

Calaveras County Water District Multi-Hazard Mitigation Plan

October 2006

Developed by AMEC Earth and Environmental, Denver, CO
Hazard Mitigation & Emergency Management Programs





Special Thanks and Acknowledgements

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Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from natural hazards. This plan develops a mitigation strategy to reduce the Calaveras County Water District's risk to natural hazards. It has also been prepared to meet the requirements of the Disaster Mitigation Act of 2000 and to maintain the Calaveras County Water District's eligibility for the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation and Hazard Mitigation Grant Programs.

The planning process followed a methodology prescribed by FEMA. It began with the formation of a Hazard Mitigation Planning Committee (HMPC) comprised of key stakeholders from the Calaveras County Water District, Calaveras County, and state and federal agencies. The HMPC conducted a risk assessment to examine the recorded history of losses resulting from natural hazards, assess probability and magnitude of future hazard events, and analyze the Calaveras County Water District's assets at risk to natural hazards. The risk assessment indicated that wildfires, floods, and drought are the hazards most likely to have significant impacts on the District.

Based upon the risk assessment, the HMPC identified goals and objectives for reducing the Calaveras County Water District's risk to natural hazards. The four **goals** of the CCWD's Multi-Hazard Mitigation Plan are to:

- 1. Reduce risk to existing facilities from natural hazards**
- 2. Prevent loss of services**
- 3. Protect public health and safety**
- 4. Improve education, coordination, and communication with stakeholders and the public**

To meet identified goals and objectives, 17 mitigation actions are recommended by the plan and summarized in the table on the following page. This plan has been formally adopted by the Calaveras County Water District and is required to be updated a minimum of every five years.



Summary of Mitigation Actions

| Mitigation Action | Priority | Links to Goals | Hazards Addressed | Schedule |
|--|----------|----------------|--------------------------------|--------------------------------------|
| 1. Provide flood protection for Jenny Lind water treatment plant and La Contenta main sewage lift station | High | 1,2,3 | Flood | 2 years |
| 2. Replace redwood water storage tanks with steel tanks | High | 1,2,3 | Wildfire | 7 years |
| 3. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning | High | 2,4 | Multi-Hazard | Ongoing through 2010 |
| 4. Promote best management practices, such as low impact development techniques, in new development to reduce runoff and urban flooding | High | 1,2,3,4 | Severe Weather, Flood | Initiate in 6 months; ongoing |
| 5. Implement recommendations in service area master plans related to critical sewer facilities | High | 3 | Severe Weather, Flood | 10 years |
| 6. Implement pipeline improvements identified in water master plans to provide adequate fire flows | High | 1,2,3 | Wildfire | 10 years |
| 7. Coordinate with the County as the new Reverse 9-11 program is put into operation | High | 3,4 | Multi-Hazard | Initiate in 6 months; ongoing |
| 8. Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas | Medium | 1,2,3 | Wildfire | Spring 2007; ongoing |
| 9. Create a disaster recovery plan | Medium | 2,3 | Multi-Hazard | 2 years |
| 10. Expand the existing water reuse and recycling program | Medium | 2,3 | Severe Weather, Flood, Drought | Initiate in 1 year; ongoing |
| 11. Develop and adopt a sewer lateral inspection program to minimize inflow and infiltration | Medium | 3 | Severe Weather, Flood | Adopt and begin July 1, 2007 |
| 12. Evaluate the need for improved redundancy at critical facilities | Medium | 2,3 | Multi-Hazard | 2 years |
| 13. Develop and adopt a tiered rate structure to encourage responsible water use | Low | 2,4 | Drought | Initiate Spring 2007 |
| 14. Hire coordinator to develop and implement a public outreach and water conservation program | Low | 2,4 | Drought | Review for next fiscal year, 07/2007 |
| 15. Apply for National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities | Low | 3 | Severe Weather, Flood | 2 years |
| 16. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan | Low | 2,3 | Drought | Initiate in 2 years |
| 17. Develop mutual aid agreements with other water providers and county agencies for support during emergencies | Low | 2,3,4 | Multi-Hazard | 2years |

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Multi-Hazard Mitigation Plan

1.0 Introduction

SCOPE

Natural hazards mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Natural hazards mitigation planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented. This plan documents the Calaveras County Water District's (CCWD) natural hazards mitigation planning process, identifies natural hazards and risks within Calaveras County, and identifies the CCWD's hazard mitigation strategy to make the water district less vulnerable and more disaster resistant and sustainable. Information in this plan can be used to help guide and coordinate mitigation activities and local land use decisions.

The four **goals** of the CCWD's Multi-Hazard Mitigation Plan are to:

- 1. Reduce risk to existing facilities from natural hazards**
- 2. Prevent loss of services**
- 3. Protect public health and safety**
- 4. Improve education, coordination, and communication with stakeholders and the public**

This is a single-jurisdictional plan that covers the water district only. Because the CCWD's boundaries are contiguous with Calaveras County boundaries, the planning area is considered Calaveras County. The CCWD Hazard Mitigation Planning Committee chose to address only natural hazards in this document; man-made hazards are better addressed in their emergency response plans.

PURPOSE AND NEED

Each year, natural disasters in the United States take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars each year 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. Additionally, many natural disasters are predictable. Many more are repetitive, often with the same results. Many of the damages caused by these events can be alleviated or even eliminated.



The Federal Emergency Management Agency (FEMA), now a part of the U.S. Department of Homeland Security, has made reducing losses from natural disasters one of its primary goals. Hazard mitigation planning and subsequent implementation of projects, measures, and policies developed through those plans, is the primary mechanism in achieving these goals. Mitigation planning has resulted in the implementation of projects that have successfully reduced disaster damages.

This plan was developed pursuant to the regulations of the Disaster Mitigation Act (DMA) of 2000, published in the *Federal Register* Volume 67, Number 38, February 26, 2002. The DMA revises the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding Section 322, which provides new and revitalized emphasis on hazard mitigation, including a new requirement for local mitigation plans. These new local mitigation planning regulations are implemented through 44 CFR Part 201.6.

The DMA requires state and local governments to develop Multi-Hazard Mitigation Plans to maintain their eligibility for certain federal disaster assistance and hazard mitigation funding programs. Communities at risk from natural disasters cannot afford to jeopardize this funding.

More importantly, proactive mitigation planning at the local level can help reduce the cost of disaster response and recovery to property owners and government by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruption. The CCWD has been affected by several disasters in the past and is committed to reducing disaster impacts and maintaining eligibility for federal mitigation grant funding.



Multi-Hazard Mitigation Plan

2.0 District Profile

The Calaveras County Water District (CCWD) includes all of Calaveras County in the central Sierra Nevada foothills in the northeastern portion of California. The CCWD's boundaries encompass approximately 640,000 acres of land ranging from the San Joaquin Valley to the Sierra Nevada Mountains. See Figure 2.1 on the following page.

The CCWD is a public, nonprofit agency that has operated continuously since 1947. It is a political subdivision of the State of California and is not part of, or under the control of, Calaveras County. As a special district, the CCWD's powers include provision of public water service, water supply development and planning, wastewater treatment and disposal, and recycling. The CCWD County Water Master Plan (1996) describes the CCWD's responsibilities as follows:

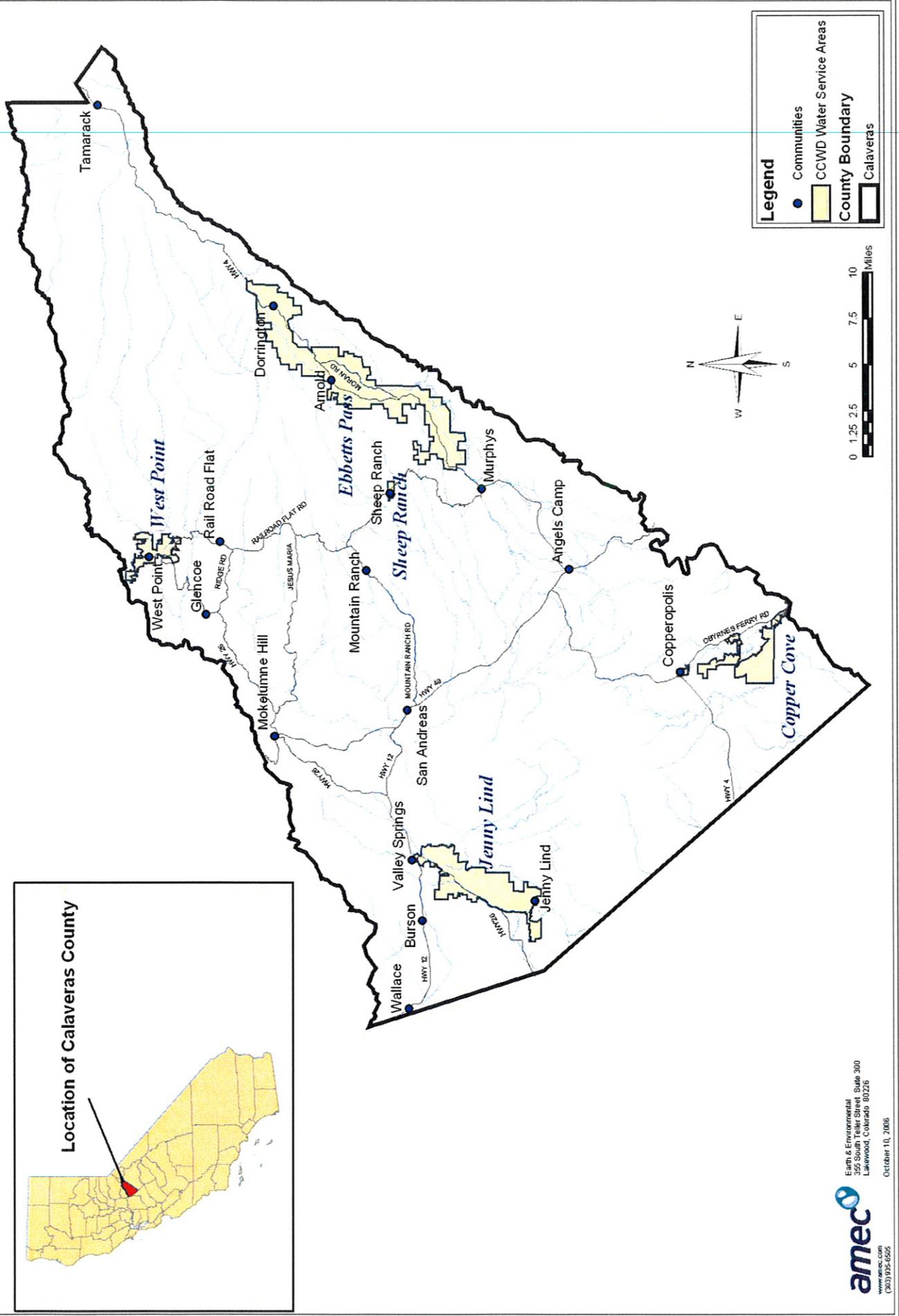
The District has broad general powers over the use of water within its boundaries, including the right of eminent domain, authority to acquire, control, distribute, store, spread, sink, treat, purify, reclaim, process and salvage any water for beneficial use, to provide sewer service, to sell treated or untreated water, to acquire or construct hydroelectric facilities and sell the power and energy produced to public agencies or public utilities engaged in the distribution of power, to contract with the United States, other political subdivisions, public subdivisions, public utilities, or other persons, and, subject to Article XIII A of the State constitution, to levy taxes and improvements.

The CCWD's service area is coincidental with Calaveras County's boundaries. It is the only water district within Calaveras County, although there are a number of other water service providers. It is the largest public water purveyor in the county in terms of service area, number of customers served, and amount of water delivered. The CCWD is governed by a five-member Board of Directors that is elected by qualified voters in the district to four-year terms. The district currently provides water service to approximately 12,000 municipal and residential/commercial customers through the following five independent water systems located throughout the county:

- Ebbetts Pass
- Copper Cove
- Jenny Lind
- West Point
- Sheep Ranch

The CCWD provides water and/or wastewater service to approximately 65 percent of the residents of Calaveras County. Other water purveyors, private wells, and springs serve the remainder of the population.

Figure 2.1: Calaveras County Water District Service Areas





Calaveras County encompasses an area of 657,920 acres, approximately 1,028 square miles, of land ranging from the San Joaquin Valley to the Sierra Nevada Mountains. It is a rural area with many small communities, some of which are rapidly urbanizing along its western border. San Andreas, the County seat, is approximately 100 miles east of San Francisco and 60 miles southeast of Sacramento. The City of Angels Camp is the only incorporated community in Calaveras County.

Topography varies from ranch land to foothills in the western and southern portions of the county to high mountainous areas typical of the Sierra Nevada in the northern and eastern portions. Elevations range from 200 feet above mean sea level (ft-msl) in the northwestern region of the county to a peak of 8,170 ft-msl above Corral Hollow near Alpine County. Warm, dry summers and temperate winters prevail in the western foothills, with temperatures ranging from the middle 30s°F to the high 90s°F, occasionally exceeding 100°F during the summer. Mild summers and cold winters characterize the mountainous eastern region with temperatures ranging from the low 20s°F to the middle 80s°F. Annual precipitation generally increases with altitude and occurs in the form of rain or snow depending upon the elevation (CCWD Urban Water Management Plan 2005 update). Table 2.1 provides further information for each service area.

Economic development of the region originally occurred due to historic placer mining mainly in the mining district above Highway 49. In more recent years, asbestos, gold, industrial minerals, limestone, and sand and gravel have been the most active segments of the mineral industry. Tourism and recreation, forest products, mineral resources, and agricultural products comprise significant elements of the area's economic base. As a result, a variety of land uses are found within CCWD's service area, including residential, forested, industrial, agricultural, and recreational land uses. In the foothills, much of the land is used for cattle ranching, while orchards, vineyards, and row crops are grown at lower elevations (CCWD Urban Water Management Plan 2005 update).

Table 2.1: Water System Connections and Demographic/Climate Information

| Service Area | Number Of Connections | | Elevation (Feet/Msl) | Annual Precipitation | Average Temperature Jan/July (°F) |
|--------------|-----------------------|------------|----------------------|----------------------|-----------------------------------|
| | Water | Wastewater | | | |
| Ebbetts Pass | 5,585 | 1,843 | 2,400-5,280 | 53" | 36° / 67° |
| Copper Cove | 2,517 | 1,502 | 510-1,150 | 20" | 45° / 78° |
| Jenny Lind | 3,810 | 926 | 200-900 | 20" | 45° / 78° |
| Sheep Ranch | 50 | 0 | 2,240-2,400 | 37" | 36° / 77° |
| West Point | 550 | 233 | 2,400-3,160 | 37" | 36° / 77° |

Source: CCWD Urban Water Management Plan, 2005 update



Multi-Hazard Mitigation Plan

3.0 Planning Process

44 CFR Requirement 201.6(c)(1):[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

The Calaveras County Water District (CCWD) recognized the need and importance of this plan and was responsible for its initiation and total funding. CCWD staff and planning team members donated to this effort by providing facilities for meetings, attending meetings, collecting data, managing administrative details, and reviewing drafts.

The CCWD contracted with AMEC Earth and Environmental (AMEC) to facilitate and develop a single-jurisdictional, multi-hazard mitigation plan. AMEC's role was to:

- Assist in establishing a Hazard Mitigation Planning Committee (HMPC) for the CCWD that incorporates key stakeholders and decision makers for the district
- Meet all of the Disaster Mitigation Act (DMA) requirements as established by federal regulations, following FEMA's planning guidance
- Facilitate the entire planning process
- Identify the data requirements that the HMPC can provide and conduct the research and documentation necessary to augment that data
- Develop and facilitate the public input process
- Produce the draft and final plan documents
- Coordinate the California Office of Emergency Services (CA-OES) and FEMA Region IX reviews of this plan and formal adoption of the plan by the CCWD Board of Directors

AMEC established the process for this planning effort using the DMA planning requirements and FEMA's associated guidance, which is structured around a four-phase process:

- 1. Organize Resources**
- 2. Assess Hazards and Risks**
- 3. Develop a Mitigation Plan**
- 4. Evaluate the Work**

This plan also uses the processes set forth in FEMA Region IX's crosswalk reference document for review and submission of local mitigation plans (2004) and the CA-OES guidance for local hazard mitigation plans (2005).



AMEC also integrated an older, more detailed 10-step planning process formerly used in requirements for other FEMA mitigation plans, such as for the National Flood Insurance Program's Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs, to formulate a single planning process that meets the requirements of six major programs: DMA, CRS, FMA, Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and new flood control projects authorized by the U.S. Army Corps of Engineers. The table below shows how this 10-step process fits within the DMA's four-phase guidance.

Table 3.1: Cross-Reference of Disaster Mitigation Act Regulations and 10-Step Planning Process

| Disaster Mitigation Act Planning Regulations (44 CFR 201.6) | 10-Step Planning Process |
|--|---------------------------------|
| Organize Resources | |
| 201.6(c)(1) | 1. Organize |
| 201.6(b)(1) | 2. Involve the public |
| 201.6(b)(2) & (3) | 3. Coordinate |
| Assess Hazards and Risks | |
| 201.6(c)(2)(i) | 4. Assess the hazard |
| 201.6(c)(2)(ii) & (iii) | 5. Assess the problem |
| Develop a 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 |
| Evaluate the Work | |
| 201.6(c)(5) | 9. Adopt the plan |
| 201.6(c)(4) | 10. Implement, evaluate, revise |

Source: Modified from Community Rating System Coordinator's Manual, 2002



10-STEP PLANNING PROCESS

Step 1: Get Organized – Building the Planning Team

AMEC worked with the CCWD to establish the framework and organization for the development of this plan. The plan was developed by the HMPC, led by AMEC, and was comprised of key water district, county, state, and other stakeholder representatives. The list of HMPC representatives is included in Appendix C.

The planning process officially began on September 5, 2006, followed by a kick-off meeting in San Andreas, California, on September 13. The meeting covered the scope of work and an introduction to the DMA regulations. The meeting was facilitated by the CCWD Water Resources and Grants Coordinator (HMPC chair) and professional planning contractors, AMEC. During this meeting the scope of work, the role of the HMPC, and data collection needs were explained. The meeting also covered an introduction to a preliminary hazard identification developed for the district. Participants were provided worksheets to facilitate the collection of information needed to support the plan, such as data on historic hazard events, values at risk, and current capabilities.

The HMPC communicated during the planning process with a combination of face-to-face meetings, phone interviews, email correspondence, and an FTP (file transfer protocol) site. The size of Calaveras County and the distance required to travel to attend meetings necessitated combining meetings on the various topics into half or full day workshops. The meeting schedule and topics are listed in the following table. Attendees and agendas for each of the HMPC meetings are on file with the CCWD.

Table 3.2: HMPC Meeting Schedule

| HMPC Meeting | Meeting Topic | Meeting Date |
|--------------|--|--------------------|
| 1 | Introduction to DMA/Kick-Off Meeting | September 13, 2006 |
| 2 | Introduction to Hazard Identification | September 13, 2006 |
| 3 | Risk and Capability Assessment Overview/ Development of Mitigation Goals and Objectives | October 3, 2006 |
| 4a | Review of Possible Mitigation Activities | October 3, 2006 |
| 4b | Development of Mitigation Actions | October 3, 2006 |
| 5 | Public Meeting | October 5, 2006 |



Step 2: Plan for Public Involvement – Engaging the Public

44 CFR Requirement 201.6(b): 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.

The HMPC undertook several strategies to engage the public in the planning process. At the kick-off meeting the team discussed a plan and options for soliciting public input. The team's approach used the CCWD's established public information mechanisms and resources.

An email letter announcing the beginning of the planning process and the kick-off meeting was distributed to key stakeholders. Public input during the planning process was solicited by making the document available for public review and comment on the CCWD website and at their office. The district also hosted a public meeting to explain the plan and planning process and to gather feedback. The CCWD developed a press release announcing the draft plan's existence and the public comment period. The local paper printed an announcement of the public meeting, which was also advertised on the CCWD's website.

Stakeholder and public comments were compiled and distributed to the planning team via email for discussion and consideration. Appropriate responses were integrated into the final draft of the plan. Record of public input, HMPC responses, and sign-in sheets are on file with the CCWD.

Step 3: Coordinate with Other Departments and Agencies

44 CFR Requirement 201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.

Early on in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state, and federal agencies to participate in the planning process. Based on their involvement in hazard mitigation planning, representatives from the following key agencies were asked to provide comments and/or participate in the process as members of the HMPC:

- CCWD Staff
- CCWD Board of Directors
- Calaveras County Environmental Health Department
- Calaveras County Planning Department
- Calaveras County Geographic Information Systems (GIS)
- Calaveras County Sheriff's Office and Emergency Services



- Calaveras County Public Works
- Angels Camp Police Department
- California Governor's Office of Emergency Services
- California Department of Transportation (Caltrans)
- California Department of Forestry and Fire Protection (Tuolumne-Calaveras Unit)
- California Highway Patrol
- U.S. Army Corps of Engineers District Office
- U.S. Forest Service (Stanislaus National Forest)
- American Red Cross

Each of the above agencies was issued an invitation by email to participate. Those comments were incorporated into this document. Additionally, technical data, reports and studies were obtained from these agencies either through web-based resources or directly from the agencies

44 CFR Requirement 201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

The requirement for the incorporation of existing plans, studies, reports, and technical information was addressed during the collection of data to support the hazard identification, vulnerability assessment, and capability assessment and in the formation of goals, objectives, and mitigation actions. These sources are documented throughout the plan and specifically in the capability assessment section.

Step 4: Hazard Identification and Step 5: Risk Assessment

44 CFR 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.

AMEC led the HMPC in a research effort to identify and document all the natural hazards that have or could impact the CCWD. Data collection worksheets were developed and used to help identify hazards and vulnerabilities. GIS was used to display, analyze, and quantify hazards and vulnerabilities. Step 5 included a capability assessment, which documents the district's current capabilities to mitigate natural hazards. A more detailed description of the risk assessment process and the results are included in Section 4: Risk Assessment.



Step 6: Identifying Goals and Step 7: Review Possible Measures

44 CFR 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.

44 CFR 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.

44 CFR 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.

AMEC facilitated brainstorming and discussion sessions with the HMPC that described the purpose and the process of developing planning goals and objectives, identified a comprehensive range of mitigation alternatives, and presented a method of selecting and defending recommended mitigation actions using selection criteria. More information on this process is included in Section 5: Mitigation Strategy.

Step 8: Draft the Mitigation Action Plan

AMEC developed a first draft of the plan, which was reviewed by members of the HMPC. The draft was also posted on the CCWD's website for public comment and agency review. The HMPC, agency, and public comments were integrated into the second draft. Public comments were also solicited at a public meeting held on October 5, 2006, in San Andreas.

