Lassen County
City of Susanville
Susanville Indian Rancheria
Hazard Mitigation Plan

Prepared By:

RMP
Risk Management Professionals, Inc.

27405 Puerta Real, Suite 220 ♦ Mission Viejo, California 92691 ♦ 949/282-0123 ♦ www.RMPCorp.com

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ES.1 Plan Requirements and Objectives

Lassen County, the City of Susanville, and the Susanville Indian Rancheria are required to have a FEMA-approved Hazard Mitigation Plan to be eligible for certain disaster assistance and mitigation funding. This document fulfills FEMA requirements and provides direction and guidance on implementing hazard mitigation action items on a hazard-level, probability, and cost-priority basis. The overall goal of the Hazard Mitigation Plan is to reduce the potential for damage to critical assets from natural hazards. In addition, the plan describes past and current hazard mitigation activities and philosophies, and outlines future mitigation goals and strategies.

Background Information

In 2000, the Congress of the United States determined that disasters and more importantly, lack of preparedness for disasters, were significant causes of loss of life, human suffering, loss of income, and property loss and damage; and because disasters often disrupt the normal functioning of governments and communities and adversely affect individuals and families with great severity, special measures designed to assist the efforts of the affected States in expediting the rendering of aid, assistance, and emergency services, and the reconstruction and rehabilitation of devastated areas, were necessary. As a result, Congress passed Public Law 106-390 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act and provide for assistance by the Federal government to State and local governments in carrying out their responsibilities to alleviate the suffering/damage which result from such disasters by:

a. revising and broadening the scope of existing disaster relief programs;
b. encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the States and by local governments;
c. achieving greater coordination and responsiveness of disaster preparedness and relief programs;
d. encouraging individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance;
e. encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and
f. providing Federal assistance programs for both public and private losses sustained in disasters.

As part of the requirements for receiving Federal Grants for improving a locality's resistance to disasters, each locality must determine their existing vulnerabilities and develop a plan to reduce or eliminate these vulnerabilities and must have this plan approved by the appropriate State officials.

The Federal Emergency Management Agency (FEMA) has developed guides, or "How To" guidebooks to assist communities in developing both the vulnerability assessments and plans to reduce or eliminate their vulnerabilities to disasters. These tools, coupled with techniques from the security and safety industries were used to develop the Lassen County, City of Susanville, and Susanville Indian Rancheria Hazard Mitigation Plans.

FEMA Requirements

FEMA requires that the Hazard Mitigation Plan meet certain requirements. First, the plan must be approved by the State Authority no later than November 1, 2004 in order to receive funding for hazard mitigation projects for disasters following that date. Although this date has already lapsed, each participating jurisdiction will be eligible for hazard mitigation project grants upon FEMA approval of this Plan. Second, the planning process must be open and public, and must allow the public to have an opportunity to comment during the drafting stage and prior to plan approval. Third, the process must allow other local jurisdictions to be involved in the planning process. Fourth, the plan must incorporate, if appropriate, existing plans, studies, reports, and technical information.

FEMA expects that each Hazard Mitigation Plan (HMP) have the following information:

1. Documentation of the ***planning process*** used to develop the plan
2. A ***risk assessment*** that provides a factual basis for upgrades and recommendations
3. A ***description of the natural hazards*** that can affect the jurisdiction
4. A ***description of the jurisdiction's vulnerability*** to these natural hazards
5. A ***description of land usage***, and an ***estimate of losses*** should a disaster occur
6. A ***mitigation strategy***
7. A plan ***maintenance process***
8. ***Documentation*** that the plan has been adopted by the jurisdiction's governing body
9. ***Review*** by the State Hazard Mitigation Officer

ES.2 Mitigation Definition

Mitigation is the ongoing effort to prevent or lessen future emergency or disaster incidents, and the impacts they might have on people, property, and the environment. Examples of mitigation activities include the following:

- Legislation, laws and regulations;
- Variances;
- Zoning and land use management;
- Engineering and building codes;
- Hazard mitigation plans & teams;
- Technical guidance & assistance;
- Financial assistance;
- Hazard Identification;
- Risk Analysis;
- Evaluation;
- Research; and
- Education.

Mitigation decreases the demand for emergency response resources, reduces the principal causes of injuries and deaths, enables a quicker lifesaving response and economic recovery because the community infrastructure remains intact, and it reduces the societal impacts of the emergency because it results in less disruption to the social environment. In essence, mitigation is the foundation of sustainable community development.

ES.3 Planning Process Summary

Hazard mitigation planning is a dynamic process built on realistic assessments of past and present information that enables each participating jurisdiction to anticipate future hazards and provide mitigation strategies to address possible impacts and identified needs. The overall approach to the Hazard Mitigation Plan included developing a baseline understanding of the natural hazards, determining ways to reduce those risks, and prioritizing mitigation recommendations for implementation. To complete these objectives, Lassen County, the City of Susanville, and the Susanville Indian Rancheria compiled a qualified team with various expertise, including risk management, public health, water infrastructure and design, and emergency response agencies; to participate on a Steering Committee to guide the development of the comprehensive Lassen County, City of Susanville, and Susanville Indian Rancheria Hazard Mitigation Plan. In addition, the planning team solicited public involvement throughout the planning process, including inviting participation of the Steering Committee and conducting a public meeting to allow the public to comment on the Hazard Mitigation Plan content and format.

ES.4 Hazard Risk Assessment

Lassen County is vulnerable to a wide array of natural hazards that threaten life and property. In order to identify the hazards that Lassen County and neighboring communities perceive as the largest threat, each member of the Steering Committee participated in the hazard prioritization utilizing an interactive spreadsheet, which yielded the following hazard prioritization (based upon hazard profiles describing hazard frequency, vulnerability, and consequence/severity):

LASSEN COUNTY

Hazard Rank	Score
High	
Wildfire	100
Power Failure	100
Wind/Tornado	80
Severe Storm	75
Drought	75
Moderately High	
Flood	48
Reservoir Failure	40
Hazardous Material Release	40
Earthquake	30
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Moderately Low	
Terrorism	12
Low	
Avalanche	4

CITY OF SUSANVILLE

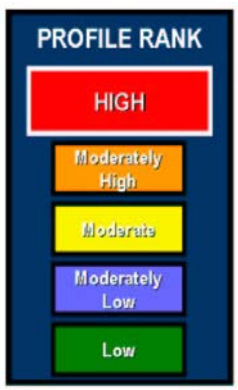
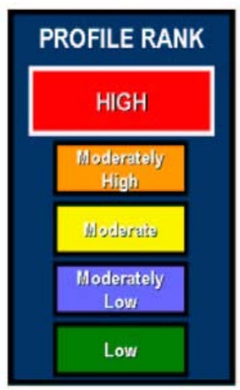
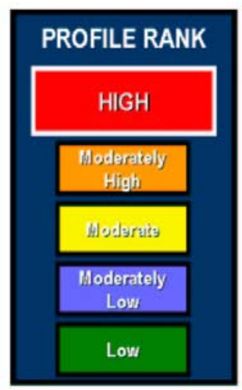
Hazard Rank	Score
High	
Power Failure	100
Severe Storm	75
Wildfire	60
Hazardous Material Release	50
Moderately High	
Flood	36
Wind/Tornado	36
Earthquake	30
Drought	30
Reservoir Failure	25
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Moderately Low	
Terrorism	12

SUSANVILLE INDIAN RANCHERIA

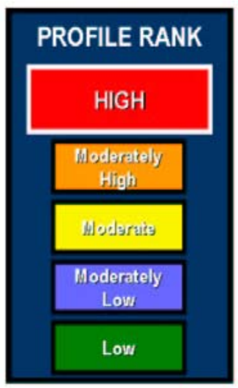
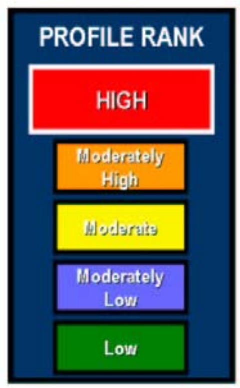
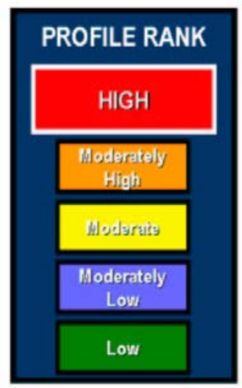
Hazard Rank	Score
High	
Wildfire	100
Power Failure	100
Wind/Tornado	80
Severe Storm	75
Drought	75
Hazardous Material Release	50
Moderately High	
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Earthquake	18
Moderately Low	
Terrorism	12
Low	
Flood	4

Additionally, the following pages detail the hazard profile and ranking characteristics for each hazard:

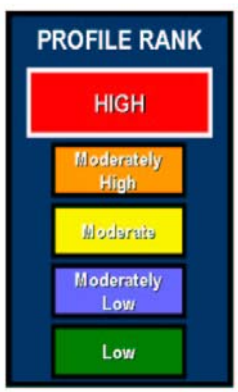
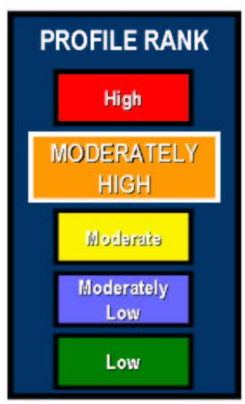
Wildfire Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time	Localized damage area, minor secondary impacts, delayed hazard onset	Widespread damage area, significant secondary impacts, no warning time
Hazard Risk Rank Score:	100	60	100
Profile Rank			

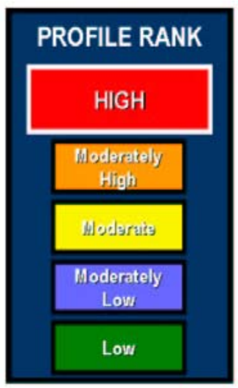
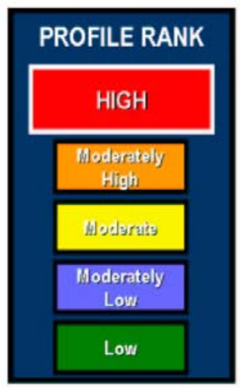
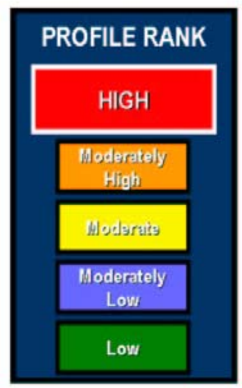
Power Failure Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	100	100	100
Profile Rank			

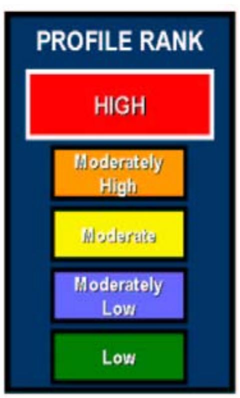
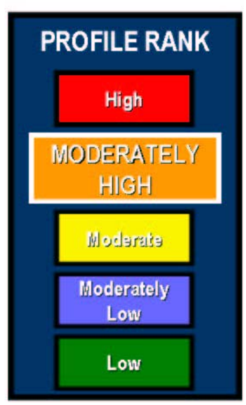
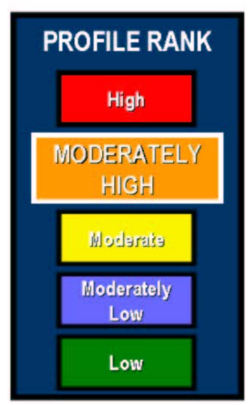
Wind Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time	Localized damage area, minor secondary impacts, delayed hazard onset	Widespread damage area, significant secondary impacts, no warning time
Hazard Risk Rank Score:	80	36	80
Profile Rank			

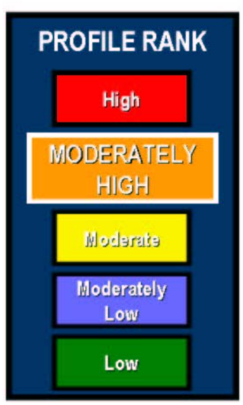
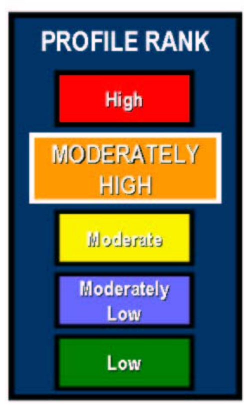
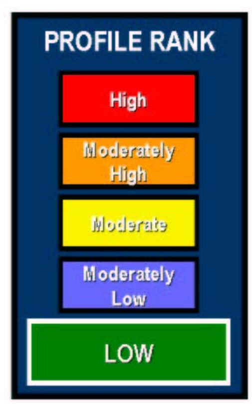
Severe Storm Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	75	75	75
Profile Rank			

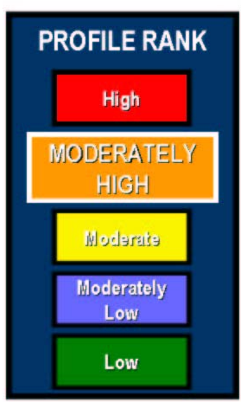
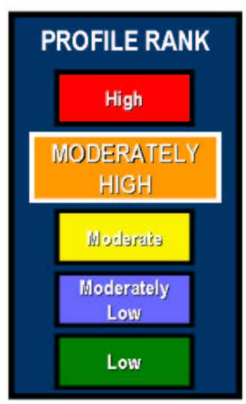
Drought Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), groundwater contamination, radium contamination, loss of life	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury, groundwater contamination, radium contamination, and no disability	
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	75	30	30
Profile Rank			

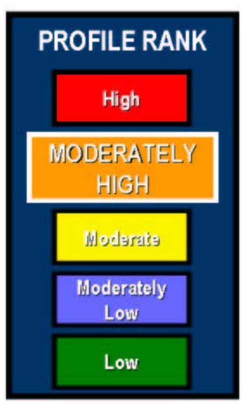
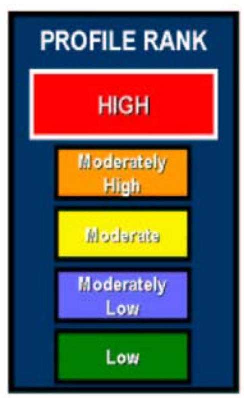
Flood Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		Rare event - occurs less than once every 50 years
Consequence/Severity:	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability		Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time	Localized damage area, minor secondary impacts, delayed hazard onset	Localized damage area
Hazard Risk Rank Score:	48	36	4
Profile Rank			

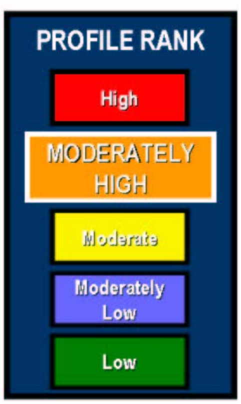
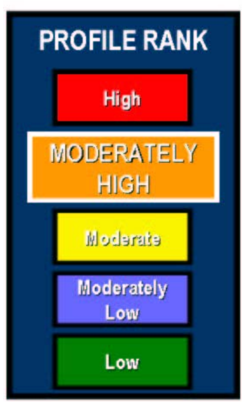
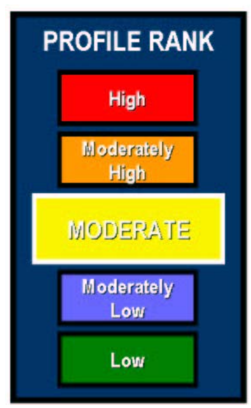
Reservoir Failure Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)	Rare event - occurs less than once every 50 years	Infeasible event - not applicable due to geographic location characteristics
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		N/A
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time		N/A
Hazard Risk Rank Score:	40	25	N/A
Profile Rank	 	 	N/A

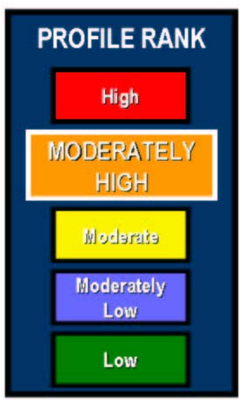
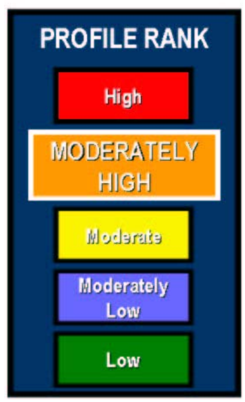
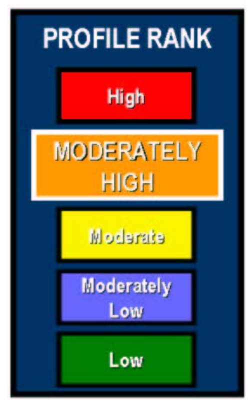
Hazardous Material Release Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time	Widespread damage area, significant secondary impacts, no warning time	
Hazard Risk Rank Score:	40	50	50
Profile Rank			

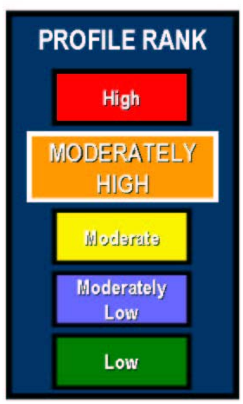
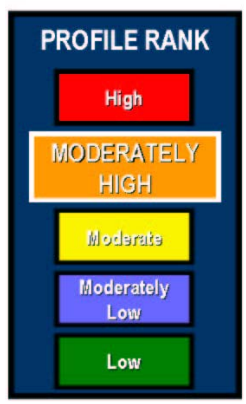
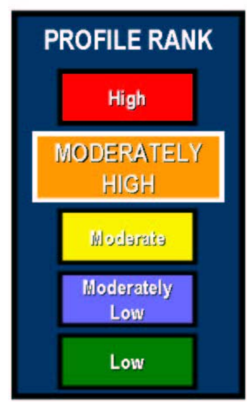
Earthquake Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Extensive building damage, potential widespread loss of lifelines (water, gas, electricity, sanitation, roads), potential loss of life		Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	30	30	18
Profile Rank			

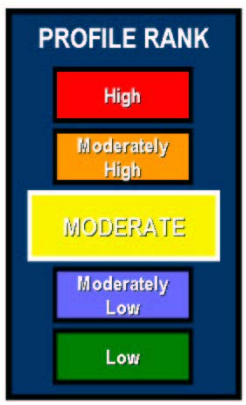
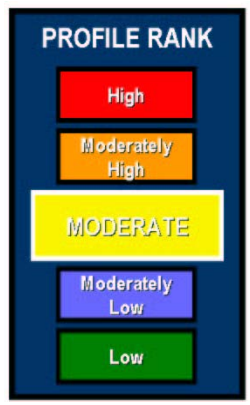
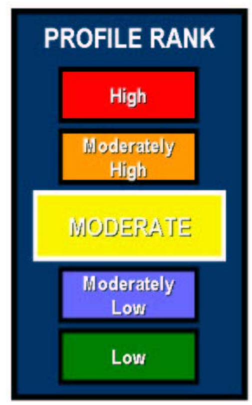
Pandemic Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	25	25	18
Profile Rank			

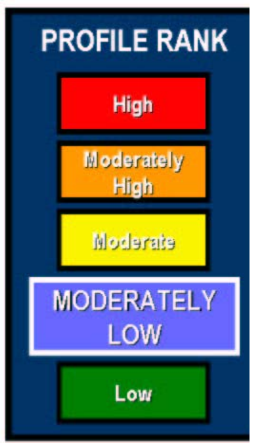
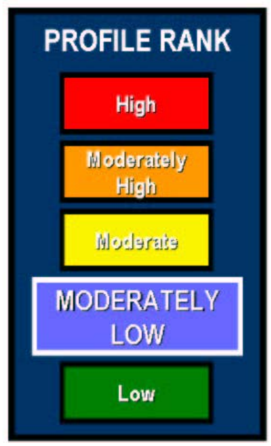
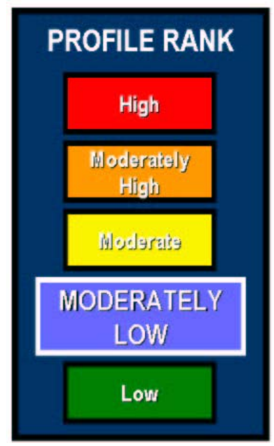
Volcano Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	25	25	25
Profile Rank			

Extreme Heat Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	No damage		
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time		
Hazard Risk Rank Score:	16	16	16
Profile Rank			

Terrorism Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability		
Vulnerability:	Localized damage area		
Hazard Risk Rank Score:	12	12	12
Profile Rank			

Avalanche Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years	Infeasible event - not applicable due to geographic location characteristics	
Consequence/Severity:	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability	N/A	N/A
Vulnerability:	Localized damage area	N/A	N/A
Hazard Risk Rank Score:	4	N/A	N/A
Profile Rank		N/A	N/A

ES.5 Mitigation Strategies and Implementation Plan

A simplified Benefit-Cost Review was applied in order to prioritize the mitigation recommendations for implementation. The priority for implementing mitigation recommendations depends upon the overall cost effectiveness of the recommendation, when taking into account monetary and non-monetary costs and benefits associated with each action. Additionally, the following questions were considered when developing the Benefit-Cost Review:

- How many people will benefit from the action?
- How large an area is impacted?
- How critical are the facilities that benefit from the action?
- Environmentally, does it make sense to do this project for the overall community?

The table on the following pages provides a detailed benefit-cost review for each mitigation recommendation, as well as a relative priority rank (High, Medium, Low).

