Crosswalk Summary for MJPs.doc

RECOMMENDED TABLE(s) OF CONTENTS (for Single Jurisdictions, Multi-Jurisdictional Lead Agency and for MJP Participating Jurisdiction's Annex)

The following Single Jurisdiction Table of Contents (TOC) is recommended as an efficient way to format a LHMP to ensure that all required content categories are covered. Information under each section or topic heading is still subject to evaluation by OES and FEMA. The suggested SJP TOC combined with the OES LHMP Development Guide (available by request on CD ROM) is a dynamic combination for single, multiple

or participating jurisdiction(s) to format their plan, and to ensure that the plan contents meet the local plan content requirements of DMA 2000.

050506 SUGGESTED SINGLE JURISDICTION PLAN TOC.doc

The Lead Agency TOC is designed to be used by the "Lead Agency" developing a Multi-Jurisdictional, LHMP (MJP). The Lead Agency should complete all sections from the perspective (a summary) of the "Whole" or "Overall" Planning Area. This is the area that includes the territory of all jurisdictions participating in the MJP. Lead Agency(s) should also complete their own Annex as one of the Participating Jurisdictions in the overall MJP.

EXAMPLE: Gold County is the Lead Agency for a MJP that includes the County and all Cities in Gold County. Gold County, as the Lead Agency of the MJP, used the "suggested" MJP - TOC to complete the main or "umbrella" portion of the MJP, from the overall planning area perspective (including the County and all Cities). Gold County then used the suggested Annex TOC to complete an Annex to the Gold County MJP from the perspective of just the unincorporated areas in Gold County.

050506 SUGGESTED MJP Lead Agency TOC.doc

A participating jurisdiction's Annex is a "supplement" to the MJP and does not require that information, presented for the "whole" planning area by the lead agency, be repeated in the Annex. It is intended that all participating jurisdiction Annexes be completed strictly from the perspective of the participating (reporting) jurisdiction in order to supplement the MJP.

050508 Suggested MJP Annex TOC.doc

LOCAL MITIGATION PLANNING WEBSITES AND CONTACT INFORMATION

The following websites provide Local Hazard Mitigation Planning Tools such as FEMA's Pre-Disaster Mitigation, "How to Guides," as well as other planning, review and guidance information:

[✓] The ***Interim Final Rules*** are found at: http://www.fema.gov/fima/ifrs.shtm

[✓] ***DMA 2000-Mitigation Planning Guidance & Text of the DMA 2000:***
http://www.fema.gov/fima/dma2k.shtm

[✓] **FEMA's Mitigation Planning Information website**:
http://www.fema.gov/fima/planning.shtm

[✓] *For Mitigation Planning Links* http://www.fema.gov/fima/plan_links.shtm
"Links" contains information on: *Environmental & Historic Preservation, Flood Hazard Mapping, HAZUS, Map Modernization, Mitigation Grant Programs, Mitigation Success Stories and Case Studies, National Dam Safety Program , National Hurricane Program, Training, Tribal Planning, Tornado Safe Rooms*

[✓] *FEMA's Planning Resource Center:* http://www.fema.gov/fima/resources.shtm (The following Resources are found at the *Planning Resource Center*.)

Mitigation Planning "How-To" Guides

FEMA developed this series of mitigation planning "How-To" guides to assist States, Tribes, and communities in enhancing their hazard mitigation planning capabilities. These guides are designed to provide the type of information state and local governments need to initiate and maintain a planning process that will result in safer communities. These guides are applicable to states and communities of various sizes and varying ranges of financial and technical resources.

Getting Started: Building Support For Mitigation Planning (FEMA 386-1)
http://www.fema.gov/fima/howto1.shtm

Understanding Your Risks: Identifying Hazards And Estimating Losses (FEMA 386-2)
http://www.fema.gov/fima/howto2.shtm

Developing The Mitigation Plan: Identifying Mitigation Actions And Implementing Strategies (FEMA 386-3)
http://www.fema.gov/fima/howto3.shtm

Bringing the Plan to Life: Implementing the Hazard Mitigation Plan (FEMA 386-4)
http://www.fema.gov/fima/howto4.shtm

Integrating Manmade Hazards Into Mitigation Planning (FEMA 386-7)
http://www.fema.gov/fima/howto7.shtm

Building a Disaster-Resistant University (FEMA 443)
http://www.fema.gov/fima/howtodru.shtm

Additional Mitigation Planning Guidance

Multi-Hazard Mitigation Planning Guidance under the Disaster Mitigation Act of 2000
http://www.fema.gov/fima/guidance.shtm

EMI Course E293, Mitigation Plan Review
http://www.fema.gov/fima/e293.shtm

DMA 2000 State & Local Plan Interim Criteria: Mitigation Planning Workshop for Local Governments
http://www.fema.gov/fima/workshop.shtm

Planning for a Sustainable Future: The Link Between Hazard Mitigation and Livability (FEMA 364)
http://www.fema.gov/fima/linkmitliv.shtm

Rebuilding for a More Sustainable Future: An Operational Framework (FEMA 365)
http://www.fema.gov/fima/rebuilding.shtm

FEMA-Approved Hazard Mitigation Plans http://www.fema.gov/fima/approved_plans.shtm

[✓] http://www.fema.gov/library/prepandprev.shtm - Provides information on FEMA's website related to several natural hazards, including floods.

The OES, Interim Local Hazard Mitigation Plan Development Guide (binder): CONTACT OES FOR AN ELECTRONIC COPY.

Natural Hazards Element of a Local Comprehensive or General Plan - Copies can be obtained by calling the FEMA Publication Warehouse and requesting FEMA Publication 421, Item #1523.

Planning for Post-disaster Recovery and Reconstruction - This landmark report breaks new ground by introducing community planners to their pivotal roles in guiding rebuilding and recovery after disasters, and provides guidance on how to plan for post-disaster reconstruction side by side with all the other players involved. Copies can be obtained by calling the FEMA Publication Warehouse.

The OES **"Recovery Manual"** explains recovery activities coordinated and performed by the Disaster Assistance Division and was designed for OES internal use, legislators, federal counterparts, etc. (Available through the Disaster Assistance Branch of OES).

The OES **"Recovery and Mitigation Handbook"** provides information about accessing the various individual and public assistance programs and maximizing hazard mitigation opportunities. The Handbook was designed for local government emergency managers. A limited supply of hard copies of the Handbook are still available for distribution. (Available through the Disaster Assistance Branch of OES).

Antiterrorism and Technological Hazard Mitigation - FEMA's role in managing terrorism includes both antiterrorism and counterterrorism activities. Antiterrorism refers to defensive measures used to reduce the vulnerability of people and property to terrorist acts, while counterterrorism includes offensive measures taken to prevent, deter, and respond to terrorism. Thus, antiterrorism is an element of hazard mitigation, while counterterrorism falls within the scope of preparedness, response and recovery.
See FEMA's antiterrorism web site. <http://www.fema.gov/fima/antiterrorism/>

Thank you for helping to promote the development of Local Hazard Mitigation Plans for a "Safer Future for all California Communities." For further information regarding California's LHMP Program, or to obtain a copy of any of the LOI or other reference documents, please contact Mr. Ken Worman, LHMP Program Manager, or Mr. Frank Hauck, LHMP Program Coordinator, at (916) 845-8150. Frank's e-mail address is **<Frank.Hauck@oes.ca.gov>.**

Thank You, Sincerely....
Frank W. Hauck, Emergency Services Coordinator
Governor's Office of Emergency Services
Disaster Assistance Division, Hazard Mitigation Section
Office Telephone: 916.845.8162 - FAX 916.845.8386
Email: <Frank.Hauck@oes.ca.gov>