Step 9: Adopt the Plan

44 CFR requirement 201.6(c)(5): The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan.

To secure buy-in and officially implement the plan, the plan was adopted by the CCWD Board of Directors. A scanned version of this resolution is included in Appendix B.



Step 10: Implement the Plan

44 CFR 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.

The true worth of any mitigation plan is its final step – implementation. To this point, all of the HMPC 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 of the specific action. An overall implementation strategy is described in Section 7: Implementation and Maintenance.

Finally, there are numerous organizations within Calaveras County whose goals and interests interface with hazard mitigation. Coordination with these other community planning efforts is paramount to the success of this plan. The CCWD and Calaveras County use a variety of comprehensive planning mechanisms, such as land use and general plans, emergency response and mitigation plans, and municipal ordinances and building codes, to manage community growth and development. Additionally, the development of this plan used information included in existing community plans, studies, reports, and initiatives. These sources are referenced throughout the document and in Section 7. The plan update and maintenance schedule and a strategy for continued public involvement is documented in Section 7.



Multi-Hazard Mitigation Plan

4.0 Risk Assessment

44 CFR Requirement §201.6(c)(2): Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Risk from natural hazards is a combination of hazard and exposure. The risk assessment process identifies relevant hazards and the exposure of lives, property, and infrastructure to these hazards. The goal of the risk assessment is to measure the potential loss to the Calaveras County Water District (CCWD), including loss of life, personal injury, property damage, and economic injury, from a hazard event. The process allows the CCWD to better understand their potential risk and associated vulnerability to natural hazards and the information provides the framework to develop and prioritize mitigation strategies and actions to help reduce risk and vulnerability from future hazard events.

The risk assessment for the CCWD followed the methodology described in the FEMA publication 386-2, *Understanding Your Risks – Identifying Hazards and Estimating Losses* (2002), which includes a four-step process:

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

The risk assessment covers **Step 4: Assess the Hazard** and **Step 5: Assess the Problem** in the 10-step planning process and is composed of the three parts: hazard identification, vulnerability assessment, and capability assessment.

- **Hazard Identification** – This section identifies the hazards that threaten the planning area and describes previous occurrences. The probability of future occurrence and an initial assessment of the CCWD's vulnerability are evaluated to determine the most significant hazards facing the district.
- **Vulnerability Assessment** – This section assesses the CCWD's total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends. The hazards recognized as most significant from the hazard identification section are evaluated in greater detail.
- **Capability Assessment** – This section analyzes risk in light of existing mitigation measures, such as building codes, warning systems, and floodplain development regulations. The capability assessment helps to identify areas where improvements in disaster resistance can be made.



4.1 Hazard Identification

44 CFR Requirement §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 should include information on previous occurrences of hazard events and on the probability of future hazard events.

Methodology

The Hazard Mitigation Planning Committee (HMPC) for the CCWD conducted a hazard identification study to determine the hazards that threaten the planning area. This section of the plan documents the previous occurrences of natural hazards, those that might occur in the future, and the probability of their recurrence. The hazard identification addresses steps one and two of FEMA's four-step process for conducting risk assessments:

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

The HMPC relied on a variety of sources to identify and profile the natural hazards affecting the CCWD. Utilizing existing data and plans available from the CCWD and other local, state, and federal agencies, as well as input from planning meetings, the HMPC agreed upon a list of those natural hazards of concern to the water district and the population it serves. Historical data from FEMA, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), the California Governor's Office of Emergency Services (CA-OES), and other sources were also examined to assess the significance of these hazards to the planning area. Because CCWD's boundaries are coincidental with Calaveras County, information is often presented at the countywide scale. However, information on the difference in risk across the planning area is included.

The significance of an identified hazard to the district was measured in general terms, focusing on key criteria, such as frequency and resulting damage, including deaths/injuries and property, crop, and economic damages. The natural hazards evaluated as part of this plan include those that have either historically caused, or have the potential to cause, significant human and/or monetary losses.



The natural hazards identified and investigated for the CCWD plan include the following:

- Dam Failure
- Drought
- Earthquakes
- Floods
- Landslides, Debris Flows, and Other Soil Hazards
- Severe Weather
 - Extreme Heat
 - Heavy Rains, Thunderstorms, Wind, Lightning, Hail
 - Winter Storms and Extreme Cold
- Tornadoes
- Wildfires
- Volcanoes

The HMPC also discussed avalanches and natural health hazards and eliminated them from further discussion. Avalanches occur occasionally in the eastern part of the county, but cause little damage and are outside the boundaries of current district service areas. The HMPC determined that natural health hazards, such as rabies and West Nile disease, will be more appropriately addressed in the upcoming countywide plan.

The following sections for each hazard are divided into three parts: hazard profile, probability, and vulnerability. The first part profiles the hazard by discussing past events, potential magnitude and extent of the hazard, and the severity of general impacts. The probability part estimates the likelihood of future occurrence, and the vulnerability part assesses historic and potential impacts to the CCWD. Probability and vulnerability for each hazard were rated using the definitions that follow. The three hazards to which the CCWD has high vulnerability are discussed in more depth in Section 4.2: Vulnerability Assessment.

Probability

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the probability 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 percent and 100 percent chance of occurrence in next year, or has a recurrence interval of 10 years or less.*

Occasional: *Between 1 percent 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.*



The probability, or chance of occurrence, was calculated where possible based on existing data. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period, which equates to a 10 percent chance of that hazard occurring in any given year.

Vulnerability

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:

Extremely Low: *The occurrence and potential cost of damage to life and property is very minimal to non-existent.*

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. 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 already occurred in the past.*

Extremely High: *Very widespread and catastrophic impact.*

To understand how natural hazards affect the CCWD, the disaster declaration history for Calaveras County is summarized on the next page, followed by a discussion of each identified natural hazard, beginning with the three hazards with the highest probability and vulnerability: flooding, drought, and wildfire.

Disaster Declaration History

One method to identify hazards based upon past occurrence is to examine the events that triggered federal and/or state disaster declarations that included Calaveras County. Disaster declarations are granted when the severity and magnitude of the event's impact surpass 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 of sufficient magnitude and severity that both the local and state government's capacity are exceeded, a federal disaster declaration may be issued, allowing for the provision of federal disaster assistance.

Table 4.1 lists the disasters on record that received state and/or federal disaster declarations and for which Calaveras County was designated. Many of the disaster



events occurred beyond the county on a regional or statewide basis; therefore, reported injuries, fatalities, and economic damages may not be an accurate estimate for the county and may not have affected the CCWD.

Table 4.1: State and Federal Disaster Declarations Affecting Calaveras County

| Hazard Type | Disaster Name | Disaster Number | State Declaration | Federal Declaration | # of Deaths | # of Injuries | Costs |
|--------------------|--|-----------------|-------------------|---------------------|-------------|---------------|-----------------|
| Flood | Floods | CDO 50-01 | 11/21/50 | Not declared | 9 | | \$32.2 million |
| Flood | Floods | DR-47 | 12/22/55 | 12/23/55 | 74 | | \$200.0 million |
| Flood | Storm/Flood Damage | DR-82 | 4/2/58 | 4/4/58 | 13 | several | \$24.0 million |
| Flood | 1969 Storms | DR-253 | 2/8/69 | 1/26/69 | 47 | 161 | \$300.0 million |
| Drought | Drought | N/A | 2/9/76 | Not declared | | | \$2.7 billion |
| Severe Storm | Storms | DR-758 | 2/20/86 | 2/18/86 | 13 | 67 | \$407.5 million |
| Fire | Wildfire | N/A | 7/21/88 | Not declared | | | |
| Fire | Calaveras/Shasta Fires | DR-958 | 8/2/92 | 8/29/92 | | 8 | \$54.0 million |
| Severe Storm/Flood | Late Winter Storms | DR-1044 | | 1/10/95 | 17 | | \$1.1 billion |
| Flood | El Nino | DR-1203 | | 2/2/98 | 17 | | \$550.0 million |
| Flood | January 1997 Floods | | 1/3/97 | | 8 | | \$1.8 billion |
| Fire | Wildfire | | 09/10/01 | | | | |
| Severe Storm/Flood | Severe Storms, Flooding, Landslides, Mudslides | DR-1646 | | 06/05/06 | | | |

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

Note: Costs are not just CCWD.

The majority of the declarations, and all but one federal declaration, were for severe weather and flooding. The seven federal declarations for storms and flooding occurred in 1955, 1958, 1969, 1986, 1995, 1998, and 2006. The remaining declarations include one state declaration for drought in 1976, with recorded losses of \$2.7 billion, and three state declarations for wildfire in 1988, 1992, and 2001. The 1992 fire in Calaveras County in combination with fires in Shasta County resulted in a federal disaster declaration with damages of \$54 million and eight injuries. Additional details on the events listed are provided in following sections.

The most recent federally-declared disaster was FEMA-1646-DR for severe storms, flooding, landslides, and mudslides from March 29-April 16, 2006. Calaveras County



was one of 17 counties designated as eligible for Public Assistance funds for emergency work and the repair or replacement of disaster-damaged facilities. The flooding caused damage to roads and threatened CCWD facilities. More details on this event are provided in the flood section of the risk assessment.

It is important to note that the federal government may also issue a disaster declaration through the U.S. Department of Agriculture (USDA) and/or the Small Business Administration, as well as through FEMA. The quantity and types of damage are the determining factors. The USDA declared 16 California counties, including Calaveras, as primary natural disaster areas due to the record-setting heat wave that occurred July 1-31, 2006. This declaration gives farmers in the county eligibility for low-interest emergency loans from USDA's Farm Service Agency.

Figure 4.1: 2006 California Disaster Declaration for Severe Storms and Flooding



Source: California State Multi-Hazard Mitigation Plan, 2004



Flood

Hazard Profile

Floods are among the most costly natural disasters in terms of human hardship and economic loss nationwide. There are three types of flood events in the Calaveras County area: riverine, flash, and urban stormwater. Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream.

Riverine flooding is the most common type of flood event and occurs when a watercourse exceeds its “bank-full” capacity. Riverine flooding generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. The 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. The warning time associated with slow rise floods assists in life and property protection.

The term “**flash flood**” describes localized floods of great volume and short duration. In contrast to riverine flooding, 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.

Urban flood events have increased as land has been converted from fields or woodlands to roads and parking lots and lost its ability to absorb rainfall. Urbanization increases runoff by two to six times that of natural terrain. Other types of floods include general rain floods, thunderstorm floods, snowmelt and rain on snow floods, dam failure floods, and local drainage floods.

The area adjacent to a river 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 that area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP).

The potential for flooding can change and increase through various land use changes and changes to land surface, resulting in a change to the floodplain. Environmental changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.



Major Sources of Flooding

California is divided into 10 hydrologic regions, and the CCWD is in the San Joaquin region, which encompasses the middle portion of the Central Valley bounded by the Sierra Nevada Mountains, the Coast Range, the divide between the American and Consumnes river watersheds, and the divide between the San Joaquin and Kings river watersheds. Although predominantly agricultural, this region has experienced increased urbanization in recent years and is subject to flooding from winter storm events and snowmelt.

In Calaveras County, flooding may occur from heavy rainfall on saturated soils, rapid snowmelt, or a combination of these factors. Riverine flooding along the main channels of the Mokelumne and Stanislaus Rivers, mid-elevation tributaries of the Mokelumne, and the upper reaches of the Calaveras usually results from heavy snowmelt in combination with heavy rainfall. In the western portion of the county, the sources of flooding are heavy rainfall associated with repeated winter storms and a saturated soil mantle. Summer thunderstorms can also lead to flooding (Calaveras County General Plan 1996).

Flood History

The seven federal declarations for storms and flooding were in 1955, 1958, 1969, 1986, 1995, 1998, and 2006. Ten additional floods are recorded from 1950-2006 in the SHELDUS database and CA-OES records. The SHELDUS database is a component of the University of South Carolina Hazards Research Lab. The main sources for the database include Storm Data and Unusual Weather Phenomena by the NCDC and information from the National Geophysical Data Center and the Storm Prediction Center. Details on recent floods are provided below:

- January 1997 floods: Heavy rains caused a mudslide along Highway 4 in Calaveras County and led to overtopping of Don Pedro Dam in Tuolumne County, resulting in 300 square miles of land flooded and 23,000 homes and 2,000 businesses damaged or destroyed.
- February 9, 1999 flash flood: A flash flood near Valley Springs in Calaveras County occurred when Cosgrove Creek left its banks and flooded four homes and a low-lying golf course. The flood threatened sewage treatment ponds, temporarily closed Highway 26, and caused \$20,000 in property damage.
- April 2006 floods: In June 2006, FEMA designated 17 counties in northern California eligible for public assistance for severe storms and flooding, including Calaveras County. From April 2-6, 2006, Calaveras received 6.8 inches of rain, 168 percent the average amount for the month of April (National Weather Service 2006). Approximately 35 acres of farmland, several homes, and a mobile home park were flooded and many people evacuated. The flood also overflowed sewage treatment plants.

According to the HMPC, Cosgrove Creek floods every few years. This occurs most often when significant periods of rain are followed by thunderstorms. However, the 2006 flooding occurred after several days of steady rain. Many homes and a highway are in the creek's floodplain.



Calaveras County participates in the NFIP. The most recent flood insurance rate map was identified in 1990. According to NFIP data, from 1994-2004, there were 229 individual assistance flood damage claims and 59 public assistance applicants eligible for \$364,924 during Presidential disaster declarations.

Probability

Based on historical data, there have been at least nine damaging floods in the last 56 years (1950-2006), which equates to a 16 percent chance of a damaging flood on any given year, or an average six-year recurrence interval. Therefore, the probability of future flood events is **likely**.

Vulnerability

The CCWD has six facilities identified as within the 100-year floodplain or within 250 feet of it. The district does not own flood insurance policies. Their Joint Powers Insurance Authority policy covers direct physical damage to vehicles and mobile equipment up to \$5 million and covers direct physical damage or loss to property from fire, theft, and or/explosion caused by earthquake or flood. In the April 2006 flood, the CCWD suffered damage to roads in all service areas and had to pump floodwaters threatening the La Contenta wastewater treatment plant. Flooding can cause wastewater storage ponds to overflow and contaminate water quality and the environment. The flood also threatened the Jenny Lind water treatment plant. Not only can flooding damage treatment and storage facilities, it may cause the loss of services of these critical facilities to homes and businesses for significant periods of time. The vulnerability to flooding is **high**. For more details on the assets at risk and the potential impacts and costs of flooding, see the flood description in Section 4.2: Vulnerability Assessment.



Drought

Hazard Profile

Drought is a complex issue, involving many factors with differing conditions and drivers throughout the state, which requires a regional perspective. Drought can be defined regionally based on its effects:

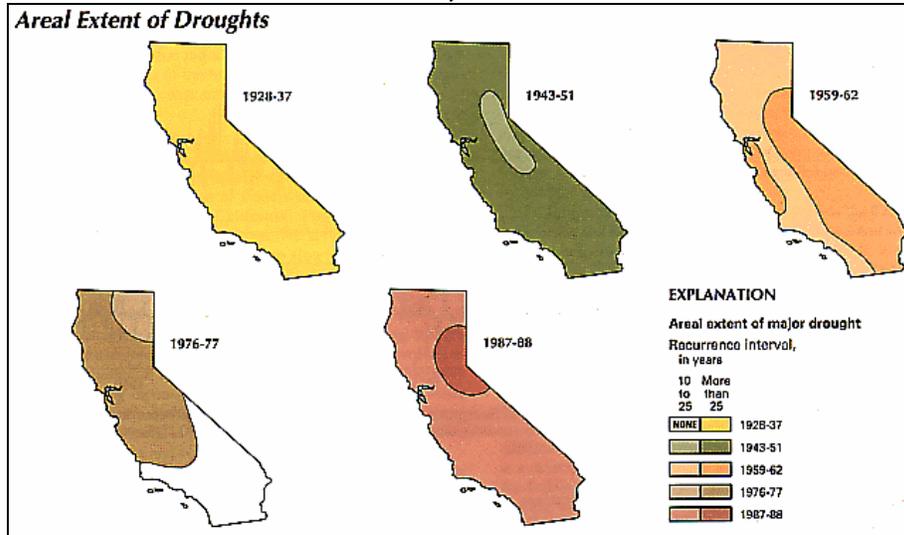
- **Meteorological** – a period of below average water supply
- **Agricultural** – inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock
- **Hydrological** – deficiencies in surface and subsurface water supplies, generally measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels
- **Socioeconomic** – when drought impacts the health, well being, and quality of life, or when a drought starts to have an adverse economic impact on a region (National Drought Mitigation Center 2006)
- **Regulatory** – when mandatory compliance with environmental protection laws (especially those pertaining to protection of endangered species), combined with low precipitation and runoff, produce deficiencies in agricultural and/or urban water supplies

The drought issue is further compounded by water rights specific to any state or region. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between agriculture and federally-protected fish habitat in the state is also at issue.

Historically, California has experienced severe drought conditions. Droughts are generally widespread events that could affect all of Calaveras County and surrounding counties. According to CA-OES, between 1950-1997, Calaveras County was included in two state of emergency proclamations due to drought, which were the droughts of 1976-1977 and of 1987-1992 (California State Multi-Hazard Mitigation Plan 2004). Figure 4.2 shows the areal extent of major droughts in California and indicates that Calaveras County is in an area having a drought recurrence interval of greater than 25 years. The Standardized Precipitation Index quantifies dry or wet conditions over varying time scales. Figure 4.3 indicates that so far this year (through August 2006), the Calaveras County region has experienced near normal to moderately wet conditions.

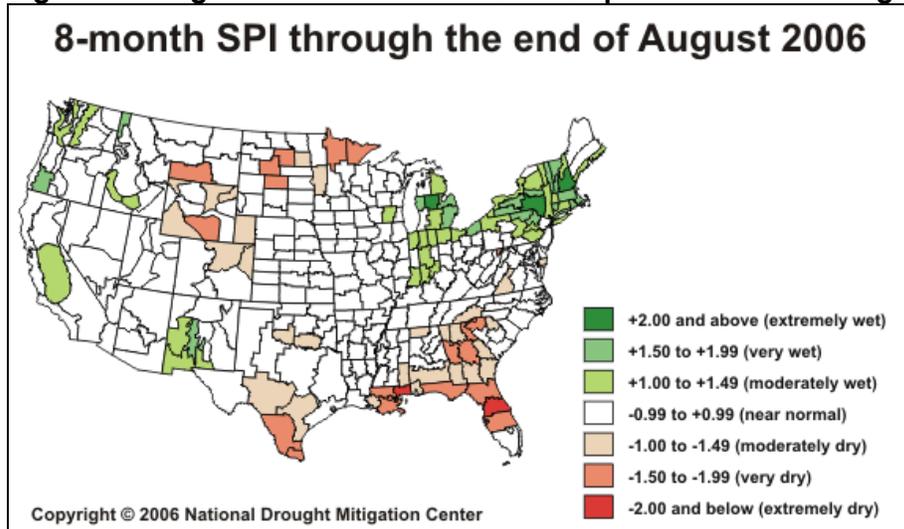


Figure 4.2: Droughts for Areas with Annual Recurrence Intervals of 10-15 and in Excess of 25 Years in California, 1827- 1989



Source: USGS, http://geochange.er.usgs.gov/sw/impacts/hydrology/state_fd/cawater1.html

Figure 4.3: Eight-Month Standardized Precipitation Index through August 2006



Source: National Drought Mitigation Center, <http://drought.unl.edu/monitor/spi/2006/aug06spi.htm>

The Southwestern States Flood and Drought Summaries from the USGS summarize California's drought history and reports that the drought of 1976-77 was most severe in the northern three-quarters of California, but the impact was experienced statewide because of the dependence of southern California on water transfers from the north. The water year 1977 was the driest year of record at almost all gaging stations in the affected area in California, and the water year 1976 was among the five driest in the central and northern Sierra Nevada. The two-year deficiency in runoff accumulated during the drought is unequalled at gaging stations in the affected area; and this deficiency has a recurrence interval that exceeds 80 years. The two-year deficiency in streamflow is also



unequaled in severity for the historical record of the Sacramento River Basin Index, which indicates a recurrence interval of more than 100 years. During the 1987-1992 drought, the runoff from the San Joaquin Valley was 47 percent of average.

Probability

Based on the historical record, 14 droughts (multi-year events counted as one) have occurred in California since 1862 (143 years). This indicates that California experiences drought on average every 10 years, which is a 10 percent chance of occurring in any given year. In Calaveras County, two multi-year droughts are on record for the last 50 years, which averages to an event every 25 years, or a 4 percent chance of occurring in any given year. The state's available record for determining hydrologic risks is short, only going back about 100 years. Tree ring studies have shown extensive dry periods far exceeding the six-year maximum drought on record (California Water Plan Update 2005). Probability of future occurrence is **likely**.

Vulnerability

The CCWD's sole source of water supply is surface water, which is vulnerable to seasonal and climatic shortage. The CCWD has experienced periods when supplies were reduced and responded by passing resolutions specific to the service area prohibiting certain uses of water and by improving and expanding water supplies.

CCWD's water rights can provide sufficient source water for the 20-year growth projections for each water system. However, the severity and extent of future droughts are unpredictable and high growth rates in the western part of the county add to the uncertainty of future conditions and water demand. As the population grows, so do the water needs for household, commercial, industrial, recreational, and agricultural uses. In addition, environmental water needs, such as for threatened and endangered species, are likely to increase in the future. Vulnerability to drought is likely to increase with these growing water needs, which are also greater in the western portion of the district because of landscape irrigation.

The CCWD's vulnerability to drought is **high**, as severe and prolonged drought could threaten its ability to provide water for human consumption, agriculture, sanitation, and fire suppression. For more details on the assets at risk, potential impacts, and potential costs of droughts, see the drought description of Section 4.2: Vulnerability Assessment.



Wildfire

Hazard Profile

Wildfire is an ongoing concern in Calaveras County and for the CCWD. Fire conditions arise from a combination of hot weather, an accumulation of vegetation, and low moisture content in the air. These conditions, when combined with high winds and years of drought, increase the potential for a wildfire to occur. Fires also occur in areas where development has expanded into the rural areas. In this wildland-urban interface, fires can result in major losses of property and structures. Generally, there are three major factors that sustain wildfires and allow for predictions of a given area's potential to burn: fuel, topography, and weather.

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to standing dead trees, live trees, brush, and cured grasses. Man-made structures and other associated combustibles are also fuel sources. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels, such as grasses, burn quickly and serve as a catalyst for fire spread. The volume of available fuel is described in terms of fuel loading.