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #1: Continue the fuels/vegetation management programs to reduce the wildfire hazard throughout County.	High
Mitigation Action #2: Weed abatement is an important factor in both reducing ignitions and the potential for fire to spread. Continue to enforce the weed abatement requirements to mitigate the risk of wildfires in the County.	High
Mitigation Action #3: Continue to identify areas vulnerable to wildfire due to inadequate water supply for firefighting and implement improvements (e.g., expansion of water supply, storage hydrants, etc.).	High
Mitigation Action #4: Implement the County Service Area #2 in Johnstonville project create backbone for fire protection in community, as identified in the Lassen County Feasibility Study.	High
Mitigation Action #5: Implement the Cady Springs Booster Station and Main line protection project, as identified in the City of Susanville Feasibility Study.	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #6: To increase firefighting capabilities, increase the water storage capacity by constructing a 200,000 gallon storage tank.	High
Mitigation Action #7: Implement the spring rehabilitation program via the installation of spring boxes to protect the spring water from contamination (from surface runoff or contact with human and animals) and to provide a point of collection and a place for sedimentation.	Low
Mitigation Action #8: Retrofit the Herlong Gymnasium to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Medium
Mitigation Action #9: Retrofit the school gymnasiums in the City of Susanville (Lassen High School, Diamond View, Meadowview, and McKinley) to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	High
Mitigation Action #10: Retrofit the Veterans Memorial Building to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	High

Mitigation Action Prioritization: Benefit-Cost Review	
Mitigation Project	Priority
Mitigation Action #11: Retrofit the Joaquin Memorial Gymnasium to accommodate emergency shelter (Generator, Emergency Supply and Kitchen expansion). Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Medium
Mitigation Action #12: Identify and designate Domestic Animal evacuation centers.	Medium
Mitigation Action #13: To ensure a continual power supply, install backup generators at essential key facilities (EOC's, Emergency Services Buildings, Shelters, Water Facilities, etc).	High
Mitigation Action #14: Add a redundant fuel system for the (primary and secondary) 911 center backup generator to be both diesel and natural gas.	High
Mitigation Action #15: To improve the consistency of emergency communications and facilitate timely response, implement Firenet/Lawnet Lassen Emergency communication equipment upgrades (backup power, additional repeaters, radios, etc.).	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #16: Purchase snowplows/blowers and Snow CATs to mitigate the hazards associated with severe storm and snow.	Medium
Mitigation Action #17: To facilitate storage for emergency response equipment and resources (e.g., salt, sand, heavy equipment) construct or purchase a dry storage facility.	High
Mitigation Action #18: To mitigate the impacts of severe storms and subsequent flooding, construct levee upgrades to provide lake shore protection along Honey Lake.	Low
Mitigation Action #19: To mitigate the impacts of severe storms and subsequent flooding, implement levee upgrades for waterways throughout the County, including Irrigation Canals.	High
Mitigation Action #20: To mitigate the impacts of severe storms and subsequent flooding, implement upgrades to reservoirs/dams to increase storage capacity.	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #21: To reduce the potential for flooding, develop a levee integrity program that includes inspection and maintenance.	High
Mitigation Action #22: To mitigate repetitive flood losses, implement the Carol Street Project Flood Prevention Project, which includes constructing a retaining wall and rip rap and/or property acquisition of Carol Street houses.	High
Mitigation Action #23: Develop a standardized operational area evacuation plan to streamline emergency response efforts.	High
Mitigation Action #24: Develop and distribute Wildfire public education materials to increase public awareness of wildfire hazards.	Low
Mitigation Action #25: Conduct EOC mock exercises and incident management position training to prepare for emergency response.	High
Mitigation Action #26: Implement City of Susanville Fire Training Center structural upgrades (e.g., installation of propane props, water supply, etc.) to providing training for emergency response, including wildfire and rescue operations.	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #27: Implement a public notification system (e.g., reverse 911) to increase alert the public to potential emergency situations and hazards.	High
Mitigation Action #28: Evaluate flooding areas and implement drainage improvements to reduce the potential for residential flooding.	Low
Mitigation Action #29: Implement water shortage contingency measures during drought periods to conserve water supply.	Low
Mitigation Action #30: Consider developing on-stream or off-stream water storage to store flood water (e.g., detention basin during periods of high flow) to store water for use during drought conditions.	Medium
Mitigation Action #31: Develop additional potable water supplies in communities that currently do not have adequate water supply and storage.	High
Mitigation Action #32: Train First Responders in hazardous materials (HazMat) response field operations and decontamination, including conducting mock exercises.	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Priority
Mitigation Action #33: Develop a commodity flow study to determine flow of hazardous materials through the county.	Low
Mitigation Action #34: Assess and implement flexible piping joints at above ground storage reservoirs, as appropriate. Also, ensure new reservoirs are designed with seismic flexible piping joints.	Medium
Mitigation Action #35: Consider evaluating all pipelines (water, sewer, gas) for seismic event reliability and determining a capital improvements schedule, considering materials of constructing and the age of the pipeline.	High
Mitigation Action #36: Provide training on the Pandemic Response Plan to prepare for pandemic events.	High
Mitigation Action #37: Purchase pandemic equipment and supplies to prepare for pandemic events.	High
Mitigation Action #38: Conduct terrorism training and awareness courses to prepare for terrorism events.	Low

Mitigation Action Prioritization: Benefit-Cost Review	
Mitigation Project	Priority
Mitigation Action #39: Update the Lassen County, City of Susanville, and Susanville Indian Rancheria websites to include natural hazard preparedness information and posting the final Hazard Mitigation Plan for public education.	High

ES.6 Monitoring, Evaluating, and Updating the Plan

The Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the Hazard Mitigation Planning process and adhere to regulatory requirements, the plan will be reviewed annually and any revisions will be incorporated into the five-year update. In addition, public involvement will be requested when applicable.

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1.1 Narrative Description of the Planning Process

§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

§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.

Hazard mitigation planning is a dynamic process built on realistic assessments of past and present information that engages Lassen County, the City of Susanville, and the Susanville Indian Rancheria to anticipate future hazards and provide meaningful strategies to address possible impacts and identified needs. The hazard mitigation planning process involves the following tasks:

- Organizing resources
- Assessing risks
- Developing mitigation strategies, goals, and priorities
- Adopting a plan
- Implementing the plan
- Monitoring progress
- Revising the plan as necessary

The overall approach to the Hazard Mitigation Plan development included developing a baseline understanding of the natural hazards, determining ways to reduce those risks, and prioritizing those recommendations for implementation. The following task descriptions provide a detailed narrative of the overall project progression.

Organize Resources

Identify Stakeholders and Compile Steering Committee

The Ted Friedline, Battalion Chief for the City of Susanville Fire Department, contacted local and public groups to form a Steering Committee and invited/coordinated participation from the appropriate law enforcement, emergency response, health organizations, City and County representatives, and public representatives. Additionally, Joe Bertotti from Lassen County was responsible for distributing the invitation to County stakeholders and Doyle Lowry was responsible for inviting stakeholders from the Susanville Indian Rancheria. The Steering Committee was responsible for providing essential insight into the past natural hazard events, current natural hazard vulnerability (including specific locations), critical assets, and possible mitigation projects. The invitation was sent out via email and posted in the local newspaper to engage public involvement. Documentation of the invitation recipients, as well as the newspaper advertisement, are located in Appendix D – Public Participation.

Public Meeting Documentation

The Disaster Mitigation Act of 2000 requires an "Open and Public Process" for developing the Hazard Mitigation Plan. This process requires, at a minimum, that the public be allowed to comment on the plan during the draft phase and prior to adoption. In addition to soliciting public involvement in the Steering Committee, Lassen County, the City of Susanville, and the Susanville Indian Rancheria conducted a public meeting to allow for the public comment prior to review and approval the final report (after FEMA approval). The public meeting was held on Friday November 13, 2009.

Risk Assessment

Identify Hazards

This task was designed to identify all the natural and man-made hazards that *might* affect each jurisdiction and then narrow the list to the hazards that are most likely to occur. The hazards included natural, technical, and human-caused events, with an emphasis on the effect of natural disasters on the jurisdiction's critical facilities. In order to compile the list, the Project Team researched newspapers, historical records, and internet websites to determine the most prevalent hazards. In addition, the Steering Committee played an integral role in the development of a list of hazards that have affected each jurisdiction in that past, with specific information regarding frequency, magnitude, and associated consequences. A Steering Committee meeting was held to identify and evaluate each selected natural hazard.

Profile Hazard Events

The hazard event profiles consist of either a map indicating the area impacted by each hazard or an important piece of data regarding the characteristics of hazard events within the planning area. To develop the detailed hazard profiles, the Project Team researched and reviewed relevant open-source natural hazard studies and mapping projects. In addition, each participating jurisdiction supplied any natural hazard studies that have been developed specifically for the respective jurisdiction. This task determined the natural hazard magnitude, frequency, and location characteristics (soil conditions, predicted ground acceleration values, fault locations, flood plains, etc.) that were used as the design-basis for the loss estimates and hazard ranking.

Asset Inventory

The purpose of this task was to determine the quantity of buildings, people, and asset values that lie in the different hazard areas and what proportion of each jurisdiction this represents. The asset inventory was completed using the baseline data contained in HAZUS-MH which includes:

- Demographic data (population, age, ethnicity, and income);
- General building stock (square footage of occupancy classes for each census tract);
- Emergency response facilities (fire, police, emergency operations centers);
- Dams;
- Hazardous materials facilities;
- Roads, airports, and other transportation facilities; and
- Electric power, oil, and gas lines and other utility facilities.

This inventory was augmented with critical Lassen County, City of Susanville, and Susanville Indian Rancheria assets, which enabled the team to estimate losses resulting from hazard events and to determine where resources should be allocated to address mitigation issues.

Loss Estimates

FEMA developed a standardized natural hazard loss estimation methodology containing models for estimating potential losses from earthquake, wind (hurricanes, thunderstorms, tornadoes, and extra-tropical cyclones), and flood (river basin and coastal) hazards. Lassen County, the City of Susanville, and the Susanville Indian Rancheria utilized HAZUS-MH, a PC-based software, which implements the FEMA-developed methodology and runs on a Geographic Information System (GIS) platform, to map and display earthquake hazard data, as well as the results of earthquake damage and economic loss estimates for buildings and infrastructure within the County.

In estimating losses, HAZUS-MH takes into account various impacts of a hazard event such as:

- Physical damage: damage to wells, reservoirs, pipelines, booster stations, power generating facilities.
- Economic loss: business interruptions, repair and reconstruction costs; and
- Social impacts: impacts to people, including potential loss of potable water and sanitation services.

In addition to the earthquake HAZUS assessments, the Project Team developed loss assessment tables for each specific hazard that identifies potential damages within the County, including population at risk, critical infrastructure, and buildings. This task was critical in determining which assets are subject to the greatest potential damages and which hazard event is likely to produce the greatest potential losses. The conclusion of this task precipitated a comprehensive loss estimate (vulnerability assessment) for each identified hazard for each specific asset in terms of damages, economic loss, and the associated consequences.

Mitigation Strategy Development

Develop Mitigation Goals and Objectives

The Project Team (based upon information provided by the Steering Committee) documented the mitigation features and resources that Lassen County, City of Susanville, and Susanville Indian Rancheria currently have in place. These mitigation features were described in sufficient detail to allow the Steering Committee to determine where practical improvements could be made and where sufficient improvements would be prohibitive due to cost, schedule, or impracticality of implementation.

For each of the hazard events, mitigation goals and objectives were developed with the intention of reducing or eliminating the potential hazard impacts. The mitigation goals and objectives were developed at a Steering Committee Meeting to provide the basis for determining the associated mitigation projects.

Identify and Prioritize Mitigation Actions

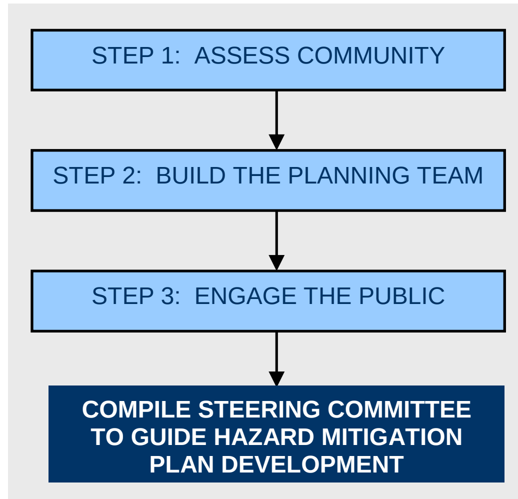
Mitigation strategies are administrative and engineering project recommendations to reduce the vulnerability to the identified hazards. It was imperative to have engineers and vital Lassen County, City of Susanville and Susanville Indian Rancheria employees involved in this phase of the plan in order to develop strategies and projects that will mitigate the hazard and solve the problem cost-effectively, as well as ensure consistency with each jurisdiction's long-term mitigation goals and capital improvements. At a Steering Committee meeting, a team-based approach was utilized to brainstorm mitigation projects based on the identified hazards and associated loss estimates. The evaluation and prioritization of the mitigation actions produced a list of recommended mitigation actions to incorporate into the mitigation plan. A separate Steering Committee meeting was held to conduct a cost-benefit review for each proposed mitigation action to determine the relative priority level of the recommendation.

Implementation & Monitoring

Prepare an Implementation Strategy

The Project Team developed an action plan to detail how the mitigation recommendations will be prioritized, implemented, and administered by Lassen County, the City of Susanville, and the Susanville Indian Rancheria. During the Hazard Mitigation Plan creation process, the Project Team coordinated with the Steering Committee to determine the mitigation project implementation strategy (including identifying responsible departments, funding resources, and estimated implementation timeframe).

1.2 Steering Committee / Public Involvement



While the Susanville Fire Department and Risk Management Professionals had lead responsibility for the development of the Lassen County, City of Susanville, and Susanville Indian Rancheria Multi-Jurisdictional Hazard Mitigation Plan, neighboring communities, agencies, businesses, and other interested parties were invited to participate on the Steering Committee to review the Hazard Mitigation Plan during each phase of the document development. In order to compile a list of Steering Committee participants, the Project Team assessed community support through active community leaders, built a planning team, and engaged the public participants during the Project Initiation and Hazard Identification meeting.

§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

§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.

Lassen County, the City of Susanville, and the Susanville Indian Rancheria brought together personnel from management, fire services, police services, and public works departments to ensure the Steering Committee included all departments and provided a mechanism for receiving input from each participant. Additionally, each participating jurisdiction compiled historical hazard data, provided relevant planning documents for incorporation into the plan, and coordinated participation with the public. Additionally, each draft chapter was reviewed by the by the Steering Committee and specific comments and input were incorporated into the plan.

The Hazard Mitigation Plan was developed with assistance/advice from the following participants:

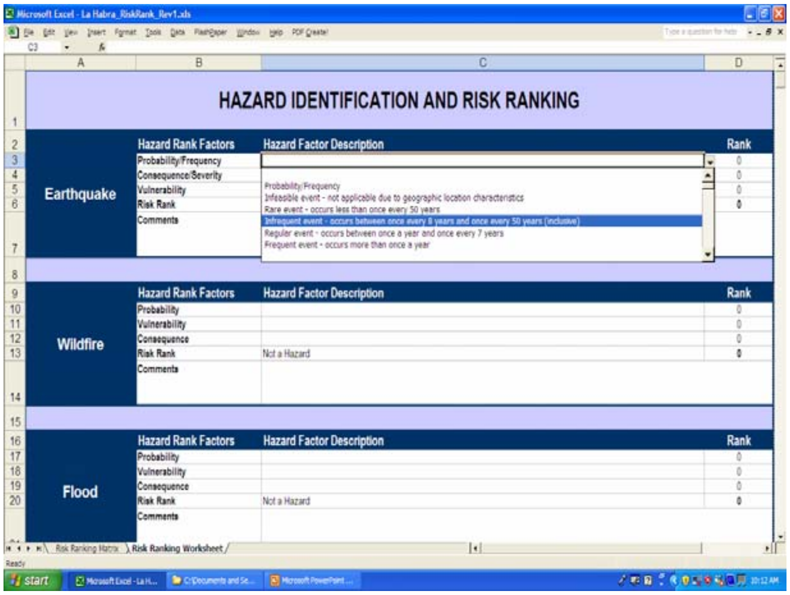
- Kristin Hockett, Risk Management Professionals, Senior Engineer
- Judith Sicairos, Risk Management Professionals, Project Engineer
- Jeffrey Williams, Risk Management Professionals, Project Engineer
- Joe Bertotti, Lassen County, Assistant Director
- Chip Jackson, Lassen County Office of Emergency Services, Chief
- Jim Donnelly, Lassen County, Agriculture Commissioner
- Ted Friedline, Susanville Fire Department, Battalion Chief
- Stu Ratner, City of Susanville Fire Department, Fire Chief
- Jeff Atkinson, City of Susanville Police Department, Chief
- Tom Downing, City of Susanville Police Department, Captain
- Bill Nebeker, City of Susanville, Community Development Director
- Craig Platt, City of Susanville, Public Works Director
- Gary McIntire, Susanville School District, Superintendent
- Doyle Lowry, Susanville Indian Rancheria, Director of Public Works
- Tim Keesey, Susanville Indian Rancheria, Natural Resources Director
- Dan Newton, City of Susanville
- Mike Howe, Cal Fire, Division Chief
- Joe Waterman, Cal Fire, Division Chief
- David Sandborg, US Forest Service, District Fire Prevention Officer

The Steering Committee met five times during the course of the project to discuss project progress and obtain valuable input and information for documenting the Hazard Mitigation Plan. The following meetings are detailed over the subsequent pages. Please refer to Appendix D – Public Participation for specific meeting handouts, participants, and associated responsibilities.

Steering Committee Meeting #1 – Project Initiation, Hazard Identification, and Information Collection

April 23, 2009

Meeting Attendees:



- Kristin Hockett
- Judith Sicairos
- Ted Friedline
- Joe Bertotti
- Doyle Lowry
- Jeff Atkinson
- Tom Downing
- Gary McIntire
- Mike Howe
- Bill Nebeker
- David Sandborg
- Stu Ratner

During the Project Initiation, Hazard Identification, and Information Collection Meeting, Risk Management Professionals presented an overview presentation that detailed the objectives and scope of the project. After a review of the project schedule and key tasks, the Steering Committee participant's areas of expertise, resultant member responsibilities, and the community meeting process was discussed.

The Steering Committee Meeting also served as a mechanism to determine the hazards to profile in detail. To effectively characterize each participating jurisdiction's risk and vulnerability, Risk Management Professionals facilitated a discussion of the historical hazards with appropriate Committee members during this meeting. This meeting also served as a forum to discuss information for the background information and asset inventory.

Additionally, the Steering Committee determined the initial hazard profile ranking through a facilitated workshop utilizing an automated interactive software spreadsheet program that asks specific questions on potential hazards and then assigns a relative value to each potential hazard accordingly, including numerical rankings (1-5) of the following criteria:

- **Consequence/Severity** – How wide spread is the impact area?
- **Secondary Effects** – Could the event trigger another event and separate response?
- **Probability/Frequency** – Historical view of how often this type of event occurs locally and projected recurrence intervals.
- **Warning/Onset** – Advance warning of the event, or none.
- **Duration** – Length of elapsed time where response resources are active.
- **Recovery** – Length of time until lives and property return to normal.

Additionally, all Steering Committee participants were requested to provide existing plans and technical studies, GIS data, and identify existing mitigation features as part of a detailed information request.

Steering Committee Meeting #2 –Hazard Risk Rank Review, Mitigation Goals and Objectives

August 5, 2009

Meeting Attendees:

- Kristin Hockett
- Judith Sicairos
- Ted Friedline
- Joe Bertotti
- Doyle Lowry
- Jeff Atkinson
- Tom Downing
- Gary McIntire
- Mike Howe
- Bill Nebeker
- David Sandborg
- Stu Ratner

TThe hazard risk ranking from Steering Committee Meeting #1 were reviewed and validated with the Steering Committee with a review of the hazard profiles. Additionally, mitigation goals and objectives were developed with the intention of reducing or eliminating the potential hazard impacts, which also provided the basis for determining the associated mitigation projects. The Steering Committee reviewed the goals and objectives from the California State Multi-Hazard Mitigation Plan and used the applicable goals and objectives as a baseline for determining Lassen County, City of Susanville, and Susanville Indian Rancheria mitigation goals and objectives.

Additionally, each Steering Committee participant was given Mitigation Activity Identification worksheets to document potential projects to be discussed during Steering Committee Meeting #3.

Steering Committee Meeting #3 – Mitigation Goals and Objectives Review and Mitigation Project Identification

September 10 2009

Meeting Attendees:

- Kristin Hockett
- Judith Sicairos
- Ted Friedline
- Joe Bertotti
- Doyle Lowry
- Jeff Atkinson
- Tom Downing
- Mike Howe
- Bill Nebeker
- Craig Platt

The identified goals and objectives from Steering Committee Meeting #2 were reviewed and validated with the Steering Committee. This meeting facilitated the identification of mitigation actions and projects that will reduce the impact of identified hazards. During the meeting the Steering Committee participants brainstormed possible projects and actions to mitigate the effects of the identified hazards based on the hazard profiles and loss estimates. As the mitigation projects were identified, the Steering Committee reviewed the previously identified mitigation projects and discussed the implementation plan according to the following characteristics:

- Jurisdiction – Lassen County, City of Susanville, Susanville Indian Rancheria
- Mitigation Action Category – Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects, Public Education and Awareness
- Corresponding Goals and Objectives
- Responsible Department – Fire Department, Police Department, Public Works, Natural Resources, etc.
- Resources – Annual Budget, Grant Programs
- Implementation Timeframe – Ongoing, Short-Term (within one year), Medium-Term (within five years), and Long-Term (greater than five years)

Steering Committee Meeting #4 – Mitigation Action Benefit-Cost Review

October 1, 2009

Meeting Attendees:

- Kristin Hockett
- Judith Sicairos
- Ted Friedline
- Joe Bertotti
- Tim Keesey
- Jeff Atkinson
- Tom Downing
- Stu Ratner
- Chip Jackson
- Joe Waterman

During the Mitigation Action Benefit-Cost Review meeting, the Steering Committee reviewed the mitigation actions identified during Steering Committee Meeting #3 and identified three additional mitigation actions. The cost-benefit review consisted of identifying all costs and benefits associated with a mitigation action and assigning a relative priority for the action based upon the evaluation.

Steering Committee Meeting #5 – Vulnerability Analysis Review and Hazard Mitigation Plan Draft Review

October 22, 2009

Meeting Attendees:

The final Steering Committee Meeting was held to discuss the Lassen County, City of Susanville, and Susanville Indian Rancheria Draft Hazard Mitigation Plan. The Steering Committee completed a preliminary review and discussion of the plan to identify areas requiring additional information to finalize the reports.

The Steering Committee participants were instructed to submit specific comments via email. Additionally, the Steering Committee discussed a timeline for the preliminary submission (prior to jurisdictional adoption) of the HMP to the California Emergency Management Agency.

Public Meeting – Hazard Mitigation Plan Draft Presentation

November 13, 2009

Copies of the Lassen County, City of Susanville, and Susanville Indian Rancheria Draft Hazard Mitigation Plan were provided to interested members of the public and a presentation was prepared to provide an overview of the planning process and the results of the analyses. Members of the public were instructed to submit specific comments to the planning team via email.

1.3 Review and Incorporation of Existing Plans

§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.

While developing the Lassen County, City of Susanville, and Susanville Indian Rancheria Multi-Jurisdictional Hazard Mitigation Plan, the Project Team reviewed existing plans (detailed below) and incorporated relevant information into the planning efforts.