Resolution # _____

Letter of Intent to Prepare

an annex to the Fresno County, California

Multi-Hazard Mitigation Plan

***Whereas**, **(Name of Government/District/Organization preparing annex to the Fresno County Multi-Hazard Mitigation Plan)** recognizes the threat that natural hazards pose to people and property within our community; and*

***Whereas,** undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and*

***Whereas,** an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and*

***Whereas, (Name of Government/District/Organization)** plans to fully participate in the preparation of an annex to the Fresno County Multi-Hazard Mitigation Plan; and*

***Whereas,** that the **(Name of Government/District/Organization)** will officially adopt their annex, (upon completion) to the* "Fresno County, California Multi-Hazard Mitigation Plan" *as an official plan; and*

***Now, therefore, be it resolved, (Name of Government/District/Organization)** will submit this letter of intent to the Fresno County Office of Emergency Services as a record of their intent to participate as a local jurisdiction in the Fresno County Multi-Hazard Mitigation Plan Process.*

Passed: ___(date)___

_____

Certifying Official

FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN JURISDICTIONAL ANNEX REQUIREMENTS AND OUTLINE

This document provides a suggested template for jurisdictional annexes to Fresno County's Multi-Jurisdictional Hazard Mitigation Plan. Suggested section headings and regulatory requirements are provided in an outline format, as well as brief descriptions and sample tables for the content needed. The outline is designed to be integrated with the planning process and timeline of the Hazard Mitigation Planning Committee (HMPC) for the multi-jurisdictional plan.

Section 1: Prerequisites

201.6 (c)(5) *The plan shall include the following…Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*

Include the resolution or other documentation of your jurisdiction's adoption of the LHMP. This may occur after the plan has been submitted to CA OES and FEMA and received conditional approval.

Section 2: Jurisdictional or Community Profile

Develop a concise (1-2 pages) profile describing your jurisdiction. Include sections on the following:

Geography and climate
History
Economy
Population

If a special district, describe information on size and location, purpose, history, and customers served. Include a map of your community or district.

Section 3: Risk Assessment

201.6(c)(2) *The plan shall include…A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

201.6(c)(2)(iii) *For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

3.1 Hazard Identification and Profiles

201.6(c)(2)(i) *The risk assessment shall include…A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

The jurisdiction should identify hazards that could affect it, where they vary from risks facing the entire planning area and develop a hazard profile for each of these hazards. Complete the table that follows to summarize your information; the definitions for the rankings can be found on the following page.

Table x: City of XX—Hazard Profiles

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards				
Avalanche				
Dam Failure				
Drought				
Earthquake				
Expansive Soils				
Extreme Heat				
Flood				
Freeze				
Fog				
Hail				
Heavy Rain/ Thunderstorm				
Landslide				
Land Subsidence				
Severe Weather				
Soil Erosion				
Soil Liquefaction				
Tornado				
Volcano				
Wildfire				
Windstorm				
Winter Storm				

Guidelines for Hazard Rankings

Frequency of Occurrence:
Highly Likely: Near 100% probability in next year.
Likely: Between 10 and 100% probability in next year or at least one chance in ten years.
Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years.
Unlikely: Less than 1% probability in next 100 years.

Spatial Extent:
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Potential Magnitude:
Catastrophic: More than 50% of area affected
Critical: 25 to 50%
Limited: 10 to 25%
Negligible: Less than 10%

Significance (your subjective opinion):
Low, Medium, High

For each hazard type, describe past events and their impacts. Provide maps of hazardous areas, if possible. Include information on the following to justify your rankings:

- Type, location, and date of event
- Nature and magnitude of event
- Deaths and injuries
- Property and infrastructure damage
- Crop losses
- Other economic/business losses
- Road and/or school closures
- Federal and state disaster relief

Example:
Extreme Heat
During the extreme heat event in summer 2006, human safety, agricultural crops, and livestock were impacted in Corcoran. There were four fatalities, of which most were elderly citizens. The cotton yield was smaller than normal, and 20 percent of the tomato crop was lost. The extreme heat also caused death in livestock and created a problem in carcass disposal. Power outage was also a problem. The city opened cooling centers during this event.

3.2 Vulnerability Assessment

201.6(c)(2)(ii) *A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*

The vulnerability assessment analyzes the population, property, and other assets at risk to natural hazards by using the best available data.

Assets at Risk

This section lists the jurisdiction's assets at risk, including critical facilities and infrastructure; historic, cultural, and natural resources; and economic assets. It discusses the impacts that occurred in past events and vulnerability to specific hazards.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are the third category; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
▪ Hospitals and other medical facilities ▪ Police stations ▪ Fire station ▪ Emergency Operations Centers	▪ Power plants ▪ Dams/levees ▪ Military installations ▪ Hazardous material sites ▪ Schools ▪ Shelters ▪ Day care centers ▪ Nursing homes ▪ Main government buildings	▪ Highways, bridges, and tunnels ▪ Railroads and facilities ▪ Bus facilities ▪ Airports ▪ Water treatment facilities ▪ Natural gas facilities and pipelines ▪ Oil facilities and pipelines ▪ Communications facilities

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Use the table below to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets. These may include hospitals, fire stations, or historic buildings. Add additional rows as necessary. If the asset is located in a hazard area or susceptible to a specific hazards, describe this vulnerability.

Table x: Critical Facilities and other Community Assets

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info

Estimating Potential Losses

201.6(c)(2)(ii) *(B) The plans should describe vulnerability in terms of…An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;*

Estimations of potential losses should be developed using best available data. This may include GIS data and/or tax assessor's data to estimate property values at risk. The table below shows the jurisdiction's total exposure to hazards in terms of population and the number and values of structures. It also shows the number and value of parcels in the 100-year (Zone A) and 500-year (X-500) flood hazard areas as mapped by FEMA. Make sure to describe how your estimates were calculated.

Table x: City of XX—Exposure to Hazards

City of XX	Population	Buildings	Value
Total Exposure (Earthquake)			
Flood: Zone A			
Flood: X-500			
Wildfire: Very High Threat ranking			

If possible, provide information on the following:

Number of flood insurance policies - total number of buildings in community that are insured against floods through the National Flood Insurance Program (NFIP)

Number of repetitive loss properties - number of repetitive losses properties (usually on a parcel basis), for which NFIP/FEMA has paid more than $1,000 twice in the past 10 years

Number of unreinforced masonry buildings

Hospitals built before 1973

Any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

Growth and Development Trends

201.6(c)(2)(ii) (C) *The plans should describe vulnerability in terms of…Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Describe the types and location of new development in your jurisdiction. How much is manufactured housing? Do you have plans for new critical facilities and/or infrastructure? Are there any hazard-related concerns, such as new growth near flood or wildfire hazard areas, problems with soil hazards, etc.?

3.3 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into four sections: regulatory, administrative and technical, fiscal, and outreach and partnerships.

Regulatory

Table x lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Indicate which are in place in your jurisdiction.

Table x: City of XX—Regulatory and Planning Capabilities

Regulatory Tool	Yes/No	Comments
General plan		(date adopted, etc)
Zoning ordinance		
Subdivision ordinance		
Site plan review requirements		
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, water conservation, wildfire)		
Building code		
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program		
Capital improvements plan		
Economic development plan		
Local emergency operations plan		

List the name and date of the ordinances and plans from the table above and any others that the city has adopted and briefly summarize their purpose and relationship to mitigation.