Topography affects an area's susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. Topography also affects the ability of response crews and vehicles to reach fires in a timely manner due to steep and winding roads.

Weather components, such as temperature, relative humidity, wind, and lightning, also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater wind speed, the faster a fire will spread, and the more intense it will be. In addition to high winds, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features, such as slopes or steep hillsides. Related to weather is the issue of recent drought conditions contributing to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases.

According to the Tuolumne-Calaveras Unit Pre-Fire Management Plan, completed in 2005 by the Tuolumne-Calaveras Unit (TCU) of the California Department of Forestry and Fire Protection (CDF), the fire environment in Calaveras County is conducive to large, damaging fires. All fuel types in the county are ranked as moderate to very high fire hazard. Rugged topography occurs through much of the area and severe fire weather occurs on 35 percent of the days during the fire season through much of the county. Fire weather is sampled daily during the wildland fire season at stations located throughout California to create critical fire weather frequency, which is classified in three categories. Calaveras County is rated in the highest frequency class.



Table 4.2 shows the location and fire hazard rating of fuel models in Calaveras County. This information is based on data in the TCU Pre-Fire Management Plan.

Table 4.2: Location and Hazard Ranking of Fuel Models in Calaveras County

| Fuel Model | Fire Hazard Ranking | Location in Calaveras County |
|----------------|---------------------|--|
| Grass | Moderate to High | West of Highway 49 in the lower foothills. Moderate to high fuel hazard ranking depends on slope. |
| Woodland | High to Very High | Scattered between 800 to 4,000 feet in elevation; fuel hazard ranking depends on slope. |
| Brush | Very High | Larger blocks in the 800 to 4,000-foot elevation in less inhabited areas of the county. Areas near New Hogan, Bear Mountain, and New Melones have large concentrations of brush as well as areas north of San Andreas. |
| Brush/Hardwood | High | Areas with a mixture of live oak, black oak, manzanita, and chamise between 1,000 to 4,000 feet in elevation. Large blocks occur east of Highway 49. |
| Heavy Timber | Very High | Consists of larger, denser dead fuels on the ground. Primarily found above 3,500 feet and in scattered blocks between Arnold and West Point. |

Source: TCU Pre-Fire Management Plan, 2005

The following history of recent wildfires was compiled using data from NCDC, CA-OES, TCU Pre-Fire Management Plan (2005), and the HMPC:

- 1992 Old Gulch fire. FEMA 958-DR-CA declared on August 21, 1992. Fifty-four homes were lost in the fire.
- 1996 Keystone fire. Lightning started this fire which burned 7,000 acres within the TCU. The fire destroyed 20 homes and damaged 7 others from August 12-19, 1996.
- 1999 Winton Incident fire. On September 9-11, 1999, this wildfire burned 120 acres near West Point. Fire suppression costs totaled \$450,000. Moderate winds and steep terrain hindered response efforts. Two homes, two outbuildings, one car, and one recreational vehicle were destroyed; property damages totaled \$290,000.
- 2001 Darby fire. This fire destroyed a wooden flume owned by the CCWD carrying water to Murphys and Angels Camp, which had to be replaced. During this fire season 30,137 acres burned in the TCU.
- 2003 Fire Season. During this fire season 884 acres burned in the TCU.



- 2004 Fire Season. During 2004, there were 380 fires, 7,796 acres burned, over \$10 million in damages, and 26 homes lost in the TCU. There were three large and damaging fires: the Copperopolis fire, which burned 3,444 acres and destroyed one home; the Armstrong Complex, which burned 963 acres and destroyed three homes; and the Pattison fire, which burned 2,676 acres and destroyed 17 homes. This fire also destroyed a CCWD redwood storage tank. The leading cause of fires during the 2004 season was vehicle use followed by arson, equipment use, and miscellaneous causes.

Probability

Fire history in combination with the occurrence of hazardous fuels, topography, and weather create conditions that are **highly likely** to result in damaging fires on a regular basis. According to the CDF, the five-year average of number of fires in the TCU is 386, which indicates there is a 100 percent chance of a wildfire in any given year.

Vulnerability

Certain areas in and surrounding Calaveras County are extremely vulnerable to fires as a result of dense grassy vegetation combined with a growing number of structures being built near and within rural lands. The National Fire Plan developed a "Communities at Risk" list to identify communities that were at risk from the threat of wildfires; this includes 34 communities in Calaveras County, many near CCWD service areas (TCU Pre-Fire Management Plan).

Water is a primary asset at risk to wildfire in Calaveras County and a primary asset needed to fight fires. Fires can have devastating effects on watersheds through major amounts of soil erosion. This impacts the CCWD by limiting water storage capacity and degrading water quality, which leads to an increase in water treatment costs. Fires can also destroy structures and facilities. The CCWD has experienced these types of damages in the past and vulnerability to wildfire is **high**. For more details on the assets at risk, potential impacts, and potential costs of wildfire, see the wildfire description in Section 4.2: Vulnerability Assessment.



Severe Weather

Severe weather conditions generally occur on an annual basis throughout Calaveras County; many of these events go unreported. A database maintained by the National Climatic Data Center (NCDC) identified nine severe weather events occurring in Calaveras County between January 1, 1950, and May 31, 2006.

Table 4.3: Severe Weather Events Affecting Calaveras County

| Date | Hazard Type | Location |
|------------|-------------|------------------|
| 07/29/1980 | Tornado | |
| 11/29/1993 | Heavy Snow | Northern Sierras |
| 01/12/1998 | Heavy Rain | |
| 01/18/1998 | Heavy Rain | |
| 02/09/1999 | Flash Flood | Valley Springs |
| 09/09/1999 | Lightning | |
| 01/10/2001 | Heavy Rain | Calaveritas |
| 05/09/2005 | Hail | San Andreas |
| 12/07/2005 | Heavy Rain | |

Source: National Climatic Data Center,
www.ncdc.noaa.gov/oa/climateresearch.html

Another information source for severe weather events is the SHELDUS database. It lists 75 severe weather events for Calaveras County from 1960-2000. Only a few of the severe weather events identified resulted in state and federal disaster declarations. The 75 identified events were predominantly characterized as follows:

- Winter Weather – 21
- High Winds – 20
- Severe Thunder Storms/Heavy Rains – 13
- Flooding/Flash Flooding – 11
- Extreme Cold – 5
- Lightning – 2
- Fog – 2
- Heat – 1

The majority of state and federal disaster declarations affecting Calaveras County are a direct result of extreme weather conditions. Weather conditions can vary greatly within Calaveras County, which is situated in a transitional zone between the San Joaquin Valley and the Sierra Nevada. Topography varies from ranch lands to foothills in the western and southern portions of the county, to high mountainous areas typical of the Sierra Nevada in the northern and eastern portions. Elevations range from 200 feet



above mean sea level (ft-msl) in the northwestern region of the county to a peak of 8,170 ft-msl above Corral Hollow near Alpine County (CCWD Urban Water Management Plan 2005 update). In this section of the plan, the western and eastern portions of the CCWD's service area will often be described separately.

Severe weather is discussed in the following subsections:

- Extreme Heat
- Severe Storms - Heavy Rains, Lightning, High Wind, Hail
- Severe Winter Storms and Extreme Cold

Extreme Heat

Hazard Profile

Extreme temperature events, both hot and cold, can have severe impacts on human health and mortality, natural ecosystems, agriculture, and other economic sectors. According to information provided by the FEMA website, 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.

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

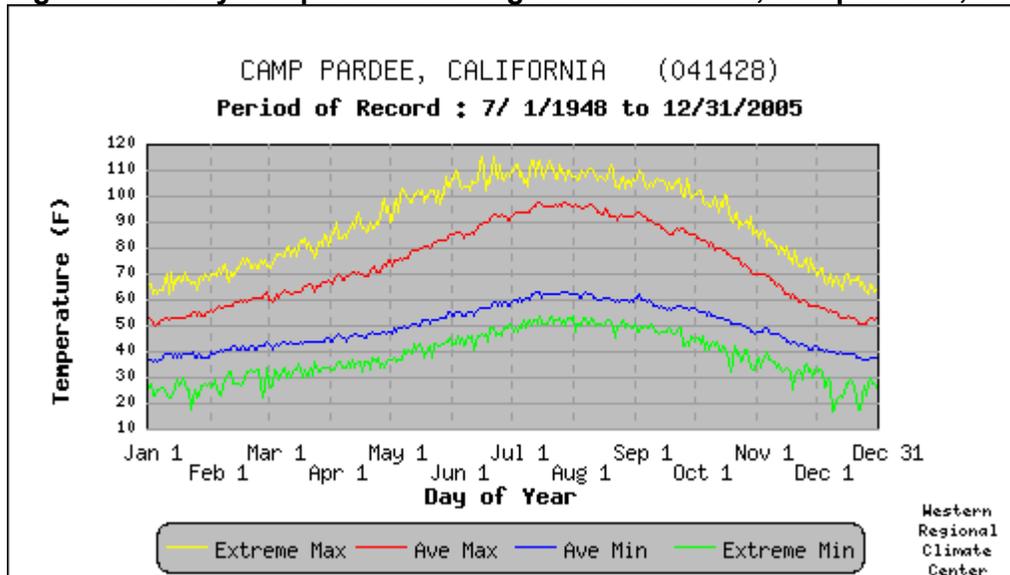
Calaveras County is characterized by warm, dry summers and temperate winters in the western foothills, with temperatures ranging from the middle 30s°F to the high 90s°F, often exceeding 100°F during the summer. Mild summers and cold winters characterize the mountainous eastern region, with temperatures ranging from the low 20s°F to the middle 80s°F.

Figures 4.4 and 4.5 show average and extreme temperatures from the Camp Pardee weather station in the northwest part of the county and the Calaveras Big Trees weather station in the southeast part of the county. The highest temperature on record at Camp Pardee is 115°F recorded on June 16, 1961. On average, there were 85 days annually with a high temperature at or above 90°F; more than half of these occurred in July and August. At Camp Pardee, temperatures of 102°F or above are on record for every month May through October.

At the Calaveras Big Trees station, the highest recorded temperature on record is 100°F on July 15, 1972. On average, there are seven days annually that are above 90°F; most occurring in July and August.



Figure 4.4: Daily Temperature Averages and Extremes, Camp Pardee, 1948-2005



Legend for Figures 4.4 and 4.5

Extreme Max is the maximum of all daily maximum temperatures recorded for the day of the year.

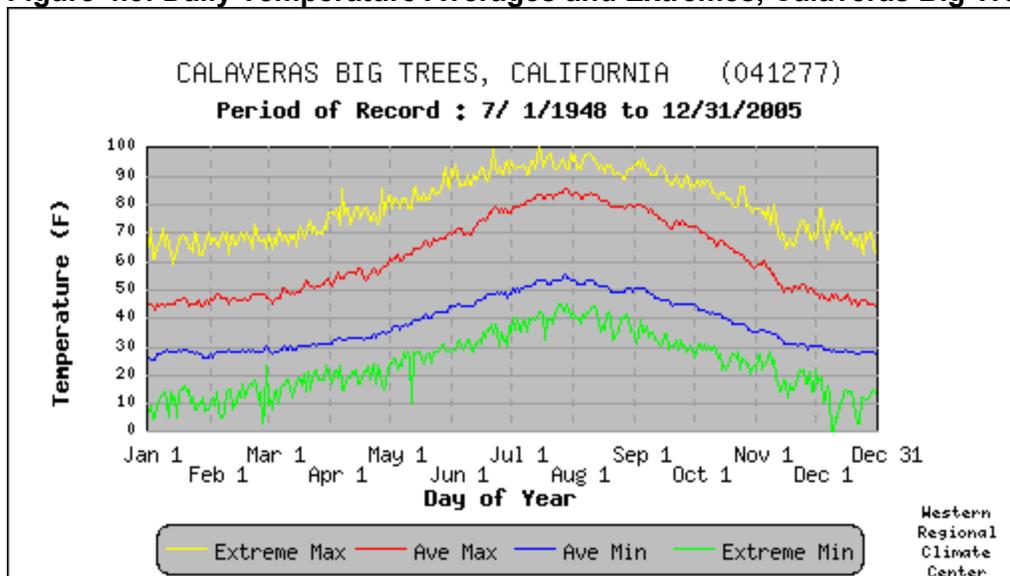
Ave Max is the average of all daily maximum temperatures recorded for the day of the year.

Ave Min is the average of all daily minimum temperatures recorded for the day of the year.

Extreme Min is the minimum of all daily minimum temperatures recorded for the day of the year.

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

Figure 4.5: Daily Temperature Averages and Extremes, Calaveras Big Trees, 1948-2005



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



In July 2006, the National Weather Service Forecast Station in Sacramento reported 11 consecutive days of temperatures over 100°F. In Stockton, California, approximately 30 miles from Calaveras County, temperatures reached 115°F on July 23, 2006. The U.S. Department of Agriculture (USDA) declared 16 California counties, including Calaveras, as primary natural disaster areas due to the record-setting heat wave that occurred July 1-31, 2006. The declaration made farmers in the county eligible for low-interest emergency loans from USDA's Farm Service Agency.

Probability

Extreme heat is less likely in eastern portions of the county at higher elevations, than in the western portion. Temperatures at or above 90°F are common most summer days in the western part of the county, and it is **highly likely** that extreme heat will continue to occur on an annual basis in the future.

Vulnerability

The prolonged high temperatures in July 2006, which spurred the USDA's natural disaster declaration, dramatically increased water usage throughout the CCWD's service area and led to power outages. During this time period, the CCWD asked residents to conserve water and placed a ban on outdoor watering in a neighborhood of the Jenny Lind service area. Pacific Gas and Electric power outages caused by the increased power demand associated with high temperatures caused interruptions in CCWD pumping capacity.

Extreme heat affects the CCWD by causing power outages and increasing water use, which can create problems with water distribution and increase operational costs; therefore, vulnerability is **medium**. The CCWD is also vulnerable to secondary impacts associated with extreme heat, such as wildfire and drought. The risks associated with these secondary impacts are discussed in other sections.

Severe Storms – Heavy Rains, Lightning, Hail, High Wind

Hazard Profile

Severe storms/thunderstorms in Calaveras County often include heavy rains accompanied by strong winds, 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: 1) hail, three-quarters inch or greater; 2) wind gusts in excess of 58 miles per hour (mph); or 3) 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 summer storms that occur throughout the late fall, winter, and spring seasons within Calaveras County. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 mph. Severe hailstorms can be quite destructive causing damage to roofs, buildings, automobiles, vegetation, and crops.



High winds often accompany thunderstorms. Thunderstorms can produce a strong rush of wind known as a downburst, or straight-line winds, which may exceed 120 mph. High winds can result in property damage and injury. Strong gusts can rip roofs from buildings, snap power lines, shatter windows, down trees, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structural fire.

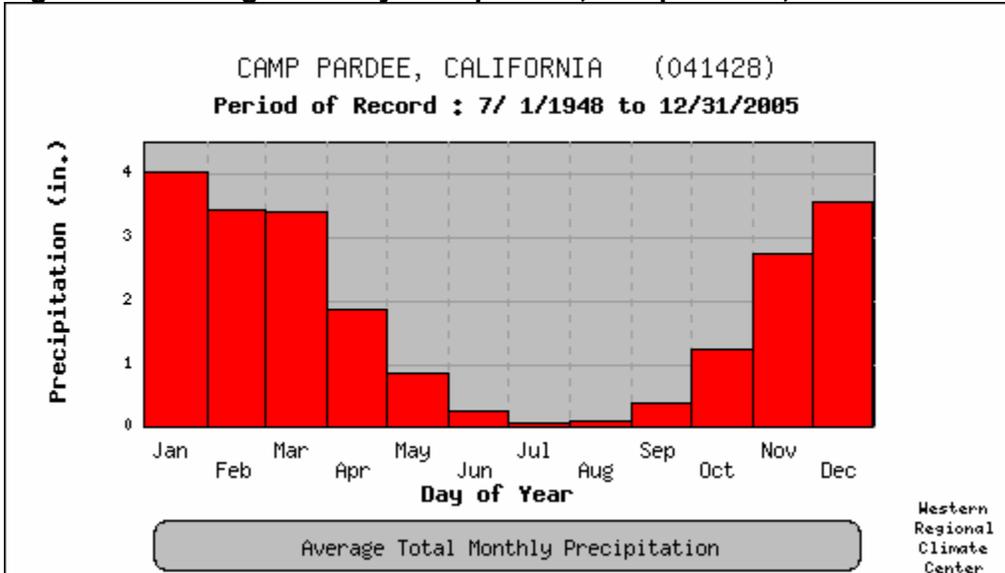
Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning can occur throughout the year and are not always accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects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

Heavy rains, lightning, and high wind in Calaveras County have occurred commonly in the past, as indicated by the SHELDUS database. Heavy rains are most likely to occur from November to May, and January is the month with the highest precipitation on average. Due to the dramatic change in elevation from the western portion of Calaveras County to the eastern, precipitation, like temperature, varies greatly throughout the county. Information from the Camp Pardee and Calaveras Big Trees weather stations on average monthly precipitation is provided in Figures 4.6 and 4.7. The highest recorded precipitation in a 24-hour period is 5.3 inches in May 1996 at the Camp Pardee weather station and 8.1 inches in February 1963 at the Calaveras Big Trees weather station.

State and federal declarations that included Calaveras County for severe storms were made in 1958, 1969, 1986, 1995, and 2006, and the flooding associated with these events was the primary cause of the declarations. Severe storms often lead to hazards of greater magnitude, such as flooding, wildfire, and landslides. Severe lightning in September 1999 in Calaveras County disrupted service for 9,000 Pacific Gas and Electric Service customers and caused dozens of grass fires (NCDRC).

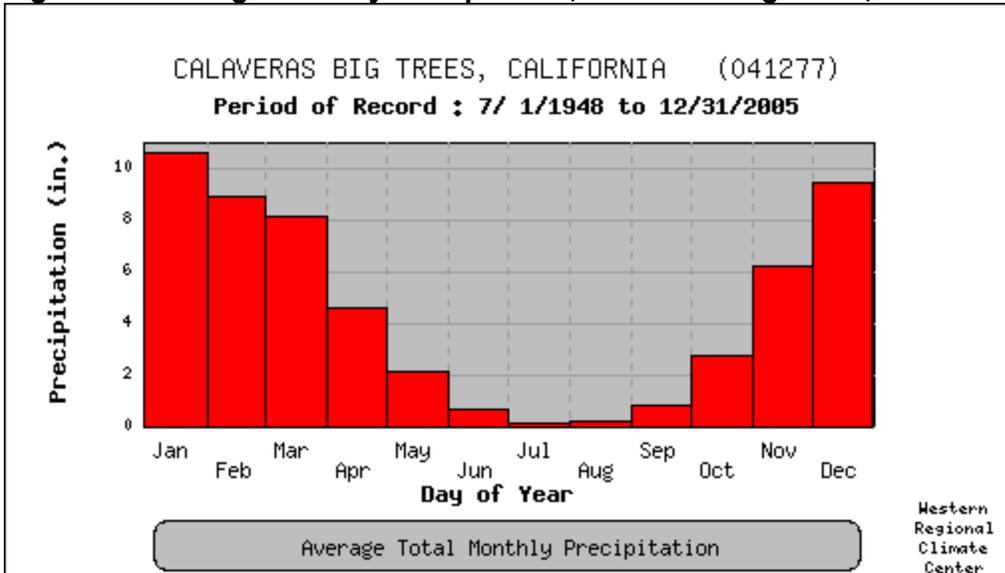


Figure 4.6: Average Monthly Precipitation, Camp Pardee, 1948-2005



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

Figure 4.7 Average Monthly Precipitation, Calaveras Big Trees, 1948-2005



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

Probability

Severe storms are well-documented in Calaveras County in the past and are **highly likely** to occur in the next year in Calaveras County.



Vulnerability

Although hail and lightning occur, the HMPC reported that the district has not had significant damages in the past due to these events. High winds and heavy rains have affected power lines and caused power outages that prevented water from being pumped and boosted to higher elevations and hindered water supply and treatment operations. In addition, high winds tore the roof off of a redwood water storage tank in the mid-1980s, which was replaced with a steel tank in 1989.

Heavy rain events can cause problems with wastewater inflow and infiltration, particularly in areas of poor construction practices and aged infrastructure. In this case, increased inflow and infiltration fills up wastewater ponds, creating additional costs in pumping and treating the wastewater. Higher levels of inflow and infiltration increase the need to find new places to store and spray wastewater.

Heavy rains also can affect the CCWD by causing mudslides and soil erosion that degrade water quality and increase treatment costs. The HMPC noted that heavy rains could potentially cause pollutants from mines to run into the water supply.

Actual damages associated with the primary effects of severe weather have been limited and the district's vulnerability to these events is **low**. It is the secondary effects of weather, such as floods, fire, and debris flows, which create larger risks. These risks are discussed in other sections.

Severe Winter Storms and Extreme Cold

Hazard Profile

Snow accounts for much of the precipitation in the higher elevations in the eastern part of Calaveras County. Snowfall in the Sierra Nevada Mountains increases with elevation. The lower foothills rarely receive any measurable snow. Middle elevations receive a mix of snow and rain during the winter. Above 6,000 feet, the majority of precipitation falls as snow. It is not unusual, in some locations, to have ten feet of snow on the ground for extended periods. Figure 4.8 shows the average annual snow accumulation in Calaveras County.

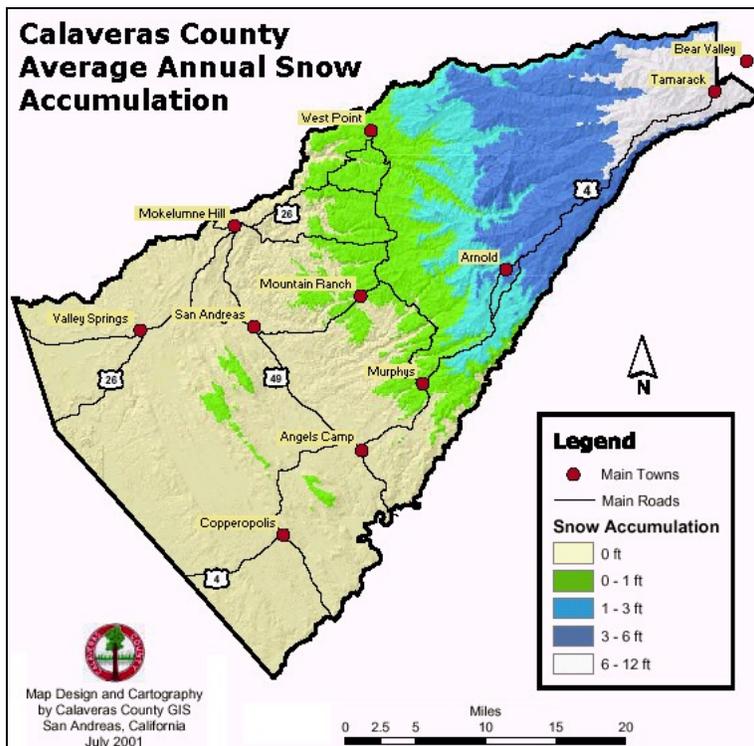
Extreme cold often accompanies a winter storm or is left in its wake. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat.