State of California Multi-Hazard Mitigation Plan (2007) – The Multi-Hazard Mitigation Plan was reviewed to ensure consistency between the State and County plan, with respect to identified hazards and vulnerability, goals and objectives, and mitigation actions. The State goals served as the basis for developing the goals at the County-wide level.

California Fire Plan – The State Board of Forestry and the California Department of Forestry and Fire Protection (CDF) have developed the Fire Plan for wildland fire protection in California. The plan defines a level of service measurement, considers assets at risk, incorporates the cooperative interdependent relationships of wildland fire protection providers, provides for public stakeholder involvement, and creates a fiscal framework for policy analysis. This information was utilized when developing the wildfire risk assessment and hazard profile.

City of Susanville Community Fire Safe Plan – The City of Susanville Community Fire Safe Plan was utilized as the basis for the wildfire risk and vulnerability assessment.

California Earthquake Loss Reduction Plan – California's Seismic Safety Commission developed the Earthquake Loss Reduction Plan to identify actions to mitigate seismic hazards. This plan was reviewed for an overall seismic hazard evaluation for the risk assessment, as well as the identification of potential seismic mitigation actions.

State of California Emergency Plan – "Attachment B -- California Proclaimed States of Emergency 1950 To 1997" indicates the types of disasters that have affected the people and property of California, by county, in emergencies proclaimed by the Governor, from 1950 through 1997. This list was reviewed for declared disasters in Lassen County and included within the risk assessment.

Flood Preparedness Guide for Levee Maintaining Agencies – According to the guide, Levee Maintaining Agencies are responsible for natural disaster emergency preparations, including training and stockpiling of flood fight supplies. This guide was utilized to identify flood preparedness issues to consider for the risk assessment and hazard profile.

Contingency Plan for Extreme Cold / Freeze Emergencies – The plan describes state operations during extreme cold/freeze related emergencies and provides guidance for State agencies, local government, and non-governmental organizations in the preparation of their extreme cold/freeze emergency response plans and other related activities. This Contingency Plan was reviewed to determine if additional hazards exist beyond severe storm/snow for the risk assessment.

Contingency Plan for Excessive Heat Emergencies - The plan describes state operations during heat related emergencies and provides guidance for local governments, non-governmental organizations, the private sector and faith-based organizations in the preparation of their heat emergency response plans and other related activities. This Contingency Plan was reviewed for relevant information to incorporate into the risk assessment.

Emergency Operations Plan – Lassen County periodically updates the Emergency Operations Plan, which includes specific response procedures for earthquake, flooding, reservoir failure, fire, etc. In order to ensure the plan includes an appropriate response, Lassen County will incorporate the risk assessment element of the Hazard Mitigation Plan into the Emergency Operations Plan update. In addition, many of the mitigation actions identified by the County are geared toward emergency response and the Emergency Operations Plan will be updated to reflect the implemented mitigation actions from the Hazard Mitigation Plan.

Urban Water Management Plan – The City of Susanville Urban Water Management Plan is updated every five years to monitor water supply issues and mitigate drought situations. As part of the Urban Water Management Plan updates, the City will review the drought risk assessment in the Hazard Mitigation Plan and incorporate the drought mitigation actions identified in the plan.

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2.1 Region Description

2.1.1 Lassen County

Lassen County is located in northeastern California. It is bordered on the north by Modoc County, on the south by Plumas and Sierra Counties, on the west by Shasta County, and on the east by the State of Nevada. Lassen County is characterized by forest-covered mountains and plateaus roughly covering the western one-third of the County and sagebrush and juniper rangeland with a number of interspersed valleys covering the eastern two-thirds. Part of the Warner Range extends into northeastern Lassen County. Most of the large valleys are comprised of the remnants of ancient lake beds. The largest valley is the Honey Lake Valley in the south central part of the County, which extends into Nevada and joins Long Valley to the southeast. The Honey Lake Valley is generally considered to be part of the Great Basin. Another large valley consists of the Madeline Plains, which includes Grasshopper Valley. Big Valley is located in the northwestern part of the County. A portion of Fall River Valley extends into the northwestern part of the County from the west. Elevations range from 3,300 feet in the Fall River Valley to about 8,700 feet at Hat Mountain in the northeast comer of the County. Eagle Lake, located 16 miles north of Susanville, is the second largest natural lake located wholly within California. At an elevation of 5,100 feet, the lake covers 42 square miles and offers a variety of recreational resources and attractions, including the famous Eagle Lake Trout.

The climate of Lassen County is variable, but in general is characterized by warm dry summers and cold moist winters. Most of the precipitation falls between October and May. The average annual rainfall ranges from four inches along the Nevada border in the eastern Honey Lake Valley and increases going west to 48 inches near Juniper Lake in Lassen Volcanic National Park. Average daily temperatures range from 69.6 degrees Fahrenheit in July to 20.4 in January. The frost-free growing season ranges from 142 days at Susanville to 65 days in the Madeline Plains. Lassen County has a total area of 3,001,780 acres (4,690.3 square miles). Over 63 percent of the land area in Lassen County is administered by Federal, state or local agencies.

**Source: County General Plan*

Lassen County Overview Map

Lassen County
County Overview Map

2.1.2 City of Susanville

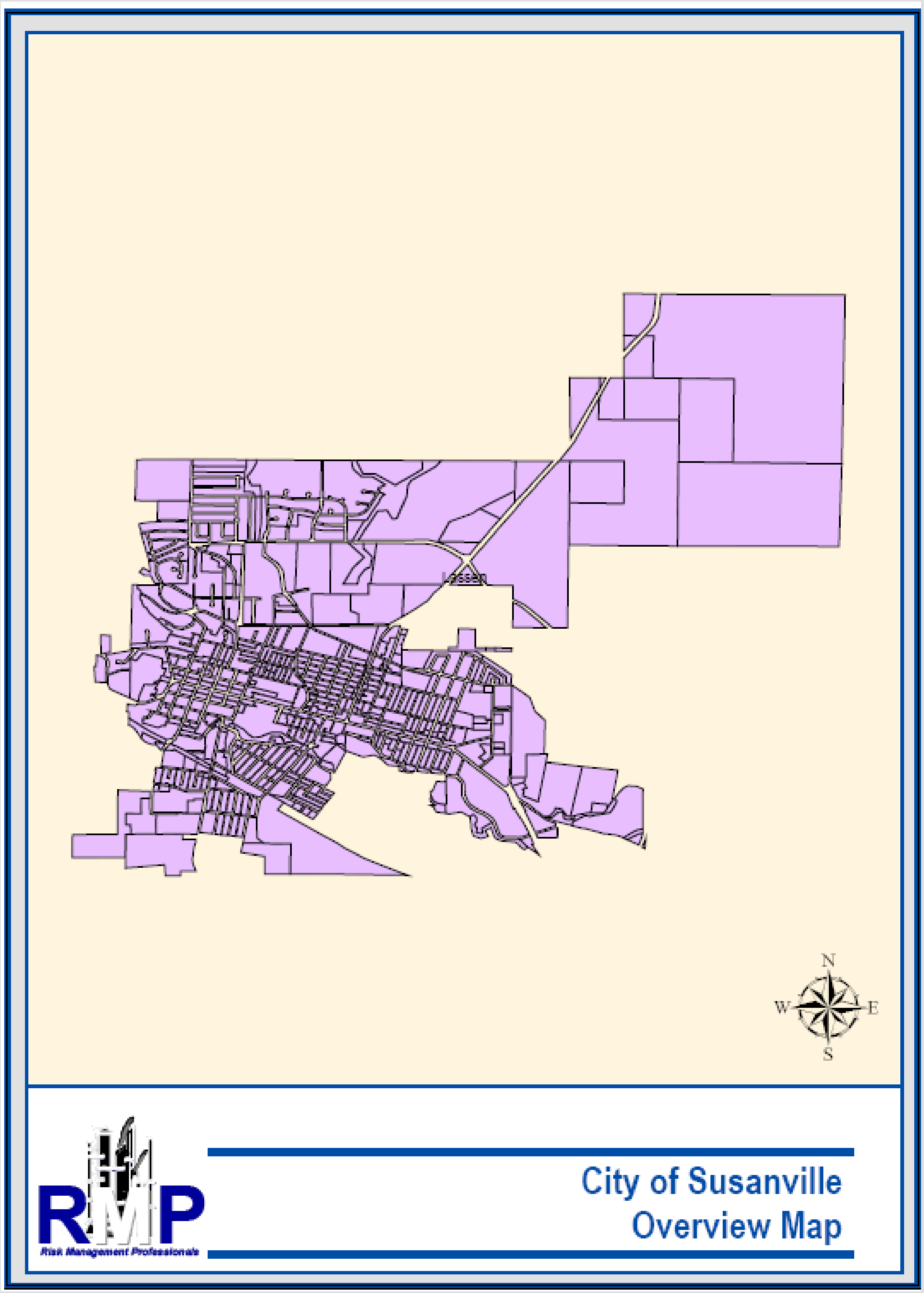
The City of Susanville incorporated in 1900 as a General Law city and is the County seat of Lassen County. Susanville is about 85 miles north-northwest of Reno, Nevada, on the eastern slopes of where the Sierra Nevada and the Cascade mountain ranges meet. Located in the south central part of the county at an elevation (at City Hall) 4,240 feet above sea level, the town straddles the Susan River which flows out of the mountains and drains southeastward into the Honey Lake Valley. Honey Lake is a dry lake, and has no known outlet.

West of Susanville, on both sides of the southeast-draining Susan River, foothills rise nearly 1,000 feet above the river valley to elevations of 5,000 to 5,200 feet. Susanville, Peak, 3½ miles due north of the city, is 6,576 feet hig. Diamond Mountain, 8 miles south of Susanville, is 7,738 feet above sea level; and Thompson Peak (13 miles southeast of Susanville and 3 miles southwest of Janesville) reaches 7,795 feet. Both Diamond Mountain and Thompson Peak straddle the Lassen County-Plumas County boundary.

State highway 36 leads west from Susanville to the small towns of Westwood and Chester and to the Central Valley and the city of Fed Bluff. A short turn-off northward from Highway 36 leads to Mt. Lassen – a 10,437-foot volcano that last erupted in 1914. The mountain is in Shasta County, six miles from the Lassen County line and approximately 50 air-miles from Susanville. Highway 36 also leads eastward to Highway 395, then south to Reno, about a 1 ½ hour drive. Eagle Lake, an important sports-fishing and tourist destination, is 23 miles north on State Route 139.

Because of the proximity of the Susan River, Honey Lake, and various other creeks, as well as the flat land near these water sources, the Susanville area is considered extremely sensitive for both historic and pre-historic resources.

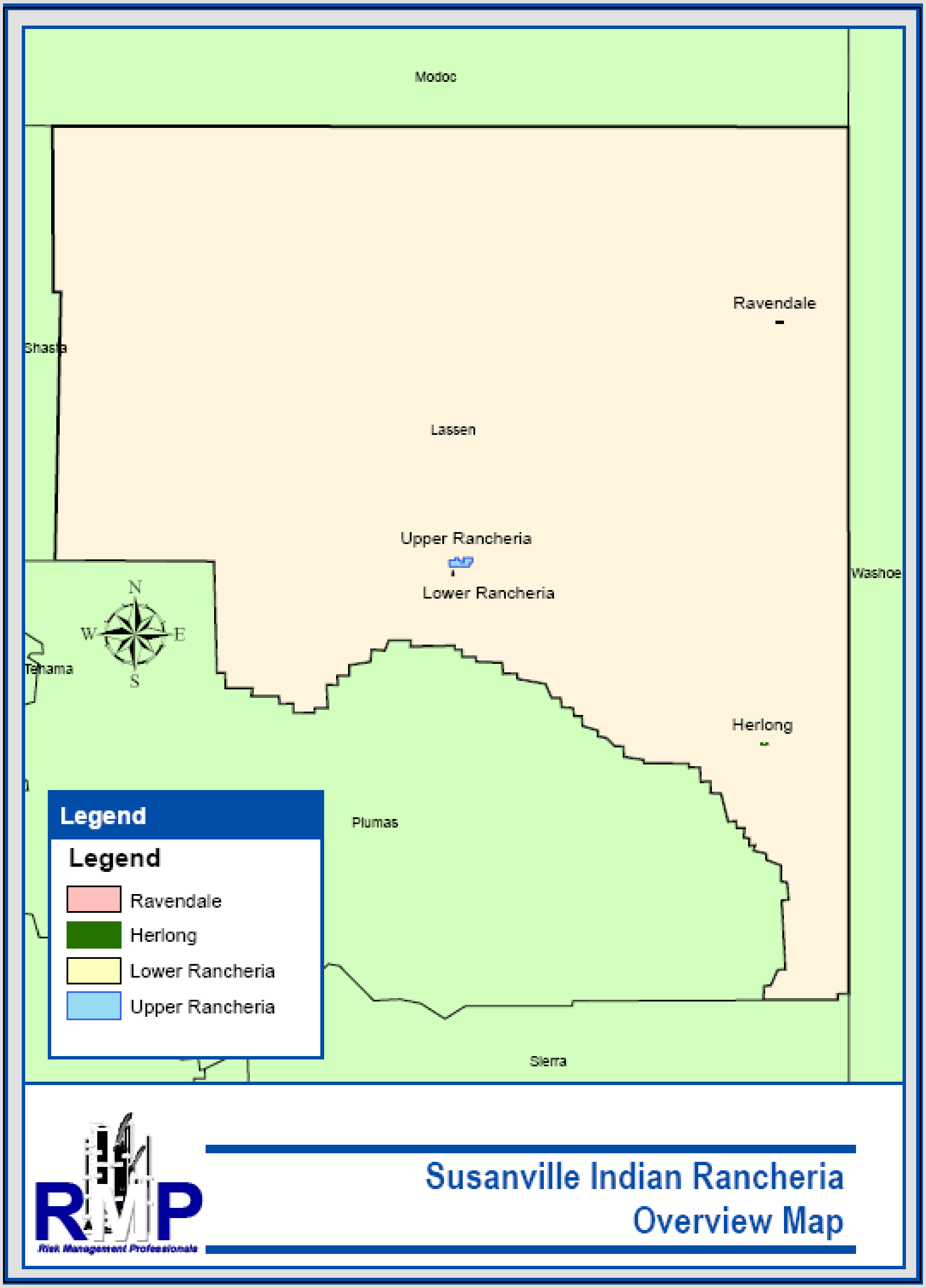
City of Susanville Overview Map



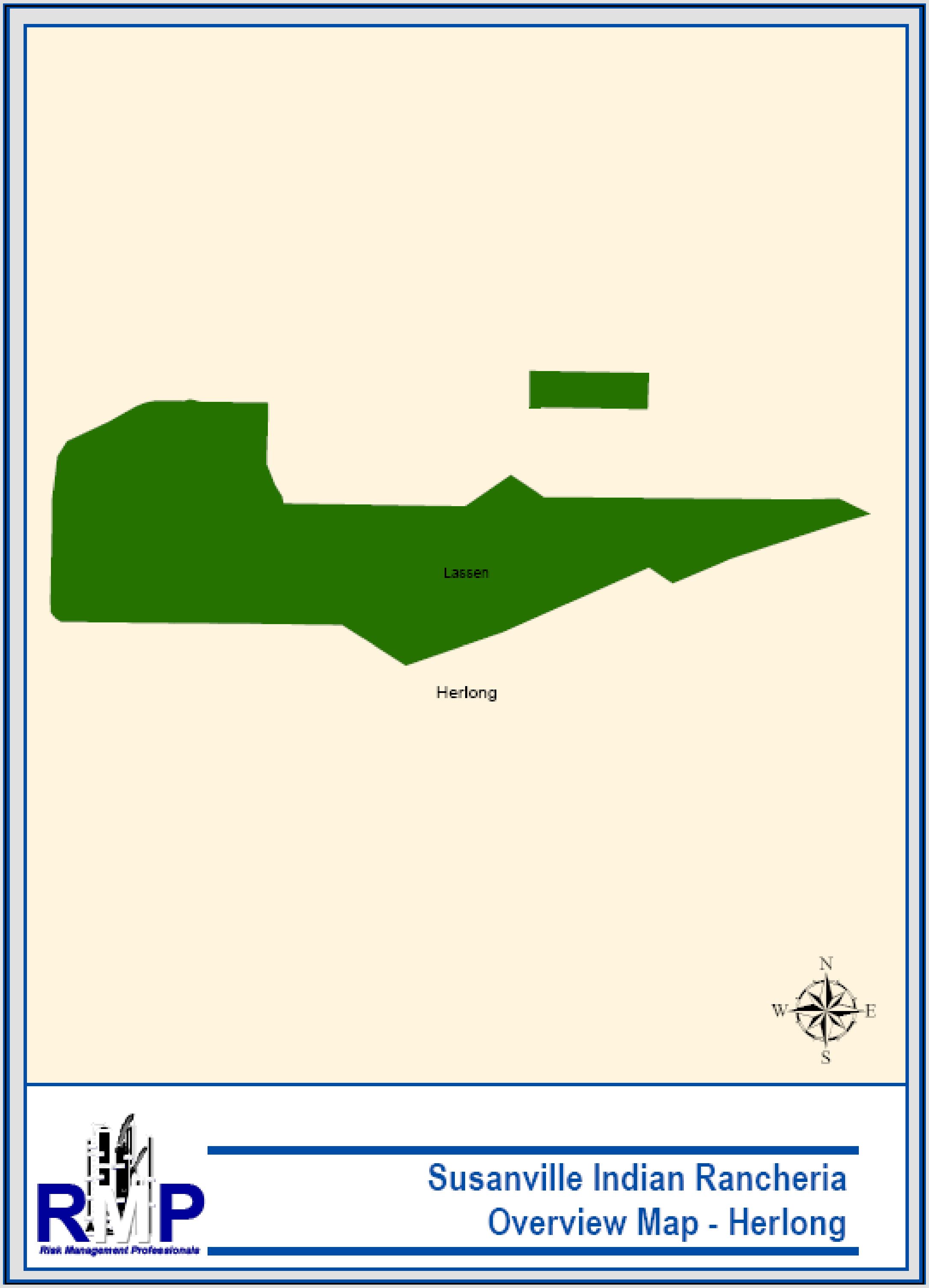
2.1.3 Susanville Indian Rancheria

The Susanville Indian Rancheria (SIR) is a federally recognized Indian Tribe in Northeastern California with aboriginal ties to the Mountain Maidu, Northern Paiute, Hammawi and Atsugewi Bands of the Pit River, and the Washoe Tribe. The Susanville Indian Rancheria currently consists of five non-contiguous landbases in Lassen and Plumas Counties totaling 1340 acres (1100 trust; 240 fee): the Lower Rancheria, Upper Rancheria, Herlong parcel, Ravendale parcel, and Cradle Valley parcel.

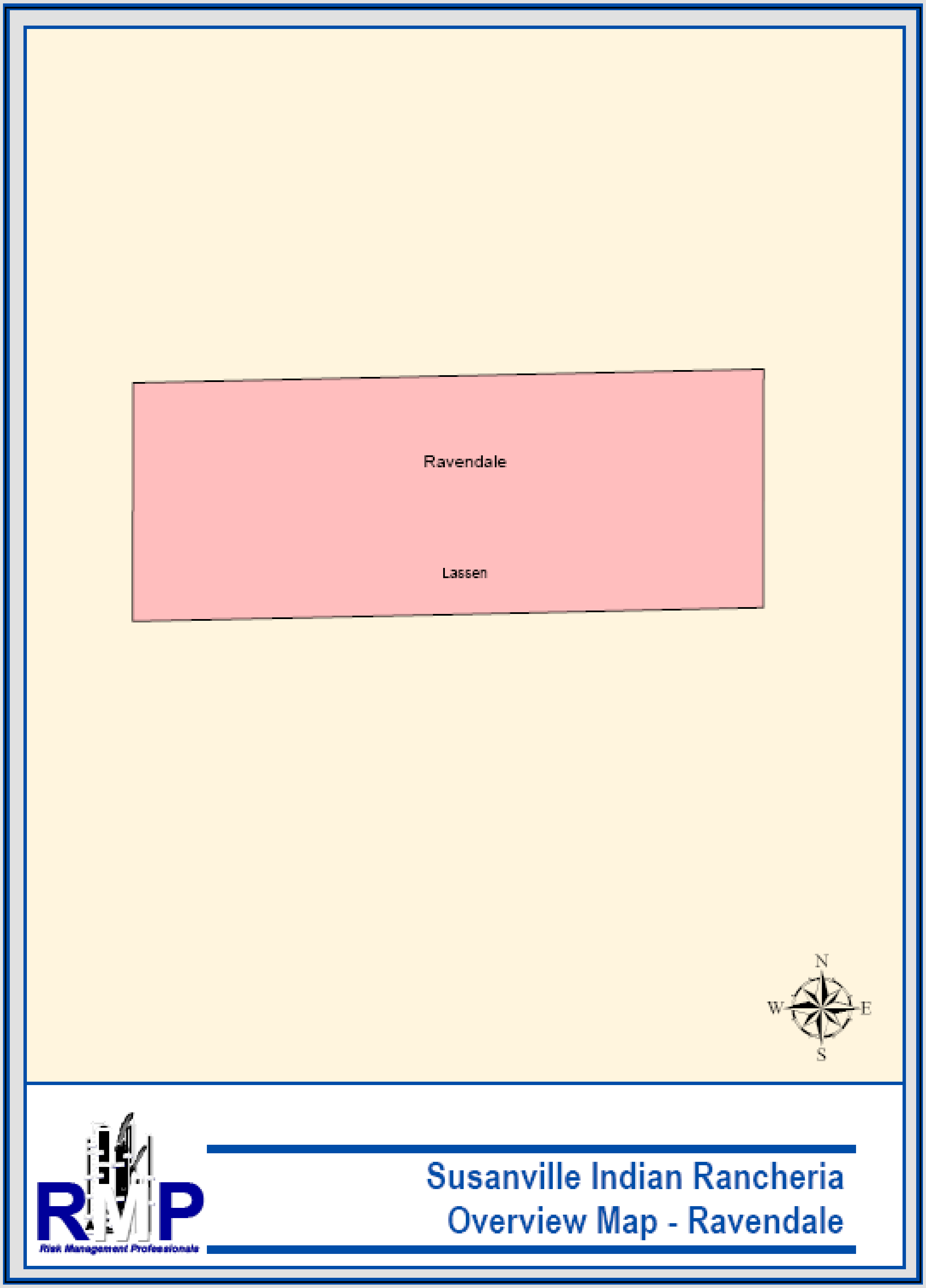
Susanville Indian Rancheria Overview Map