Examples:
Conservation and Open Space Zoning District – This zoning district applies to pathways, storm drainage basins, and water recharge areas throughout the city and is intended to provide for permanent open spaces in areas of the city that exhibit significant vegetation, scenic qualities, wildlife or recreation potential, and that are designated as open space sites by the General Plan.
Urban Water Management Plan, 2005 – This plan describes the vulnerability of the city's water supply to seasonal or climatic shortage. It compares the projected normal, single-dry, and multiple-dry year water supply to the projected water demand for each of these scenarios over the next 25 years, in 5-year increments. The plan designates water shortage stages of action, including up to a 50 percent reduction, and outlines specific water supply conditions at each stage.

Administrative/Technical

The table below identifies the personnel resources responsible for activities related to mitigation and loss prevention in the jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Table x: City of XX—Personnel/Technical Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices			
Engineer/Professional trained in construction practices related to buildings and/or infrastructure			
Planner/Engineer/Scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain Manager			
Emergency Manager			
Grant writer			
Other personnel			
Warning Systems/Services (Reverse 9-11, outdoor warning signals)			
Other			

Briefly describe the community's administrative and/or technical challenges or obstacles to improving mitigation capabilities. What are existing strengths or areas of opportunities?

Fiscal

The following table identifies financial tools or resources that the jurisdiction could potentially use to help fund mitigation activities. Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Table x: City of XX—Fiscal Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants		
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		
Incur debt through general obligation bonds		
Incur debt through special tax bonds		

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Incur debt through private activities		
Withhold spending in hazard prone areas		
Other		

Outreach and Partnerships

Does your jurisdiction have any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education? Are there any partnerships or committees, such as an emergency management planning committee, in which your jurisdiction participates?

Example:
Outreach and Partnerships
Corcoran participates in the "Are You Okay?" program administered by the Kings County Sheriff's Office. The program is a free computerized telephone system used to check on senior citizens or disabled/homebound individuals. The Amigos de la Communidad was a successful outreach program of the Corcoran Police Department intended to form a partnership with the Spanish speaking community. The program is still in existence but not very active; it could potentially be used to communicate to the Latino community about hazards and emergencies.

Other Mitigation Efforts

Describe other ongoing and completed mitigation projects and programs. Include information such as:

- Any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?
- Past or ongoing projects or programs designed to reduce disaster losses, these may include projects to protect critical facilities.
- Improvements to stormwater system to minimize local street flooding.

Section 4: Mitigation Strategy

201.6 (c)(3) *The plan shall include…A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

Once the Risk Assessment is complete, the Mitigation Strategy must be developed. This involves 1) indicating support for the goals and objectives of the countywide plan or adding your own and 2) identifying mitigation actions for your community or district. An implementation worksheet must be completed for each identified mitigation action. The mitigation strategy should be developed through a collaborative group process and consists of goals, objectives, and mitigation actions. The following definitions are based upon those found in FEMA publication 386-3, *Developing a Mitigation Plan* (2002):

- Goals are general guidelines that explain what you want to achieve. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. They are usually long-term, broad, policy-type statements.
- Objectives define strategies or implementation steps to attain the identified goals and are specific and measurable.
- Mitigation actions are specific actions that help achieve goals and objectives.

4.1 Goals and Objectives

201.6 (c)(3)(i) *The mitigation strategy section shall include…A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

The HMPC for the countywide plan will develop goals and objectives to provide direction for reducing hazard-related losses in Fresno County. Review these goals and identify any new unique goals and objectives for your jurisdiction.

4.2 Mitigation Actions

201.6 (c)(3)(ii) *The mitigation strategy section shall include…A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

201.6 (c)(3)(iv) *For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Through a collaborative group process, the HMPC for the countywide plan will also identify specific mitigation actions to achieve goals and objectives for reducing vulnerability to natural hazards. The HMPC will prioritize these mitigation actions using the STAPLEE criteria recommended by FEMA. STAPLEE stands for: social, technical, administrative, political, legal, economic, and environmental, which are the factors that should be considered when assessing mitigation measures. A description of the STAPLEE criteria, as well as examples of mitigation actions, can be found in your packet of jurisdictional annex information. Your jurisdiction should identify the countywide actions that it would like to specifically implement and also identify unique mitigation actions to the jurisdiction. The table on the following page can be used to summarize actions.

Table x: Summary of Mitigation Actions

Mitigation Action	Priority	Links to Goals	Hazards Addressed	Schedule
Example 1. Replace redwood water storage tanks with steel tanks to prevent losses from wildfire.	High	1,2,3	Wildfire	7 years

4.3 Action Implementation Worksheets

201.6 (c)(3)(iii) *The mitigation strategy section shall include…An action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

The jurisdiction should complete an implementation worksheet for each mitigation action identified in the previous section. The worksheet provides the details for how the jurisdiction will complete the action, such as identifying the responsible office, timeline, and funding, as well as the background information and costs/benefits of the project. An example of a completed worksheet is provided below. A blank worksheet is included on the following page.

Example Mitigation Action #1: Replace redwood water storage tanks with steel tanks

Priority (H, M, L): High

Issue/Background: The CCWD owns 11 redwood water storage tanks that are approaching 40 years of age. These tanks are made of wood and are vulnerable to fire—the 602 tank in the Jenny Lind service area was destroyed by wildfire in 2004 and had to be replaced with a steel tank. Many of these tanks are also in high wildfire risk areas. There is a strong likelihood one or more redwood tanks will be destroyed by fire in the next few years, depriving a large group of customers their drinking water and depleting water storage available for fire protection. These tanks also release small amounts of organics into the drinking water, leaving behind a taste and odor, as well as creating substrate materials for carcinogen creation. The CCWD plans to replace all redwood tanks due to the vulnerability to fire and to the problems with water quality.

Responsible Office: CCWD Engineering

Partners: California Department of Forestry and Fire Protection

Potential Funding:
District revenue from rates, fees, property taxes, interest on investments
FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
U.S. EPA
State revolving fund grants and/or loans

Cost Estimate: The replacement cost for a typically-sized redwood tank is $600,000. Total capital cost for replacing all redwood tanks is $6.6 million.

Benefits (Losses Avoided):
Reliable water delivery for domestic consumption and fire flow
Reduce risk of property damage
Protect public health and safety

Timeline: Replace all 11 tanks within next seven years

Mitigation Action #xx:

Action Title:
Jurisdiction:
Priority:
Issue/Background:
Ideas for Implementation:
Responsible Office:
Partners:
Potential Funding:
Cost Estimate:
Benefits: **(Losses Avoided)**
Timeline:
Completed by:

EXAMPLES OF MITIGATION ACTIONS

- Prevention
  - Planning and Zoning
  - Open Space Preservation
  - Land Development Regulations
  - Storm Water Management
  - Fuels Management

- Property Protection
  - Firewise Construction
  - Defensible Space/Fuels Modification
  - Water Supply
  - Flood Protection

- Natural Resource Protection
  - Erosion and Sediment Control
  - Wetlands Protection
  - Threatened and Endangered Species Protection
  - Fuels Management

- Emergency Services
  - Warning an Evacuation
  - Communications
  - Critical Facilities Protection
  - Lifeline Utilities Protection
  - Health and Safety Maintenance

- Structural Projects
  - Detention/Retention structures
  - Sediment Basins/Low-head Weirs
  - Channel Modifications
  - Culvert resizing/replacement/Maintenance
  - Floodwalls

- Public Information
  - Hazard Maps
  - Outreach Programs (mailings, media, web, speakers bureau)
  - Education Program (Children/Adults)

MITIGATION ACTION SELECTION AND PRIORITIZATION CRITERIA

Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systemic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HPMC should ask, and consider the answers to, the following questions:

Social

Does the measure treat people fairly (different groups, different generations)?

Technical

Is there capacity to implement and manage project?

Political

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal

Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental

Does it comply with environmental regulations or have adverse environmental impacts?