At the Camp Pardee weather station in western Calaveras County, the lowest temperature on record is 13°F on December 9, 1972. On average, there are 12 days per year when temperatures reach below 32°F. These occur primarily in December and January.

At the Calaveras Big Trees weather station in eastern Calaveras County, the lowest temperature on record is 0°F on December 12, 1972. On average, the temperature reaches 32°F or below 136 days per year. These days are distributed fairly evenly over the months of December to March.



Figure 4.8: Average Annual Snow Accumulation in Calaveras County



Source: Calaveras County GIS, www.co.calaveras.ca.us/comaps.asp

The average annual snowfall at Calaveras Big Trees is 128.9 inches; the highest annual amount was 275.4 in 1967. On average, the month of January receives the most snow. At Camp Pardee, no snowfall is on record. San Andreas, the county seat, averages one-half inch per year, with the highest annual amount recorded at three inches in 1975. Winter storms are the most common severe weather event on record in Calaveras County. Winter storms occur countywide and involve heavy rains, snow, ice, and high winds causing downed trees and power lines, power outages, accidents, and road closures. There are typically few injuries and limited damages. Most problems arise from downed trees and power lines.

The HMPC reported that during a Christmas holiday in the 1990s, freezing temperatures caused many residential pipelines to freeze, especially in unoccupied vacation homes. The pipelines leaked water, and CCWD staff had to travel to homes to shut off water connections. However, CCWD facilities fared well in this event.

Probability

Based on historic data for Calaveras County, severe snow and winter weather events are well-documented occurrences and are **highly likely** to continue to occur on an annual basis.



Vulnerability

The HMPC reported that winter storms are a chronic problem for the CCWD, causing damage to infrastructure and buildings. Roads may be closed for extended periods limiting access to facilities and slowing response times. Extreme cold causes pipes to break and creates leaks in the water distribution system, which may not be detected immediately.

Although winter storms are highly likely to occur, damages are limited and the vulnerability of the CCWD to these events is **low**.

Dam Failure

Hazard Profile

Dams are man-made structures built for a variety of uses including flood protection, power, 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 a larger flood occurs, then that structure will be overtopped. Overtopping is the primary cause of earthen dam failure in the United States.

Failed dams can create floods that are catastrophic to life and property as a result of the tremendous energy of the released water. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Dams typically are constructed of earth, rock, concrete, or mine tailings. Two factors that influence the potential severity of a full or partial dam failure are the amount of water impounded and the density, type, and value of development and infrastructure located downstream.

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

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

According to the California State Multi-Hazard Mitigation Plan, there are 1,483 dams in California. Since 1950, there have been nine dam failures. Overtopping caused two of the failures, and the others were caused by seepage or leaks. One failure resulted in three deaths. In Calaveras County, there are many dams used for downstream flood control, water storage, and hydroelectric generation, including six major dams.



Probability

No dam failures have occurred in Calaveras County in the past, and the HMPC found no information to indicate a significant threat of dam failure. Therefore, probability is **unlikely**.

Vulnerability

The CCWD depends on surface water for its water supply and on several dams for water storage, include: New Hogan Reservoir, New Melones Reservoir, Tulloch Reservoir, McKays Point Dam, and Spicer Meadow Reservoir. The Jenny Lind water treatment plant downstream of New Hogan dam would be severely affected by a dam failure, which would cause damage to facilities as well as to water supply and treatment capabilities. The U.S. Army Corps of Engineers (USACE) completed the New Hogan dam in 1964 for purposes of flood control and water supply. The HMPC indicates that the dam was built for greater than 100-year flood protection according to 1983 standards and does not believe circumstances have changed significantly. The Copper Cove water supply would be adversely affected by dam failure at Tulloch or the New Melones Reservoir upstream. Some sewage pump stations in Copper Cove would be adversely affected by dam failure at New Melones Reservoir upstream of Tulloch.

The HMPC also noted a problem with stock ponds throughout the county that easily erode and nearly overtop during heavy rain events. Stock ponds are primarily managed by CA-OES and were physically inspected by Calaveras County in spring 2006. They are not classified as dams by the State.

The probability of dam failure is unlikely; however, if it were to occur, damage to the CCWD could be significant. Vulnerability is **medium**.



Earthquake

Hazard Profile

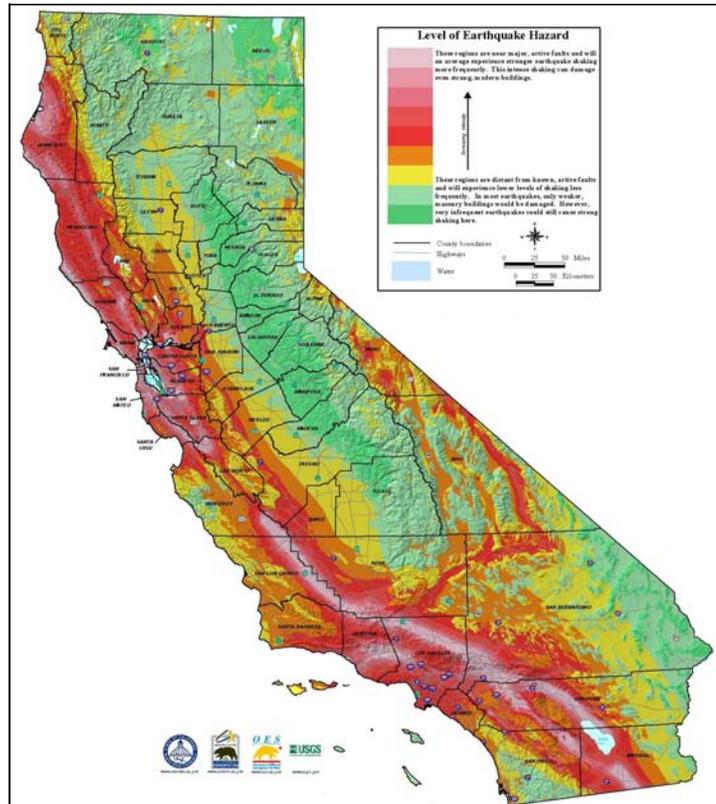
An earthquake is caused by a sudden slip on a fault. Stresses in the earth’s outer layer push the sides of the fault together. Stress builds up and the rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. The amount 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. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Seismologists have developed the Mercalli Intensity Scale to quantify the shaking intensity of an earthquake’s effects, which is measured by how an earthquake is felt by humans.

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 lines. Other damage-causing effects of earthquakes include surface rupture, fissuring, settlement, and permanent horizontal and vertical shifting of the ground.

Secondary impacts can include landslides, seiches, liquefaction, and dam failure.

Figure 4.9: Level of Earthquake Hazard in California



Source: California State Multi-Hazard Mitigation Plan, 2004

In populated areas, the greatest potential for loss of life and property damage can come as a result of ground shaking from a nearby earthquake. The degree of damage depends on many interrelated factors. Among these are the Richter 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 ground water, topography, and finally, the design, type, and quality of building construction.

Calaveras County is in the Sierra Block, an area of historically low seismicity. There has never been a state earthquake proclamation in Calaveras County, nor in any of the surrounding counties, and there are no recorded earthquakes in the county. The California State Multi-Hazard Mitigation Plan (2004) ranks the level of earthquake hazard in Calaveras County as low due to its distance from known, active faults, which also means it is thought to suffer lower levels of shaking, less frequently. According to the Calaveras County General Plan (1996) and the HMPC, ground-shaking resulting from earthquakes has been felt in the past, notably during the Mono Lake, California, earthquake in October 1990, but no damage occurred.

The nearest known source of large earthquakes is the Sierra Frontal Fault System along the eastern edge of the Sierra Nevada, which includes the Carson Valley Fault located within a few miles of the eastern portion of the county. The Melones-Bear Mountain Fault System crosses the western portion of the County, but the level of seismic activity here is unknown. The risk of surface rupture is not considered high and the potential for ground-shaking is lower than most of California. Shaking of intensity 4.0-5.0 on the Mercalli Intensity Scale, which means "felt by most everyone and objects disturbed," may be felt throughout the county during infrequent events on the San Andreas Fault System or the Owens Valley portion of the Sierra Frontal Fault System. The eastern portions of the county could experience stronger shaking if a rupture occurred on the Carson Valley Fault (Calaveras County General Plan 1996).

Probability

Because there are no recorded earthquakes in Calaveras County and the California State Hazard Mitigation Plan ranks the earthquake hazard in the area as low, the probability of ground-shaking is occasional, but the probability of a large, damaging earthquake is **unlikely**.

Vulnerability

The California Geological Survey reports that no damaging earth shaking has occurred in Calaveras County in the recorded past. In most earthquakes, only weaker, unreinforced masonry building would suffer damage; however, very infrequent earthquakes could still cause strong shaking. Impacts from earthquakes could include damage to infrastructure and buildings. Most of CCWD's facilities are constructed of steel and/or cinder block and are compliant with the State's Uniform Building Code enforced by the County, which includes requirements to meet seismic codes. The CCWD's vulnerability to earthquake damage is **low**. Earthquakes also can trigger secondary events, such as dam failures, landslides, explosions, and fires that become disasters themselves.



Landslides, Debris Flow, and Other Soil Hazards

Hazard Profile

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. Although landslides are primarily associated with steep slopes (i.e., greater than 15 percent), they may also occur in areas of generally low relief and occur as cut-and-fill failures, river bluff failures, lateral spreading landslides, collapse of mine-waste piles, and failures associated with quarries and open-pit mines. Debris flows are another type of landslide, which generally occur in the immediate vicinity of existing drainage swales or steep ravines. Debris flows occur when near-surface soil in or near steeply sloping drainage swales becomes saturated during unusually heavy precipitation and begins to flow downslope at a rapid rate.

Landslides may be triggered by both natural and human-induced changes in the environment resulting in slope instability. Precipitation, topography, and geology affect landslides and debris flows. Human activities, such as mining, road construction, and changes to surface drainage areas, also affect the landslide potential. 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, forested areas and can cause injuries and death.

There are several areas in Calaveras County with steep slopes of 50 percent or greater and that have landslide potential. Areas of particular concern are those that include high elevations and steep ravines and gulches associated with river and stream channels (Calaveras County General Plan 1996). The report "Landslide Overview Map of the Conterminous United States" finds that landslides are uncommon in the Central Valley and in the Sierra Nevada stating, "in general, landslides are uncommon, although rock falls occasionally drop from the high peaks, and mudflows run off the easily eroded Tertiary volcanoclastic flows and breccias," (USGS 2001).

Hazards associated with soils include land subsidence, expansive clay soils, erosion, soil liquefaction, and radon. The following hazards are identified in the Calaveras County General Plan Safety Element: slope instability, soil liquefaction, expansive soils, and soil erosion (1996).

Liquefaction is the transformation of uncemented, saturated sand or silt to a liquified state due to the groundshaking of an earthquake. Liquefaction only occurs in soils with little or no clay and depends upon the level of ground shaking at the site. In Calaveras County, liquefying soils include deep alluvial soils with groundwater and sand or silt layers of uniform grain sizes within about 30 feet of the surface; these conditions are very rare in the county (Calaveras County General Plan 1996).

Expansive soils usually are characterized by a high clay content, which swells with increased moisture content and then contracts during dry periods. This change in



volume usually associated with season changes can damage building foundations, roads, and concrete pavement. On slopes, it can bury or break utility lines. These soils are most likely to occur in the central part of the county north of Mountain Ranch.

The HMPC noted one large mudslide in the past that occurred after very heavy rains in January 1997. The mudslide was located on U.S. Forest Service land near Highway 4 at the 6,000-foot elevation level in Calaveras County.

Probability

Landslides in the form of debris flow, or mudslides, have occurred occasionally in the past in Calaveras County, and expansive soils and those prone to erosion are common. Therefore, the probability of future debris flow and soil hazards events are **likely**.

Vulnerability

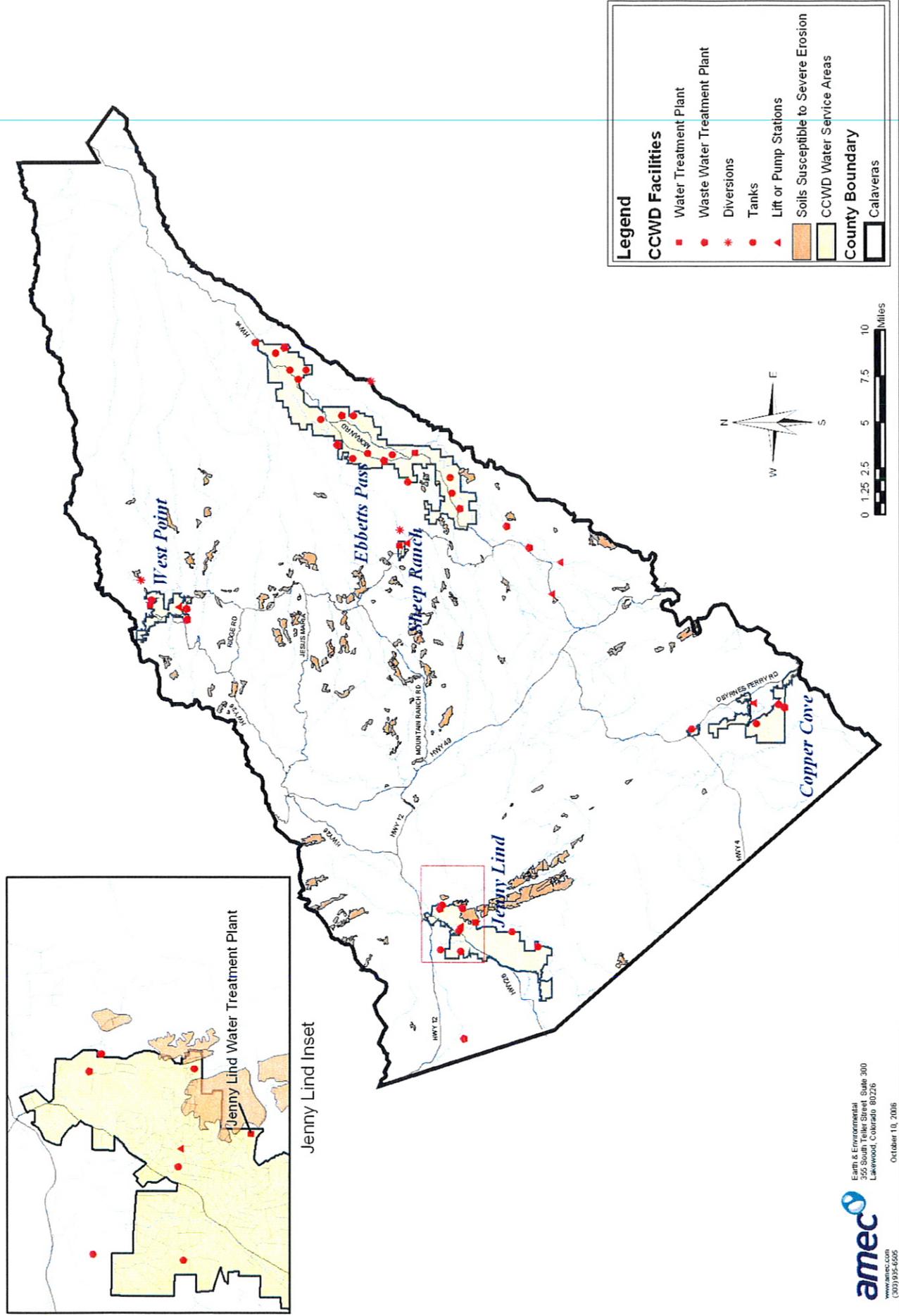
A soils map digitized by the CCWD and downloaded from the County's website was used to identify soils with severe erosion potential. The soils map covers the western two-thirds of the county. The mapped area covers all of CCWD's service areas except for the eastern three-fourths of the Ebbetts Pass service area. Severe erosion of these soils could pose problems with water quality and stress water treatment and water impoundment facilities. These sites should be evaluated and possibly avoided when siting new infrastructure. See Figure 4.10 on the following page.

Of the service areas, only Jenny Lind and Ebbetts Pass have areas of soils mapped as having a severe erosion potential. There are significant areas of these soils near and in Jenny Lind along the western edge of New Hogan Reservoir. There are two parcels of land owned by the district in the southwest Ebbetts Pass area that contain significant amounts of soils classified as having severe erosion potential.

One known potential mudslide area occurs above McKays Reservoir near Murphys. This dam is operated by the North California Power Association (NCPA), but also supplies water to the CCWD. A mudslide into the reservoir could impact the water quality and operations cost to the CCWD. The NCPA continually monitors the slide area and has prepared a response plan should a slide occur.

Although the probability of landslide and soil hazards are occasional to likely, potential impacts to life and property are minimal and vulnerability is **low**.

Figure 4.10 Calaveras County Water District Soils Susceptible to Severe Erosion





Tornadoes

Hazard Profile

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 be comprised of the same pressure differential that fuels 300-mile wide hurricanes across a path only 300 yards wide or less. Tornado magnitude is ranked according to the Fujita scale, which is based on wind speeds.

According to data from the California State Multi-Hazard Mitigation Plan from 1950–1995, when compared to other states by the frequency of tornadoes per square mile, California ranks number 44th for the frequency of tornadoes, 44th for injuries per area, and 40th for costs per area. During the period from 1953-2004, an average of five tornadoes occurred in California, and none were rated strong to violent, F2-F5, on the Fujita Scale (NCDC 2006).

One tornado was recorded in Calaveras County near Angels Camp during the period from 1950-2006. It occurred on July 29, 1980 and rated an F0 on the Fujita Scale, which is the lowest rating and is given to tornadoes with wind speeds of 40-72 mph. No property or crop damages, injuries, or deaths were reported (NCDC 2006).

Probability

Although funnel clouds may occur, tornadoes have been very infrequent in Calaveras County and in California in the past and of low magnitude; the probability of future events is **occasional**.

Vulnerability

Funnel clouds could cause damage to CCWD buildings and infrastructure; however, tornadoes of strong magnitude are extremely rare in Calaveras County and it is unlikely that tornadoes would cause significant damage to the CCWD. Therefore, vulnerability is found to be **low**.



Volcanoes

Hazard Profile

The California State Hazard Mitigation Plan identifies the Long Valley Caldera as the nearest volcanic hazard that has been active in the last 2,000 years. Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away.

The USGS does not include Calaveras County in their map of areas identified as subject to hazards from potential eruptions in California. The map in Figure 4.11 shows volcanic hazards based on activity in the last 15,000 years. An eruption from Long Valley has the potential to adversely impact Calaveras County with ashfall less than five centimeters in most areas, but greater than five centimeters in eastern areas.

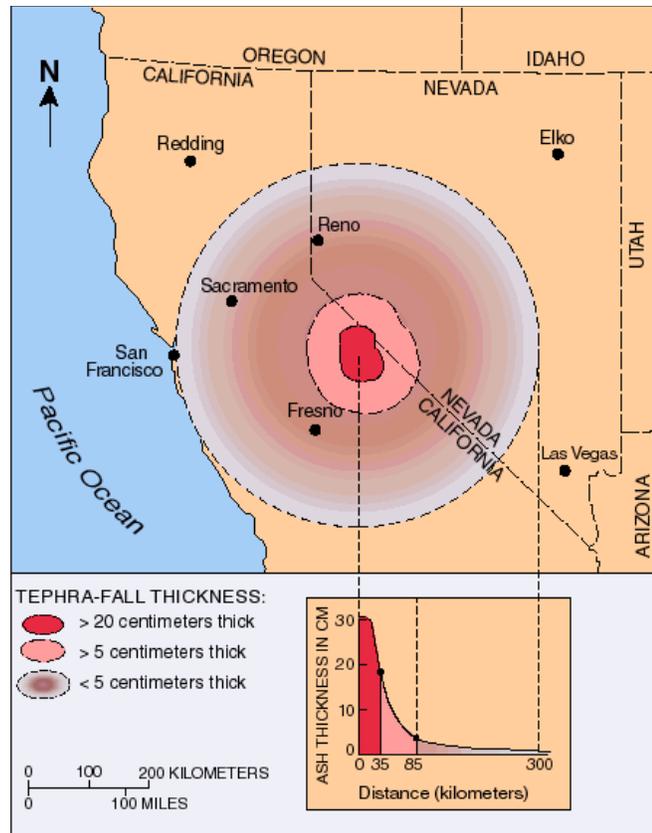
Probability

Based on the available data and the location of Calaveras County relative to potentially active volcanoes, it is **unlikely** that volcanic activity will occur of sufficient magnitude to adversely impact the CCWD.

Vulnerability

The very low probability of volcanic hazards in the planning area limits the CCWD's vulnerability to this hazard. There is **low** vulnerability to ashfall associated with large, explosive eruptions from the Long Valley Caldera. It was learned during the 1980 Mt. St. Helens eruption in the state of Washington that the impact of distant ashfall is primarily clogging of motor air filters, difficulties with breathing in certain individuals, and resulting sediment issues. Ashfall and sedimentation could also affect water quality and treatment costs.

Figure 4.11: Volcanic Ash Dispersal Map for the Long Valley Caldera



Source: USGS,
<http://vulcan.wr.usgs.gov/Volcanoes/California/>



Summary

The following table summarizes the results of the HMPC's assessment of the likelihood of and the CCWD's vulnerability to individual hazards. Vulnerability is highest to the hazards of flood, drought, and wildfire. The assets at risk and potential impacts and costs of these three hazards are discussed in more detail in the next section. Although vulnerability to dam failure is medium, the resulting impacts to the CCWD are primarily flood-related and are discussed further in the next section. Similarly, the increased water usage associated with extreme heat can cause problems with water supply and distribution similar to the impacts of drought and is addressed in the drought section.