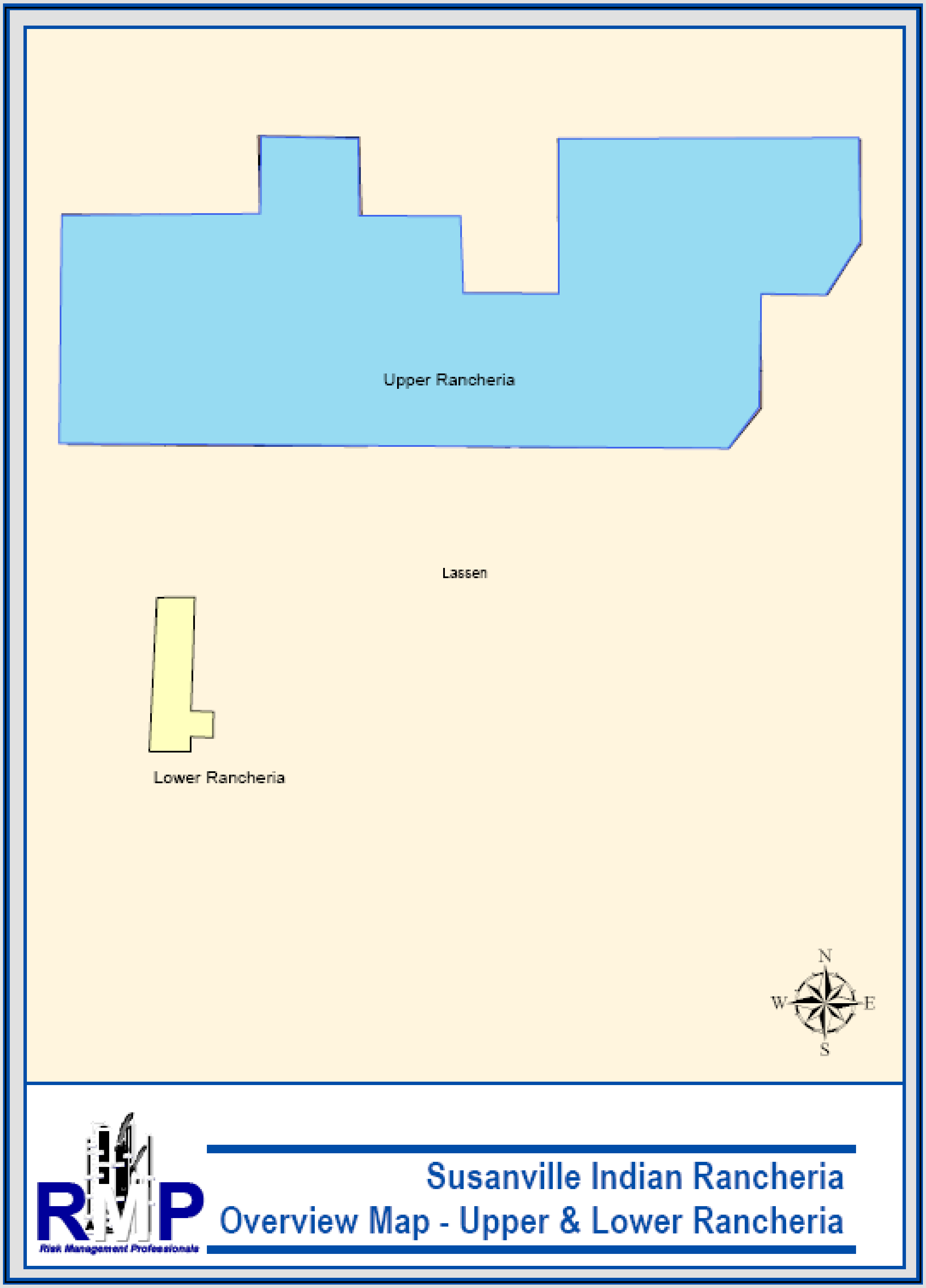
Susanville Indian Rancheria Overview Map - Herlong



Susanville Indian Rancheria Overview Map - Ravendale



Susanville Indian Rancheria Overview Map – Upper & Lower Rancheria



2.2 Land Use

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

2.2.1 Lassen County Land Use

Lassen County is comprised of 2,916,670 acres. The following describes land use designations for Lassen County. These descriptions are derived from the Lassen County General Plan in an attempt to designate the proposed general distribution and intensity of uses of the land for housing, business, industry, open space, natural resources, public facilities, waste disposal sites, and other categories of public and private uses. The land use categories listed below are illustrated on the Lassen County Land Use Map.

Residential Land Uses

Town Center

- designates the central area of a small, unincorporated community. It typically serves as the commercial and social center of the surrounding community with a mixture of commercial and residential uses and may also include community services and social buildings (e.g., school, post office, fire hall, Grange, etc.).
- Building intensity: 1-7.25 dwelling unit per acre (DUA)
- Population Density: 3-22 people per acre (PPA)

Residential Center

- Identifies areas outside of recognized Town Centers which have or have had residential densities and numbers of residential-size parcels which were higher than surrounding agricultural, timber and open space areas.
- The following areas are recognized as Residential Centers:
    - Lake Forest Estates: Urban Residential, Low Density
    - Pumpkin Center: Rural Residential
    - Willow Creek Pines: Rural Residential

- o South Adin: Rural Residential
- o Center School House: Rural Residential
- o Silver Lake: Rural Residential

Urban Residential

- Indicates residential areas receiving community sewer and/or water services capable of supporting relatively high-density residential development.
- Building Intensity and Population Density:

  Low Density: 1-7.25 DUA and 3-22 PPA

  High Density: Exceed 8 DUA and 24 PPA

Estate Residential

- Designation provides areas for relatively large-lot residential subdivisions.
- Building Intensity and Population Density: 0.2-1 DUA and 0.6-3 PPA

Planned Development Residential

- Designation provides for densities in the range of urban or estate residential land uses when units are clustered to maintain open space areas or preserve sensitive and/or unique environmental features, resources and amenities.
- Average Building Intensity and Population Density: 4 DUA and 12 PPA

Planned Development Option

- Designation denotes areas which the County recognizes will, in the future, be considered for development.
- Building Intensity and Population Density for development in this area would correspond, in general, to the Planned Development Residential designation.

Rural Residential

- designation provides for medium density residential use in a generally rural environment.
- Building Intensity and Population Density: 0.05-0.33 DUA and 0.15-1 PPA

Agricultural Residential

- designation identifies areas where limited residential use is allowed, but agricultural land use is predominant and residential development not related to some form of agricultural land use or retention of open space is generally not appropriate.

- Building Intensity and Population Density: 0.025-0.05 DUA and 0.075-0.15 PPA

Commercial Land Uses

Commercial

- Designation indicates areas identified as appropriate for general commercial land uses. These may range from retail, service, lodging, and light commercial uses which may be allowed "by right" to heavier commercial operations which may verge on being considered "industrial" in character.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Business Park

- Designates a commercial area intended to provide for and promote the development of harmonious business park environments, typically for light manufacturing, fabrication, assembly, wholesaling, research and related compatible uses.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Neighborhood Commercial

- Designation provides a limited selection of convenience goods within either walking or brief driving distance from residential areas.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Highway Commercial

- Designates sites which primarily serve the needs of highway travelers.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Industrial Land Uses

Industrial (General)

- Designation provides for general industrial and manufacturing uses, recognizing varying degrees of impacts and service requirements.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Industrial Park

- Designates areas for limited industrial uses to be designated and developed as a "planned development" with on-site services.
- Building Intensity and Population Density: 1-7.25 DUA and 3-22 PPA

Urban Reserve

Designation is used as an overlay to indicate areas where the development of urban-type uses will be directed in the future.

Natural Resource Land Uses

Intensive Agriculture

- Designation identifies lands devoted to or having high suitability potential for the growing of crops and/or the raising of livestock on natural or improved pasture land.
- Building Intensity and Population Density: Not exceed 0.025 DUA and average 0.067 PPA

Extensive Agriculture

- Designation primarily represents typical rangeland areas with grazing and general rangeland values, natural wildlife habitat, open space and scenic values, and/or low intensity outdoor-oriented recreational values, as well as general forest areas, timber production areas and related uses.
- Building Intensity and Population Density: Not exceed 0.025 DUA and average 0.067 PPA

Open Space

Scenic Corridor

Conservation/Conservation Corridor

Trail Corridor

Institutional Land Uses

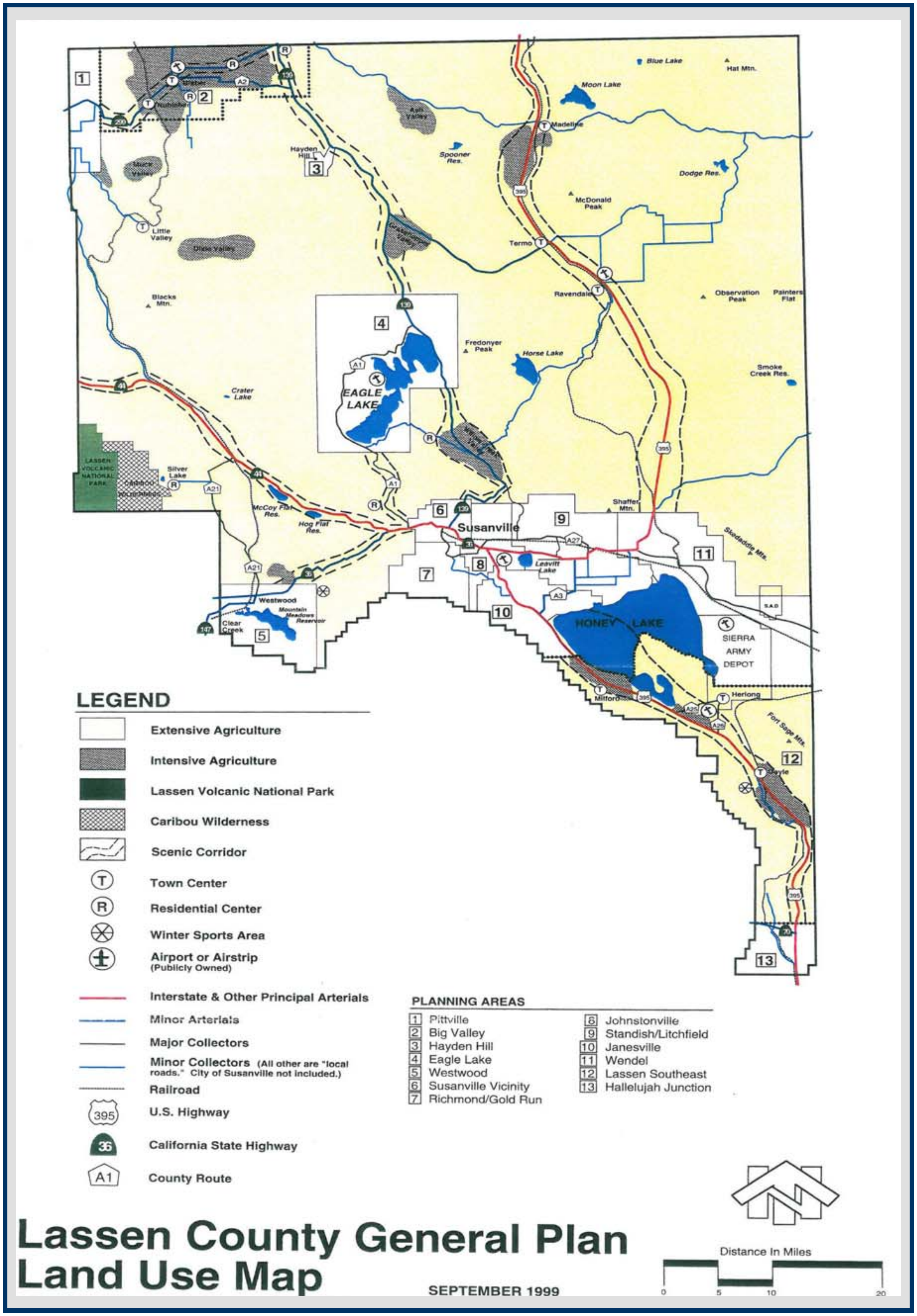
Institutional

- Designation is applied to lands used and typically owned by public or quasi-public agencies, districts and organizations for governmental or public service purposes. The range of uses varies widely, including educational facilities, detention facilities, military establishments, fire management facilities, and general governmental administrative buildings.

- Building Intensity and Population Density: Wide range

Schools

**From County General Plan


Lassen County General Plan
Land Use Map
SEPTEMBER 1999
LEGEND
Extensive Agriculture
Intensive Agriculture
Lassen Volcanic National Park
Caribou Wilderness
Scenic Corridor
Town Center
Residential Center
Winter Sports Area
Airport or Airstrip (Publicly Owned)
Interstate & Other Principal Arterials
Minor Arterials
Major Collectors
Minor Collectors (All other are "local roads." City of Susanville not included.)
Railroad
U.S. Highway
California State Highway
County Route
PLANNING AREAS
1 Pittville
2 Big Valley
3 Hayden Hill
4 Eagle Lake
5 Westwood
6 Susanville Vicinity
7 Richmond/Gold Run
8 Johnstonville
9 Standish/Litchfield
10 Janesville
11 Wendel
12 Lassen Southeast
13 Hallelujah Junction
Distance In Miles
0
5
10
20
Blue Lake
Hat Mtn.
Moon Lake
Madeline
Spooner Res.
Dodge Res.
McDonald Peak
Hayden Hill
Little Valley
Termo
Ravendale
Observation Peak
Painters Flat
Blacks Mtn.
Fredonyer Peak
Horse Lake
Smoke Creek Res.
Crater Lake
EAGLE LAKE
Silver Lake
McCoy Flat Res.
Hog Flat Res.
Susanville
Shaffer Mtn.
Leavitt Lake
Westwood
Mountain Meadows Reservoir
Clear Creek
HONEY LAKE
SIERRA ARMY DEPOT
Herlong
Milford
Fort Sage Mts.
Doyle
Skedaddle Mts.

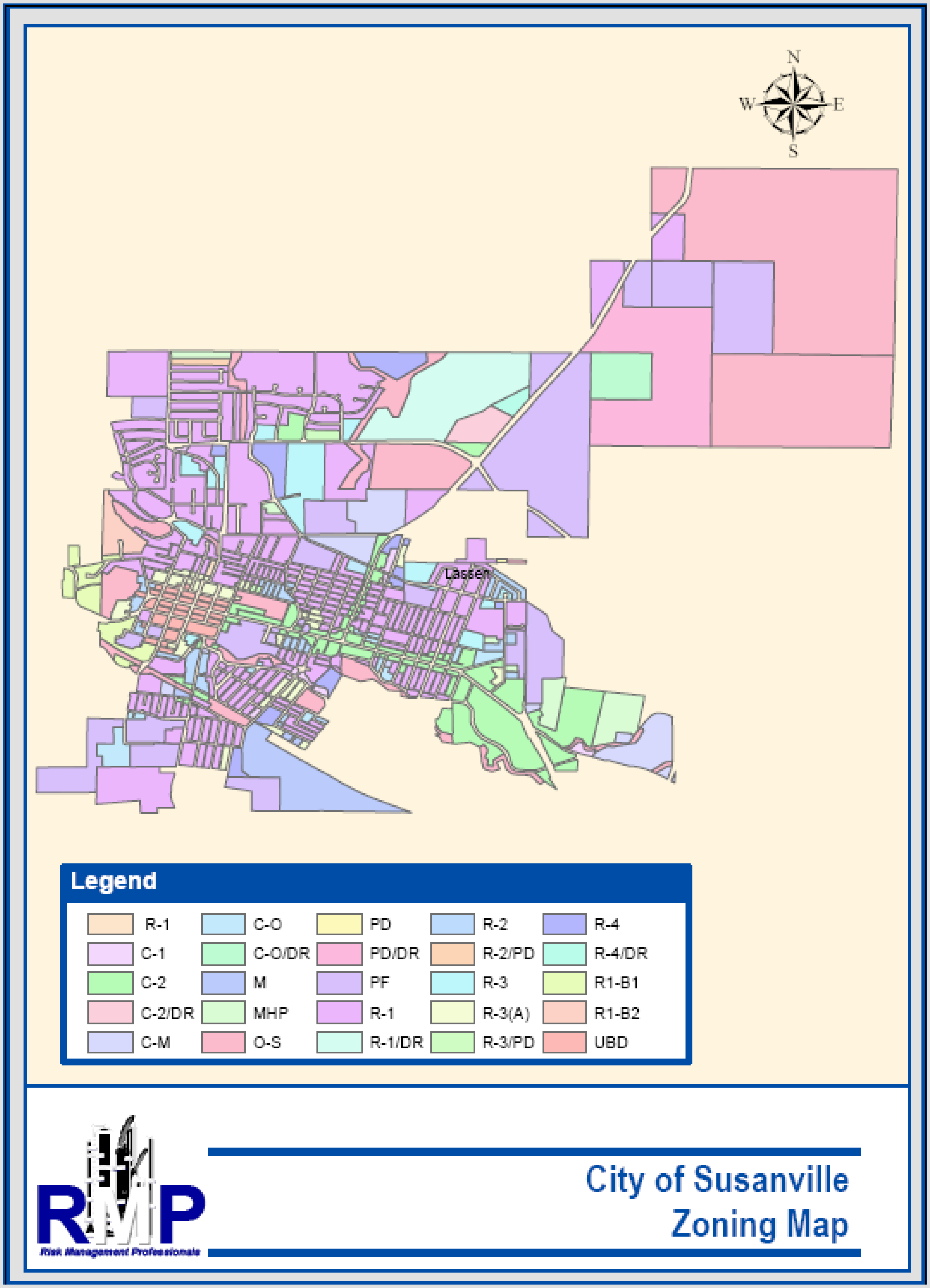
2.2.2 City of Susanville Land Use

Because of regular flooding along the river, Susanville's earliest residential area was built on the high ground now known as Uptown. Originally, the center of the town was at Main and Lassen, but the commercial area has now extended eastward along Main Street about two miles. All land within the Susanville planning area is grouped into categories.

Land Use Categories			
Land Use Categories	**Description**	**DU/Acre**	**Consistent or Allowable Zone Districts**
Residential	Single Family	0-7	R-1, R-1B-1 & B-2, R-2, MHP, AR-1
	Duplex & Triplex	0-12	R-2, R-3 & R-3A, MHP
	Multiple Family	5-20	R-3, R-4, MHP
	Mobile Home Parks	0-14	MHP
Commercial	Local/Neighborhood		C-1, C-O
	Commercial Office		C-O
	Gen Comm/Shopping Center		R-4, C-1, C-O, C-2, C-M, MHP
	Mixed Use		UBD, R-4
	Commercial/Light Industrial		C-O, C-M, C-2, M-L
Industrial	Light Industry/Business Park		C-M, M-L, M
	Heavy/General		
Open Space	Resource Conservation		OS, AR-1, AE-20
	Parks & Rec		OS
Agricultural	Agricultural Residential	0-2	AR-1, AE-20 1
Public & Govt	Critical Facilities		PF
	Other Public		PF
Other	Planned Development		All zones with PD
Overlay	Floodplain		All zones
	Planned Development		All zones
	Historic Preservation		All zones
	Design Review		All zones
	B (combining lot size)		All zones

Source: (1) Susanville General Plan

City of Susanville Zoning Map



2.2.3 Susanville Indian Rancheria Land Use

Lower Rancheria

The Lower Rancheria is the original 30 acre land base purchased in 1923 with funds from a congressional appropriation for the procurement of land for landless and homeless California Indians and today is utilized for housing, a health care facility, education facilities, gymnasium, administrative offices, a gaming facility, and a mini-mart (See SIR Land Use Map). In 2001 the SIR purchased 3.21 acres adjacent to the Lower Rancheria that was put into trust in 2003 and is currently being developed for 12 additional tribal housing units.

Upper Rancheria

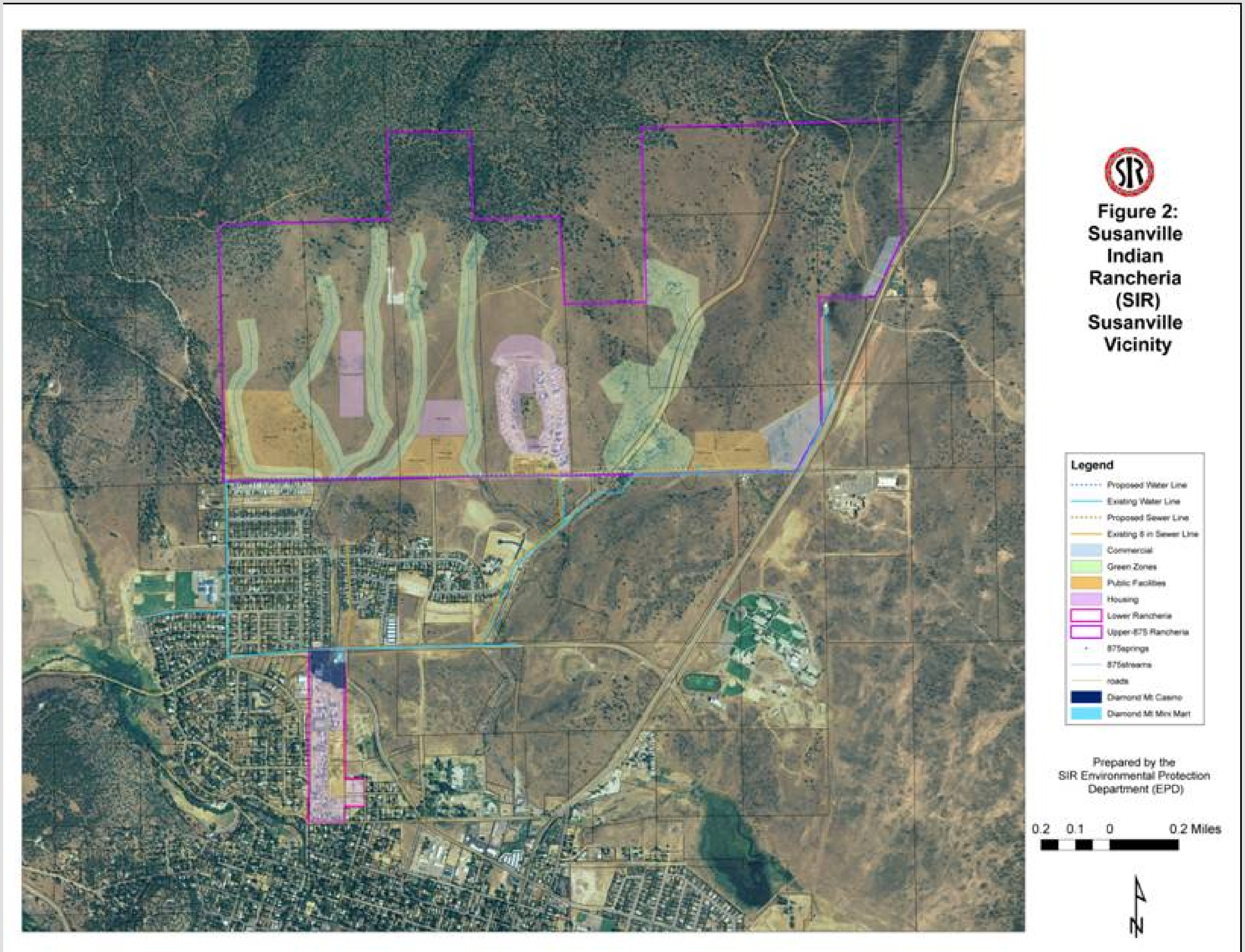
The Upper Rancheria is a 120 acre parcel which was appropriated to the tribe by an act of congress in 1978 with help from Congressman Bizz Johnson and is located just north of Susanville city limits (See SIR Land Use Map). The land is used for tribal housing, a public water system, and open space.