SUPPLEMENTAL CROSSWALK - FOR CA LOCAL GOVERNMENTS PARTICIPATING IN MULTI-JURISDICTIONAL PLANS

The following Supplemental Plan Review Crosswalk should be completed by each jurisdiction participating in a Multi-Jurisdictional, LHMP, including the Lead Jurisdiction of the Multi-Jurisdictional Plan (MJP). This information **will most likely be found in each jurisdiction's annex or supplement** to the MJP, and not in the main body of the MJP. This supplement is designed to locate information, needed by the multi-jurisdictional planning effort, but specific to each participating jurisdiction. Each requirement and element of this supplemental crosswalk should be **completed from the perspective** of the MJP participating jurisdiction.

Participating Jurisdiction:	Title/Lead Jurisdiction of Multi-Jurisdictional Plan:	Date of Completion:

Local Point of Contact:	Address:
Title:	
Agency:	
Phone Number:	E-Mail:

State Reviewer:	Title:	Date:

FEMA Reviewer:	Title:	Date:

Jurisdiction's NFIP Status*			
Y	N	N/A	CRS Class

* Notes: [Y] – Participating [N] - Not Participating [N/A] - Not Mapped

COLOR CODE: Submitting Jurisdiction input in Green. State requested information & OES comments in Blue. FEMA requirements in Black:

SCORING SYSTEM: All Requirements & Elements of the requirements must be rated "Satisfactory," unless otherwise indicated, in order for the requirement to be fulfilled and receive an overall score of "Satisfactory." All requirements must be satisfactory in order for the plan to receive final approval.

Elements displayed in shaded boxes, must be completed in order to meet FEMA's requirements or to support the State's Hazard Mitigation Plan, however, a "Needs Improvement" score on these requirements or elements will not preclude the plan from being recommended by OES or approved by FEMA.

N – Needs Improvement: The jurisdiction's portion of the multi-jurisdiction's plan does not meet the minimum for a plan requirement. Reviewer's comments must be provided.

S – Satisfactory: The jurisdiction's portion of the multi-jurisdiction's plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

SUPPLEMENTAL CROSSWALK - FOR CA LOCAL GOVERNMENTS PARTICIPATING IN MULTI-JURISDICTIONAL PLANS

LOCAL MITIGATION PLAN REVIEW SUMMARY

A jurisdiction participating in a MJP must adopt the MJP and their own Supplement or Annex to the MJP, in order receive final approval from FEMA for their own LHMP.

SCORING SYSTEM - Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	N *	S
Local Capabilities Assessment §201.4(c)(ii) and §201.6(c)(1)**		

Risk Assessment: Jurisdictional Hazards	N *	S
Hazard Identification & Profiling:		

Risk Assessment: Jurisdictional Vulnerability	N *	S
Vulnerability: Overview & Impact:		
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)		
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		
§201.6(c)(2)(i) & Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii) Unique Hazards		

Mitigation Strategy	N *	S
UNIQUE Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii) (At least 1 Action per jurisdiction)		

Additional State Requirements**	N *	S
See **Planning Process**, Local Capabilities Assessment	___	___

STATE OES REVIEW STATUS OF THE SUPPLEMENT TO THE MJP:	
STATE OES REVIEW COMPLETED on DATE: _____	
FORWARDED TO FEMA FOR REVIEW / APPROVAL DATE: _____	

*** See Reviewer's Comments**

** States that have additional requirements may add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SUPPLEMENTAL CROSSWALK - FOR CA LOCAL GOVERNMENTS PARTICIPATING IN MULTI-JURISDICTIONAL PLANS

PLAN REVIEW CRITERIA	REQUIREMENT AS TAKEN FROM THE INTERIM FINAL RULE PART 201	LOCATION IN THE (MJP) MULTI JURISDICTIONAL PLAN (INDICATE SECTION OR ANNEX AND PAGE #)	SCORE / STATE / FEMA REVIEWER COMMENTS SCORING SYSTEM [M] MET [NM] NOT MET (FOR PREREQUISITE (S) ONLY) [N]--NEEDS IMPROVEMENT OR [S]--SATISFACTORY	
PREREQUISITE (S) - NOTE: The prerequisite, or prerequisites in the case of multi-jurisdictional plans, may be reviewed before, but must be met before the plan can receive final FEMA approved.		**LOCATION**	**SCORE**	**COMMENTS**
Multi-Jurisdictional Plan Adoption **Requirement §201.6(c)(5):** For multi-jurisdictional plans, each participating jurisdiction must provide supporting documentation, such as a letter of adoption, that the MJP, and the jurisdiction's "annex" has been formally adopted as their own LHMP.			**[M] [NM]**	
		SUMMARY SCORE:	**[M] [NM]**	
Multi-Jurisdictional Planning Participation: Requirement §201.6(a)(3): **Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process.** The MJP must document EACH jurisdiction's participation OR the participating jurisdiction must include this information in EACH jurisdiction's annex to the MJP.			**[M] [NM]**	
		SUMMARY SCORE:	**[N] [S]**	

PLANNING PROCESS: Local Capabilities Assessment ***Requirement*** – Section §201.4(c)(3) (ii) of the Federal Register Interim Final Rule 44 CFR Parts 201 and 206 states, "[The State mitigation strategy shall include] a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.	**LOCATION**	**SCORE**	**COMMENTS**
Local Capabilities Assessment *Element* A: Does the plan provide a description of the human, technical and financial resources available within this jurisdiction to engage in a mitigation planning process and to develop a local hazard mitigation plan? (These resources are described in Section 2.2 of the OES LHMP Development Guide).		[N] [S]	***Note: This information is required to complete the State Hazard Mitigation Plan and must be covered. However, a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.***
Element B: Does the plan list local mitigation funding sources (taxes, fees, assessments or fines) which affect or promote mitigation within the reporting jurisdiction?		[N] [S]	***Note: This information is required to complete the State Hazard Mitigation Plan and must be covered. However, a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.***
Element C: Does the plan list local ordinances which promote disaster mitigation or emergency management within the reporting jurisdiction?		[N] [S]	***Note: This information is required to complete the State Hazard Mitigation Plan and must be covered. However, a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.***
Element D: Does the plan describe the details of ongoing and completed mitigation projects and programs within the reporting jurisdiction? For completed actions, measures and projects, have the post disaster results been tabulated or documented?		[N] [S]	***Note: This information is required to complete the State Hazard Mitigation Plan and must be covered. However, a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.***
	SUMMARY SCORE:	[N] [S]	

SUPPLEMENTAL CROSSWALK - FOR CA LOCAL GOVERNMENTS PARTICIPATING IN MULTI-JURISDICTIONAL PLANS

RISK ASSESSMENT: HAZARDS: §201.6(c)(2)(i) & (ii): Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. **Identifying Hazards - §201.6(c)(2)(i):** [The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction	**LOCATION**	**SCORE**	**COMMENTS**
For EACH Hazard identified by THIS Jurisdiction a Narrative Summary of the Overview of the Hazard (from the jurisdiction's perspective) and the Impact (to people, buildings, the environment etc.) if the Hazard occurred, shall be part of each jurisdiction's annex or supplement to the MJP.		[N] [S]	
	SUMMARY SCORE:	[N] [S]	

RISK ASSESSMENT: Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	**LOCATION**	**SCORE**	**COMMENTS**
Does the annex or supplement describe vulnerability in terms of the types and numbers of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
Does the annex or supplement describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
	SUMMARY SCORE:	[N] [S]	

RISK ASSESSMENT: Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	**LOCATION**	**SCORE**	**COMMENTS**
Does the annex or supplement estimate **potential dollar losses** to vulnerable structures?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
Does the annex or supplement describe the methodology **used to prepare the estimate?**		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
	SUMMARY SCORE:	[N] [S]	