Table 4.4: Hazard Probability and Vulnerability Rankings for the CCWD

| Hazard | Probability | Vulnerability |
|-------------------------------|---------------|---------------|
| Wildfire | Highly Likely | High |
| Drought | Likely | High |
| Flooding | Likely | High |
| Dam Failure | Unlikely | Medium |
| Severe Weather: Extreme Heat | Highly Likely | Medium |
| Severe Weather: Severe Storms | Highly Likely | Low |
| Severe Weather: Winter Storms | Highly Likely | Low |
| Landslide and Soil Hazards | Likely | Low |
| Tornadoes | Occasional | Low |
| Earthquake | Unlikely | Low |
| Volcanoes | Unlikely | Low |

Source: HMPC, 2006



4.2 Vulnerability Assessment

44 CFR Requirement §201.6(c)(2)(ii): The risk assessment shall include (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential dollar losses to vulnerable structures...and a description of the methodology used to prepare the estimate; (C) A general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Methodology

A more detailed vulnerability assessment was conducted based on the best available data and significance of the hazard. The vulnerability assessment is an attempt to quantify assets at risk and to further define populations, buildings, and infrastructure at risk to natural hazards. The vulnerability assessment for this plan followed the methodology described in the FEMA 386-2, *Understanding Your Risks – Identifying Hazards and Estimating Losses* (2002) and addresses parts three and four, where data permits, of the following four-step process:

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

Data to support the vulnerability assessment was collected and compiled from the following sources:

- (1) County GIS data (hazards, base layers, and assessor's data)
- (2) Statewide GIS datasets compiled by the CA-OES to support mitigation planning
- (3) Written descriptions of inventory and risks provided by the CCWD
- (4) Existing plans and vulnerability studies
- (5) Personal interviews with HMPC members and CCWD staff

The vulnerability assessment first describes the CCWD's total exposure to natural hazards by identifying assets at risk, critical facilities, and population served. Development trends related to population growth, water demand, and recommendations for new and improved facilities are summarized. Lastly, assets at risk, critical facilities, and development trends are assessed specifically for the most significant hazards: flood, drought, and wildfire.



Total Exposure to Hazards

Assets at Risk

The HMPC used the most recent infrastructure valuation, or Governmental Accounting Standards Board (GASB) Statement 34 for fiscal year 2003, to determine values for CCWD's assets. Calaveras County Assessor data and information from the master plans of each service area within the CCWD were used to supplement the GASB statement. Table 4.5 shows the total assessed values of CCWD capital assets by service area. The Sheep Ranch service area is very small and those values have been combined with Ebbetts Pass values. Land values have been purposely excluded because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value.

Table 4.5: Asset Values by Service Area, Net Book Value as of 6/30/06

| Service Area | Buildings | Improvements | Machinery/ Equipment | Totals |
|--------------------------|--------------------|---------------------|-------------------------|---------------------|
| Copper Cove | | | | |
| Water System | \$843,358 | \$8,884,396 | \$183,021 | \$9,910,775 |
| Sewer System | \$454,528 | \$5,560,545 | \$378,672 | \$6,393,745 |
| Subtotal | \$1,297,886 | \$14,444,941 | \$561,693 | \$16,304,520 |
| West Point | | | | |
| Water System | \$284,177 | \$4,114,810 | \$244,455 | \$4,643,442 |
| Sewer System | \$61,616 | \$1,352,543 | \$11,023 | \$1,425,182 |
| Subtotal | \$345,793 | \$5,467,353 | \$255,478 | \$6,068,624 |
| Ebbetts Pass | | | | |
| Water System | \$3,255,559 | \$23,005,215 | \$241,203 | \$26,501,977 |
| Forest Meadows Sewer | \$128,431 | \$3,111,423 | \$440,767 | \$3,680,621 |
| Arnold Sewer System | \$138,476 | \$2,733,244 | \$185,418 | \$3,057,138 |
| Vallecito Sewer System | \$135,373 | \$2,081,907 | \$13,364 | \$2,230,644 |
| Subtotal | \$3,657,839 | \$30,931,789 | \$880,752 | \$35,470,380 |
| Jenny Lind | | | | |
| Water System | \$2,879,614 | \$9,007,822 | \$312,674 | \$12,200,110 |
| La Contenta Sewer System | \$454,528 | \$5,560,545 | \$378,672 | \$6,393,745 |
| Subtotal | \$3,334,142 | \$14,568,367 | \$691,346 | \$18,593,855 |
| Grand Total | \$8,635,660 | \$65,412,450 | \$2,389,269 | \$76,437,379 |

Source: CCWD GASB Statement 34, 2004



Critical Facilities at Risk

The CCWD provides a critical lifeline utility, water, to thousands of people in Calaveras County. The CCWD does not have exact numbers of population served but uses a general rule of thumb of 2.75 persons per water connection in Jenny Lind and Copper Cove and 2.5 persons per water connection in Ebbetts Pass and West Point. The persons per connection data is based on the 2000 U.S. Census for Calaveras County. Table 4.6 shows the estimated number of customers served by each water service and wastewater area of the CCWD in 2005.

Table 4.6: Estimated Population Served by Water and Wastewater Systems, 2005

| Water System | Population Served |
|--------------|-------------------|
| Copper Cove | 5,739 |
| West Point | 1,363 |
| Ebbetts Pass | 13,813 |
| Jenny Lind | 9,900 |

| Wastewater System | Population Served |
|-------------------|-------------------|
| Copper Cove | 4,131 |
| West Point | 583 |
| Forest Meadows | 1,635 |
| Vallecito | 873 |
| Arnold | 2,100 |
| La Contenta | 2,547 |

Source: CCWD, 2006

Lifeline utility systems for water and wastewater are critical facilities, so on this basis, all of CCWD's facilities are critical. In addition, the HMPC identified their own critical facilities – those that are essential to maintaining their operations. Standby power is necessary for critical facilities in the event of a power outage, which can be the result of many natural hazard events, such as severe weather, earthquake, or wildfire. The CCWD has emergency generation capabilities at all of its critical facilities.



Development Trends

Population Growth and Water Demand

Population is scattered in Calaveras County but higher populations are in the upper Highway 4 corridor from Murphys to Big Tree Village, from Valley Springs to Jenny Lind, and in the Copperopolis area. Other population centers include Angels Camp, San Andreas, Mokelumne Hill, Mountain Ranch, and West Point. Due to the recreational opportunities in the region, many vacation homes exist in the county. Population increases during summer months when seasonal residents, tourists, and workers are in the area.

The percentage of growth in Calaveras County from 1980-1990 was 55 percent and from 1990-2000 was 27 percent based on numbers from the U.S. Census Bureau. The CCWD has identified future growth areas by overlaying land use maps from the Calaveras County General Plan and Special Plans onto the existing system maps. Table 4.7 below shows the CCWD's estimated number of water connections per service area until 2025. The estimates include known developer projects. Table 4.8 shows the number of people served in each service area based upon the number of connection. The greatest rate of growth over the next 20 years is predicted to occur in the Copper Cove service area.

Table 4.7: Water Connections Forecast by Service Area

| System | 2005 | 2010 | 2015 | 2020 | 2025 |
|--------------|-------|-------|-------|-------|-------|
| Copper Cove | 2517 | 3808 | 5994 | 7992 | 9642 |
| West Point | 550 | 575 | 600 | 625 | 650 |
| Ebbetts Pass | 5,635 | 6,197 | 6,841 | 7,147 | 7,481 |
| Jenny Lind | 3810 | 4590 | 5190 | 5790 | 6390 |

Table 4.8: Forecast of Population Served by Water Service Area

| System | 2005 | 2010 | 2015 | 2020 | 2025 |
|--------------|--------|--------|--------|--------|--------|
| Copper Cove | 5,739 | 10,060 | 16,071 | 21,566 | 26,928 |
| West Point | 1,363 | 1,425 | 1,488 | 1,550 | 1,613 |
| Ebbetts Pass | 13,813 | 15,218 | 16,825 | 17,593 | 18,428 |
| Jenny Lind | 9,900 | 12,045 | 13,695 | 15,345 | 16,995 |

Source: CCWD, 2006

The main source of economic growth expected in Calaveras County, and in nearby foothills counties, in the next few decades is residential development. Much of the growth will be from those working in Stockton, Modesto, and other areas within commuting distance and from the retirement community as they relocate away from employment centers (CCWD County Water Master Plan 1996).



Proposed New Facilities

The CCWD has recently updated master plans for each of its service areas. These plans provide information on the type and location of growth expected and recommendations for improved and new facilities. This information is summarized below:

Copper Cove

The Copper Cove Water System Water Master Plan Update (2005) reports that development in the Copper Cove area has been sporadic with some periods of rapid growth followed by relatively slow growth. The plan assumes that facilities must eventually be constructed to provide service for "buildout" as zoned by the County. The highest priority facilities projects are the expansion of the Tank B pump station and pipe to Tank C. Another very high priority is the replacement of Tank C, arguably the most important tank in the system and currently a redwood tank in poor condition, with a steel tank. These two projects are currently under construction.

The Copper Cove Wastewater Facility Plan (2005) lists the following recommendations to meet future demand: improvements to the existing collection system, treatment plant improvements and expansion, and expansion of the storage and irrigation system.

Jenny Lind

Four major subdivisions make up this service area: Rancho Calaveras, Mother Lode Acres, La Contenta, and New Hogan Lake Estates. Most of the growth in this area is expected to be rural, single-family residential development; however, some commercial and multi-family development has been zoned in the La Contenta Community Center. The Jenny Lind water treatment plant is currently near capacity and short-term expansion is under construction. The Jenny Lind Water System Master Plan (2005) recommends a new water treatment plant be put in service before mid-2008. Improvements are also planned to pipelines to improve fire flow.

Major improvements recommended in the New Hogan/La Contenta Wastewater Facilities Plan (2005) to meet projected 20-year demand are an expansion of the lower storage reservoir, improvements to the wastewater treatment plant, and acquisition of additional disposal land.

Ebbetts Pass

Future residential growth is primarily anticipated from proposed new developments in Meadowmont and Forest Meadows and infill development at Big Trees and Pinebrook. Upcoming capital improvement projects in this area include replacing redwood water tanks with steel tanks, pipeline improvements, and an expansion of the Hunters water treatment plant with a third treatment train in the existing facility.

The Douglas Flat, Vallecito, Six-Mile Village Wastewater Facilities Master Plan (2005) recommends several capital improvement projects to meet future growth scenarios, including: additional emergency storage at the Six-Mile Village pump station, acquiring additional land for new spray fields and new storage ponds, and other improvements to facilities. The Arnold Sewer System Master Plan (2005) recommends immediate improvements to the wastewater treatment plant and the replacement of two lift stations.



In the longer term, additional spray fields and treatment plant expansion are recommended. The Forest Meadow Wastewater Facility Plan (2004) recommends collection and treatment plant improvements, interim limits on new connections, and the collection of data required to obtain a surface water discharge permit.

West Point

New development in West Point is mainly expected as infill within the existing service area. Improvements have recently been completed to improve the diversion structure and replace pipeline at the Bear Creek diversion. Recommended improvements include upgrades to the pump station at the Mokelumne River intake to keep the motors and controls out of the floodplain and to increase pumping. Expansion of Wilson Lake Dam is recommended to maximize capacity and the reservoir's ability to attenuate a flood event. Replacing the existing redwood tank serving the Bummerville system is also recommended to improve water storage.

The West Point Sewer System Master Plan (2005) indicates that the existing sewer system has adequate capacity to accommodate project flows and no capacity-related improvements are required.

Irrigated agriculture in Calaveras County has been limited in the past to irrigating orchards, pastures, and vineyards. Agriculture is foreseen to grow in wine, grapes, fruits, and nuts according to the 1996 County Water Master Plan. Because wine grapes are a permanent crop with high investment, a high reliability water supply is required to support this type of investment. In the Murphys/Angels Camp/Dogtown area, wine grape crops are predicted to grow by 10 times from 2000-2040 and deciduous orchards to double. Water supply for light industrial and commercial activities is incorporated into the water demands projected for increasing urban and residential needs. There are not other substantial, specialized industrial needs currently or predicted.

The next sections further refine the vulnerability assessment through more detailed analyses of assets at risk, critical facilities, and development trends related to flood, drought, and wildfire.



Flood

Inundation of the water and wastewater treatment plants could result in costs associated with:

- Facility damage and repair
- Facility downtime and loss of service to customers
- Pumping of floodwaters
- Damage to facility access roads
- Overflow of wastewater storage ponds

A number of wastewater storage facilities do not have sufficient capacity to accommodate the flows being conveyed to the wastewater treatment plant during the 100-year rainfall return interval event. Increasing urbanization has led to increased runoff exacerbating problems with wastewater inflow and infiltration.

Assets at Risk

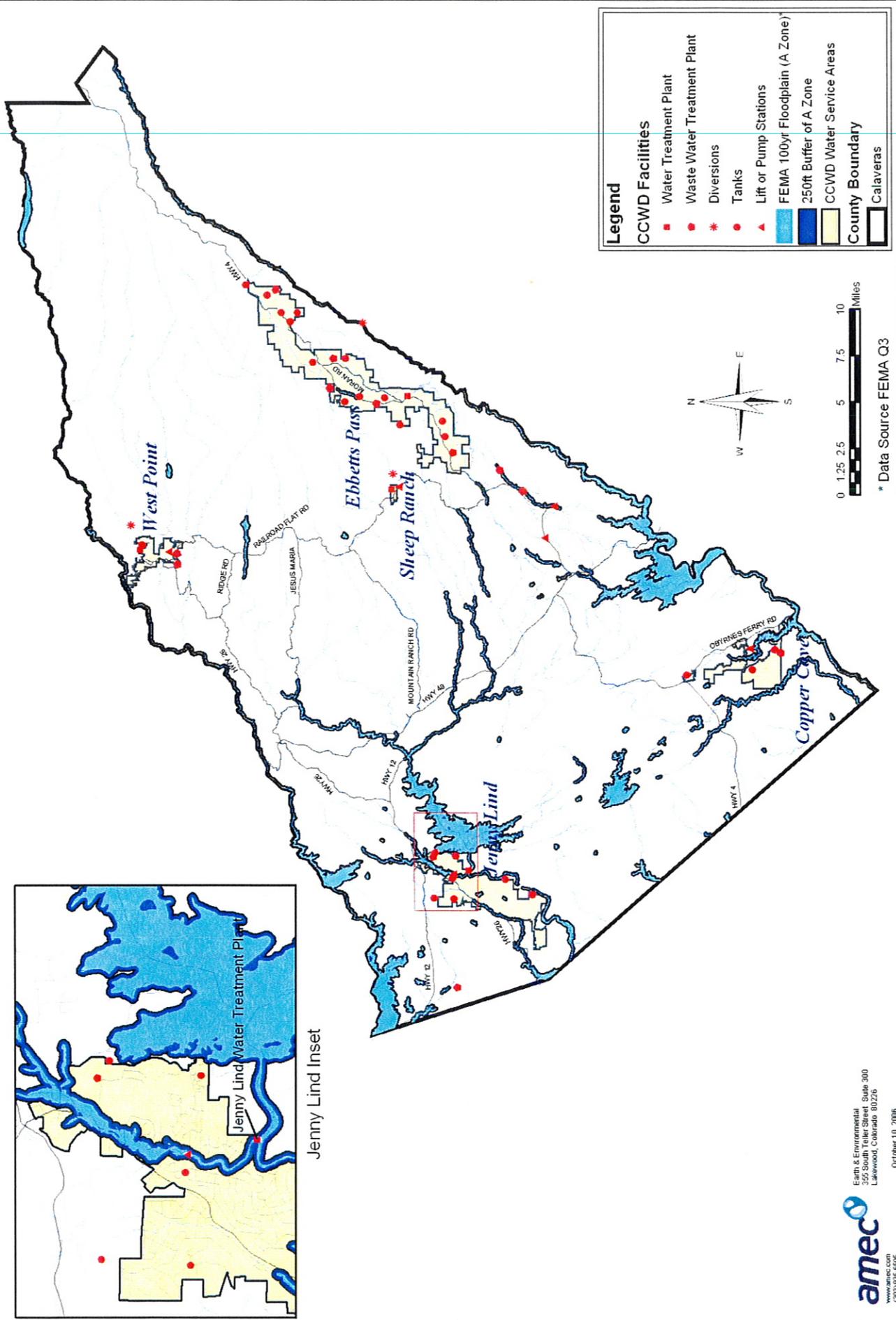
GIS was used to overlay flood hazards with the CCWD service areas to determine areas of concern for existing and future development. This analysis is limited to the 100-year (approximate A zone) boundary only and does not account for smaller events or larger events that may occur and do not have mapped boundaries. Three data sets were used: FEMA Q3 flood hazard, CCWD water service area boundaries, and CCWD infrastructure locations. (A digital flood insurance rate map (DFIRM) was not available for Calaveras County). Table 4.9 shows flooding sources for facilities in the 100-year flood zone for each service area. The HMPC indicated that the West Point Service Area has potential flood problems associated with the Middle Fork of the Mokelumne River, which does not have a mapped floodplain. A small portion of the West Point Service Area is also downstream of the Middle Fork Dam.

Table 4.9: Flooding Sources for CCWD Facilities in the Flood Zone

| Service Area | Flood Zone | Flooding Sources |
|--------------|--------------|---|
| Jenny Lind | A (100 year) | Cosgrove Creek, Calaveras River, New Hogan Dam failure |
| Copper Cove | A (100 year) | Black Creek, Littlejohns Creek, Tulloch Reservoir, New Melones Dam failure, |
| Ebbetts Pass | A (100 year) | Cowell Creek |

Source: AMEC, 2006

Figure 4.12 Calaveras County Water District Flood Hazards



* Data Source FEMA Q3



A GIS layer of point locations of CCWD water and sewer facilities was intersected with the FEMA Q3 flood hazard layer, as shown in Figure 4.12. A buffer of 250 feet was added to the FEMA Q3 to account for uncertainties and inaccuracies that may exist with this data. It is generally accepted policy to protect critical facilities against the 500-year flood event, which would likely affect any facilities located in the 250-foot buffer. This analysis indicated the following facilities at risk to flooding:

- The Jenny Lind water treatment plant is in the 100-year floodplain of Cosgrove Creek.
- The “Huckleberry” lift station is within the floodplain of Cosgrove Creek, but this structure was elevated during construction.
- The Indian Rock Vineyards sewer treatment plant and Vallecito wastewater treatment plant are not in the 100-year floodplain of Coyote Creek but are within 250 feet of it (near Ebbetts Pass).
- The Vallecito sewer main lift station is also within 250 feet of Coyote Creek (near Ebbetts Pass).
- The HMPC indicated the pumping station at the Mokelumne River intake in the West Point service area is at risk to flooding.

Estimating Potential Losses

Based on a summary of FEMA Public Assistance project costs associated with flooding in 2005, the majority of impacts from the flooding were to roads leading to district facilities. Estimated capital costs of damage to roads from the April 2006 flood event was \$524,108. Estimated cost of pumping and hauling treated effluent from the Southworth storage pond to the La Contenta wastewater treatment plant was \$29, 836.

Flood damage to the Jenny Lind water treatment plant would have significant impacts. The plant supplies water to approximately 10,000 people, about 20 percent of the population of Calaveras County. Flooding could affect the raw water pumping station, which has an estimated replacement cost of \$500,000. However, if the station became inoperable, the loss of services would create much higher costs.

Development Trends

The Jenny Lind water treatment plant is currently near capacity and the CCWD is pursuing short-term expansion. The Jenny Lind Water System Master Plan (2005) recommends a new water treatment plant be put in service before mid-2008. The expansion of the existing facility and siting of the new plant present opportunities to pursue hazard mitigation objectives as well as planning for supply. The West Point Water System Master Plan (2005) recommends improvements to the pump station at the Mokelumne River intake to elevate the motors and controls out of the floodplain and to increase pumping capacity.



Figure 4.13: Flooding of Calaveras River near Jenny Lind Water Treatment Plant, April 2006





Drought

The CCWD's sole source of water supply is surface water, which is vulnerable to seasonal and climatic shortage. The district does possess pre- and post-1914 water rights and agreements to assure a long-term water supply for uses within the county. The CCWD has experienced periods when supplies were reduced and responded by passing resolutions specific to the service area prohibiting certain uses of water.

The earliest action on record by the CCWD was a declared water shortage in the West Point and Copper Cove service areas in 1961, but there are no records of the amount of water supply reduction nor the cause of the shortage. In the statewide 1976-1977 drought, the district restricted water use in the Copperopolis and Ebbetts Pass service areas, though the amount of reduction is unknown. The CCWD adopted Ordinance 77-1 Prohibiting Nonessential Uses of Water to respond to water shortage emergencies.

In the 1987-1994, multi-county drought, water storage in New Hogan Reservoir was greatly diminished, actually falling below the minimum pool level, leading to poor quality, silty water and additional water treatment costs. Voluntary reduction measures in the Jenny Lind service area were adequate to respond to the shortage. Additional water storage at New Melones Reservoir, completed in 1979, and New Spicer Meadow Reservoir in 1990, prevented the Copperopolis and Ebbetts Pass service areas from being affected by this drought. Construction of an intertie linking the community of West Point with the Wilseyville service area, and an agreement for purchasing supplemental water with Calaveras Public Utility District using the Middle Fork of the Mokelumne River as a backup water supply source to the primary Bear Creek water source, helped ensure adequate water supply to the communities of West Point, Wilseyville, and Bummerville. In the community of Sheep Ranch, the normal San Antonio Creek water source was supplemented by releases from the Ebbetts Pass water system.

Assets at Risk

Drought is different than many other hazard events as it is a slow onset event unlikely to damage buildings or facilities. However, as a water district, drought can be one of the most detrimental hazards to the CCWD and one requiring the most substantive planning as local conditions change and grow. Potential costs to droughts are difficult to assess. In the past, the CCWD has borne cost themselves and not implemented any sort of surcharge to customers. Extreme heat in July 2006 led to water distribution problems similar to conditions that might occur during a drought event, including increased power and treatment expense and reduced consumptive revenue.

The CCWD analyzed revenue changes due to implementing the water conservation plan in the 2005 update of the Urban Water Management Plan. The tables on the following page show the normal yearly budget per service area and the impacts to the budget of a 20 percent, 35 percent, and 50 percent reduction in water consumption. These consumption reductions may be thought of as three levels of drought severity. As water shortage causes consumption to decrease, revenue also decreases, revealing a conflict between conservation practices and revenue. In the future, the CCWD may consider



implementing surcharges to reflect the true value of water to customers during times of reduced supply and provide added incentives for conservation.