Herlong Parcel

The Susanville Indian Rancheria (SIR) acquired 72 acres from the Sierra Army Depot (SIAD) through the Base Realignment and Closure Act (BRAC) which was put into trust in 2000 (See SIR Herlong Sierra Housing Program Map). The property consists of: 120 housing units, many of which were in disrepair when SIR acquired them from the army; a commercial building; and open space adjacent to a railroad track. The Tribe currently operates a housing rental program and is investigating other economic development opportunities for the property.

SIR Herlong Sierra Housing Program Map

Susanville Indian Rancheria (SIR) Land Use Map



2.2.2 Future Land Use

Lassen County

As Lassen County's population continues to grow, new housing will be needed. A major land use question concerns where this development should occur. Some developers and real estate speculators will claim that areas which are already designated for residential development are inadequate and that there should be increased opportunities for development of new residential areas. Some housing specialists will argue that the County needs to direct new housing projects to higher density developments in existing communities to mitigate the rising costs of housing and to minimize the sprawl of residential land uses into outlying agricultural and open space areas.

In January, 1993, the Lassen County Department of Community Development conducted an inventory of the number and acreage of vacant parcels which are located in zones which typically accommodate residential land uses. These calculations indicated that the County had the estimated capacity for more than 18,300 dwelling units on vacant land which is already zoned to allow residential development. Much of the issue, therefore, is not whether there is enough land designated for residential and other development, but whether or not areas designated and to be considered for future development are distributed in well-conceived land use patterns and densities with adequate services, and to what extent can the County attempt to accommodate the variety of development proposals with which it will be presented.

Meeting the demand and expectations for new housing and related development as Lassen County's population continues to grow will be one of the major growth and development issues in the years to come. The need for new employment and market opportunities for a growing population will also necessitate the growth and development of commercial and industrial land uses as well as schools and other community facilities to provide needed services.

City of Susanville

Susanville is the largest city in Lassen County, and the focus of the County’s economy. The Lassen economy was historically based on lumber and agriculture, but the government sector became the largest employer in the 1980’s.

Economic growth in Susanville could take advantage of some existing features of the area, so long as it can overcome existing obstacles. Large areas of land available for development, accompanied by scenic beauty, recreational opportunities, underutilized geothermal resources and available labor force are positive features that can be attractive to new industries. At the same time, the city is located at some distance from markets and from most natural resources, so it is not an obvious location for manufacturing or distribution, little of the large amount of land available for development is ready and the distance from the city to a major education can be deterrents for growth.

In order to address these potential obstacles, the City of Susanville has included, as part of the Susanville General Plan, goals, policies and programs formulated to provide economic development and tourism, thus promoting growth and expansion.

Susanville Indian Rancheria

Upper Rancheria

In 2001, the SIR purchased an additional 875 acres adjacent to the Upper Rancheria. This property was put into trust in 2004 and tribe plans to utilize the property for additional housing, economic development, renewable energy, and protection of cultural sites on the property. A Class III Archaeological survey performed in conjunction with an Environmental Assessment required to put the land into trust, revealed 72 sites potentially eligible for the National Register of Historic Places, many of which were petroglyph panels.

Ravendale Parcel

SIR was donated 80 acres east of Ravendale, CA (T35N, R16E, S1/2 of the SE1/4 of Sec. 36) in 1994. Buckhorn creek bisects the NW corner of the property which has steep slopes, sagebrush and western juniper habitats, and no road access. The SIR has been discussing a possible land transfer to the Bureau of Land Management (BLM), which manages land adjacent to the property, in exchange for BLM managed lands adjacent to the Upper Rancheria and Highway 139.

Cradle Valley Parcel

SIR acquired 160 acres of forested property in Plumas County, completely surrounded by the Plumas National Forest, in 2003. The SIR is currently developing a proposal to put this land into trust. The long-term goal for this property, executed through the Cradle Valley Indigenous Landscape Enhancement Project (CVILEP), is to return the property to pre-settlement conditions and develop a Cultural Retreat.

2.3 Population

A healthy rate of growth and development is necessary for the economic well-being of the County, City, Rancheria and its people, even if it is difficult to determine exactly what a "healthy" rate of growth may be in many circumstances. The economic benefits of growth include employment opportunities, expanded markets, and increased property values and tax base. Adverse impacts of growth include increased traffic, greater demands on existing community services and schools, and pressure for development in previously undeveloped areas which may possess high natural resource values.

Estimated populations as of 2007 are as follows.

- Lassen County: 35,031 (41% urban, 59% rural)
- City of Susanville: 14,055
- Susanville Indian Rancheria: 698

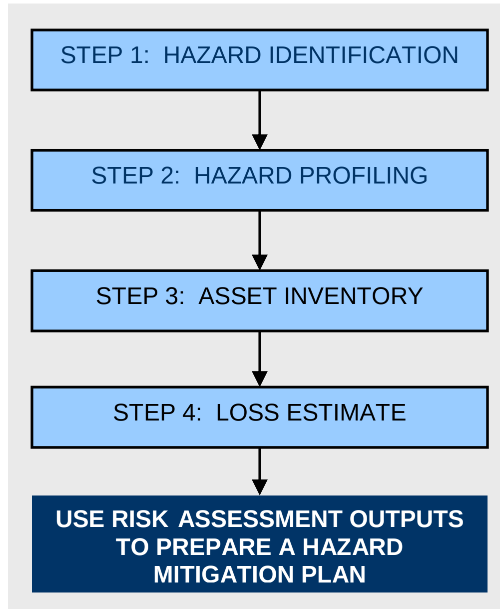
Projected Growth for Lassen County[1]						
	2006	**2010**	**2020**	**2030**	**2040**	**2050**
Population	36,515	37,918	42,394	47,240	51,596	55,989

Source: (1) California Department of Finance

Table of Contents

3.1 Risk Assessment

The Risk Assessment consists of four steps: Hazard Identification, Hazard Profiling, Asset Inventory, and Loss Estimate. This chapter includes the Hazard Identification and Hazard Profiling steps to evaluate the hazards of primary concern to local decision-makers to provide a basis for loss estimates. Additionally, the Risk Assessment provides a foundation for the evaluation of mitigation measures that can help reduce the impacts of a hazard when one occurs.



Step 1: Identify Hazards

This task was designed to identify all the natural and man-made hazards that *might* affect the Lassen County, the City of Susanville and the Susanville Indian Rancheria and then narrow the list to the hazards that are most likely to occur. These hazards included natural, technical, and human-caused events, with an emphasis on the effect of natural disasters on critical facilities (e.g., police stations, fire stations, schools, medical facilities, emergency shelter locations, Emergency Operations Center). The Steering Committee participated in a Hazard Identification Workshop to identify and rank the potential hazards within Lassen County, the City of Susanville and the Susanville Indian Rancheria.

Step 2: Profile Hazard Events

The hazard event profiles consist of either a map indicating the area impacted by each hazard or key information regarding the characteristics of hazard events within the planning area. To develop detailed hazard profiles, relevant open-source natural hazard studies and mapping projects were reviewed and documented within this report. In addition, Lassen County, the City of Susanville and the Susanville Indian Rancheria supplied natural hazard studies (e.g. Susanville Fire Safe Plan, Emergency Operations Plan, etc.) that included specific hazard and emergency information. This planning step determined the natural hazard magnitude, frequency, and location characteristics (wildland fire threat, predicted ground acceleration values, fault locations, flood plains, etc.) that were utilized as the design-basis for the loss estimates.

Step 3: Inventory Assets

The purpose of this task is to determine the quantity of buildings, people, and assets in Lassen County, the City of Susanville, and the Susanville Indian Rancheria that lie in the different hazard areas and what proportion of jurisdiction this represents. The asset inventory was completed utilizing spatial GIS asset locations and specifications for the following assets:

- General Building Stock
- Critical Facilities: fire stations, police stations, schools, hospitals, etc.
- Water system components: storage reservoirs, pumping plants, wells, etc.

The development of the comprehensive inventory facilitated the development of loss estimates for all hazard scenarios.

Step 4: Loss Estimates

The HAZUS-MH software package, which implements the FEMA-developed methodology and runs on a Geographic Information System (GIS) platform, was utilized to map and display hazard data, as well as the results of damage and economic loss estimates for buildings and infrastructure within the County, City and Rancheria.

In estimating losses, HAZUS-MH takes into account various impacts of a hazard event such as:

- Physical damage: damage to residential and commercial buildings, schools, critical facilities, and infrastructure;
- Economic loss: lost jobs, business interruptions, repair and reconstruction costs; and
- Social impacts: impacts to people, including requirements for shelters and medical aid.

In addition to earthquake loss estimates, the Project Team developed loss estimates that detail the monetary impact of each hazard on the County, City, and Rancheria.

3.2 Hazard Identification

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

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

§201.6(c)(2)(ii): [The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

§201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The hazard identification and ranking was obtained primarily from the Multi-Jurisdictional Hazard Identification Workshop. Therefore, each hazard profile includes a summary of the Hazard Identification Workshop identified risk factors and overall rank for each hazard, in addition to the detailed hazard description, historical occurrences, and future probability, magnitude, and frequency.

The Hazard Identification Workshop was conducted as a participatory Steering Committee workshop to identify the potential hazards within the respective jurisdictions. The Hazard Identification Workshop was facilitated utilizing an automated interactive software spreadsheet program that asks specific questions on potential hazards and then rates them accordingly. These questions guide the team in the correct facilitation and application of the program. The following table summarizes the Hazard Identification Workshop risk factors, lists the descriptions of each factor, and provides the specific descriptor choices for each risk factor and description. The following table summarized the risk ranking associated with each hazard:

Risk Factor	Description	Descriptors
Probability / Frequency	Prediction of how often a hazard will occur in the future	Infeasible event - not applicable due to geographic location characteristics
		Rare event - occurs less than once every 50 years
		Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)

Risk Factor	Description	Descriptors
		Regular event - occurs between once a year and once every 7 years
		Frequent event - occurs more than once a year
Consequence / Severity	Physical Damage - structures and lifelines Economic Impact – loss of function for power, water, sanitation, roads, etc.	No damage
		Minor/slight damage to buildings and structures, no loss of lifelines
		Moderate building damage, minor loss of lifelines (less than 12 hours)
		Moderate building damage, lifeline loss (less than 24 hours)
		Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life
Vulnerability	Impact Area - area impacted by a hazard event Secondary Impacts - Capability of triggering additional hazards Onset - Period of time between initial recognition of an approaching hazard and when the hazard begins to impact the community	No physical damage, no secondary impacts
		Localized damage area
		Localized damage area, minor secondary impacts, delayed hazard onset
		Moderate damage area, moderate secondary impacts, moderate warning time
		Widespread damage area, significant secondary impacts, no warning time

Each profile also includes a profile ranking of the hazard (ranging from no/low risk to severe risk). The planning team determined this initial profile ranking based on all of the hazard identification, profile research, group discussion, and evaluation of all of the data.

Risk Rank Categorization	
High Hazard	50 to 100
Moderately High Hazard	25 to 49
Moderate Hazard	15 to 24
Moderately Low Hazard	5 to 14
Low Hazard	1 to 4

Risk Ranking Matrix

Probability/Frequency Description	Risk Ranking Matrix
Rare Event: Occurs less than once every 50 years	Probability/Frequency Value: 1
Infrequent Event: Occurs between once every 8 years and once every 50 years (inclusive)	Probability/Frequency Value: 2
Regular Event: Occurs between once a year and once every 7 years	Probability/Frequency Value: 3
Frequent Event: Occurs more than once a year	Probability/Frequency Value: 4

Probability/Frequency Value 1

Vulnerability \ Consequence/Severity	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Probability/Frequency Value 2

Vulnerability \ Consequence/Severity	1	2	3	4	5
1	2	4	6	8	10
2	4	8	12	16	20
3	6	12	18	24	30
4	8	16	24	32	40
5	10	20	30	40	50

Probability/Frequency Value 3

Vulnerability \ Consequence/Severity	1	2	3	4	5
1	3	6	9	12	15
2	6	12	18	24	30
3	9	18	27	36	45
4	12	24	36	48	60
5	15	30	45	60	75

Probability/Frequency Value 4

Vulnerability \ Consequence/Severity	1	2	3	4	5
1	4	8	12	16	20
2	8	16	24	32	40
3	12	24	36	48	60
4	16	32	48	64	80
5	20	40	60	80	100

3.3 Hazard Profiling

This section presents additional information regarding the hazards of concern (detailed below) as hazard profiles. Hazard profiles are designed to assist communities in evaluating and comparing the hazards that can impact their community by comparing a number of hazard factors. Each type of hazard has unique characteristics and the impact associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Lassen County Hazard Ranking Summary

Hazard Rank	Score
High	
Wildfire	100
Power Failure	100
Wind/Tornado	80
Severe Storm	75
Drought	75
Moderately High	
Flood	48
Reservoir Failure	40
Hazardous Material Release	40
Earthquake	30
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Moderately Low	
Terrorism	12
Low	
Avalanche	4

City of Susanville Hazard Ranking Summary

Hazard Rank	Score
High	
Power Failure	100
Severe Storm	75
Wildfire	60
Hazardous Material Release	50
Moderately High	
Flood	36
Wind/Tornado	36
Earthquake	30
Drought	30
Reservoir Failure	25
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Moderately Low	
Terrorism	12
Low	
Avalanche	4

Susanville Indian Rancheria Hazard Ranking Summary

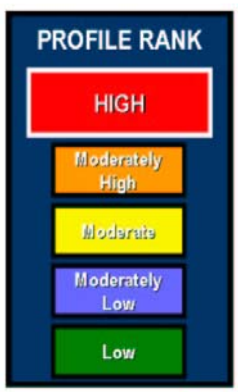
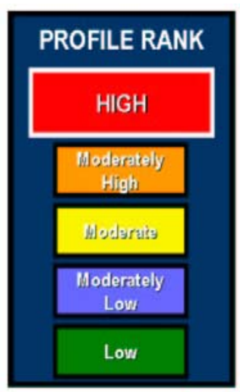
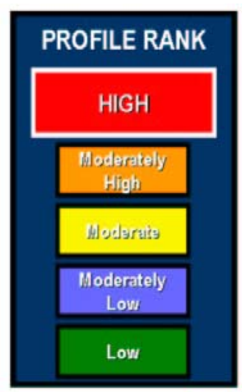
Hazard Rank	Score
High	
Wildfire	100
Power Failure	100
Wind/Tornado	80
Severe Storm	75
Drought	75
Hazardous Material Release	50
Moderately High	
Pandemic	25
Volcano	25
Moderate	
Extreme Heat	16
Earthquake	18
Moderately Low	
Terrorism	12
Low	
Flood	4

Comprehensive Hazard Ranking Summary

HAZARDS CONSIDERED	JURISDICTION		
	Lassen County	City of Susanville	Susanville Indian Rancheria
Wildfire	HIGH	HIGH	HIGH
Power Failure	HIGH	HIGH	HIGH
Wind	HIGH	MODERATELY HIGH	HIGH
Severe Storm	HIGH	HIGH	HIGH
Drought	HIGH	MODERATELY HIGH	HIGH
Flood	MODERATELY HIGH	MODERATELY HIGH	LOW
Reservoir Failure	MODERATELY HIGH	MODERATELY HIGH	NOT A HAZARD
Hazardous Material Release *Includes Gas Pipeline and Nuclear Releases	MODERATELY HIGH	HIGH	HIGH
Earthquake	MODERATELY HIGH	MODERATELY HIGH	MODERATE
Pandemic	MODERATELY HIGH	MODERATELY HIGH	MODERATELY HIGH
Volcano	MODERATELY HIGH	MODERATELY HIGH	MODERATELY HIGH
Extreme Heat	MODERATE	MODERATE	MODERATE
Terrorism	MODERATELY LOW	MODERATELY LOW	MODERATELY LOW
Avalanche	LOW	NOT A HAZARD	NOT A HAZARD

3.4 Wildfire Hazard Profile

Wildfire Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts	Localized damage area, minor secondary impacts	Widespread damage area, significant secondary impacts
Hazard Risk Rank Score:	100	60	100
Profile Rank			

3.4.1 Fire Hazard Information and Background

Fire is a rapid oxidation process that can lead to uncontrolled burning, exposing and possibly consuming structures. Fires often spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. Fires can be human-caused through acts such as arson, or can be caused by natural events such as lightning. Fires are typically classified according to the following categories:

- **Urban fires** are primarily those associated with structures and the activities in and around them.
- **Wildland fires** occur in forests or other generally uninhabited areas and are fueled primarily by natural vegetation.
- **Urban Interface fires** occur where development and forest interface, with both vegetation and structures providing fuel. (May also be referred to as urban-wildland interface fires)

The following factors contribute significantly to aforementioned fire behavior:

- **Slope/Topography**: As slope increases, the rate of fire spread increases. South facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying fire behavior.
- **Fuel**: Weight and volume are the two methods of classifying fuel, with volume also referred to as fuel loading. Each fuel is assigned a burn index (the estimated amount of potential energy released during a fire), an estimate of the effort required to contain a fire, and an expected flame length.
- **Weather**: Variations in weather conditions have a significant effect on the occurrence and behavior of fires.

Firestorms that occur during extreme weather (e.g., high temperatures, low humidity, and high winds) have high intensity making fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted. Even small fires can threaten lives and resources, and destroy improved properties. It is also important to note that in addition to affecting people, fires may severely affect livestock and pets. Such events may require the emergency watering/feeding, shelter, evacuation, and even burying of animals.

Fire Secondary Events

The aftermath of a fire can be as disastrous if not more so than the fire. A particularly destructive fire burns away plants and trees that prevent erosion. If heavy rains occur after such a fire, landslides, ash flows, and flash floods can occur. This can result in property damage outside the immediate fire area, and can affect the water quality of streams, rivers and lakes.

Fire as a Secondary Event

In addition to typical ignition sources for fires, earthquakes or floods have the potential to rupture buried gas lines, and high winds or accidents could cause overhead electric lines to break, creating ignition sources for fires. Catastrophic earthquakes could cause widespread urban fires, as multiple gas and electrical lines could be broken or disrupted.

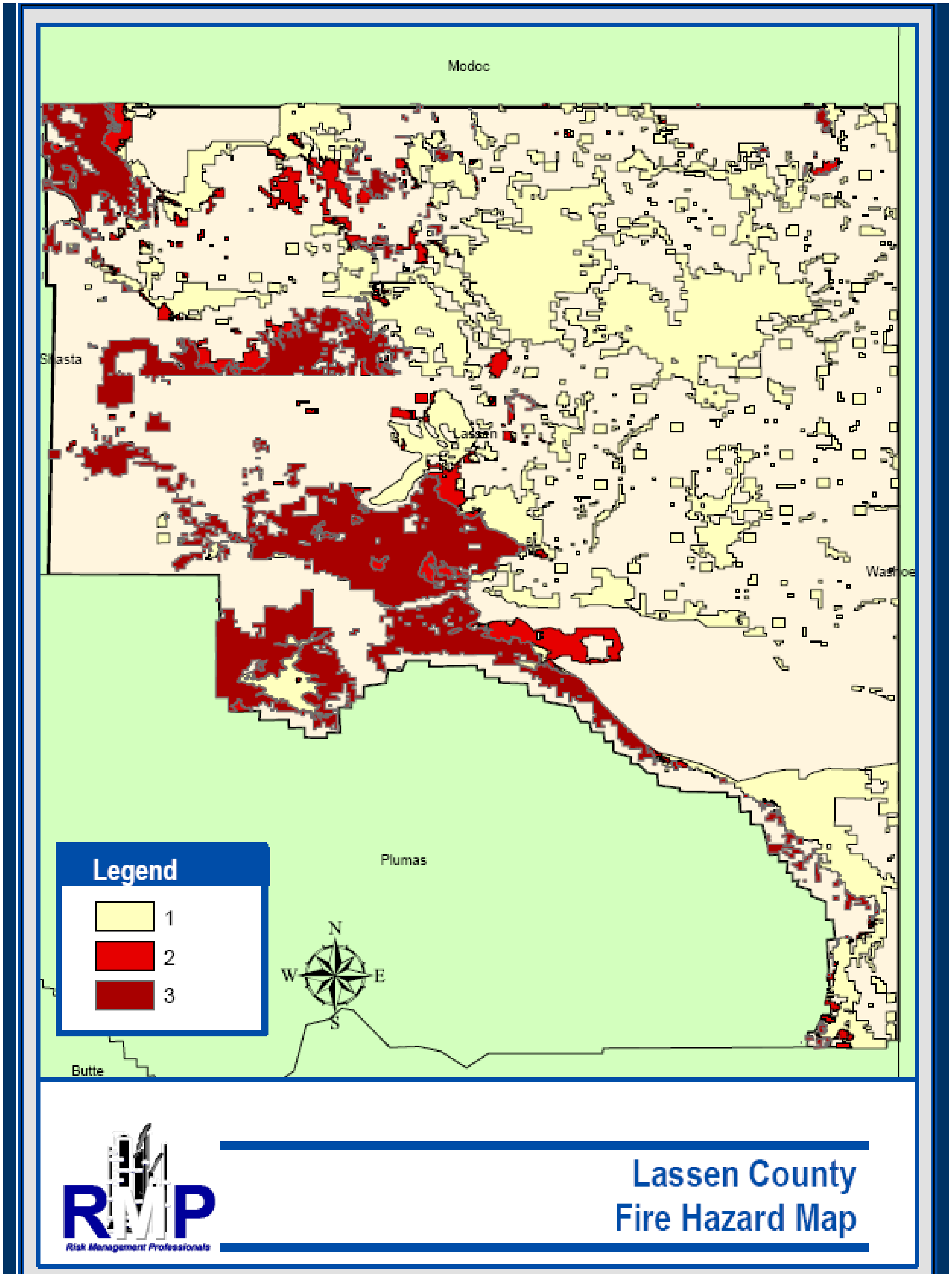
3.4.2 Fire History

Lassen County is subject to periodic wildland fires. In order to illustrate the historical fire frequency, the map on the following page depicts the fire history throughout Lassen County, the City of Susanville and the Susanville Indian Rancheria.