SUPPLEMENTAL CROSSWALK - FOR CA LOCAL GOVERNMENTS PARTICIPATING IN MULTI-JURISDICTIONAL PLANS

RISK ASSESSMENT: HAZARDS: §201.6(c)(2)(i) & (ii): Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. **Identifying Hazards - §201.6(c)(2)(i):** [The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction	LOCATION	SCORE	COMMENTS
For EACH Hazard identified by THIS Jurisdiction a Narrative Summary of the Overview of the Hazard (from the jurisdiction's perspective) and the Impact (to people, buildings, the environment etc.) if the Hazard occurred, shall be part of each jurisdiction's annex or supplement to the MJP.		[N] [S]	
	SUMMARY SCORE:	[N] [S]	

RISK ASSESSMENT: Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	LOCATION	SCORE	COMMENTS
Does the annex or supplement describe vulnerability in terms of the types and numbers of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
Does the annex or supplement describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
	SUMMARY SCORE:	[N] [S]	

RISK ASSESSMENT: Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	LOCATION	SCORE	COMMENTS
Does the annex or supplement estimate **potential dollar losses** to vulnerable structures?		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
Does the annex or supplement describe the methodology **used to prepare the estimate?**		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
	SUMMARY SCORE:	[N] [S]	

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RISK ASSESSMENT: Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	LOCATION	SCORE	COMMENTS
For EACH Hazard identified by THIS Jurisdiction, does the annex or supplement describe the impact of land use and development trends within the participating jurisdiction? (W*ith particular emphasis on future buildings and infrastructure). EXAMPLE: The annex or supplement should describe how a jurisdiction's land use and development trends would affect the flood hazard areas, the fire hazard areas, etc.*		[N] [S]	*Note: This information must be included, however a "Needs Improvement" score on this requirement will not preclude the plan from being recommended by OES or approved by FEMA.*
	SUMMARY SCORE:	[N] [S]	

Multi-Jurisdictional Risk Assessment: Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.	LOCATION	SCORE	COMMENTS
Identifying Unique Jurisdictional Hazards & Risks: **Was a** risk assessment (all sections) completed, by this participating jurisdiction, for each unique hazard or risk that was not covered in the main section of the MJP? [Only unique or additional hazards and risks, within a participating jurisdiction, should be included. These would be hazards and risks that are **not already included** as part of the MJP. For each unique hazard, a profile of the hazard along with vulnerabilities should be included in the jurisdiction's annex or supplement to the MJP. Example: A jurisdiction with a volcano, not covered in the MJP, would complete all Risk Assessment section for their volcano.]	[N/A] / [Yes]	[N] [S] [N/A]	
	SUMMARY SCORE:	[N] [S]	

MITIGATION STRATEGY: §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses *identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*	**LOCATION**	**SCORE**	**COMMENTS**
Does the Annex or Supplement include a description of mitigation goals **to reduce or avoid long-term vulnerabilities to each of this jurisdiction's identified hazards?**		**[N] [S]**	NOTE: Do not repeat goals listed for the overall planning area in the MJP. List only goals that are **different or unique**, or have a different priority, for your participating jurisdiction.
	SUMMARY SCORE:	**[N] [S]**	

MITIGATION STRATEGY: Multi-Jurisdictional Mitigation Actions: Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.	**LOCATION**	**SCORE**	**COMMENTS**
Does the plan include **at least one** identifiable action item for each jurisdiction requesting FEMA approval of the plan? AND Does the Annex or Supplement for this jurisdiction identify and analyze, for at least one action item; **1.** How this action is prioritized in comparison to other proposed actions. (For example, is there a discussion of the process and criteria used to determine its priority). **2.** How was (or will) cost-benefit criteria be considered for this action, and will cost-benefit be used in the prioritization of this action (as compared to other proposed jurisdiction actions). **3.** How will this mitigation strategy / action be implemented and administered? (For example, does it identify the responsible department, existing and potential resources, and timeframe?)		**[N] [S]**	
	SUMMARY SCORE:	**[N] [S]**	

ADDITIONAL STATE REQUIREMENTS	FEMA has included a provision for States that have additional requirements to add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. See Local Capabilities Assessment under the Documentation of the Planning Process Section.

List of Invitees to Participate in the Fresno County Multi-Jurisdictional Local Hazard Mitigation Plan

A letter requesting jurisdictions to participate in the Fresno County Multi-Jurisdictional LHMP was sent in May 2007 to City Managers for the incorporated cities within the County, the OES Coordinators for those cities, School Districts, Special Districts and appropriate State and Federal Agencies. This is a total of 100 jurisdictions or agencies that had an opportunity participate as an annex or contributor to the plan.

List of City Managers that were invited to participate:

City of Fresno
City of Clovis
City of Coalinga
City of Firebaugh
City of Fowler
City of Huron
City of Kerman
City of Kingsburg
City of Mendota
City of Orange Cove
City of Parlier
City of Reedley
City of San Joaquin
City of Sanger
City of Selma

List of OES Coordinators that were invited to participate:

City of Fresno
City of Clovis
City of Coalinga
City of Firebaugh
City of Fowler
City of Huron
City of Kerman
City of Kingsburg
City of Mendota
City of Orange Cove
City of Parlier
City of Reedley
City of San Joaquin
City of Sanger
City of Selma

School Districts that were invited to participate:

Clovis Unified School District
Selma Unified School District
Reedley College-State Center Community College District
California State University Fresno
Dos Palos-Oro Loma Elementary
Washington Colony Elementary School District
West Hills Community College
Riverdale Unified School District
Sierra Unified School District
Caruthers Unified School District
Central Unified School District
Fresno County Office of Education
Kerman Unified School District
Golden Plains Unified School District
Fowler Unified School District
Washington Union High School District
Kings Canyon Unified School District
Sanger Unified School District
Fresno Unified School District
Parlier Unified School District
Kingsburg Joint Union Elementary School District
Kingsburg Joint Union High School District
Fresno Community College-State Center Community College District
Chawanakee Unified School District
Alvina Elementary School District
West Park Elementary School District
West Fresno Elementary School District

Special Districts that were invited to participate:

Clovis Cemetery District
Clovis Memorial District
Selma Cemetery District
Firebaugh Canal Water District
Fresno Metro Flood Control District
Westlands Water District
Oak Grove Cemetery District
Tranquility Irrigation District
Lower San Joaquin Irrigation District
Oak Grove Cemetery District
Henry Miller Reclamation District
Riverdale Public Utility District
San Luis Conservation District
Alta Irrigation District
Selma-Kingsburg-Fowler County Sanitation District

International Water District
Liberty Water District
Mercy Springs Water District
Pacheco Water District
Pinedale County Water District
Penoche Water District
Pleasant Valley Water District
Stinson Water District
San Luis Water District
San Luis Canal District
Waterworks District #18
Biola Community Services District
Del Rey Community Services District
Bald Mountain Fire Protection District
Fresno County Fire Protection District
Central California Irrigation District
Orange Cove Fire Protection District
Coalinga-Huron Unified School Library District
Consolidated Mosquito Abatement District
Fresno Mosquito and Vector Control District
Fresno-Westside Mosquito Abatement District
Fresno Slough Water District
Mid Valley Water District
Sierra RCD/Hwy 168 Fire Safe Council
Oaks to Timberline Fire Safe Council

List of State, Federal and Tribal Agencies that were invited to participate:

California Office of Emergency Services
California Department of Water Resources
Army Corp of Engineers
California Bureau of Reclamation
CAL Fire
Table Mountain Rancheria