Table 4.10: Normal Year Budget

| System | Consumptive Revenue | Power Expense | Chemical Expense | Net Revenue |
|--------------|---------------------|---------------|------------------|-------------|
| Copper Cove | \$310,000 | (\$112,000) | (\$20,500) | \$177,500 |
| Ebbetts Pass | \$392,000 | (\$215,000) | (\$33,500) | \$143,500 |
| Jenny Lind | \$576,000 | (\$102,000) | (\$73,500) | \$400,500 |
| West Point | \$49,000 | (\$17,200) | (\$6,000) | \$25,800 |

Table 4.11: Twenty Percent Consumption Reduction Impact

| System | Consumptive Revenue | Power Expense | Chemical Expense | Net Revenue | Net Change |
|--------------|---------------------|---------------|------------------|-------------|------------|
| Copper Cove | \$248,000 | (\$89,600) | (\$16,400) | \$142,000 | (\$35,500) |
| Ebbetts Pass | \$313,600 | (\$172,000) | (\$26,800) | \$114,800 | (\$28,700) |
| Jenny Lind | \$460,800 | (\$81,600) | (\$58,800) | \$320,400 | (\$80,100) |
| West Point | \$39,200 | (\$13,760) | (\$4,800) | \$20,640 | (\$5,160) |

Table 4.12: Thirty-Five Percent Consumption Reduction Impact

| System | Consumptive Revenue | Power Expense | Chemical Expense | Net Revenue | Net Change |
|--------------|---------------------|---------------|------------------|-------------|-------------|
| Copper Cove | \$201,500 | (\$72,800) | (\$13,325) | \$115,375 | (\$62,125) |
| Ebbetts Pass | \$254,800 | (\$139,750) | (\$21,775) | \$93,275 | (\$50,225) |
| Jenny Lind | \$374,400 | (\$66,300) | (\$47,775) | \$260,325 | (\$140,175) |
| West Point | \$31,850 | (\$11,180) | (\$3,900) | \$16,770 | (\$9,030) |

Table 4.13: Fifty Percent Consumption Impact

| System | Consumptive Revenue | Power Expense | Chemical Expense | Net Revenue | Net Change |
|--------------|---------------------|---------------|------------------|-------------|-------------|
| Copper Cove | \$155,000 | (\$56,000) | (\$10,250) | \$88,750 | (\$88,750) |
| Ebbetts Pass | \$196,000 | (\$107,500) | (\$16,750) | \$71,750 | (\$71,750) |
| Jenny Lind | \$288,000 | (\$51,000) | (\$36,750) | \$200,250 | (\$200,250) |
| West Point | \$24,500 | (\$8,600) | (\$3,000) | \$12,900 | (\$12,900) |

Source: CCWD Urban Water Management Plan, 2005 update



Development Trends

New water connections are added at a rate from two percent to seven percent, depending on the system. The higher growth rates are in the Copper Cove (seven percent) and Jenny Lind systems (seven percent). New and proposed development in the Copper Cove/Copperopolis area along with proposed developments in the Camanche/Valley Springs area will require additional water supply projects to meet the increasing demands during average, single-dry, and multiple-dry water years. Projected supply and demand comparison to the year 2025 indicates that water demand is expected to increase the fastest in the areas of Copper Cove and Camanche Springs.

According to the CCWD Urban Water Management Plan (2005 update), small populations and low usage per connection have allowed water supplies to satisfy demand even in periods of drought, such as the driest years of record, 1976-1977 and 1987-1994. Low usage per connection is a reflection of the geography and climate of each system. In general, extensive landscaping, which can account for up to 40-60 percent of a single-family connection usage, is not feasible in many of CCWD's systems. However, recent and proposed growth in certain systems will require existing policies to be reviewed and modified and/or new policies to be developed and implemented in order to better manage and conserve water supplies. The CCWD has established and used short-term water transfer arrangements to address water supply shortages.



Wildfire

Wildfires can cause short-term and long-term disruption to the CCWD. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the CCWD by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires may result in casualties and can destroy buildings and infrastructure.

The 2001 Darby fire destroyed a flume owned by CCWD but used by the City of Angels Camp water provider to transport water to Murphys and Angels Camp. The Pattison fire in September 2004 destroyed a 150,000 gallon redwood potable water storage tank in the Rancho Calaveras area of the Jenny Lind service area. The cost estimate for the replacement steel tank was \$800,000 and funded by CA-OES.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. In some cases, the economic impact of this loss of services may be comparable to the economic impact of physical damages or, in some cases, even greater. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services.

Fires can also cause major damage to power plants and power lines needed to distribute electricity to operate facilities. The CCWD pump stations have back-up power generators, which also may be destroyed by fire. Potential wildfire mitigation measure for these facilities are considered in the mitigation strategy of this plan.

Assets at Risk

The National Fire Plan is a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The National Fire Plan identifies the following 34 “Communities at Risk” in Calaveras County:

- | | | |
|--------------|-----------------|----------------|
| Altaville | Cottage Springs | Paloma |
| Angels Camp | Dorrington | Rail Road Flat |
| Arnold | Douglas Flat | San Andreas |
| Avery | Forest Meadows | Sandy Gulch |
| Big Meadow | Ganns | Sheep Ranch |
| Big Trees | Glencoe | Sky High |
| Burson | Hathaway Pines | Vallecito |
| Calaveritas | Jenny Lind | Valley Springs |
| Camp Connell | Milton | West Point |
| Campo Seco | Mokelumne Hill | Wilseyville |
| Clements | Mountain Ranch | |
| Copperopolis | Murphys | |



The CCWD has facilities near and serves many of these communities; water supply is required for fire protection. The TCU Pre-Fire Management Plan identifies watersheds and water utilities as primary assets at risk to wildfire, and CCWD facilities are considered critical assets by the plan.

Two GIS layers were used to determine CCWD risk to wildfire. A fuels hazard layer developed by the CDF was used as the hazard input. The fuel ranking methodology assigns ranks based on expected fire behavior for unique combinations of topography and vegetative fuels under a given severe weather condition. The fuel ranking procedure makes an initial assessment of rank based on an assigned fuel model and slope, then increases the ranks based on the amount of ladder and crown fuel present. The fuel rank that is assigned to the 30-meter grid cells in the dataset are classified below:

| Fuel Rank | Description |
|-----------|-------------|
| 1 | Non-Fuel |
| 1 | Moderate |
| 2 | High |
| 3 | Very High |

Based on the fuel hazard ranking map (see Figure 4.14), the water service areas in the eastern portion of the County, Ebbetts Pass and West Point, are the most at-risk areas to wildfire. The Ebbetts Pass area has the greatest percentage of very high fuels as well as the greatest number and value of critical facilities. It should be noted that other CCWD documents indicate that West Point is the area most vulnerable to wildfire based on weather, fuels, and the social vulnerability of the community, which is an economically depressed area with many low-income residents.

Critical Facilities

The average fuel hazard in the area of each facility was derived by overlaying the critical facilities layer on the wildfire fuel hazard layer. By adding a construction materials factor (2 for redwood, 1 for everything else) to the fuel hazard, the relative risk to wildfire was calculated. CCWD staff reviewed the resulting information and made adjustments or “ground-truthing” to correct information to reflect conditions not revealed by the GIS map, such as underground facilities. The table on the following page displays relative risk based on this process with the highest ranking facilities at the top of the list. Most of the “very high risk” facilities are located in the Ebbetts Pass service area.

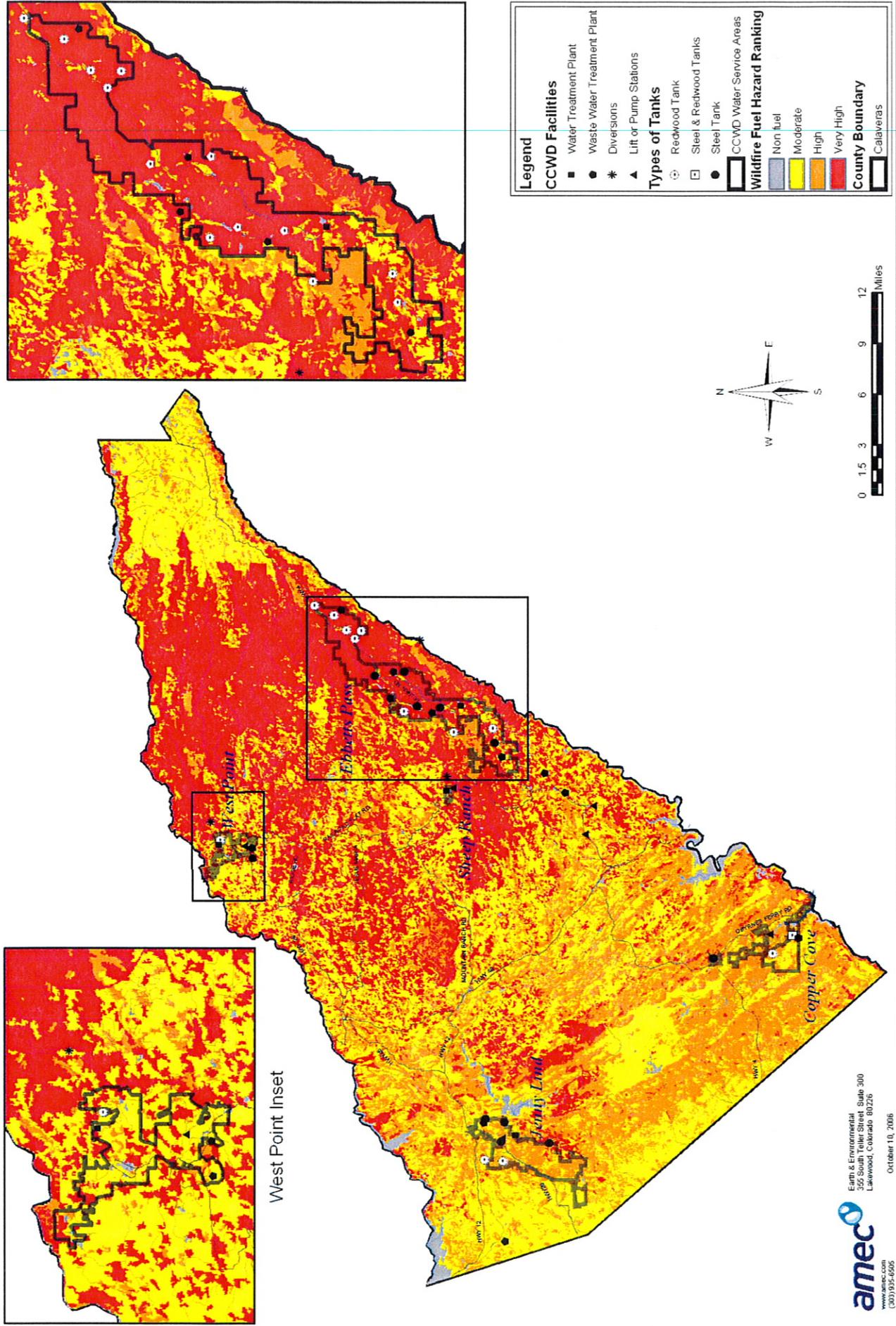


Table 4.15: Relative Fire Risk of CCWD Facilities

| Facility | Average Fuel Hazard A | Building Materials Factor B | Risk Rank A+B | Relative Risk |
|---|-----------------------|-----------------------------|---------------|---------------|
| EP Big Trees 1 Redwood Tank | 3.00 | 2.00 | 5.00 | Very High |
| EP Big Trees 60k Redwood Tank | 3.00 | 2.00 | 5.00 | Very High |
| EP Big Trees 8 Redwood Tank | 3.00 | 2.00 | 5.00 | Very High |
| EP FM#1 Redwood Tank | 3.00 | 2.00 | 5.00 | Very High |
| EP Timber Trails | 3.00 | 2.00 | 5.00 | Very High |
| EP Hunters Water Treatment Plant | 3.00 | 1.00 | 4.00 | Very High |
| EP Big Trees 3 Redwood Tank | 2.00 | 2.00 | 4.00 | Very High |
| EP Big Trees 4 Redwood Tank | 2.00 | 2.00 | 4.00 | Very High |
| EP Big Trees 5 Redwood Tank | 2.00 | 2.00 | 4.00 | Very High |
| EP MM 13 Redwood tank | 2.00 | 2.00 | 4.00 | Very High |
| EP Pinebrook STEel Tank | 3.00 | 1.00 | 4.00 | Very High |
| EP Sawmill Steel Tank | 3.00 | 1.00 | 4.00 | Very High |
| EP WP Bummerville RDWD Tank | 2.00 | 2.00 | 4.00 | Very High |
| Forest Meadows Wastewater Treatment Plant | 3.00 | 1.00 | 4.00 | Very High |
| Sheep Ranch Diversion | 3.00 | 1.00 | 4.00 | Very High |
| Millwoods Sewer Treatment System | 2.00 | 1.00 | 3.00 | High |
| Sequoia Woods Sewer Treatment System | 2.00 | 1.00 | 3.00 | High |
| Arnold Wastewater Treatment Plant | 2.56 | 1.00 | 3.56 | High |
| WP Bear Creek Diversion | 2.33 | 1.00 | 3.33 | High |
| CC "B" Steel & Redwood Tanks | 1.00 | 2.00 | 3.00 | High |
| EP FM#2 Steel Tank | 2.00 | 1.00 | 3.00 | High |
| JL "B" Steel Tank | 2.00 | 1.00 | 3.00 | High |
| La Contenta Wastewater Treatment Plant | 1.68 | 1.00 | 2.68 | Moderate |
| Sheep Ranch Water Treatment Plant | 1.61 | 1.00 | 2.61 | Moderate |
| West Point Water Treatment Plant | 1.49 | 1.00 | 2.49 | Moderate |
| Wilseyville Wastewater Treatment Plant | 1.46 | 1.00 | 2.46 | Moderate |
| Copper Cove Wastewater Treatment Plant | 1.40 | 1.00 | 2.40 | Moderate |
| Jenny Lind Water Treatment Plant | 1.30 | 1.00 | 2.30 | Moderate |
| Indian Rock Vineyards Sewer Treatment Plant | 1.25 | 1.00 | 2.25 | Moderate |
| West Point Wastewater Treatment Plant | 1.11 | 1.00 | 2.11 | Moderate |
| Copper Cove Water treatment Plant | 1.05 | 1.00 | 2.05 | Moderate |
| EP McKays Point Reservoir & Diversion Dam | 1.00 | 1.00 | 2.00 | Moderate |
| JL "A" Steel Tank | 1.00 | 1.00 | 2.00 | Moderate |
| JL "F" Steel Tank | 1.00 | 1.00 | 2.00 | Moderate |
| Southworth Wastewater Treatment Plant | 1.00 | 1.00 | 2.00 | Moderate |
| Vallecito Wastewater Treatment Plant | 1.00 | 1.00 | 2.00 | Moderate |

Source: CDF, HMPC, and AMEC, 2006

Figure 4.14: Calaveras County Water District Fire Hazards





Estimating Potential Losses

Table 4.16 shows the total assets at risk in the two service areas with very high wildfire risk, Ebbetts Pass and West Point, and the population that would be affected by the loss of services of those facilities. However, a wildfire that destroyed all the facilities in a service area is a catastrophic, worst case scenario.

Table 4.16: Total Assets at Risk to Wildfire and Potential Customers Affected

| Service Area | Capital Losses | Population Affected by Loss of Water Services |
|--------------|----------------|---|
| Ebbetts Pass | \$35,470,380 | 13,813 |
| West Point | \$6,068,624 | 1,363 |

Source: CCWD and AMEC Earth and Environmental

In the TCU plan, CDF analyzed ignition density, which indicated that in Calaveras County, the area near Valley Springs had the most ignitions. This is an area being considered for future incorporation into the existing service area. Areas with higher amounts of recreational use or higher population density also experience more ignitions.

The rural character and scattered population in Calaveras County increases wildfire risk. The Calaveras County General Plan sites long response times, inadequate water supplies, and limited budgets for apparatus and training as additional challenges in fire protection.

Development Trends

The primary type of growth occurring in Calaveras County is in rural residential development, which is often in the wildland-urban interface. This puts more people and property at risk, adds a new fuel source to vegetative fuels, and increases the fire protection challenges for local governments. The wildfire mitigation practices of surrounding land owners affects the fire risk of the CCWD and emphasizes the importance of education and partnerships regarding this shared responsibility.

The CCWD's service area master plans identify inadequate fire flows as a problem currently and as growth and water demand increases. This is most immediately a problem in the West Point service area, which also has a high fire hazard ranking. The highest priority improvement for the West Point distribution system is to improve fire flows to the commercial district and school, where there have been fire problems in the past. The existing water distribution system does not meet fire flow standards due to inadequate pipe diameter and water pressure concerns related to elevation changes. The next priority is the upper northwest West Point area, which is at a higher elevation and has some of the lowest fire flows. The CCWD also is currently in the process of upgrading the Wilseyville fire flow pump and power generator, which will supply adequate fire flow to the southeastern area of Wilseyville. Replacing the existing redwood tank serving the Bummerville system is also recommended to improve water storage.



Figure 4.15: Redwood Storage Tanks Near Bummerville, California





Summary of Key Findings

The CCWD's Risk Assessment revealed a number of problems areas to be addressed in the mitigation strategy. These key findings are summarized in the following list:

1. There are a small number of facilities in the 100-year floodplain and 250-foot buffer zone, notably the Jenny Lind water treatment plant, which serves approximately 10,000 people.
2. Several facilities at Ebbetts Pass and West Point occur in high to very high wildfire risk areas.
3. The Ebbetts Pass area has the greatest percentage of very high fuels as well as the greatest number and value of critical facilities at risk to wildfire.
4. Redwood water storage tanks are not only a high fire risk (one was destroyed in 2004) but their replacement is needed to meet other water quality and storage objectives.
5. Old pipelines need replacement to adequately meet current and future fire flow standards, most importantly in the West Point service area.
6. During heavy precipitation events, the water and runoff can create problems with wastewater inflow and infiltration.
7. Soils with severe erosion potential occur in the Jenny Lind and Ebbetts Pass service areas and should be evaluated and possibly avoided when siting new infrastructure.
8. Public education and outreach programs are needed for effective water conservation programs, particularly during times of drought.
9. As water consumption decreases, revenue also decreases (though in times of water shortage, treatment costs may increase), revealing a conflict between the need for conservation and for revenue.
10. Increasing residential growth and development in Calaveras County increases the exposure of people and property to natural hazards and requires the CCWD to plan for meeting greater water demand in the future



4.3 Capability Assessment

The capability assessment describes the CCWD's ongoing and completed mitigation programs and plans and describes the major federal, state, and local natural hazards-related policies and plans that guide and regulate the CCWD's management and operations.

Calaveras County Water District Ongoing and Completed Mitigation Programs and Plans

County Water Master Plan, 1996

The water master plan is a countywide plan that guides the development and management of the county's water resources. The plan summarizes the water supplies needed for meeting the county's projected water demands and prioritizes the principal tasks for ensuring highly reliable water supplies. This plan and the Urban Water Management Plan described below provide the framework for drought mitigation and response activities.

Water Reuse Activities

The CCWD currently uses reclaimed water for golf courses, but is considering expanding water reuse for agriculture and irrigated pastures. The potential for reclaimed water availability within the county is limited; the County Water Master Plan predicts about 15 percent potential reclaimed water availability over the service area. The greatest opportunity for water reuse is to provide water for agricultural or public activities in areas where water would not be available or is susceptible to drought. The reuse of wastewater produced from growth projected in Copper Cove could provide a reliable water supply for special types of agriculture in that area. There are opportunities for water reuse at other CCWD facilities, as well (CCWD County Water Master Plan 1996).

Urban Water Management Plan, 2005 update draft

California's Urban Water Management Act requires water utilities of a specified size to prepare an Urban Water Management Plan to promote water conservation and efficient water use. The plans should evaluate water supply during normal, single dry, and multiple dry years and be updated every five years. In 2005, the CCWD developed a draft update to their 2000 plan. The plan includes water demand management measures currently being implemented or planned, many of which mitigate drought. Measures include school and public education programs and incentive programs for high-efficiency washing machines and toilets, among others.

Within the water management plan is a Water Shortage Contingency Plan, which plans for water shortage emergency response and a water conservation program with voluntary and mandatory rationing depending on the severity and anticipated duration of the water supply emergency. The CCWD has also established and used short-term water transfer arrangement to address water supply shortages.



Mokelumne/Amador/Calaveras Integrated Regional Water Management Plan

This document has been created by agencies and organizations within the Mokelumne, Amador, and Calaveras watershed region to better manage existing resources and plan for future conditions. The integrated regional water management plan reflects the region's diversity and goals for ensuring a reliable water supply, reduction in flood-related impacts, and preservation of water quality and the environment.

System Master Plans

The CCWD has recently completed or updated the master plans for individual service systems. These plans describe the existing system, regulations, and current and projected demands, then provide a system evaluation and recommendations for improvements, or capital improvements plans. System master plans were used in this planning project to identify development trends and proposed new facilities. Often the system evaluations reveal vulnerability to natural hazard events, such as insufficient fire flow and have led to capital improvement projects to mitigate those vulnerabilities. The following master plans have been developed:

- Copper Cove Water System Water Master Plan Update, 2005
- Copper Cove Wastewater Facility Plan Update, 2006
- Jenny Lind Water System Master Plan, 2005
- Ebbetts Pass Water Master Plan, 2005
- New Hogan/La Contenta Wastewater System, 2003
- Vallecito Wastewater Master Plan, 2005
- West Point Sewer Master Plan, 2005
- West Point Water System Master Plan, 2005
- Arnold Sewer Master Plan, May 2005
- Forest Meadows Wastewater Master Plan, September 2004

Vulnerability Assessments for Jenny Lind, Copper Cove, and Ebbetts Pass

Vulnerability assessments were conducted to comply with the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. The assessments provide a risk assessment to various threats, which are primarily human-induced but also address natural disaster at a very general level. System components are also described and security vulnerability self-assessments completed.

Water System Emergency Response Plans for Jenny Lind, Copper Cove, and Ebbetts Pass

These plans are companion pieces to the vulnerability assessments and were also developed to comply with the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. The purpose of the emergency response plans (ERPs) is to provide the CCWD with a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin. The ERPs describe how CCWD will respond to potential threats or actual terrorist scenarios



identified in the vulnerability assessment, as well as additional emergency response situations. They identify emergency planning partnerships, mutual aid agreements, and emergency response policies, procedures, and documents. They also include specific action plans that will be used to respond to events and incidents.

Ordinance No. 77-1 Prohibiting Nonessential Uses of Water

The CCWD adopted this ordinance on April 14, 1977, because of a water shortage emergency in the 1976-1977 drought. The ordinance is enforced in the CCWD's improvement districts when an emergency water shortage condition is declared due to drought conditions that prevent the ordinary demands and requirements of water consumers from being satisfied without depleting the water supply of the district that would be needed for human consumption, sanitation, and fire protection. Specific water uses are regulated and prohibited in the ordinance.