The following table illustrates the California Department of Forestry and Fire Protection historical fire archives for Lassen County:

Historical Fire History (2003 – 2009)		
Fire Name	**Date**	**Approximate Damage**
Straylor Fire	July 22-30, 2004	Took place in the CDF Lassen-Modoc Unit, burning 3,422 acres.
Lassen/Modoc Lightning Fires	June 25, 2006	Burned approximatey 3,500 acres.
Creek Fire	July 18 – 23, 2006	The Creek Fire took place in the CDF Lassen-Modoc Unit, burning 1,611 acres.

Historical Fire History (2003 – 2009)		
Fire Name	**Date**	**Approximate Damage**
Popcorn File	June 24, 2008	The Popcorn Fire joined with the Peterson Fire to become the Peterson Complex and burned 3,100 acres near Little Valley in the Lassen National Forest in Shasta County and Lassen County.
Corral Fire	June 23, 2008	Burned 12,434 acres in the Upper Gooch Valley in Lassen County.
Dodge Complex Fire	August 1, 2009	Burned 1,600 acres, 10 miles southeast of Madeline in Lassen County.
Hat Creek Complex	August 1, 2009	Burned 11,269 acres throughout multiple locations in the Lassen and Shasta Counties. The Hat Creek Complex consists of several fires. The three major fires are Sugarloaf, Brown and Butte.
Day Fire	August 27, 2009	Burned 853 acres near Day Road/Hwy 299E in Lassen County.



Lassen County - Historical Wildland Fires

3.4.3 Fire Probability, Frequency, and Magnitude

Wildfires are a major environmental hazard that have historically cost California more than $800 million each year and contribute to "bad air days" throughout the state. Heat and smoke from fire can be more dangerous than the flames. Inhaling the smoke can sear the lungs. Fire also produces poisonous gases that causes disorientation and drowsiness. As a result, asphyxiation is the leading cause of fire deaths, exceeding burns by a three-to-one ratio.

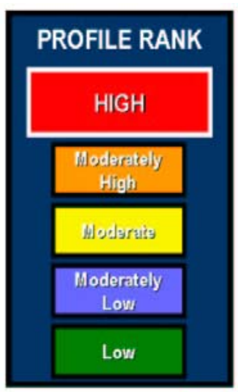
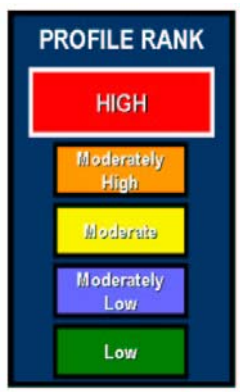
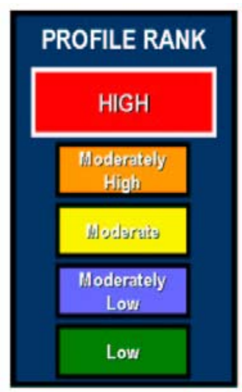
Lassen County's climate, with its warm and dry summers, contributes to low relative humidity and low fuel moistures. When combined with high fuel loading, the potential for a catastrophic fire event is significant. Three weather conditions specific to Lassen County that may cause the ignition and/or impact the behavior of wildfires are as follows.

- Thunderstorms and the associated lightning is a significant source of fire starts, and usually occur mid to late summer.
- High winds can become steady up to 20 mph and gust up to 30-40 mph most commonly occur in late spring and in late August to mid October.
- Hot, dry conditions most commonly occur in August and September.

Furthermore, Lassen County's rural appeal and associated lifestyles are highly desirable and are sought out by many. However, the integration of residential, recreational and commercial occupancies and activities within the flammable natural vegetation of the area is a dangerous mix. Indeed all or portions of each of the communities in Lassen County are within designated high or very high fire hazard severity zones.

**Lassen County Community Wildfire Protection Plan.

3.5 Power Failure Hazard Profile

Power Failure Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	100	100	100
Profile Rank			

3.5.1 Power Failure Hazard Information and Background

A power outage is the loss of the electricity supply to an area. In addition to natural hazards, power failure can result from a defect in a power station, damage to a power line or other part of the distribution system, a short circuit, or the overloading of electricity mains.

A power outage may be referred to as a blackout if power is lost completely, or as a brownout if some power supply is retained, but the voltage level is below the minimum level specified for the system, and a short circuit indicates a loss of power for a short amount of time (usually seconds). Some brownouts, called voltage reductions, are made intentionally to prevent a full power outage.

3.5.2 Power Failure History

The 2000-2001 California electricity crises brought to light many critical issues surrounding the state's power generation and distribution system, including its dependency on out-of-state resources. Although California has implemented effective energy conservation programs, the state continues to experience both population growth and weather cycles that contribute to a heavy demand for power. The 2000 and 2001 blackouts occurred due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption. Additionally, the July 2006 heat wave brought about rolling blackouts which indicates the demand for power during extreme heat events will exceed availability and appropriate planning for alternate power sources is extremely important to protect the community.

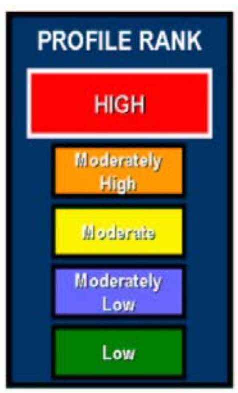
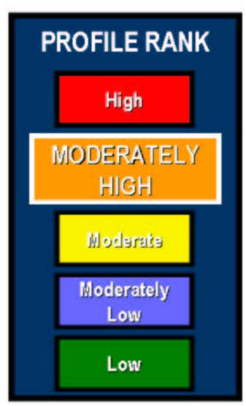
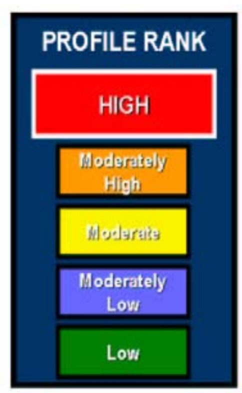
Lassen County, including the City of Susanville and the Susanville Indian Rancheria, receives power from Pacific Gas and Electric Company on the western side of the Sierras via two transmission lines – the Caribou and Hat Creek lines. Since these lines cross the Sierra's and are subject to severe winter storms, power failures are an annual occurrence. The outage duration varies depending upon the event, but can last for several days during events damaging both transmission lines.

3.5.3 Power Failure Probability, Frequency, and Magnitude

Currently, there is no mechanism to calculate the probability of a power failure, without evaluating the failure as a cascade effect from natural hazards (i.e., earthquakes). However, based upon historical events power failure occurs at least annually. To help mitigate the severity in an extreme power outage, Lassen County has the capability to obtain power from the Honey Lake Power biomass plant via an agreement with PG&E to purchase the power. In addition, in order to evaluate the damage inflicted by a power outage the Federal Emergency Management Agency (FEMA) has assigned economic values to the loss of electric power. The following table summarizes the loss estimates per capita per day.

Economic Impacts of Loss of Electric Power	
Category	**Estimated Economic Impact**
Reduced regional economic activity	$87
Impacts on Residential Customers • Direct economic losses • Disruption economic impact • Total Best estimate	 $30 to $35 $63 to 85 $101
Total economic impacts	**$188**

3.6 Wind Hazard Profile

Wind Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability
Vulnerability:	Widespread damage area, significant secondary impacts	Localized damage area, minor secondary impacts	Widespread damage area, significant secondary impacts
Hazard Risk Rank Score:	80	36	80
Profile Rank			

3.6.1 Wind Hazard Information and Background

Severe wind storms represent a significant risk to life and property in the region by creating conditions that can disrupt essential systems such as public utilities, telecommunications, and transportation routes. High winds can and do occasionally cause tornado-like damage to local homes and businesses. High winds may also have destructive impacts, especially to trees, power lines, and utility services.

Life and Property

Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building components and surfaces outward. With extreme wind forces, the roof or entire building can fail causing considerable damage.

Debris carried by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike a community, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after a windstorm event.

Utilities

Historically, falling trees have been the major cause of power outages in the region. Windstorms can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the potential for lethal electric shock.

Infrastructure

Windstorms can damage buildings, power lines, and other property and infrastructure due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

Windstorms can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment.

Transportation

Windstorm activity can have an impact on local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong winds, major highways can be temporarily closed to truck and recreational vehicle traffic. However, typically these disruptions are not long lasting, nor do they carry a severe long term economic impact on the region.

3.6.2 Wind History

To indicate the potential for a wind event, the table below lists all wind hazards that have resulted in damage in Lassen County:

Historical Wind Damage in Lassen County

Date	Injuries	Fatalities	Property Damage	Crop Damage	Hazard Description
2/7/1962	0.26	0.35	86,206.90	0.00	Severe Storm/ Thunder Storm-Wind
10/10/1962	1.79	0.36	35,714.29	35,714.20	Severe Storm/ Thunder Storm-Wind
1/30/1963	0.57	0.14	35,714.29	0.00	Severe Storm/ Thunder Storm-Wind
12/23/1979	0	0	14,285.71	0	Severe Storm/ Thunder Storm-Wind
12/22/1982	0.21	0.06	1,041,666.67	104.17	Wind

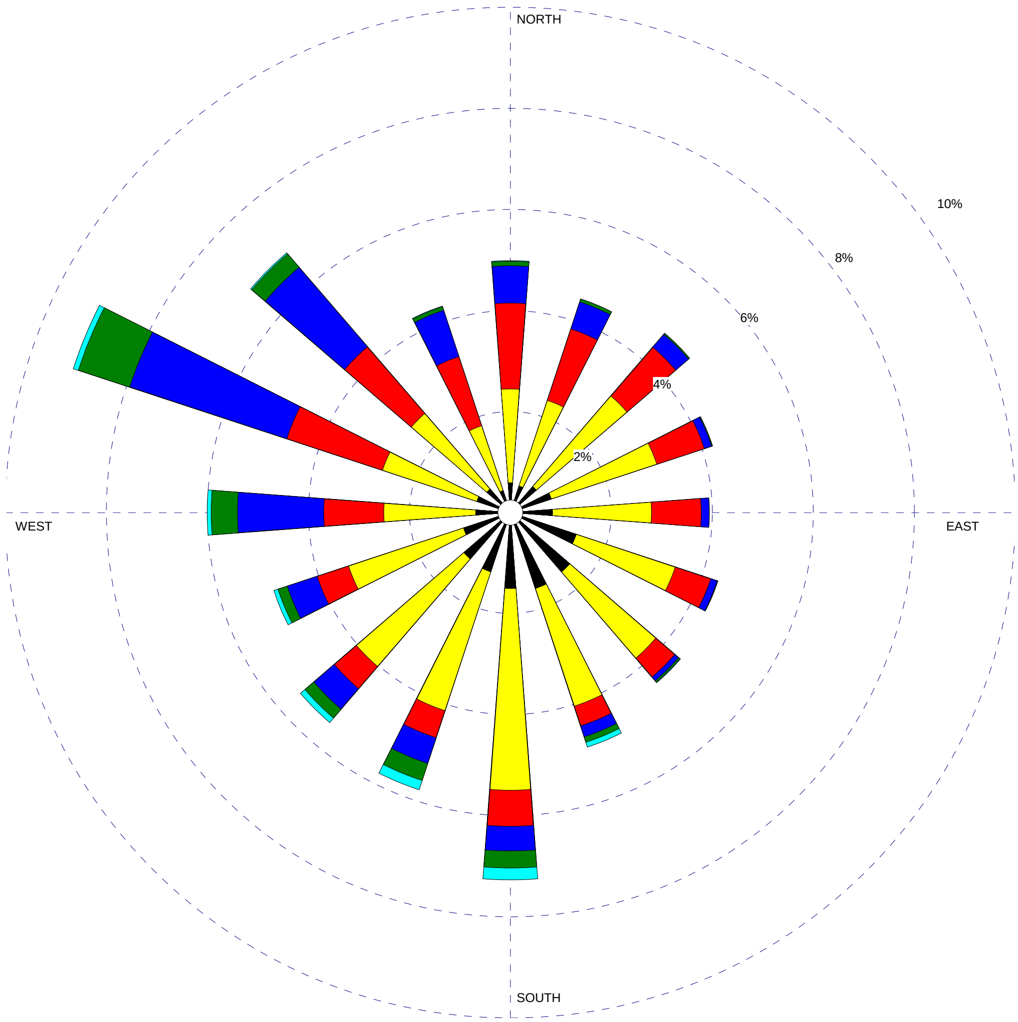
Historical Wind Damage in Lassen County					
Date	**Injuries**	**Fatalities**	**Property Damage**	**Crop Damage**	**Hazard Description**
1/19/1993	0.31	0.00	31,250.00	31250.00	Wind-Winter Weather
1/21/2002	0	0	50,000.00	0	Wind
11/7/2002	0	0	50,000.00	0	Wind
12/14/2002	0	0	50,000.00	0	Wind
12/26/2006	0	0	16,250.00	0	Wind

3.6.3 Wind Probability, Frequency, and Magnitude

The wind conditions prevailing in the Lassen County service area are presented on the following pages as a representative City of Reno Wind Rose. As evidenced in the wind rose, the direction and intensity of the wind changes with the seasons. Additionally, the Wind Zone National Map provides an overview of the wind classifications, which characterizes Lassen County as Zone 1 (130 mph) and a Special Wind Region.

WIND ROSE PLOT

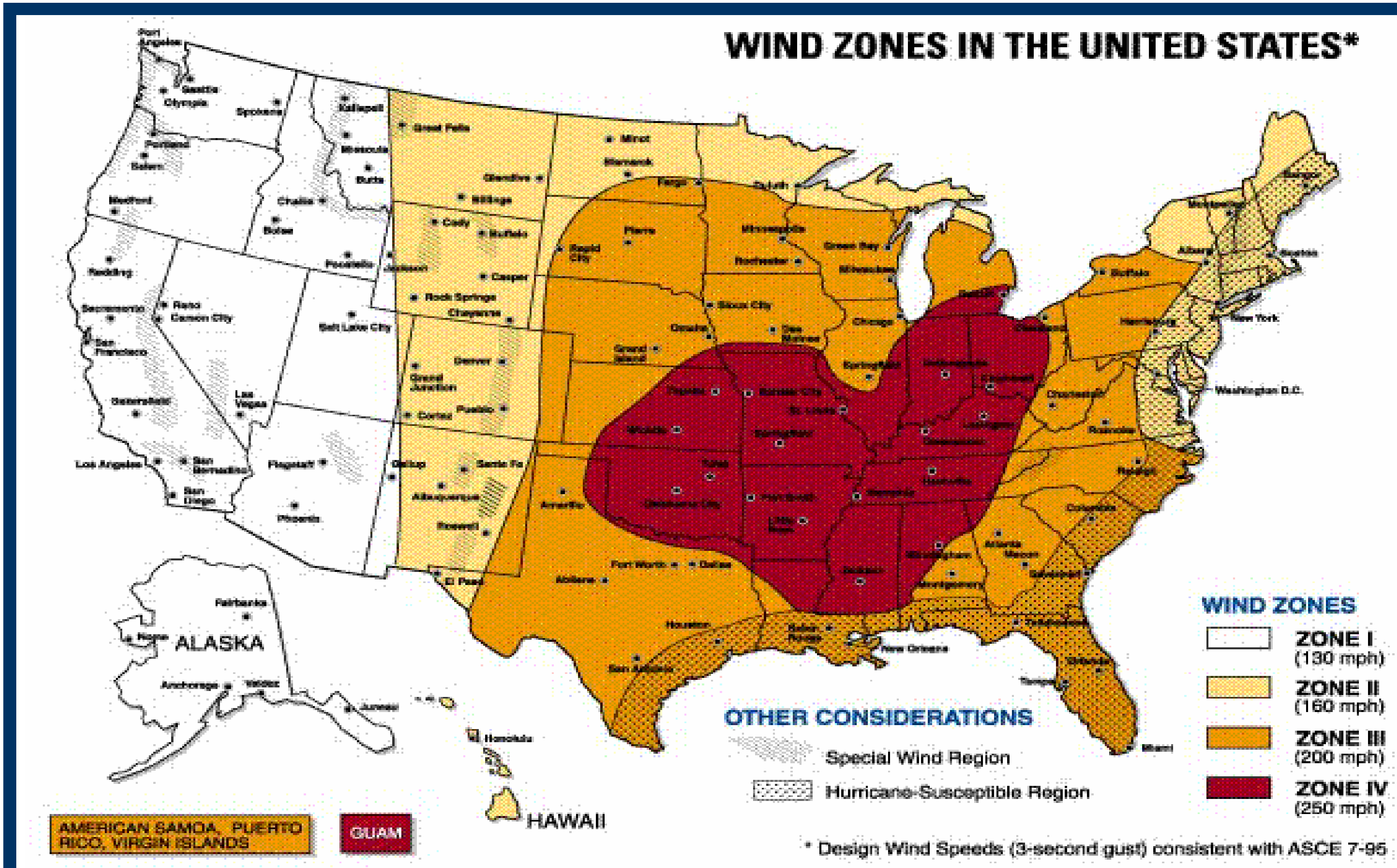
Station #23185 - RENO/CANNON INT'L ARPT, NV 1987-1991



Wind Speed (m/s)	MODELER	DATE	COMPANY NAME
> 11.06		**5/28/2003**	
8.49 - 11.06	DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS
5.40 - 8.49	AVG. WIND SPEED **3.69 m/s**	CALM WINDS **14.38%**	
3.34 - 5.40			
1.80 - 3.34	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987 Jan 1 - Dec 31 Midnight - 11 PM**	PROJECT/PLOT NO. **1987-1991**
0.51 - 1.80			

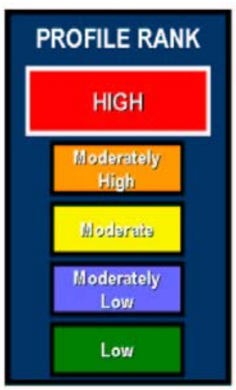
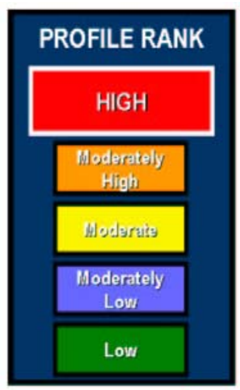
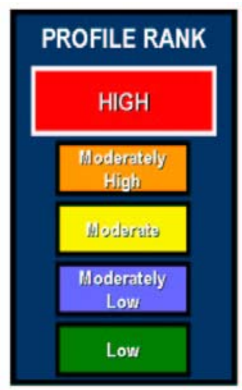
WRPLOT View 3.5 by Lakes Environmental Software - www.lakes-environmental.com

City of Reno Wind Rose



Wind Zone National Map

3.7 Severe Storm Hazard Profile

Severe Storm Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts		
Hazard Risk Rank Score:	75	75	75
Profile Rank			

3.7.1 Severe Storm Hazard Information and Background

Lightning/Thunderstorms

Lightning is a powerful natural electrostatic discharge produced during a thunderstorm. This abrupt electric discharge is accompanied by the emission of visible light. The electric current passing through the discharge channels rapidly heats and expands the air, producing acoustic shock waves (thunder) in the atmosphere.

All lightning originates around 15,000 to 25,000 feet above sea level when raindrops are carried upward until some drops convert to ice. A cloud-to-ground lightning flash originates in this region, moving downward in 50-yard sections called step ladders. Eventually, the charge encounters something on the ground that conducts electricity. At this point the circuit is complete and the charge is lowered from the cloud to the ground. The return stroke is a flow of charge, which produces visible light.

Lightning causes thunder. The bright light of the lightning flash caused by the return stroke represents a great deal of energy. This energy heats the air in the channel to above 50,000 degrees Fahrenheit in only a few millionths of a second. The air that is now heated to such a high temperature has no time to expand, resulting in very high pressure. The high-pressure air then expands outward into the surrounding air, compressing it and causing a disturbance that propagates in all directions away from the stroke. The disturbance is a shock wave for the first 10 yards, after which it becomes an ordinary sound wave, or thunder.

Nearly 2,000 people per year in the world are injured by lightning strikes, and between 25% to 33% of those struck die. Lightning injuries result from three factors: electrical damage, intense heat, and the mechanical energy which these generate. The following list provides the lightning hazards to the general population:

- Direct strike
- 'Splash' from nearby objects struck
- Ground strike near victim causing a difference of potential in the ground itself, amounting to several thousand volts-per-foot, depending upon the composition of the earth that makes up the ground at that location.
- Electromagnetic pulse from close strikes - especially during positive lightning discharges

The following table on the next page details threat level classifications for lightning hazard events:

Threat Level	Threat Level Descriptions
Extreme	Within 12 miles of a location, a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a very high likelihood of CG lightning (or 80% to 90% thunderstorm probability), with storms capable of occasional CG lightning.
High	Within 12 miles of a location, a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a high likelihood of CG lightning (or 60% to 70% thunderstorm probability), with storms capable of occasional CG lightning.
Moderate	Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of excessive CG lightning. AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a moderate likelihood of CG lightning (or 50% thunderstorm probability), with storms capable of occasional CG lightning.
Low	Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of frequent CG lightning. AND/OR...a low likelihood of CG lightning (or 30% to 40% thunderstorm probability), with storms capable of occasional CG lightning.
Very Low	Within 12 miles of a location, a very low likelihood of CG lightning (or 10% to 20% thunderstorm probability), with storms capable of occasional CG lightning.
No Threat	Within 12 miles of a location, environmental conditions do not support CG lightning.
Occasional - CG lightning at the rate of 1 to 3 flashes per minute (about 5 to 15 flashes per 5 minutes) associated with a given lightning storm. **Frequent** - CG lightning at the rate of 4 to 11 flashes per minute (about 20 to 55 flashes per 5 minutes) associated with a given lightning storm. **Excessive** - CG lightning rate of 12 flashes or more per minute (about 60 flashes or more per 5 minutes) and is nearly continuous associated with a given lightning storm.	