Fresno County Multi-Jurisdictional Local Hazard Mitigation Plan

HMPC Representatives with Job Titles and Department Names

1. City of Clovis
   Chad Fitzgerald
   Disaster Services Supervisor
   Clovis Fire Department

2. City of Coalinga
   Chief Dan Hernandez
   OES Coordinator/Fire Chief
   Coalinga Fire Department

3. Fresno Metropolitan Flood Control District
   Peter Sanchez
   Operations Engineer

4. City of Fresno
   Rainer Streib
   OES Coordinator
   Fresno Fire Department

5. City of Huron
   Chief Frank Steenport
   Police Chief/OES Coordinator
   Huron Police Department

6. City of Kerman
   Mary Rodriques
   Administrative Assistant to OES Coordinator/Police Chief
   Kerman Police Department

7. City of Kingsburg
   Chief Gary Rocha
   OES Coordinator/Fire Chief
   Kingsburg Fire Department

8. Lower San Joaquin Levee District
   Reggie Hill
   Secretary/Manager

9. City of Mendota
   Bryce Atkins
   Management-Intern
   City of Mendota

10. City of Sanger
    Les Ramsey
    Deputy Chief
    Sanger Fire Department

11. City of Selma
    Dawn Essenmacher
    Disaster Management Coordinator
    Selma Fire Department

12. Sierra RCD/Hwy 168 Fire Safe Council
    Rich Bagley/Terry Sandridge
    Presidents

13. County of Fresno
    Wayne Fox
    Assistant Emergency Services Coordinator
    Public Health Department

Fresno County LHMP
Hazard Mitigation Planning Committee (HMPC)
List of Meeting Attendees

The following HMPC members attended one or more meetings for the LHMP:

Fresno County	
Sgt. Greg Andreotti Fresno County Sheriff's Office Emergency Services	Lynn Gorman Deputy Director of Planning Planning and Public Works Department
Cesar Aranda Fresno County, FW&P	John Hays Fresno County GSA
Ken Austin Fresno County Office of Emergency Services	Jeff Heller Fresno County GSA
Joseph Blohm Fresno County Sheriff's Office	Will Kettler Principle Staff Analyst Planning and Public Works Department
Lt Phil Caporale Fresno County Sheriff's Office	Steve Lawshe Battalion Chief Fresno County Fire Department
Tim Casagrande Fresno County Environmental Health & Safety Office of Emergency Services	Ed Moreno Fresno County Department of Community Health
Juan Diaz Chief Building Inspector Planning and Public Works Department	Robert Palacios Maintenance Engineer/Road Division Planning and Public Works Department
Andrew Escamille Accountant II Fresno County Auditor-Controller/Treasurer-Tax Collector	Fred Rinder Fresno County Department of Agriculture Supervisor-Wildlife Damage & Vegetation Management
Matt Feryan Office of Emergency Services	Michael Schroeder Sr. Information Technology Analyst Information Technology Services Department
Louie Guerra Fresno County Department of Agriculture Pesticides Supervisor	Bill Secrest, Jr. Fresno County Library
Wayne Fox Assistant Emergency Services Coordinator Public Health Department	Billy See Fresno County/Cal Fire
Karen Francone Fresno County Department of Agriculture Deputy Agricultural Commissioner	Steve Stinger Development Services
Daniel Gibbs Senior Engineer Planning and Public Works Department	John Thomas Fresno County OES
George Gomez Fresno County Auditor-Controller/Treasurer-Tax Collector	

City of Clovis	
Hal Eidal PPS/IS	John Holt Administrative
Chad Fitzgerald Disaster Services Supervisor Clovis Fire Department	Lisa Koehn Public Utilities
Bill Fox Administrative	Sam Mann Personnel/Risk Management
Dan Guile Clovis Fire Department	Luke Serpa Clovis Public Utilities

City of Coalinga	
Chief Dan Hernandez OES Coordinator/Fire Chief Coalinga Fire Department	

City of Fresno	
Sandra Brock Planning	Bob Werner Assessor
Jeff Jones Fresno/Madera Red Cross	Jen Williams Fresno Irrigation Department
Rainer Streib OES Coordinator Fresno Fire Department	

City of Huron	
Michael Lyon	Chief Frank Steenport Police Chief/OES Coordinator Huron Police Department

City of Kerman	
Kirk Collins Kerman Police Department	Tim Przybyla
Jay Gumez	Don Ramirec Kerman Police Department
Robert Gruce Kerman Pubic Water	Mary Rodriques Administrative Assistant to OES Coordinator/Police Chief Kerman Police Department
Lydia Madruga	Phil Suson Kerman Police Department
Bill Newton Kerman Police Department	

City of Kingsburg	
Sue Baud City Clerk	Kathy Pickrell Human Resources
Jeff Dunn Kingsburg Police Department	Chief Gary Rocha OES Coordinator/Fire Chief Kingsburg Fire Department
Darren Hayes Kingsburg Public Works	Daryl Sonksen Building Department
Don Jensen Finance	Ashlee Winslow Community Services
Don Pauley City Manager	

City of Mendota	
Bryce Atkins Senior Management Analyst	John Self Building Inspection
Domingo Morales	

City of Sanger	
Les Ramsey Deputy Chief Sanger Fire Department	Jim Deaver Sanger Fire Department

City of Selma	
Christie Ediger Selma Police Department	Mike Gaston
Dawn Essenmacher Disaster Management Coordinator Selma Fire Department	Jerry Howeh City of Selma, GIS
Roseann Glavan	Tom Whiteside Selma Police Department

City of San Joaquin	
Cruz Ramos	

DISTRICTS

Fresno Metropolitan Flood Control District
Kristine Johnson

Peter Sanchez
Operations Engineer

Brent Sunamoto

Fresno Mosquito District
Dave Farley

Lower San Joaquin Levee District
Reggie Hill
Secretary/Manager

San Joaquin Valley Resource Conservation and Development
Sandy Wright

Sierra RCD/Hwy 168 Fire Safety Council
Terry Sandridge
President

Richard Bagley

Pat Gallegos

State Center Community College District
Marc Boswell
Director, Environmental Health and Safety

Darren Cousineau

Upper San Joaquin River Watershed Program
Steve Haze

Westlands Water District
Robert T. Burns
Representative

OTHER PARTICIPATING AGENCIES

Bureau of Reclamation
Edward Salazar
Civil Engineer
South Central California Area Office

County of Madera
Janet Stanovich
OES

Department of Water Resources
Brian Smith
Chief, Resources Assessment Branch
San Joaquin District

Oak to Timberline Fire Safe Council
Mike Ellis
President

Red Cross
Jeff Jones
Fresno/Madera Red Cross

State Office of Emergency Services
Paul Calkins
Emergency Services Coordinator

Kevin Nagata

Table Mountain Rancheria
Frank Marquez Jr
Tribal Chief

U.S. Army Corp of Engineers
Tom Ehrke
Pine Flat Lake and Dam

Mike LaFrentz
Park Manager
Pine Flat Lake and Dam
Sacramento District

MULTI-HAZARD MITIGATION PLAN
DATA COLLECTION GUIDE

For

FRESNO COUNTY
HAZARD MITIGATION PLANNING COMMITTEE (HMPC)

Prepared by

AMEC Earth and Environmental, Inc.

June 2007

OVERVIEW

The contents of this workbook have been designed to assist Fresno County in collecting necessary background information to support the hazard mitigation planning process pursuant to the Federal Disaster Mitigation Act (DMA) of 2000. This includes a hazard identification and vulnerability assessment, an assessment of Fresno County's current hazard mitigation capabilities, and an identification of potential mitigation projects that, if undertaken, could prevent or reduce future losses.