West Point/Wilseyville Water System Improvements

Two major projects are underway to improve the West Point Water System:

- The U.S. Environmental Protection Agency (EPA) awarded the CCWD a State, Tribal, and Assistance Grant to upgrade the West Point community's backup water supply from the Middle Fork Mokelumne River. This is a high priority project, identified in the West Point Water System Master Plan as needed immediately, to secure a more reliable backup water supply to the community. West Point is an area identified as at very high fire risk.
- The CCWD submitted a grant application to USDA Rural Utility Service and to the Department of Housing and Urban Development Community Development Block Grant Program for funding to replace the water distribution system in West Point/Wilseyville. This is a high priority project identified in the West Point Water System Master Plan as needed immediately to address insufficient fire flow in the high fire risk area in and around West Point. See the attached letter from the West Point Fire Department in Appendix D.

Multi-Agency Coordinating Group

The Multi-Agency Coordinating (MAC) Group is an emergency management team composed of the major jurisdictional representatives in Calaveras County, who are responsible for responding to and managing broad-based emergency events. The CCWD serves on MAC as the liaison for all wastewater and utility agencies in the county. Other participants include the following:

- Calaveras County Administration
- Calaveras County Office of Emergency Services (acts as the MAC coordinator)
- Calaveras County Sheriff's Office
- Calaveras County Fire
- California Department of Forestry and Fire Protection
- Pacific Gas and Electric
- CalTrans
- Angels Camp Police Department



- California Highway Patrol
- U.S. Forest Service

Federal, State, and Local Existing Policies and Plans

Federal

Safe Drinking Water Act

Under the Safe Drinking Water Act, the U.S. EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. The CCWD must meet all existing and proposed regulatory requirements of the Act.

Source Water Assessment Program

Source water protection is a national priority as a result of the 1996 amendments to the Safe Drinking Water Act and provides a comprehensive watershed-based approach to improving and preserving water quality of the public water supply source. States have a great deal of flexibility in how they design their program. California's Source Water Assessment and Protection program allows water utilities to conduct their own assessments to improve and preserve water quality of the public water supply sources and provide information to communities that wish to develop local programs to protect their sources of drinking water. Because of the significant negative effects of wildfires on watersheds, potential wildfire mitigation measures could be linked to source water protection for the CCWD.

State

California State Multi-Hazard Mitigation Plan, 2004

The State Multi-Hazard Mitigation Plan establishes goals and priorities for CA-OES to carry out disaster mitigation activities. The plan provides the basis for funding pre-mitigation priorities for projects and consolidates the plans of other state agencies and interagency groups into a comprehensive set of recommendations for California's long-term mitigation strategy. CCWD's multi-hazard mitigation planning process used the state plan for information to conduct their risk assessment, to identify mitigation goals and objectives, and to prioritize potential mitigation projects.

California Fire Plan, 1996

The California Fire Plan is the state's road map for reducing the risk of wildfire. The fire plan is a cooperative effort between the State Board of Forestry and Fire Protection and the CDF and places the emphasis on what needs to be done before a fire starts. The current plan was finalized in March 1996 and is now undergoing review by CDF.

California Water Plan, 2005 update

The California Water Plan provides a framework for water managers to consider options and make decisions regarding California's water future. The plan presents basic data and information on California's water resources, including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The plan also provides water managers with general



guidance on preparing for climate change and sudden changes caused by natural disasters.

California Water Code

Sections of the California Water Code related to the CCWD and hazards mitigation are summarized below:

- Water Code 350. Gives the governing body of a public water supply distributor the power to declare a water shortage emergency condition within their area when ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.
- Water Code 10610-10656. Urban Water Management Planning Act. Requires the active management of urban water demands and efficient use of water to protect both the people of the state and their water resources as a guiding criterion in public decisions and the development of water management plans to actively pursue the efficient use of available supplies.
- Water Code 10910. Requires cities and counties to identify the public water system that will supply water for a new project subject to the California Environmental Quality Act. If the city or county is not able to identify any public water system, then they must prepare a water supply assessment. The city or county must request each public water system to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan. If the projected water demand was not accounted for, or there is no urban water management plan, "the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses."

Local

Calaveras County General Plan, 1996

This is the County's long-term, comprehensive plan for the development of the county as required by California law. The plan includes seven elements: land use, transportation, conservation, open space, safety, noise, and housing, and sets goals, policies, implementation measures, and related maps for each. Elements with goals and policies most-related to the CCWD include land use, conservation, open space, and safety. Policies more specifically related to the CCWD and/or this plan are the following:

- Policy II-3A—Allow for maximum densities in Natural Resource Lands, (which include dam inundation areas, wildlife, botanical, and agricultural preserve)
- Policy II-25C—Encourage all sewer districts in the county to improve and expand sewer systems and services



- Policy IV-9A—Support the development of water projects in the county for domestic and irrigation purposes
- Policy IV-9B—Encourage continued cooperation among water suppliers in meeting the water need for the county as a whole
- Policy V-9A—Balance water resources development with the preservation of streams and rivers in their natural state
- Policy V-9B—Protect public access to streams and rivers
- Policy VII-1B—Review all proposed building in the county for compliance with current building standards relating to seismic safety and slope stability
- Policy VII-1C—Review proposals to locate dams or other major facilities in the county for geologic and seismic safety
- Policy VII-4A—Review building proposals for flood safety

The General Plan also includes the following individual community plans: Arnold Community Plan, Avery/Hathaway Pines Community Plan, Ebbetts Pass Special Plan, Mokelumne Hill Community Plan, Murphys/Douglas Flat Community Plan, Rancho Calaveras Special Plan, San Andreas Community Plan, and Valley Springs Community Plan. Assessing these individual plans was beyond the scope of this plan.

The Calaveras County Zoning Code includes the Environmental Protection Combining Zone, Chapter 17.58, which designates environmentally sensitive areas for protection of the public health, safety, and welfare. The zone is intended for areas subject to flooding, sensitive archeological areas or environmental habitats, or areas where future construction or subdivision may have a significant effect on the environment.

Calaveras County is beginning the update process for their General Plan and many changes are anticipated due to the significant growth in the county in the last 10 years. The update process presents an excellent opportunity for the CCWD to be involved in county land use planning and champion mitigation goal and objectives.

Multi-Hazard Functional Plan

The Multi-Hazard Functional Plan outlines the functions, responsibilities, and regional risk assessments of Calaveras County for large-scale emergencies, such as wildfires, hazardous materials incidents, flooding, dam failure, light airplane crashes, etc. It sets forth an operating strategy for managing these incidents.

Calaveras Operational Area Hazardous Materials Emergency Response Plan, 2006

This plan establishes the policies, responsibilities, and procedures required to protect the health and safety of Calaveras County's citizens, environment, and property from the effects of hazardous materials emergencies. In this plan, the CCWD, along with other water and sewer districts, has the following responsibilities:

- Immediately notify proper authorities in the event of a hazardous materials incident affecting waterways under their jurisdiction



- Provide remedial actions when a hazardous material affects water sources and/or distribution systems
- Assist in product analysis
- Issue warning or advisements to customers

Tuolumne-Calaveras Unit Pre-Fire Management Plan, 2005

The TCU of CDF developed this plan which combines all of the TCU's pre-fire components into one document and also serves as the Community Wildfire Protection Plan for all communities in Calaveras County. The plan provides an excellent assessment of wildfire risk and capabilities in the TCU, including GIS analysis and maps. Pre-fire management projects are identified for both the entire unit and for each of the six battalions. The plan also documents the activities of the Calaveras Foothills Fire Safe Council.

The TCU plan identifies watersheds and water utilities as critical assets at risk to wildfire. The CCWD should integrate their wildfire mitigation strategy with projects identified in the TCU plan to the extent possible and consider further involvement with the Fire Safe Council in the future.



Multi-Hazard Mitigation Plan

5.0 Mitigation Strategy

The mitigation strategy for the Calaveras County Water District's (CCWD) Multi-Hazard Mitigation Plan is designed to meet phase three of FEMA's four-phase guidance: "Developing the Mitigation Plan," and includes the following steps from the 10-step planning process:

Step 6: Set Planning Goals

Step 7: Review Possible Activities

Step 8: Draft an Action Plan

Up to this point in the planning process, the HMPC has organized resources, assessed natural hazards and risks, and documented mitigation capabilities. This section presents the mitigation strategy developed by the HMPC based on the resulting profile of vulnerability. The mitigation strategy was 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.

GOALS AND OBJECTIVES

44 CFR 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.

The HMPC developed goals and objectives to provide direction for reducing hazard-related losses to the water district. These were based upon the results of the risk assessment and a review of community goals from other state, local, and CCWD plans. The HMPC reviewed goals from the following plans to ensure their mitigation strategy was integrated with existing plans and policies:

- State of California Multi-Hazard Mitigation Plan, 2004
- California Fire Plan, 1996



- Tuolumne-Calaveras Unit County Pre-Fire Management Plan, 2005
- CCWD County Water Master Plan, 1996
- CCWD Emergency Response Plans for Service Areas, 2005

Through a brainstorming process, the HMPC identified a variety of possible goals and then came to a consensus on four main ones. Following the development of goals, the HMPC identified specific objectives to achieve each goal. Goals and objectives are listed below, but are not prioritized:

Goal 1 Reduce risk to existing facilities from natural hazards

- Objective 1.1 Implement mitigation measures for facilities identified in the 100-year floodplain.
- Objective 1.2 Reduce the fire vulnerability of facilities identified in high fire hazard areas.
- Objective 1.3 Update and improve risk assessment data and maps.

Goal 2 Prevent loss of services

- Objective 2.1 Increase interconnections with regional water suppliers to prevent loss of service during drought and other emergencies.
- Objective 2.2 Increase water supply storage capacity.
- Objective 2.3 Improve redundancy at critical facilities.
- Objective 2.4 Integrate natural hazards mitigation into future facilities planning.

Goal 3 Protect public health and safety

- Objective 3.1 Maintain adequate flows in water system for fire protection.
- Objective 3.2 Improve capacity of critical sewer infrastructure to accommodate peak events.

Goal 4 Improve education, coordination, communication with public and stakeholders

- Objective 4.1 Educate public on responsible water use and conservation measures.
- Objective 4.2 Foster partnerships with other water and sewer providers locally and regionally.
- Objective 4.3 Maintain and enhance participation in multi-agency groups, such as the Multi-Agency Coordinating Group, related to natural hazards and emergencies.



Mitigation Actions

44 CFR 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.

44 CFR 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.

Through a collaborative group process, the HMPC identified specific mitigation actions to achieve their goals and objectives for reducing vulnerability to natural hazards. The HMPC then prioritized the mitigation actions through a multi-voting process. Prioritization was based on 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.

The HMPC developed 17 mitigation actions, which are summarized in Table 5.1 on the following page. The HMPC filled out a worksheet for each mitigation action, which includes information on the background issues, possible alternatives, responsible office, cost estimate, benefits, potential funding, and schedule for each action. The 17 worksheets are provided at the end of this section.



Table 5.1: Summary of Mitigation Actions

| Mitigation Action | Priority | Links to Goals | Hazards Addressed | Schedule |
|--|----------|----------------|--------------------------------|--------------------------------------|
| 1. Provide flood protection for Jenny Lind water treatment plant and La Contenta main sewage lift station | High | 1,2,3 | Flood | 2 years |
| 2. Replace redwood water storage tanks with steel tanks | High | 1,2,3 | Wildfire | 7 years |
| 3. Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning | High | 2,4 | Multi-Hazard | Ongoing through 2010 |
| 4. Promote best management practices, such as low impact development techniques, in new development to reduce runoff and urban flooding | High | 1,2,3,4 | Severe Weather, Flood | Initiate in 6 months; ongoing |
| 5. Implement recommendations in service area master plans related to critical sewer facilities | High | 3 | Severe Weather, Flood | 10 years |
| 6. Implement pipeline improvements identified in water master plans to provide adequate fire flows | High | 1,2,3 | Wildfire | 10 years |
| 7. Coordinate with the County as the new Reverse 9-11 program is put into operation | High | 3,4 | Multi-Hazard | Initiate in 6 months; ongoing |
| 8. Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas | Medium | 1,2,3 | Wildfire | Spring 2007; ongoing |
| 9. Create a disaster recovery plan | Medium | 2,3 | Multi-Hazard | 2 years |
| 10. Expand the existing water reuse and recycling program | Medium | 2,3 | Severe Weather, Flood, Drought | Initiate in 1 year; ongoing |
| 11. Develop and adopt a sewer lateral inspection program to minimize inflow and infiltration | Medium | 3 | Severe Weather, Flood | Adopt and begin July 1, 2007 |
| 12. Evaluate the need for improved redundancy at critical facilities | Medium | 2,3 | Multi-Hazard | 2 years |
| 13. Develop and adopt a tiered rate structure to encourage responsible water use | Low | 2,4 | Drought | Initiate Spring 2007 |
| 14. Hire coordinator to develop and implement a public outreach and water conservation program | Low | 2,4 | Drought | Review for next fiscal year, 07/2007 |
| 15. Apply for National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities | Low | 3 | Severe Weather, Flood | 2 years |
| 16. Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan | Low | 2,3 | Drought | Initiate in 2 years |
| 17. Develop mutual aid agreements with other water providers and county agencies for support during emergencies | Low | 2,3,4 | Multi-Hazard | 2years |

Source: HMPC and AMEC, 2006



Mitigation Action #1: Provide flood protection for Jenny Lind water treatment plant and La Contenta main sewage lift station

Issue/Background: The April 2006 flood event, which resulted in a federal disaster declaration covering 17 counties in California, dumped several inches of rain during a six-hour period and caused the Calaveras River and Cosgrove Creek to overflow their banks threatening CCWD facilities at the Jenny Lind water treatment plant and the La Contenta main sewage lift station. The water plant delivers water to 10,000 people and provides fire flow to these residents, as well as to a thriving commercial area. The La Contenta lift station conveys several hundred thousand gallons a day of raw sewage. Overflowing sewage would threaten downstream residents and water users and the Jenny Lind water treatment plant. Besides being a threat to public health, huge fines would be assessed for overflowing sewage due to the recent state regulation regarding sewer overflows.

To better assess the flood risk at Jenny Lind, the CCWD has recently conducted field surveying and flood modeling to calculate flood elevation levels resulting from various flood events. A benefit-cost analysis is currently being conducted to evaluate potential mitigation measures, such as elevating certain facilities, constructing a flood wall, or constructing some type of flood-proof housing for critical facilities. The results of this analysis are expected in October 2006.

Other Alternatives: To be determined by current modeling and cost-benefit studies

Responsible Office: CCWD Engineering/Field Operations

Priority (H, M, L): High

Cost Estimate: To be determined by current benefit-cost study

Benefits (Losses Avoided):

- Reliable water delivery for domestic consumption and fire flow
- Reduce risk of property loss
- Protect safety of downstream water users from sewage overflow
- Avoid fines due to sewer overflow

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

Schedule: As soon as possible - within two years



Mitigation Action #2: Replace redwood water storage tanks with steel tanks

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.

Other Alternatives: No action

Responsible Office: CCWD Engineering

Priority (H, M, L): High

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

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

Schedule: Replace all 11 tanks within next seven years



Mitigation Action #3: Work with Calaveras County on County General Plan update to integrate natural hazards mitigation measures in new development planning

Issue/Background: Calaveras County is beginning the process to update their General Plan (last version completed in 1996). The CCWD has already initiated contact with the County Administrative Office regarding participation in the Water Element of the new General Plan. The District's 1946 charter establishes the boundaries of the entire County to be the CCWD's responsibility. Therefore, the CCWD's participation and leadership in updating the General Plan is appropriate. The CCWD has identified several issues with existing infrastructure placement that can be improved with appropriate planning for future development. Several examples include avoiding floodplain areas and installing underground infrastructure to avoid potential damage from landslides and/or wildfires.

Other Alternatives: No Action

Responsible Office: CCWD Administrative Department

Priority (H, M, L): High

Cost Estimate: The cost is unknown but will be based upon the amount of CCWD staff time necessary to attend meetings, review plan elements, and communicate recommendations in the County's planning process.

Benefits (Losses Avoided): Cost-effective planning with the County will result in the development of more efficient, pragmatic, long-term mitigation solutions.

Potential Funding: General CCWD budget

Schedule: Update will be an ongoing process through at least 2010



Mitigation Action #4: Promote best management practices, such as low impact development techniques, in new development to reduce runoff and urban flooding

Issue/Background: CCWD infrastructure is at risk to flooding. The areas of flooding (i.e., Cosgrove Creek) have experienced heavier flows during rain events due to new construction near the creek's channel. In all areas of the county where development is occurring, the increased runoff results in more frequent and extensive urban flooding due to the reduced ability of the surrounding terrain to buffer and absorb rainfall. The implementation of best management practices and other requirements for reducing runoff in the development planning phase prior to construction will be significantly more cost-effective than regularly repairing and expanding facilities to accommodate larger and more frequent flooding.

Other Alternatives: No action

Responsible Office: CCWD Administrative and Engineering Departments

Priority (H, M, L): High

Cost Estimate: The cost is unknown but will be based upon the amount of CCWD staff time necessary to attend meetings, review documents, and communicate recommendations to the County.

Benefits (Losses Avoided):

- Reduce incidence of urban flooding
- Reduce risk of damage to CCWD infrastructure

Potential Funding: General CCWD budget

Schedule: Initiate within in six months; then participate on an ongoing basis in the Calaveras County General Plan update process



Mitigation Action #5: Implement recommendations in service area master plans related to critical sewer facilities

Issue/Background: The CCWD owns and operates 45 sewer lift stations in their 12 wastewater systems. Many lift stations are located near water bodies used for recreational activities including full-body contact. One example is Lake Tulloch, where the CCWD has 30 lift stations within a few feet from the lake. These stations can convey up to 100,000 gallons of raw sewage each day. Heavy rainfall and flooding create inflow/infiltration in the collection system exacerbating the quantity of sewage these stations must pump. It is imperative that the public be protected from overflows from these lift stations. A recent state regulation requires collection system operators to reduce overflows and spills from their systems or face mandatory monetary penalties.

Six of the largest sewer systems have been recently master planned. Computer modeling of collection systems was conducted to determine adequacy for current and future flows. Many were found to be deficient and recommendations were made for the improvements needed to bring them up to capacity.

Other Alternatives: No action

Responsible Office: CCWD Engineering Department

Priority (H, M, L): High

Cost Estimate: \$7.9 million

Benefits (Losses Avoided):

- Protect public safety and the environment and access to recreational activities in rivers and lakes
- Avoid mandatory fines due to overflows and spills
- Reduce revenue losses due to closures of recreational areas (not CCWD revenue)

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- U.S. EPA
- USDA Rural Utility Service
- California State Water Resources Control Board Small Community Wastewater Grant
- State revolving fund grants and/or loans

Schedule: Project initiated, completion within 10 years



Mitigation Action #6: Implement pipeline improvements identified in water master plans to provide adequate fire flows

Issue/Background: The CCWD owns and operates five potable water systems in the county. Recently, master plans have been prepared for the four largest systems: Copper Cove, Ebbetts Pass, Jenny Lind, and West Point. In each system, the computer models identified zones of inadequate fire flow in the distribution systems. Most of the systems were installed when 500 gallons per minute (gpm) was considered adequate flow. By today's standards that flow is inadequate; today's fire experts recommend at least 1,000 gpm fire flow.

Particularly in the West Point system, but also to smaller degrees in the other three systems, it was found that the system does not even deliver the CCWD's own standard of 500 gpm. This lack of fire flow is a threat to the safety of the West Point residents and is also curbing the development of the business section of downtown West Point. County planners will not approve the construction of buildings, residential or commercial, in areas of inadequate fire flows.

Other Alternatives: No action

Responsible Office: CCWD Engineering Department

Priority (H, M, L): High

Cost Estimate: \$2.6 million

Benefits (Losses Avoided):

- Ensure adequate fire flow for the protection of lives and property from fire
- Provide for community development
- Protect public health and safety

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- Department of Housing and Urban Development Community Development Block Grant Program (Eminent Threat in West Point)
- USDA Rural Utility Service
- State revolving fund grants and/or loans

Schedule: Project initiated, completion within 10 years



Mitigation Action #7: Coordinate with the County as the new Reverse 9-11 program is put into operation

Issue/Background: The CCWD has the ability to identify areas impacted by problems with our water or sewer systems. The customer utility billing database can be queried to provide a subset of customers who are likely to experience an interruption in service. Calaveras County has implemented a “Reverse 9-11” automated calling system specifically for emergency communications with the public. The CCWD could get information out more quickly using the County’s automated dialing system.

Other Alternatives: Use existing CCWD two-line automated voice calling unit

Responsible Office: CCWD Administrative Department

Priority (H, M, L): High

Cost Estimate: The cost is minimal and mainly will involve staff time to communicate district data with the County.

Benefits (Losses Avoided): Faster notification to the public in the event of an emergency

Potential Funding: General CCWD budget

Schedule: Initiate in the next six months; then ongoing



Mitigation Action #8: Create and maintain wildfire defensible spaces around facilities identified as in high fire hazard areas

Issue/Background: The risk assessment indicates that much of Calaveras County is at high to very high wildfire risk due to vegetative fuels, topography, and weather. Damaging fires are likely to occur each year. The risk assessment also showed many of CCWD's facilities to be in high fire hazard areas; the operations of these facilities are critical lifeline utilities for the public and critical for fire protection. Maintaining the recommended 100-foot defensible face around facilities will reduce potential for losses during a fire. CDF fire crews or California Conservation Corps crews may be available to complete work.

Other Alternatives:

Responsible Office: CCWD Operations and Administrative Departments

Priority (H, M, L): Medium

Cost Estimate: Staff time to coordinate with CDF and costs of temporary hires

Benefits (Losses Avoided):

- Reduce risk of damage or destruction to facilities due to wildfire
- Reduce risk of loss of services to customers and for 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. Forest Service Wildland-Urban Interface grants
- California State Fire Safe Council or local Fire Safe Council
- State revolving fund grants and/or loans

Schedule: Initiate in spring 2007 and maintain annually



Mitigation Action #9: Create a disaster recovery plan

Issue/Background: The CCWD does not have a disaster recovery plan for the 5 water and 12 sewer facilities it owns and operates. These facilities deliver drinking water and provide fire flow to 100 to 13,000 people, depending on the system, and treat the wastes from 50 to 4,000 people, depending on the system. There is not a written plan to bring these facilities back into operation after a forced shut-down due to natural or man-made causes. Bringing these systems back on line as quickly as possible protects public health and safety and is essential for the county's disaster recovery in the short and long term. By creating a pre-disaster plan for post-disaster recovery, the CCWD can think through critical decisions now instead of being forced to make quick decisions in the high-pressure, political environment during and following an emergency.