Hail

Hail forms in strong thunderstorm clouds, particularly those with intense updrafts, high liquid water content, great vertical extent, large water droplets, and where a good portion of the cloud layer is below freezing (< 32 °Fahrenheit, 0 Celcius). The growth rate is maximized at about -13 Celcius, and becomes vanishingly small much below -30 Celcius as supercooled water droplets become rare. For this reason, hail is most common in midlatitudes during early summer where surface temperatures are warm enough to promote the instability associated with strong thunderstorms, but the upper atmosphere is still cool enough to support ice. Accordingly, hail is actually less common in the tropics despite a much higher frequency of thunderstorms than in the midlatitudes because the atmosphere over the tropics tends to be warmer over a much greater depth. Also, entrainment of dry air into strong thunderstorms can increase the frequency of hail by promoting evaporational cooling which lowers the freezing level of thunderstorm clouds giving hail a larger volume to grow in.

Fog

Fog occurs when moisture from the surface evaporates; and as this evaporated moisture moves upward, it cools and condenses into fog. All types of fog form when the relative humidity reaches 100% and the air temperature drops below the dewpoint, pushing it lower by forcing the water vapor to condense. Fog can form suddenly, and can dissipate just as rapidly, depending on what side of the dewpoint the temperature is on.

3.7.2 Severe Storm History

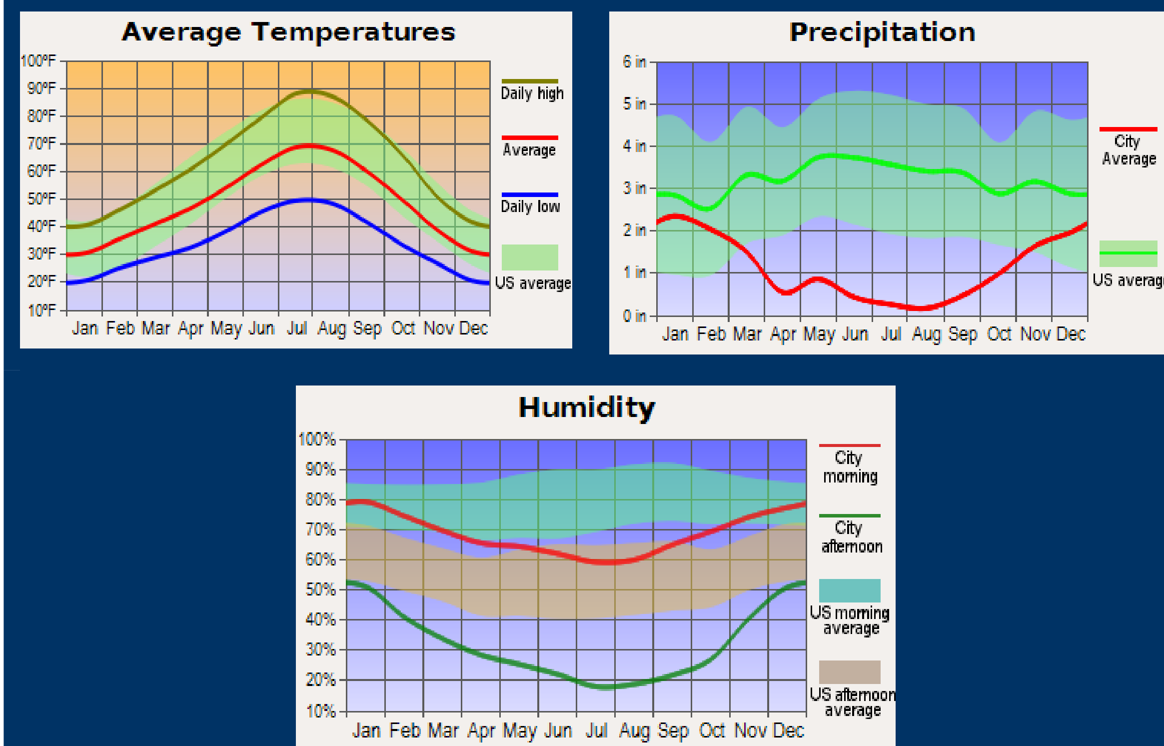
To indicate the potential for a severe storm event, the table below lists an excerpt of large-scale severe storms extracted from an emerging event database, including lightning, thunderstorms, hail, fog, winter weather, and wind that have resulted in extensive regional damage. This list is not considered to be comprehensive, since severe storms are an annual event causing minor damages and economic disruption (closed roads, fallen power lines, etc.).

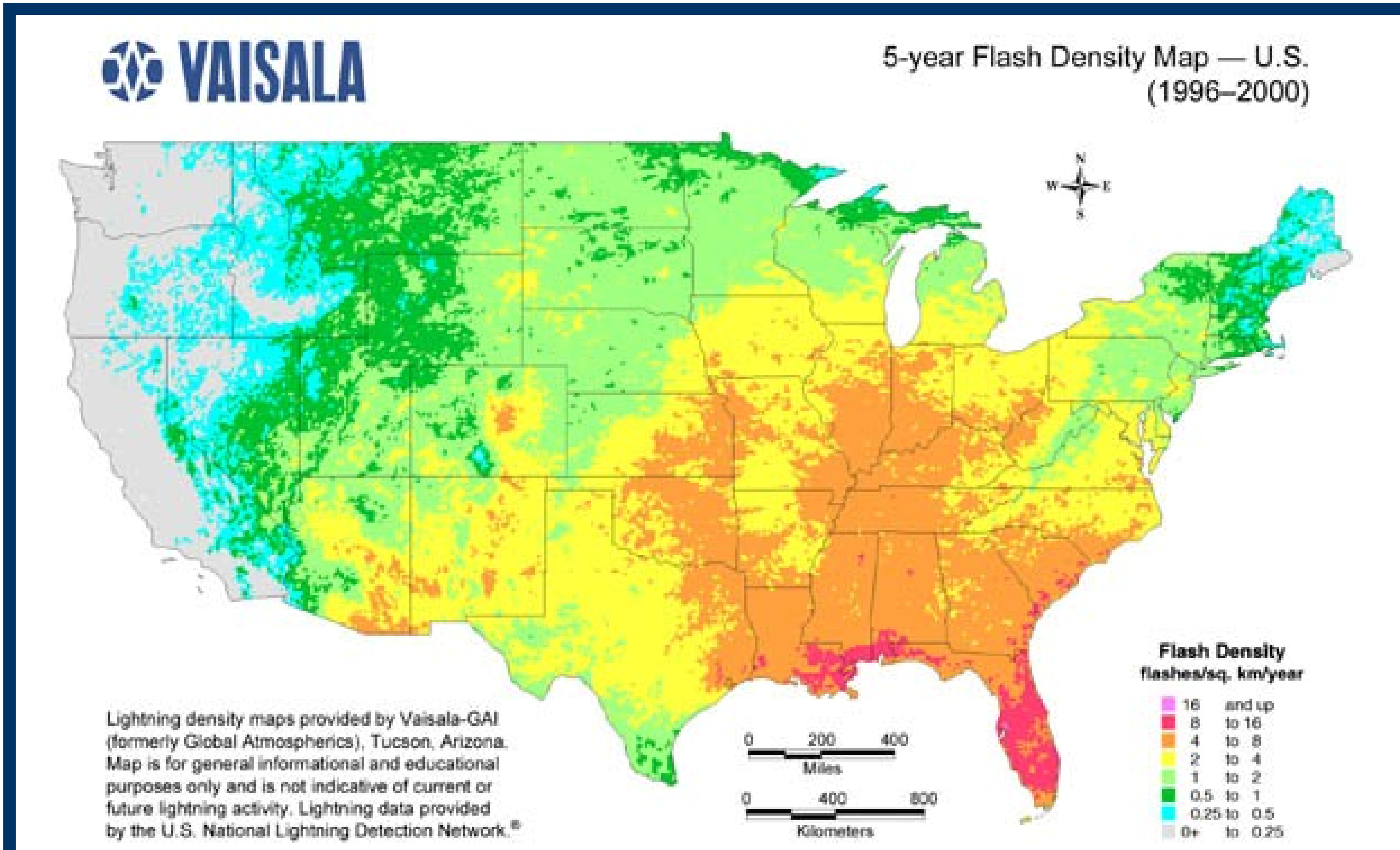
Historical Severe Storm Damage in Lassen County					
Date	Injuries	Fatalities	Property Damage	Crop Damage	Hazard Description
9/1/1987	7.29	0.57	3571428.57	0	Lightning
2/7/1962	0.26	0.35	86206.90	0	Severe Storm/ Thunderstorm - Wind
10/10/1962	1.79	0.36	35714.29	35714.29	Severe Storm/ Thunderstorm - Wind
1/30/1963	0.57	0.14	35714.29	0	Severe Storm/ Thunderstorm - Wind
1/18/1969	0.17	0.78	862068.97	8620.69	Severe Storm/ Thunderstorm
1/16/1973	0	0	86206.90	0	Flooding - Severe Storm/ Thunderstorm
12/20/1990	0	0.05	86206.90	8620689.66	Winter Weather
1/13/1993	0.29	0	357142.86	0	Winter Weather
1/13/1993	0	0	166666.67	0	Winter Weather
1/22/1997	0	0	66666.67	0	Winter Weather

3.7.3 Severe Storm Probability, Frequency, and Magnitude

Given the severe storm history in the Lassen County, City of Susanville and Susanville Indian Rancheria areas, severe storms, including fog, rain, hail, lightning, thunderstorms, and winter weather, are very likely to continue to occur frequently. The following pages provide information and trends for the aforementioned hazards, including average climate information for the City of Susanville and a national lightning flash density map.

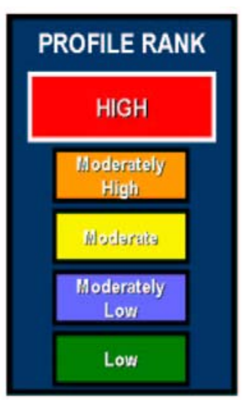
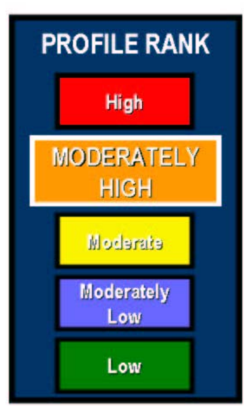
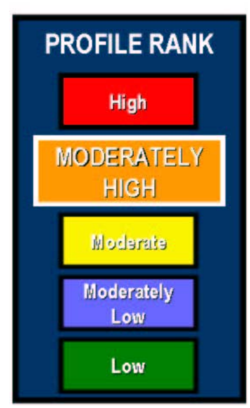
City of Susanville Average Weather Data





Lightning Hazard National Frequency Map

3.8 Drought Hazard Profile

Drought Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), groundwater contamination, radium contamination, loss of life	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury, groundwater contamination, radium contamination, and no disability	
Vulnerability:	Widespread damage area, significant secondary impacts		
Hazard Risk Rank Score:	75	30	30
Profile Rank			

3.8.1 Drought Hazard Information and Background

A drought or an extreme dry periodic climate is an extended period where water availability falls below the statistical requirements for a region. Drought is not a purely physical phenomenon, but rather an interplay between natural water availability and human demands for water supply. The precise definition of drought is made complex owing to political considerations, but there are generally four types of conditions that are referred to as drought:

- **Meteorological drought** is brought about when there is a prolonged period with less than average precipitation.
- **Agricultural drought** is brought about when there is insufficient moisture for average crop or range production. This condition can arise, even in times of average precipitation, owing to soil conditions or agricultural techniques.
- **Hydrologic drought** is brought about when the water reserves available in sources such as aquifers, lakes, and reservoirs falls below the statistical average. This condition can arise, even in times of average (or above average) precipitation, when increased usage of water diminishes the reserves.
- **Socioeconomic drought** associates the supply and demand of water services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall.

Due to the extensive nature of water supply infrastructure – reservoirs, groundwater basins, and inter-regional conveyance facilities – mitigation for the effect of short-term dry periods is implicit for most systems. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or wildland fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall – ranchers engaged in dryland grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

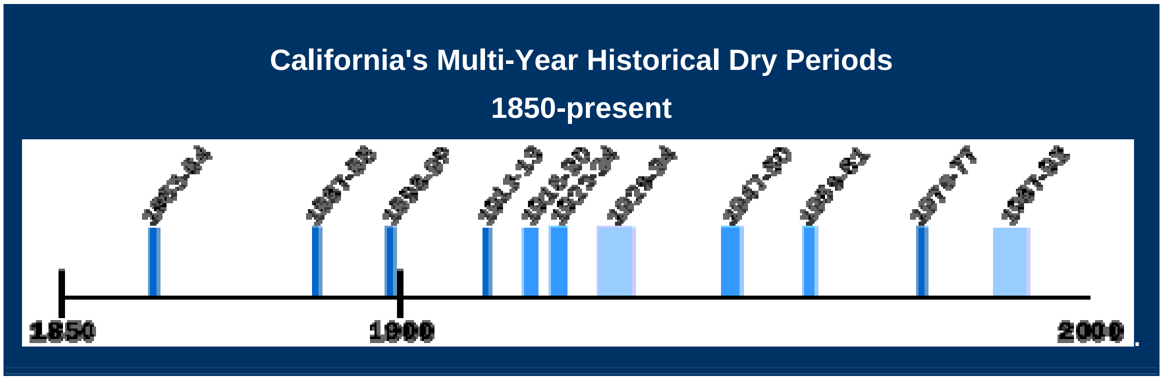
Droughts may cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline and the number and severity of wildland fires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and raise unemployment.

3.8.2 Drought History

The majority of Lassen County is included in the North Lahontan Hydrologic Region. Hydrologic regions are defined as "major drainage basins" by the California Water Plan. This means that much of the County's surface water, including the Susan River, drains to the series of alkaline lakes, such as Honey Lake, that make up the region, and do not feed to the ocean. In addition, much of the western portion of the County contributes surface water to the Sacramento River Hydrologic Region, eventually feeding the Pacific Ocean through the Sacramento-San Joaquin Delta. In addition to the Susan River and Honey Lake, prominent water resources include Eagle Lake and a portion of the Pitt River.

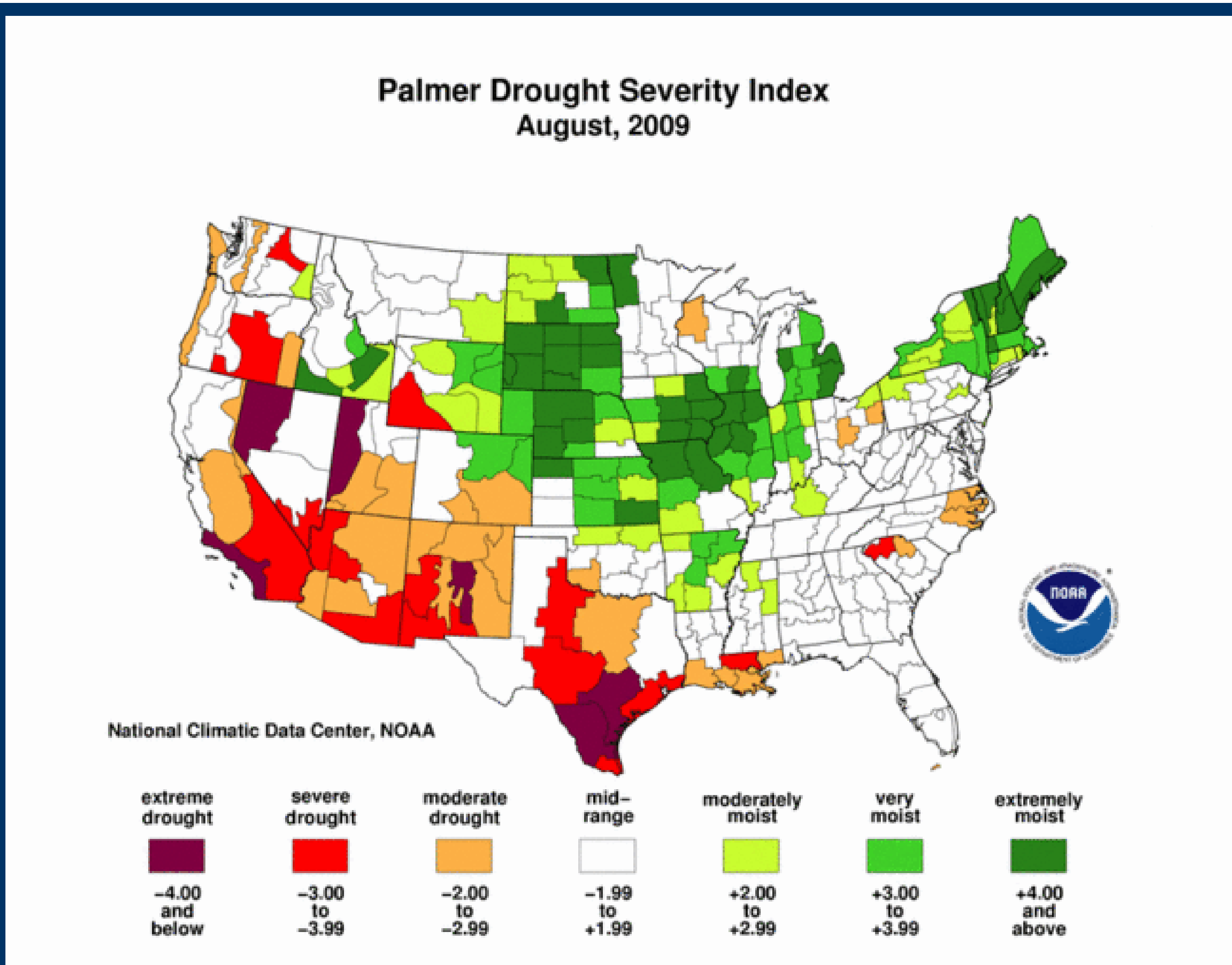
Much of the northern portion of North Lahontan region is chronically short of water. In the Modoc and Lassen County areas drought is a way of life for agriculture, and seasonal irrigation takes place only as long as water is available. During dry years areas with little or no surface storage may only have irrigation water available for a short period early in the season, resulting in irrigation of limited acreage unless growers are able to supplement their surface water supply by pumping groundwater. However, in the Modoc and Lassen regions groundwater is also limited and some well-pumping capacities are known to diminish very rapidly during the first year of droughts.

The following timeline depicts periods of drought throughout the State of California:



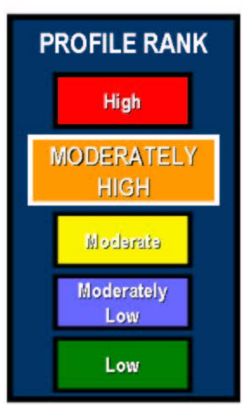
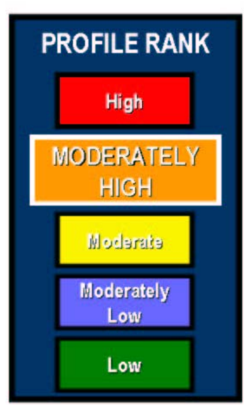
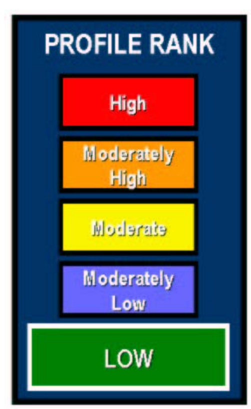
3.8.3 Drought Probability, Frequency, and Magnitude

While no standardized approach exists to assessing risks associated with drought, the Palmer Drought Severity Index is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. The map on the following page depicts the Palmer Drought Severity Index for the United States, which indicates that Lassen County, the City of Susanville, and the Susanville Indian Rancheria are located in what is considered a moderate drought or mid-range region.



Palmer Drought Index – Long-Term Conditions

3.9 Flood Hazard Profile

Flood Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Regular event - occurs between once a year and once every 7 years		Rare event - occurs less than once every 50 years
Consequence/Severity:	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability		Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time	Localized damage area, minor secondary impacts	Localized damage area
Hazard Risk Rank Score:	48	36	4
Profile Rank			

3.9.1 Flood Hazard Information and Background

Despite its generally dry conditions, Lassen County, the City of Susanville, and the Susanville Indian Rancheria experience periodic winter storms and thunderstorms that often result in flash floods. Under storm conditions, the region's stream systems pose a significant threat.

Floods can take several hours to days to develop; the following flood characterization designates the amount of time for response:

- **Flood Watch** – a flood is possible in the area.
- **Flood Warning** – flooding is already occurring or will occur soon in the area.
- **Flash Flood Watch** – a flash flood is possible in the area. Seek immediate shelter or higher ground.
- **Flash Flood Warning** – flooding is already occurring or will occur soon in the area. Flash floods can occur without warning, during heavy rain in mountainous regions ensure that precautions and flash flood warnings are adhered to.

Alluvial Fan Flooding

Alluvial fan flooding occurs in the steep arid or semiarid mountains found throughout California. Alluvial fans are fan-shaped deposits of eroded rock and soil carried out of mountains and into valley floors by landslides, mudslides, mudflows, and surface runoff. At the beginning of the valley, alluvial fans are steep and narrow with boulders and other course material. The deposited material becomes increasingly fine as the gradient decreases and the material, mainly gravels, sand and mud, spreads.

When rain falls, runoff from the canyon walls flows as a high-velocity sheet that channels into rivulets, and then to natural drainage courses. The rapidly moving water often carries large boulders and other material from the watershed depositing them into runoff channels, blocking the flow of water. Floodwater then spills out onto the fan, with each event finding a new channel that soon fills up with deposits and overflows. Flooding in alluvial fans often can cause greater damage than clear-water flooding.

Flash Flooding

A flash flood is a rapid flooding of low-lying areas, rivers and streams, that is caused by the intense rainfall associated with a thunderstorm, or multiple thunderstorms. Flash floods also occur when a man-made structure, such as a dam, collapses. Flash flooding occurs when the ground under a storm becomes saturated with water so quickly that it cannot be absorbed. The runoff collects in low-lying areas and flows rapidly downhill. As a result, anything in its path is suddenly in rising water. A typical flash flood begins with a slow moving thunderstorm. This usually takes longer to move out of the affected areas and causes the area to endure a greater amount of rainfall for a longer period of time. In addition, a thunderstorm may pass over an affected area repeatedly, dumping even more rainfall.