The essential information needed to support the planning process includes background information about Fresno County; plans, technical studies, and data related to hazards and risks; current governing codes, ordinances, regulations, and procedures whose intent is to minimize future losses; and an assessment of Fresno County' technical and organizational capabilities to perform hazard mitigation/loss prevention functions. It is important that the plan shows what Fresno County is doing now to limit future disaster losses.

The planning process is heavily dependent on existing data to be supplied by each of the participants represented on the Hazard Mitigation Planning Committee (HMPC). The DMA plan development process does not require the development of new data, but requires *existing data only*.

The goal of this process is to produce a hazard mitigation plan that meets Fresno County's needs, as well as the requirements of DMA 2000 and that contains a list of projects that may be eligible for streamlined federal mitigation funding pre or post disaster.

PARTICIPATION

The DMA planning regulations and guidance stress that each entity seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the planning area where the risk differs from that facing the entire area;
- Identify specific projects to be eligible for funding; and
- Have the governing board formally adopt the plan.

For HMPC members, 'participation' means the planning committee representatives will:

- Attend and participate in HMPC meetings;
- Provide available data that is requested of the HMPC coordinator;
- Review and provide/coordinate comments on the draft plans;
- Advertise, coordinate and participate in the public input process; and
- Coordinate the formal adoption of the plan by the governing board.

DATA COLLECTION GUIDE

This guide contains an explanation of the types of hazard mitigation/loss prevention data that is needed for the hazard mitigation planning process. This guide identifies specific requirements for the Risk Assessment Process, which includes the Hazard Identification, Vulnerability, and Capability Assessments as well as defines requirements for development of the Mitigation Strategy.

The worksheets have been developed to assist with the data collection. These need to be completed by each person participating on the HMPC and will serve two purposes:

1) They will help facilitate the collection of the necessary information, and
2) They will function as evidence of "participation" in the planning process.

THE RISK ASSESSMENT PROCESS

The risk assessment process includes three components: 1) Hazard Identification, 2) Vulnerability Assessment, and 3) Capability Assessment. Data needs and worksheets for each of the risk assessment components are included in the following pages.

FRESNO COUNTY MULTI-HAZARD MITIGATION PLAN
WORKSHEET #1: HAZARD IDENTIFICATION

Name of Department/Jurisdiction:_____

Use this worksheet to identify possible hazards that may impact your jurisdiction. Please rank according to the guidelines that follow the table. Use the Hazard Event Worksheet #2 to provide evidence to justify your conclusions.

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance	Hazard Map? (paper/GIS/ source)
Agricultural					
Avalanche					
Dam Failure					
Drought					
Earthquake					
Extreme Heat					
Flood					
Freeze					
Fog					
Hailstorms					
Heavy Rains/Storms					
High Wind					
Landslide					
Man-made Hazards					
Soil Hazards: Expansive Liquefaction Erosion					
Tornado					
Winter Storms					
Wildfire					

Guidelines

Frequency of Occurrence:
Highly Likely: Near 100% probability in next year.
***Likely*:** Between 10 and 100% probability in next year or at least one chance in ten years.
***Occasional*:** Between 1 and 10% probability in next year or at least one chance in next 100 years.
***Unlikely*:** Less than 1% probability in next 100 years.

Potential Magnitude
***Catastrophic*:** More than 50% of area affected
***Critical*:** 25 to 50%
Limited: 10 to 25%
***Negligible*:** Less than 10%

Spatial Extent
***Limited*:** Less than 10% of planning area
***Significant*:** 10-50% of planning area
***Extensive*:** 50-100% of planning area

Significance (your subjective opinion)
Low, Medium, High

Prepared by:
Phone:
Email:

FRESNO COUNTY MULTI-HAZARD MITIGATION PLAN
WORKSHEET #2: HISTORIC HAZARD EVENT

Name of Department/Jurisdiction:_____

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

Prepared by: _____
Phone: _____
Email: _____
Date:_____

Please return worksheets by mail, email, or fax to:
Jeanine Foster, AMEC Earth & Environmental
355 S. Teller St, Suite 300
Lakewood, CO 80226
fax: (303) 935-6575
email: jeanine.foster@amec.com

FRESNO COUNTY MULTI-HAZARD MITIGATION PLAN
WORKSHEET #3: VULNERABILITY ASSESSMENT

Name of Department/Jurisdiction: _____

The purpose of this worksheet is to assess the vulnerable buildings, populations, critical facilities, infrastructure, and other important assets in your community by using the best available data to complete the table and questions that follow. Use the table on the next page to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets as defined below. These may include hospitals, fire stations, or historic buildings. Attach supporting documentation, such as photographs, reports, or plans if possible. In the hazard specific column of the asset inventory table, indicate if there is a specific hazard to which the asset is at risk.

Critical Facilities

FEMA generally defines four kinds of critical facilities:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials
- Hospitals, nursing homes, and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a hazard event
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for emergency response activities before, during, and after a hazard event
- Public and private utility facilities that are vital to maintaining or restoring normal services to hazard areas before, during, and after a hazard event

FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. 'Essential facilities' are those that if damaged would have devastating impacts on disaster response and/or recovery. 'High potential loss facilities' are those that would have a high loss or impact on the community. Transportation and lifeline facilities are third category of critical assets; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
▪ Hospitals and other medical facilities ▪ Police stations ▪ Fire station ▪ Emergency Operations Centers	▪ Power plants ▪ Dams/levees ▪ Military installations ▪ Hazardous material sites ▪ Schools ▪ Shelters ▪ Day care centers ▪ Nursing homes ▪ Main government buildings	▪ Highways, bridges, and tunnels ▪ Railroads and facilities ▪ Bus facilities ▪ Airports ▪ Water treatment facilities ▪ Natural gas facilities and pipelines ▪ Oil facilities and pipelines ▪ Communications

facilities

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Asset Inventory

Name of Asset	Type	Replacement Value	Displacement Cost	Occupancy/ Capacity #	Hazard Specific Info

Additional Vulnerability Questions

1. Number of flood insurance policies

2. Number of repetitive loss properties

3. Average depth of 100-year floodplain

4. Number of unreinforced masonry buildings

5. Hospitals built before 1973

6. Describe any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

7. Describe development trends and expected growth areas and how they relate to hazard areas and vulnerability concerns/issues.

Prepared by: _____
Phone: _____
Email: _____
Date: _____

Please return worksheets by mail, email, or fax to:
Jeanine Foster, AMEC Earth & Environmental
355 S. Teller St, Suite 300
Lakewood, CO 80226
fax: (303) 935-6575
email: jeanine.foster@amec.com

FRESNO COUNTY MULTI-HAZARD MITIGATION PLAN
WORKSHEET #4: CAPABILITY ASSESSMENT

Name of Department/Jurisdiction: _____

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete this worksheet and provide supporting documentation if possible.

Regulatory

The following planning and land management tools are typically used by local jurisdictions to implement hazard mitigation activities. Please indicate which of the following your jurisdiction has in place. If your jurisdiction does not have this capability or authority, please indicate in the comments column if a higher level of government has the authority. Also use the comments column to indicate how we can obtain a copy of the plan or document (i.e. available on the web, will put on ftp, will email or mail).