Other Alternatives: Use information in existing plans

Responsible Office: CCWD Field Operations

Priority (H, M, L): Medium

Cost Estimate: The cost of creating a recovery plan will mainly be staff time

Benefits (Losses Avoided):

- Improve timeliness of restoring services following an emergency, which will allow for faster community recovery
- Protect public health and safety

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA

Schedule: Complete plan within two years



Mitigation Action #10: Expand the existing water reuse and recycling program

Issue/Background: Reducing the amount of inflows to the sewer system helps reduce the potential for overflows. The CCWD successfully worked with several local developers to use their golf courses for irrigation with reclaimed water. However, “purple pipe/reclaimed water” disposal methods have never been implemented. Several of the sewer storage ponds are at risk of flooding every year. Implementing a “purple pipe” program could expand the CCWD’s ability to discharge reclaimed water and reduce the amount of storage needed. In addition, reusing water decreases surface water demand and the district’s vulnerability to drought.

Other Alternatives: Continue to work solely with developers to create disposal systems in their developments, such as golf courses

Responsible Office: CCWD Administrative and Engineering Departments

Priority (H, M, L): Medium

Cost Estimate: Costs for staff time. General installation costs for trunk line “purple-pipe” run up to \$100 for a linear foot.

Benefits (Losses Avoided):

- Reduce potential for spillage in severe weather events
- Reduce vulnerability to drought through water recycling

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- U.S. EPA
- State revolving fund grants and/or loans

Schedule: Initiate planning within one year; ongoing



Mitigation Action #11: Develop and adopt a sewer lateral inspection program to minimize inflow and infiltration

Issue/Background: The CCWD experiences high inflow and infiltration into the sewer systems at many facilities. This leads to extra costs to treat, store, and dispose of extra water. The problem is exacerbated by heavy rainfall and flooding. Recent studies indicate that more than half the inflow and infiltration received in a typical sewer collection system comes from house lateral connections. The CCWD is pursuing action to mitigate this source for inflow and infiltration by adopting a policy that requires mandatory periodic testing of house laterals.

Other Alternatives: Continue to build storage and disposal capacity

Responsible Office: CCWD Field Operations

Priority (H, M, L): Medium

Cost Estimate: Inspection and repair costs are expected to be borne by customers. This may be a possible hardship for low-income residents.

Benefits (Losses Avoided):

- Significant potential savings in avoiding land purchases and construction of facilities for storage and disposal. These costs average about \$16,000/acre-foot to install, so reducing inflow and infiltration saves that amount in capital costs. There are additional savings in the operation and maintenance of storage and disposal facilities.
- Avoid mandatory fines due to overflows and spills
- Protect public health and safety

Potential Funding: District revenue from rates

Schedule: Adopt policy and begin implementation by July 1, 2007



Mitigation Action #12: Evaluate the need for improved redundancy at critical facilities

Issue/Background: The CCWD owns and operates 5 water and 12 sewer facilities that deliver drinking water and provide fire flow to 100 to 13,000 people and treat wastewater of 50 to 4,000 people, depending on the system. Redundancy of critical processes at these facilities can avoid outages and loss of services during emergencies. The extent of redundancy and need for improvements are currently unknown.

Other Alternatives: In a few systems water delivery can be provided through interties, but this is limited. No alternate sewer conveyance/treatments are available for any system.

Responsible Office: CCWD Field Operations

Priority (H, M, L): Medium

Cost Estimate: The cost of creating plans will be low. The capital costs related to redundancy is unknown until study is done.

Benefits (Losses Avoided):

- Improve reliability of water delivery and sewer conveyance facilities
- Protect public health and safety

Potential Funding: District revenue from rates, fees, property taxes, interest on investments

Schedule: Complete study within two years



Mitigation Action #13: Develop and adopt a tiered rate structure to encourage responsible water use

Issue/Background: Currently, the CCWD does not use a tiered water rate structure. There are a number of CCWD's residential customers who have extensively landscaped their homes, often creating "mini-ranches" which require significant amounts of water for livestock and orchards. The residential connection is designed for the average single family home. Customers who use significantly more than the average amount of water to care for extensive landscaping create the need for additional infrastructure to meet demand and fire protection standards, and increase the area's vulnerability to drought.

Other Alternatives: Continue to allow all consumption to be billed at a standard rate.

Responsible Office: CCWD Administrative Department

Priority (H, M, L): Low

Cost Estimate: Staff time needed to implement program and changes in billing. The billing program is already setup to handle tiered rates.

Benefits (Losses Avoided):

- Reduce the amount of peak water usage
- Reduce CCWD revenue losses and extra costs during times of drought or other water shortage or distribution problems
- Provide incentives for conservation and responsible water use

Potential Funding: CCWD general budget

Schedule: Discuss during next rate review scheduled for spring 2007



Mitigation Action #14: Hire coordinator to develop and implement a public outreach and water conservation program

Issue/Background: The risk assessment identified the importance of public education in the case of voluntary and mandatory water restrictions due to drought or other emergencies. In the past, the CCWD has used newsletters, a school poster contest, and school classroom training on responsible water use as means of public education. It also has provided high efficiency water kits to homeowners. These kits included low-flow shower heads and materials encouraging wise water usage. Currently, the district participates in a multi-agency education program for school children. It does not have a staff member responsible for public outreach or education programs, such as the newsletter or the kit program.

Other Alternatives: Maintain the current education program only

Responsible Office: CCWD Administrative Department

Priority (H, M, L): Low

Cost Estimate: Salary for the coordinator. The kits cost approximately \$30,000 for 1,000 kits. Additional costs related to a newsletter or printed materials.

Benefits:

- Improve public relations in case of drought or other water shortage emergency
- Improve responsible water use

Potential Funding: CCWD general budget; district revenue from rates

Schedule: Review for the next fiscal year starting July 2007



Mitigation Action #15: Apply for National Pollutant Discharge Elimination System (NPDES) permits for wastewater facilities

Issue/Background: There are two ways to dispose of treated wastewater effluent – disposal to land (waste discharge requirements (WDR) permit) or discharge to creeks or rivers (NPDES permit). The permits are obtained from the Regional Water Quality Control Board, but each permit type has differing requirements. Until recently, the CCWD was not allowed to apply for a water discharge NPDES permit and, thus, was restricted to finding land for storage and disposal under the land application WDR permit. However, costs of land and construction of facilities have skyrocketed in recent years, making land application very costly for small customer-based agencies such as CCWD.

Heavy rainfall and flooding causes high inflow/infiltration, thus exacerbating the amount of sewage to treat, store, and dispose of. The CCWD is applying for water discharge NPDES permits when current storage or disposal capacities are reached, to reduce vulnerability during heavy precipitation events and to reduce costs to the CCWD and ratepayers.

Other Alternatives: Continue to purchase land and build facilities for storage and disposal

Responsible Office: CCWD Field Operations

Priority (H, M, L): Low

Cost Estimate: Staff time to prepare and coordinate applications. Costs average \$16,000 per acre-foot to construct storage and disposal facilities

Benefits (Losses Avoided):

- Reduce sewer overflows or spills
- Avoid mandatory fines due to overflows and spills
- Protect public health and safety and the environment
- Significant potential savings in avoiding land purchases and construction of facilities for storage and disposal.

Potential Funding: CCWD general budget; district revenue from rates, fees, property taxes, interest on investments

Schedule: One permit has been applied for and a second one is being prepared. Complete application for remaining facilities within two years.



Mitigation Action #16: Identify and incorporate strategies for increasing water storage capacity to mitigate impacts of drought and other emergencies in an updated CCWD County Water Master Plan

Issue/Background: The CCWD County Water Master Plan is 10 years old. There are a number of strategies recommended in this plan. Some are related to communications between local agencies, whereas others focus on policy issues and feasibility studies. An updated comprehensive analysis is needed to address changing conditions and ensure a high reliability water supply for the future. The updated plan will review the status of accomplished feasibility studies, assess new priorities, include measures to maintain and enhance interagency communications, and incorporate strategies to increase the district's and community's disaster resistance.

Other Alternatives: No action

Responsible Office: CCWD Administrative Department

Priority (H, M, L): Low

Cost Estimate: \$50,000 to \$100,000

Benefits (Losses Avoided):

- Reduce vulnerability to drought
- Ensure future water supply needs

Potential Funding: Potential funding in next fiscal year's budget starting in July, 2007

Schedule: Initiate within two years



Mitigation Action #17: Develop mutual aid agreements with other water providers and county agencies for support during emergencies

Issue/Background: There may be times during an emergency or disaster when CCWD resources are overwhelmed—in terms of staff and equipment. While the CCWD is an active participant in the countywide Multi-Agency Coordinating Committee (MAC) and receives support from them, no formal mutual aid agreements exist with other county or regional water/sewer service providers. Quick response to emergencies and restoration of services is vital to protect public health and allow for community disaster recovery. This action seeks to develop mutual aid agreements with the Tuolumne Utilities District and Amador Water Agency, neighboring countywide agencies, and with WARN, the statewide emergency response network.

Other Alternatives: Continue to respond with existing staff and equipment

Responsible Office: CCWD Field Operations

Priority (H, M, L): Low

Cost Estimate: Staff time

Benefits (Losses Avoided):

- Improve timeliness of restoring services following emergencies, which will allow communities and businesses to recover more quickly
- Protect public health and safety

Potential Funding: General district budget

Schedule: Completed within two years



Multi-Hazard Mitigation Plan

6.0 Plan Adoption

44 CFR requirement 201.6(c)(5): The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan.



The purpose of formally adopting this plan is to secure buy-in from governing officials, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes **Step 9 Formal Plan Adoption** of the 10-step planning process. The Calaveras County Water District Board of Directors will adopt the Multi-Hazard Mitigation Plan by passing a resolution upon approval of the plan by FEMA. A copy of the generic resolution is included in Appendix B.



Multi-Hazard Mitigation Plan

7.0 Implementation and Maintenance

44 CFR 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 are critical to the plan's overall success. This section describes **Step 10: Implement, Evaluate, and Revise** of the 10-step planning process.

Implementation

Upon adoption, the plan faces the truest test of its worth, implementation, which implies two concepts: action and priority. While this plan makes many worthwhile and high priority recommendations, the decision about which action to undertake first will be the first task facing the HMPC. Two factors will help in decision-making. First, during the planning process, the HMPC identified high priority actions. Second, funding availability will affect decisions. Low or no cost, high-priority recommendations have the greatest chance of successful implementation.

Another highly-effective and low cost implementation mechanism is to incorporate the mitigation plan recommendations into other community plans and mechanisms, such as comprehensive planning, capital improvement budgeting, economic development goals and incentives, or other regional plans (e.g., those put forth by CDF). Mitigation is most successful when it is incorporated in the day-to-day functions and priorities of government and development planning. This integration can be accomplished through networking and identifying multi-objective, win-win benefits to each program and constituent and through the routine actions of monitoring agendas, attending meetings, sending memos, and promoting safe, sustainable communities.

Simultaneous to these efforts, potential funding opportunities to implement some of the more costly recommendations should be constantly monitored. This will include creating and maintaining a bank of ideas on how local match or participation requirements can be met. When funding does become available, the HMPC will be in a position to capitalize on the opportunity. Funding opportunities to be monitored may include special pre- and post-disaster funds, special district budgeted funds, state or federal earmarked funds, and grant programs, including those that can serve or support multi-objective applications. Additional mitigation strategies include consistent and ongoing enforcement of existing rules and regulations and vigilant review of countywide programs for opportunities for better coordination and to meet multiple objectives.



Hazard Mitigation Coordinating Committee

With adoption of this plan, the HMPC will be tasked with plan implementation and maintenance as the ongoing Hazard Mitigation Coordinating Committee led by the CCWD. The committee 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 or no cost recommended actions
- Keep the concept of mitigation in the forefront of district decision-making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability
- Maintain vigilant monitoring of multi-objective, cost-share opportunities to assist the community in implementing the plan's recommended actions
- Meet annually to monitor the implementation and updating of the plan
- Report on plan progress and recommended changes to the Board of Directors
- Inform and solicit input from the public

The committee is an advisory body and will not have any powers over CCWD or County staff. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities for the CCWD. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the CCWD website.

Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate the plan's implementation and make updates as progress, roadblocks, or changing circumstances are recognized. To track progress and update the Mitigation Strategy, the Hazard Mitigation Coordinating Committee will revisit the CCWD Multi-Hazard Mitigation Plan annually and after a hazard event. The CCWD General Manager is responsible for initiating this review. A five-year written update will be submitted to the state and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame.

Progress evaluation should be achieved by monitoring changes to the vulnerabilities identified in the plan, including reduced vulnerability as a result of implementing recommended actions and increased vulnerability as a result of failed or ineffective mitigation action or of new development (and/or annexation). Updates to this plan will document and incorporate the following:

- Success stories where mitigation efforts have proven effective
- Areas where mitigation actions were not effective
- Any new hazards that may arise or were previously overlooked
- New data or studies on hazards and risks



- New capabilities or changes in capabilities (i.e., planning and zoning)
- Growth and development-related changes to the CCWD's facilities and assets
- New project recommendations or changes in project prioritization

The plan should be changed to reflect projects that have failed or are not considered feasible after a review of consistency with established criteria, timeframe, community priorities, and funding resources. Priorities that were not ranked high but identified as potential mitigation strategies should be reviewed during the monitoring and update of the plan to determine feasibility of future implementation. Updating of the plan will be made through written changes and submissions as the coordinating committee deems appropriate and necessary, and as approved by the CCWD Board of Directors. In keeping with the process of adopting the plan, a public hearing to receive public comment on plan maintenance and updating should be held during the annual review period and the final product adopted by the Board of Directors.

Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii):[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

The overall mitigation strategy presented in Section 5 recommends using existing plans and/or programs to implement hazard mitigation, where possible. Based on the capability assessment described previously, the CCWD has and continues to implement programs to reduce losses to life and property from natural hazards. This plan builds upon the momentum developed through previous and related planning and mitigation and recommends implementing projects through the following plans, where possible:

- CCWD Water Supply Master Plan
- CCWD Integrated Water Master Plan (currently being updated)
- CCWD Service Area Master Plans
- CCWD Service Area Vulnerability Assessments and Emergency Response Plans
- Calaveras County General Plan (currently being updated) and Zoning Code
- Other capital improvement and community plans within the county
- Calaveras County Multi-Hazard Functional Plan
- Calaveras County Multi-Hazard Mitigation Plan (when completed)
- Local Fire Safe Plans and Community Wildfire Protection Plans
- Other plans and policies outlined in the capability assessment section of this plan



Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. A public hearing(s) to receive public comment on plan maintenance and updating should be held during the annual review and five-year update periods. When the HMPC reconvenes for the update they will coordinate with all stakeholders participating in the planning process—or that have joined the committee since inception of the planning process—to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available web postings and press releases to the local media outlets, primarily newspapers.



Multi-Hazard Mitigation Plan

Appendix A

References

Calaveras County General Plan. 1996.

Calaveras County Water District County Water Supply Master Plan. 1996

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http://go2.cla.sc.edu/sheldus/db_registration.

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Multi-Hazard Mitigation Plan

Appendix B

District Adoption

Note to reviewers: When this plan has been reviewed and approved pending adoption by FEMA Region IX, the adoption resolutions will be scanned and put on the document CD which will contain the adoptions, as Appendix B. A model resolution is provided below:

Resolution # _____

Adopting the Calaveras County Water District, California

Multi-Hazard Mitigation Plan

Whereas, the Calaveras County Water District 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, the Calaveras County Water District 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 "Calaveras County Water District Multi-Hazard Mitigation Plan" () and approved it () contingent upon this official adoption of the participating governing body;

Now, therefore, be it resolved, that the Calaveras County Water District Board of Directors adopts the "Calaveras County Water District Multi-Hazard Mitigation Plan" as an official plan; and

Be it further resolved, Calaveras County Water District will submit this Adoption Resolution to the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials to enable the Plan's final approval.

Passed: _____ (date)

Certifying Official



Multi-Hazard Mitigation Plan

Appendix C

Hazard Mitigation Planning Committee and Public Involvement

The following three items are included in Appendix C:

1. Hazard Mitigation Planning Committee participants,
2. Letter from the Calaveras County Water District inviting participation in the Hazard Mitigation Planning Committee, and
3. Announcement of a public meeting for the multi-hazard mitigation plan from the local newspaper.

Hazard Mitigation Planning Committee

Edwin Pattison, Calaveras County Water District, Chair

David Andres, Calaveras County Water District

Fred Burnett, Calaveras County Water District

John Gomes, Calaveras County Water District

Ed Rich, Calaveras County Water District Board of Directors

Bob Dean, Calaveras County Water District Board of Directors

Jeff Davidson, Calaveras County Water District Board of Directors

Mike Miller, Calaveras County Administrative Office

Tom Mitchell, Calaveras County Administrative Office

Brian Moss, Calaveras County Environmental Health Department

Dave Pastizzo, Calaveras County Technology Services Department

Clay Hawkins, Calaveras County Sheriff's Office/Office of Emergency Services

Carole Mutzner, American Red Cross

Andy McMurry, California Department of Forestry and Fire Protection

Margo Erickson, U.S. Department of Agriculture Forest Service

Brian Anderson, U.S. Army Corps of Engineers



Calaveras County Water District
423 East St Charles Street
PO Box 846
San Andreas, CA 95249
(209) 754-3543
www.ccwd.org

RE: Multi-Hazard Mitigation Plan – Hazard Mitigation Planning Committee

Dear Interested Parties:

The Disaster Mitigation Act of 2000 requires all local governments and districts to have an approved Multi-Hazard Mitigation Plan in place to maintain their eligibility for FEMA Pre-Disaster Mitigation and Hazard Mitigation Grant Programs.

AMEC Earth & Environmental is assisting the Calaveras County Water District in the preparation of a Multi-Hazard Mitigation Plan. The purpose of hazard mitigation and this plan is to reduce or eliminate long-term risk to people and property from natural hazards and their effects. The intent is to focus on actions that produce less vulnerable conditions to the district, not on those actions that might be considered emergency planning or emergency services.

Because of your interest in the Calaveras County Water District and/or natural hazards, we are sending you this notice and invite you to participate as a member of the Hazard Mitigation Planning Committee (HMPC). As a member, you will have the opportunity to contribute information about past natural hazard events, the impact these events had on the community, possible impacts of other potential hazards, and reviewing and providing comments on the draft Multi-Hazard Mitigation Plan.

If you have any plans, programs, activities, or ideas that could help us in our efforts to identify the best ways to reduce danger and damage from natural hazards, please contact me or our planning consultant:

Julie Baxter
AMEC Earth & Environmental
355 South Teller Street, Suite 300
Lakewood, CO 80226
(303) 742-5324
julie.baxter@amec.com

Thank you for assisting in the development of an HMP for CCWD's service area. **The first meeting will be Wednesday, September 13 at 1:30 p.m. at CCWD's Board Chambers.** Please plan on attending to learn more about the HMP process. Representatives from local, state, and federal agencies as well as local community members will be in attendance. Please call if you have any questions, comments, or suggestions.

Sincerely,

Edwin Pattison
Calaveras County Water District
(209) 754-3543 x29
edwinp@ccwd.org



CALAVERAS ENTERPRISE
FRIDAY, SEPTEMBER 29, 2006

Notice of Public Meeting

MULTI-HAZARD MITIGATION PLAN
Thursday, October 5, 2006
6:30 p.m.
Calaveras County Water District Board Room
423 East St. Charles Street, San Andreas, CA

The Calaveras County Water District (CCWD) staff and AMEC Consulting will present a Draft Multi-Hazard Mitigation Plan to maintain eligibility for mitigation funding from the Federal Emergency Management Agency (FEMA). The public is invited and encouraged to participate to provide input to the Draft document, to be approved by the CCWD Board of Directors, the State of California, and FEMA. The Plan identifies natural hazards that pose a threat to the water district facilities and evaluates the current abilities of the District to reduce the impacts of future disasters.

Hazard mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Natural hazard mitigation planning is the process in which natural hazards that threaten a community are identified, their likely impacts are assessed, mitigation goals are set, and appropriate strategies for reducing risk are developed, prioritized, and implemented. The Draft Plan will be available for review at the meeting, CCWD's web page (www.ccwd.org), and at the County Library in San Andreas.

Comments on the Draft Multi-Hazard Mitigation Plan are due to CCWD by 4 p.m., Tuesday, October 10, 2006. Comments will be accepted by mail, fax or email. For questions or comments, contact Ed Pattison, CCWD's HMP Project Manager, at (209) 754-3543 Ext. 29 / Fax (209) 754-9620, E-Mail: edwip@ccwd.org.

Calaveras County Water District
423 E. St. Charles Street
PO Box 846
San Andreas, CA 95248

Published: September 29, 2006CE



Multi-Hazard Mitigation Plan

Appendix D

Letter from West Point Fire Protection District

To: Ed Pattison, Calaveras County Water District

From: Captain Bill Fullerton/Fire Chief Jim Carroll, West Point Fire Protection District

Regarding: West Point/Bummerville/Wilseyville Water Distribution System Code Deficiencies

Date: October 12, 2006

Dear Mr. Pattison,

The West Point/Bummerville/Wilseyville communities are in a severe wildland urban interface dilemma. Because of topography, fuel loading from decreased logging and severe weather patterns these communities are in extreme danger of catastrophic fires. Based on independent fire flow testing performed by our agency we have found serious deficiencies in the water deliver system.

During these tests of 85 total hydrants within our fire district only five hydrants tested out over 1000 gpm. Per the California Fire Code, Division III fire protection flows, and sizes of existing structures within the study area, major deficiencies in residual pressure were found for both commercial and residential structures. During our last Insurance Services Rating on October 2005, the Insurance Services Office Representative plainly stated that the West Point Fire Protection District would never reduce its ISO rating unless desperately need changes were made to the water delivery system.

Changes that were suggested as a result of our studies should include, larger diameter pipe sizes and enhanced pumping stations in strategic locations to bring the fire flow standards to satisfactory levels, thus providing a greater fire protection possibility to the citizens of these communities. By improving these standards we can also have a noticeable financial impact in these citizens by reducing fire insurance rates and being able to provide fire insurance to those residences declined coverage because of the lack of water to fight fires on their properties. The other major financial impact is the impact to prospective businesses moving into the area because of the lack of costs associated with fire insurance services.

The West Point Fire Protection District recommends that CCWD do everything in your power to address these problems as soon as possible. If there are any questions or concerns feel free to contact either myself or Chief Jim Carroll at (209) 293-7000.

Fire Captain/Bill Fullerton

Fire Chief/Jim Carrol