Regulatory Tool (ordinances, codes, plans)	Y/N	Comments
General plan		
Zoning ordinance		
Subdivision ordinance		
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, steep slope, wildfire)		
Building code		Version:
BCEGS Rating		
Fire department ISO rating		Rating:
Erosion or sediment control program		
Stormwater management program		
Site plan review requirements		
Capital improvements plan		
Economic development plan		
Local emergency operations plan		
Other special plans		
Flood insurance study or other engineering study for streams		
Elevation certificates		
Other		

Administrative/Technical

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices			
Engineer/Professional trained in construction practices related to buildings and/or infrastructure			
Planner/Engineer/Scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain Manager			
Emergency Manager			
Grant writer			
Other personnel			
GIS Data – Hazard areas			
GIS Data - Critical facilities			
GIS Data – Building footprints			
GIS Data – Land use			
GIS Data – Links to Assessor's data			
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)			
Other			

Fiscal

Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants		
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		
Incur debt through general obligation bonds		
Incur debt through special tax bonds		
Incur debt through private activities		
Withhold spending in hazard prone areas		
Other		

Additional Capabilities Questions

1. Does your community have any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?

2. List any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education.

3. List any other past or ongoing projects or programs designed to reduce disaster losses. These may include projects to protect critical facilities.

Prepared by: _____
Phone: _____
Email: _____
Date: _____

Please return worksheets by mail, email, or fax to:
Jeanine Foster, AMEC Earth & Environmental
355 S. Teller St, Suite 300
Lakewood, CO 80226
fax: (303) 935-6575
email: ieanine.foster@amec.com

THE MITIGATION STRATEGY

One of the planning process' last activities will be for HMPC members to prepare brief descriptions of proposed mitigation projects that would effectively reduce future disaster losses. This section provides guidance on the categories of mitigation measures to be considered and a mitigation project outline with one example projects.

Categories of Mitigation Measures

PREVENTION: Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- ***Planning***
- ***Zoning***
- ***Open Space Preservation***
- ***Land Development Regulations***
  - ***Subdivision regulations***
  - ***Building Codes***
    - ***Fire-Wise Construction***
  - ***Floodplain development regulations***
  - ***Geologic Hazard Areas development regulations (for roads too!)***
- ***Storm Water Management***
- ***Fuels Management, Fire-Breaks***

EMERGENCY SERVICES measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- ***Warning*** (flooding, tornadoes, winter storms, geologic hazards, fire)
  - NOAA Weather Radio
  - Sirens
  - "Reverse 911" (Emergency Notification System)
- ***Emergency Response***
  - ***Evacuation & Sheltering***
  - ***Communications***
  - ***Emergency Planning***
    - Activating the EOC (emergency management)
    - Closing streets or bridges (police or public works)
    - Shutting off power to threatened areas (utility company)
    - Holding/releasing children at school (school district)
    - Passing out sand and sandbags (public works)
    - Ordering an evacuation (mayor)
    - Opening emergency shelters (Red Cross)
    - Monitoring water levels (engineering)
    - Security and other protection measures (police)

- ***Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)***
  - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
  - Lifeline Utilities Protection
- ***Post-Disaster Mitigation***
  - Building Inspections
  - ID mitigation opportunities & funding before reconstruction

PROPERTY PROTECTION: Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- ***Retrofitting/disaster proofing***
  - ***Floods***
    - Wet/Dry floodproofing (barriers, shields, backflow valves)
    - Relocation/Elevation
    - Acquisition
    - Retrofitting
  - ***High Winds/Tornadoes***
    - Safe Rooms
    - Securing roofs and foundations with fasteners and tie-downs
    - Strengthening garage doors and other large openings
  - ***Winter Storms***
    - Immediate snow/ice removal from roofs, tree limbs
    - "Living" snow fences
  - ***Geologic Hazards (Landslides, earthquakes, sinkholes)***
    - Anchoring, bracing, shear walls
    - Dewatering sites, agricultural practices
    - Catch basins
  - ***Drought***
    - Improve water supply (transport/storage/conservation)
    - Remove moisture competitive plants (Tamarisk/Salt Cedar)
    - Water Restrictions/Water Saver Sprinklers/Appliances
    - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
    - Create incentives to consolidate/connect water services
    - Recycled wastewater on golf courses
  - ***Wildfire, Grassfires***
    - Replacing building components with fireproof materials
      - Roofing, screening
    - Create "Defensible Space"
    - Installing spark arrestors
    - Fuels Modification

- ***Noxious Weeds/Insects***
    - Mowing
    - Spraying
    - Replacement planting
    - Stop overgrazing
    - Introduce natural predators

- ***Insurance***

NATURAL RESOURCE PROTECTION: Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- ***Wetlands Protection***
- ***Riparian Area/Habitat Protection/Threatened-Endangered Species***
- ***Erosion & Sediment Control***
- ***Best Management Practices***

  Best management practices ("BMPs") are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project's design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

1. Avoidance: setting construction projects back from the stream.
2. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
3. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- ***Dumping Regulations***
- ***Set-back regulations/buffers***
- ***Fuels Management***
- ***Water Use Restrictions***
- ***Landscape Management***
- ***Weather Modification***

STRUCTURAL PROJECTS have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they "stop" flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.

- They disturb the land and disrupt natural water flows, often destroying habitats or requiring Environmental Assessments.

- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.

- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.

- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- ***Detention/Retention structures***
- ***Erosion and Sediment Control***
- ***Basins/Low-head Weirs***
- ***Channel Modifications***
- ***Culvert resizing/replacement/Maintenance***
- ***Levees and Floodwalls***
- ***Anchoring, grading, debris basins (for landslides)***
- ***Fencing (for snow, sand, wind)***
- ***Drainage System Maintenance***
- ***Reservoirs(for flood control, water storage, recreation, agriculture)***
- ***Diversions***
- ***Storm Sewers***

PUBLIC INFORMATION: A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners,

renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- ***Hazard Maps and Data***
- ***Outreach Projects*** (mailings, media, web, speakers bureau, displays)
- ***Library Resources***
- ***Real Estate Disclosure***
- ***Environmental Education***

MITIGATION ACTION WORKSHEET

Instructions: Use this guide to record potential mitigation projects (1 page per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary. These will be collected following HMPC meetings on mitigation goals and measures and included in the plan.

Jurisdiction:

Mitigation Project Title:

Hazards Addressed:

Issue/Background:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office:

Cost Estimate:

Benefits (Losses Avoided):

Potential Funding:

Schedule:

Worksheet Completed by:
Name and Title:
Phone:

Mitigation Action Worksheet - EXAMPLE

Action #12: Elevate Remaining 95 Homes in the Dry Creek Watershed

Issue/Background: Historically, flooding in the Dry Creek watershed has been a major concern. The February 1986 flood caused widespread damage in most of the Dry Creek watershed. Nearly all bridges and culverts were overtopped, with 30 sustaining embankment damages and one crossing washing out; two bridges over Dry Creek were damaged, street cave-ins occurred at a number of locations, and over 125 homes flooded. Of the 145 homes subject to historical flooding within the Watershed, 95 structures remain non-elevated. Of these 95 remaining homes, 25-30 declined initial grant money for elevation as did the three repetitive loss structures. Placer County is not only concerned with existing flooding problems, but with future problems resulting from increased growth and development in the area. According to the 1992 Dry Creek Watershed, Flood Control Plan, substantial flood damages will occur with the 100-year flood under existing conditions. Areas with the most extensive and frequent damages include areas in the location of the 95 homes. The report indicates that some of these areas are susceptible to flooding from storms as frequent as the 10-year storm. Elevating the remaining 95 homes will reduce future flood-related losses.

Other Alternatives: No Action

Responsible Office: Placer County Flood Control and Water Conservation District, in conjunction with its member agencies including the cities of Rocklin, Loomis, and Roseville.

Priority (H, M, L): Medium

Cost Estimate: The cost to elevate is estimated at $40 per square foot. Homes need to be elevated anywhere from one to six feet. Of the 95 homes where elevating is feasible, it is estimated to cost $6 million or $50 to $60 K per home.

Benefits (Losses Avoided): Life Safety; Reduction in Property Loss.

Potential Funding: HGMP, PDM, Dry Creek Trust Fund

Schedule: Within three years