The heavy rainfall associated with these storm systems contributes to urban flooding in a number of ways. Primarily, heavy rainfall will often overwhelm the capacity of the conventional drainage system made up of storm drains, catch basins, sewers, and additional natural mechanisms for storm-water management. These systems typically cannot handle more than one or two inches of rainfall per hour before they begin to backup and overflow. This amount is further diminished if the storm drains, and other components of the storm-water management system, have not been adequately maintained, are clogged with debris such as trash or natural waste, or are old and in a state of disrepair. Heavy rainfall, combined with storm-water runoff, can cause local waterways to rise and overflow their banks.

3.9.2 Flood History

Approximately 40 miles long, the Susan River crosses the southern portion of Lassen County and drains into Honey Lake. Based upon historical records, the Susan River is the primary source of flooding within Lassen County. More Specifically, according to the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Advanced Hydrologic Prediction Service for the Susan River, the following are the most significant flooding events and the associated flood levels:

- 18.47 ft on 01/24/1970
- 17.31 ft on 01/02/1997
- 17.26 ft on 02/17/1986
- 17.23 ft on 12/22/1964
- 16.30 ft on 11/23/1981
- 15.10 ft on 01/31/1963
- 14.85 ft on 01/13/1980

- 14.40 ft on 12/23/1955
- 13.93 ft on 02/24/1958
- 13.89 ft on 12/31/2005

Additionally, to indicate the potential for a flooding event, the table below lists an excerpt of large-scale flooding events in Lassen County that have resulted in a presidential emergency declaration and associated damage:

Historical Flooding Damage in Lassen County					
Date	**Injuries**	**Fatalities**	**Property Damage**	**Crop Damage**	**Hazard Description**
1/1/1997	0.22	0.00	36,670,000.00	00	Flooding
12/31/2005	0.00	0.00	500,000.00	0.00	Flooding
2/18/1986	0.00	0.00	500,000.00	0.00	Flooding
12/18/1964	1.96	0.64	1,785,714.29	178.57	Flooding
1/16/1973	0	0	86,206.90	0	Flooding – Severe Storm/ Thunderstorm
2/14/1992	0	0	9,090.91	0	Flooding – Winter Weather
12/10/1992	0	0	1,315.79	0	Flooding–Wind–Winter Weather
3/1/1995	0	0	0	11,241,379.31	Flooding – Severe Storm/ Thunderstorm-Wind
1/8/1973	0	0	0	35,714.29	Flooding- Severe Storm/Thunder Storm

3.9.3 Flood Probability, Frequency, and Magnitude

Floods within Lassen County area are classified into three types. The first consists of those that occur during late fall and winter, primarily as a result of prolonged rainstorms. The second type occurs during spring and early summer, mainly as a result of snowmelt from the Sierra Nevada Mountains. The third type occurs during summer as a result of intense convective rainstorms. The most significant flood-producing rainstorms are those that occur during fall and winter.

Lassen County does not have a well-developed flood protection system. As a result, flooding often occurs along many streams, damaging agricultural and urban properties and causing channel and bank erosion. Flooding and erosion are particularly serious along the Susan River. The following tables illustrate the Susan River flood categories and associated heights, as well as the predicted damage at those heights.

Susan River Flood Categories (ft)	
Major Flood Stage:	14
Moderate Flood Stage:	13
Flood Stage:	12
Action Stage:	10.5

Susan River Flood Levels	
River Level (ft.)	**Flooding Description**
10.5	Those along river should begin careful monitoring of river and keep informed of forecast updates. Localized minor lowland flooding below Susanville in Johntonville, Leavitt Lake, Standish, and Litchfield rural areas.
11.0	Local minor lowland flooding below Susanville in Johnstonville, Leavitt Lake, Standish, and Litchfield rural areas.

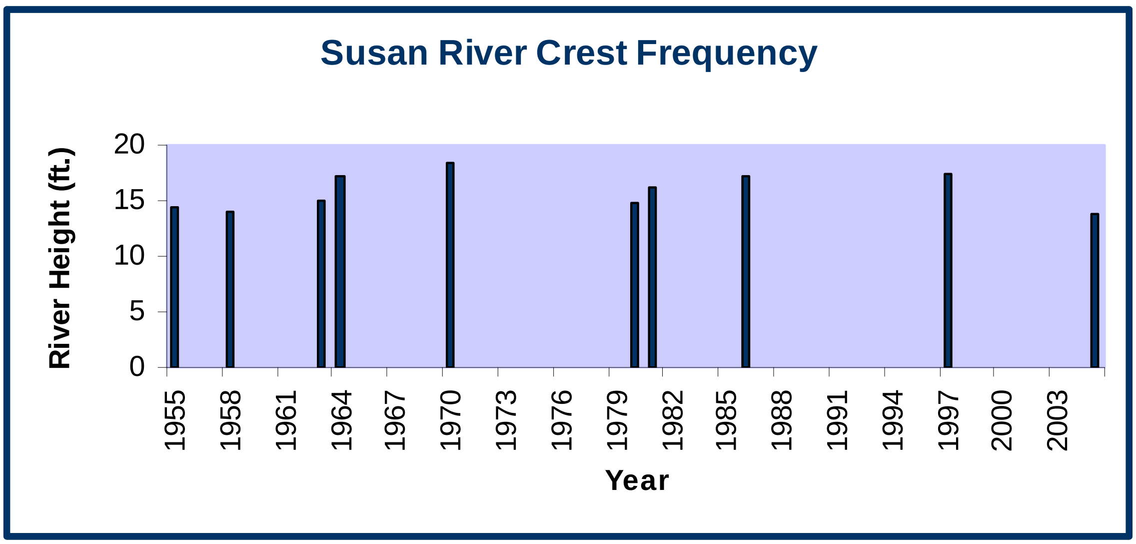
Susan River Flood Levels	
River Level (ft.)	**Flooding Description**
11.5	Localized minor to moderate lowland flooding below Susanville in the Johnstonville, Leavitt Lake, Standish, and Litchfield rural areas.
12.0	Flood Stage. Several homes on Carroll Street in Susanville begin to flood. Local flooding in Susanville from Lassen Street downstream along Riverside Drive, especially below Piute Creek which enters river near Alexander Drive. Moderate lowland flooding below Susanville in Johnstonville, Leavitt Lake, Standish, and Litchfield areas. Some rural roads affected by flooding.
12.5	Minor to moderate flooing in Susanville from Lassen Street downstream along Riverside Drive. Several homes along river affected, especially on Carroll Street. Moderate lowland flooding below Susanville in Johnstonville, Leavitt Lake, Standish, and Litchfield areas. Rural roads and bridges begin to flood in these areas.
13.0	Moderate flooding in Susanville from Lassen Street downstream along Riverside Drive. Some homes along river have moderate flood affects, especially on Carroll Street. Significant lowland flooding below Susanville in Johnstonville, Leavitt Lake, Standish, and Litchfield areas. Rural roads and bridges in these areas flood. Similar to flood of 3/13/1983.
13.5	Moderate to major flooding in Susanville, Johnstonville, Leavitt Lake, Standish, and Litchfield. Susanville flooded from Lassen Street downstream along Riverside Drive and from Cornell/River Street on north to Hood Street/Sunkist Drive on south. River up to bottom of Lassen Street bridge. Many homes along river have minor to moderate flooding. Many roads and bridges in the Honey Lake Valley area flood, with moderate transportation impacts. Similar to 3/30/1974 and 1/21/1969 floods.

Susan River Flood Levels	
River Level (ft.)	**Flooding Description**
14.0	Major flooding in Susanville, Johnstonville, Leavitt Lake, Standish, and Litchfield. Susanville flooded from Lassen Street downstream along Riverside Drive and from Main St (Highway 36) on north to railroad tracks on south. Many homes, businesses, schools, roads, and bridges in the Honey Lake Valley area flooded. Serious transportation impacts. Impacts to power, phone, and rural water systems begin. Similar to 2/24/1958 flood.
14.5	Major flooding in Susanville, Johnstonville, Leavitt Lake, Standish, and Litchfield areas in Honey Lake Valley. Susanville flooded from Lassen Street downstream along Riverside Drive and from Main Street (Highway 36) on north to railroad tracks on south. Serious flood impacts to homes, businesses, schools, roads, and bridges throughout Honey Lake Valley. US Highway 395 flooded. Serious transportation impacts, moderate impacts to power, phone, and rural water systems. Similar to 12/23/1955 flood.
15.0	Major flooding in Susanville, Johnstonville, Leavitt Lake, Standish, and Litchfield areas. Major flooding in Susanville from Lassen Street downstream along Riverside Drive, and from Main Street (Highway 36) on north to railroad tracks on south. Serious flood impacts to homes, businesses, schools, roads, and bridges throughout Honey Lake Valley. US Highway 395 flooded. Serious transportation, power, phone, and rural water system impacts. Similar to 1/31/1963 and 1/13/1980 floods.
15.5	Major flood damage from Susanville to Honey Lake. Flooding of homes, businesses and schools in flood plain throughout Honey Lake Valley, including Susanville. Extensive damage to transportation systems as roads, bridges, and culverts are flooded or washed out. US Highway 395 is flooded. Major transportation, power, phone, and rural water system impacts. Similar to 1/31/1963 flood.

Susan River Flood Levels	
River Level (ft.)	**Flooding Description**
16.0	Extensive flood damage from Susanville to Honey Lake. Serious flood impacts to homes, businesses, schools, roadways, and bridges in flood plain throughout Honey Lake Valley. Transportation impacts may be serious as US Highway 395 and Highway 36 are flooded. Extensive power, phone, and rural water system impacts. Similar to 11/23/1981 flood.
16.5	Extensive flood damage from Susanville to Honey Lake with flooding of homes, businesses, schools, roadways, brides, and water systems in flood plain throughout Honey Lake Valley. Extensive transportation, power, phone, and rural water system impacts. US Highway 395 and Highway 36 flooded. Similar to 11/23/1981 flood.
17.0	Flood disaster from Susanville to Honey Lake. Extensive flooding of homes, businesses, schools, roadways, bridges, and water systems in flood plain throughout Honey Lake Valley. Transportation very difficult as US Highway 395 and Highway 36 flooded or washed out. Extensive power, phone, and rural water system impacts. Slightly less severe than floods of 12/22/1964, 2/17/1986, and 1/02/1997.
17.5	Near record flooding from Susanville to Honey Lake. Extensive damage to homes, businesses, schools, roadways, bridges, and water systems in flood plain throughout Honey Lake Valley. Transportation in valley very difficult as US Highway 395 and Highway 36 flooded or washed out. Extensive power, phone, and rural water system impacts. Similar to floods of 12/22/1964, 2/17/1986, and 1/02/1997.
18.0	Near record flooding from Susanville to Honey Lake. Extensive damage to homes, businesses, schools, roads, bridges, and water systems in flood plain throughout Honey Lake Valley, including Susanville area. Transportation in and out of Honey Lake Valley cut off as US Highway 395 and Highway 36 flooded or washed out. Extensive power, phone, and rural water system impacts. Only exceeded by flood of 1/24/1970.

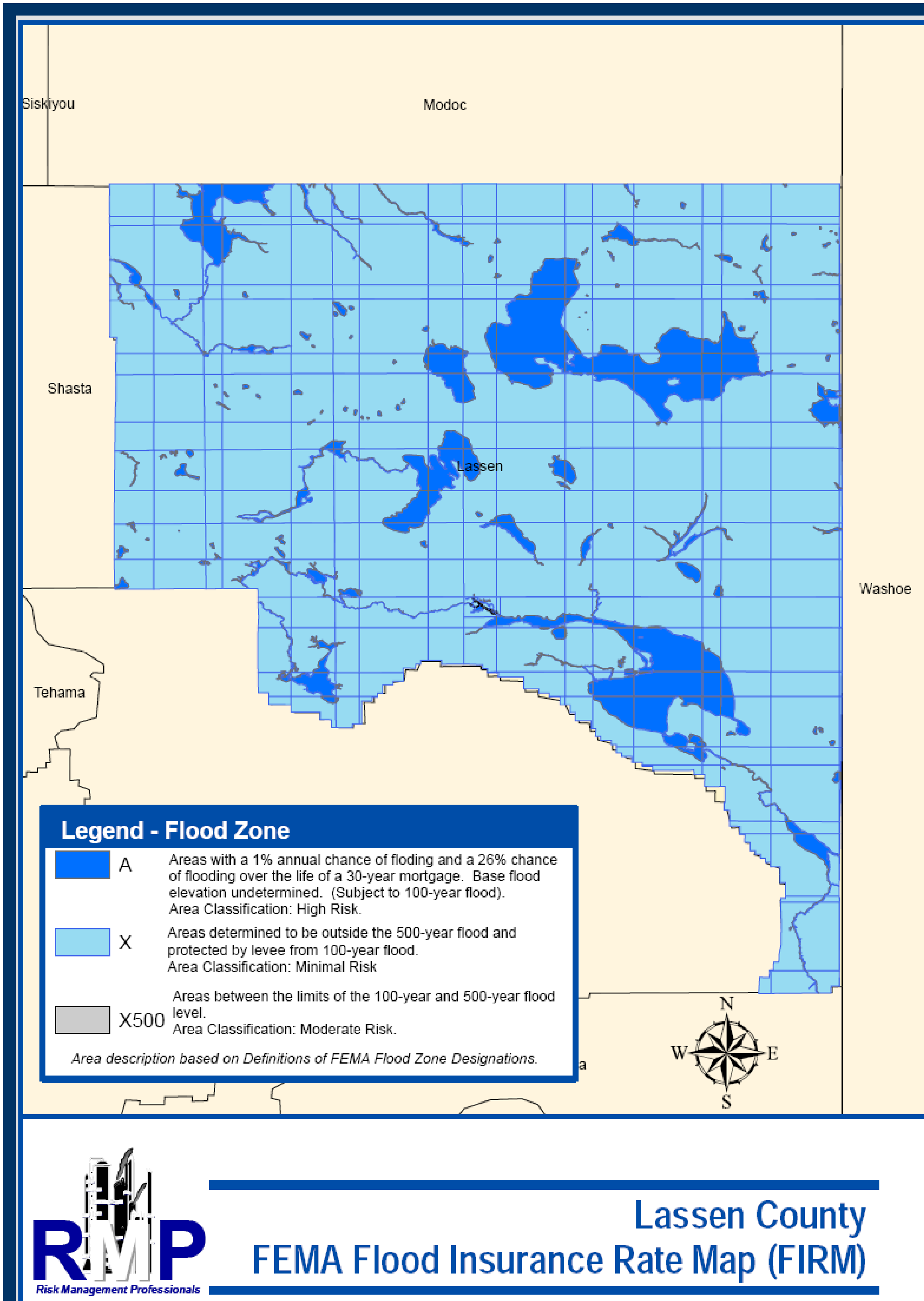
Susan River Flood Levels	
River Level (ft.)	**Flooding Description**
18.5	Record flooding from Susanville to Honey Lake. Extensive damage to homes, businesses, schools, road, bridges, and water systems throughout Honey Lake Valley, including Susanville area. Transportation in and out of valley cut off, as US Highway 395 and Highway 36 is flooded or washed out. Extensive power, phone, and rural water system impacts. Exceeds record flood of 1/24/1970.

In addition, the frequency of obtaining these flood levels are indicated in the chart below, which graphically represents the crest heights/years provided in the historical flooding section:



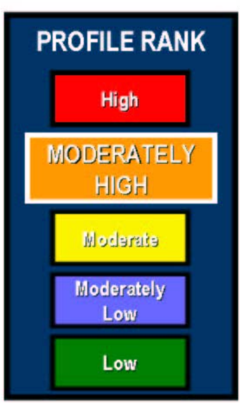
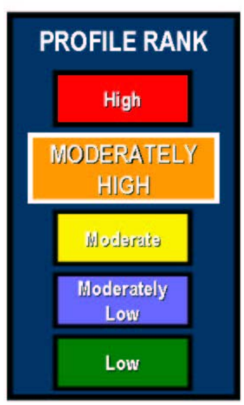
Repetitive Loss Properties

Currently, Carol Street in the City of Susanville is repetitively impacted by flooding of the Susan River during high periods of rainfall. When flooding reaches levels above 13 feet in the Susan River the homes on Carol Street are subject to significant damage. The frequency of these events is illustrated in the figure above. Mitigation measures are currently under consideration to eliminate or minimize the repetitive loss potential.



Lassen County - FEMA Flood Insurance Rate Map (FIRM)

3.10 Reservoir Failure Hazard Profile

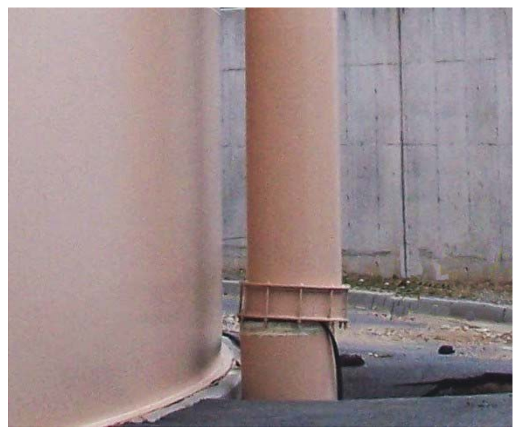
Reservoir Failure Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)	Rare event - occurs less than once every 50 years	Infeasible event - not applicable due to geographic location characteristics
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		N/A
Vulnerability:	Moderate damage area, moderate secondary impacts, moderate warning time	Widespread damage area, significant secondary impacts, no warning time	N/A
Hazard Risk Rank Score:	40	25	N/A
Profile Rank			N/A

3.10.1 Reservoir Failure Hazard Information and Background

Water Storage Reservoirs

Reservoir failure is the uncontrolled release of impounded water from a Reservoir. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism can all cause a reservoir to fail. Additionally, erosion of the face or foundation, improper sittings, rapidly rising floodwaters, and structural/design flaws can also contribute to reservoir failure. Seismic activity may also cause inundation by the action of a seismically induced wave that overtops the dam without causing failure of the dam, but significant flooding downstream. Reservoir failure causes downstream flooding that can affect life and property.

Above Ground Water Storage Reservoirs



One of the more common failures for water storage tanks during an earthquake is the shearing of the connecting piping. Typically, the inlet, outlet, and overflow piping on water storage tanks are connected to flanged iron fittings that are then connected to underground flanged piping. This piping configuration is rigid and does not allow for motion of the piping during a seismic event. Unsynchronized motion between water storage tanks and piping can create large stresses and subsequent structural failure. During a moderate earthquake water storage tanks without proper protective features can release the entire contents of a tank, which may cause unwanted secondary effects on the tank foundation and even surrounding property and population.

During a seismic event, the tank itself is subjected to many different types of motion influenced by the size and shape of the tank, the use of anchors, impulsive and convective forces of the water contained in the tank, and the properties of the soil. These factors influence the tank motion, while ground motion has a linear effect on the underground piping. This differential in piping and tank motion during an earthquake has proven to be a key weakness in a typical configuration during seismic events of magnitudes credible in California.

3.10.2 Reservoir Failure History

Water Storage Reservoirs

The degree of flood impact is dependent upon topography, vegetation, duration and intensity of rainfall with consequent storm water runoff. Lassen County has numerous reservoirs and dams; however, historically there have only been minor impacts associated with washout or overflow.

Above Ground Water Storage Reservoirs

In order to determine the severity of tank damage, the American Lifelines Alliance developed a database of water storage tanks, which included classification by tank type and configuration, peak ground acceleration experienced within the earthquake, and tank damage. This database was utilized as the basis for the Seismic Fragility Formulations for Water Systems, which details the methodology for utilizing water storage tank fragility curves and classifying respective damage states. The figure to the right illustrates the historical earthquakes and the associated number of tanks evaluated.

Event	No. of Tanks	PGA Range (g)	Average PGA (g)
1933 Long Beach	49		0.17
1952 Kern County	24		0.19
1964 Alaska	39	0.20 to 0.30	0.22
1971 San Fernando	27	0.20 to 1.20	0.51
1972 Managua	1	0.50	0.50
1975 Ferndale	1	0.30	0.30
1978 Miyagi-ken-ogi	1	0.28	0.28
1979 Imperial Valley	24	0.24 to 0.49	0.24
1980 Ferndale	1	0.25	0.25
1980 Greenville	1	0.25	0.25
1983 Coalinga	48	0.20 to 0.62	0.49
1984 Morgan Hill	12	0.25 to 0.50	0.30
1985 Chile	5	0.25	0.25
1986 Adak	3	0.20	0.20
1987 New Zealand	11	0.30 to 0.50	0.42
1987 Whittier	3	0.17	0.17
1989 Loma Prieta	141	0.11 to 0.54	0.16
1989 Loma Prieta (Low g)	1,670	0.03 to 0.10	0.06
1991 Costa Rica	38	0.35	0.35
1992 Landers	33	0.10 to 0.56	0.30
1994 Northridge	70	0.30 to 1.00	0.63
Total (excl. low g)	**532**	**0.10 to 1.20**	**0.32**

3.10.3 Reservoir Failure Probability, Frequency, and Magnitude

Water Storage Reservoirs

Although a reservoir/dam failure is considered to have a very low possibility of failing due to poor construction or lack of appropriate maintenance, the reservoirs are additionally vulnerable as a secondary impact to a seismic event - compromising dam structural integrity causing failure. Additionally, during high precipitation events in a very short period of time, dams can be crested, their structure weakened, and supports eroded. Potentially damaged infrastructure associated with dam failure include the following:

- Utility systems
- Transportation surface roadways
- Electricity service
- Telephone lines
- Cellular towers

Most dams in this sparsely populated county are removed from the population clusters of the county. The remote location minimizes the potential hazards associated with dam failure and resulting inundation. Failure of a dam would cause damage to the natural landscape in the path of floodwaters, as well as any population residing within the inundation zone.

Dams in Lassen County are closely monitored to ensure dam stability and integrity. The California Department of Water Resources is entrusted with supervision and inspections over non-federal dams in the State. Dams under jurisdiction are artificial barriers, together with appurtenant works, which are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more. Any artificial barrier not in excess of six feet in height, regardless of storage capacity, or that has a storage capacity not in excess of fifteen acre feet, regardless of height, is not considered jurisdictional. The tables on the following pages provide a list of reservoirs/dams within Lassen County.

Lassen County Dam List																			
Dam No.	National ID #	Name	Owner	County	Lat	Long	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Ac)	Drainage Area (mi²)	Crest Elev. (ft)	Freeboard (ft)	Height (ft)	Length (ft)	Width (ft)	Type	Volume (yd^3)
1242-000	CA00948	Albaugh No 1	J E Albaugh	Lassen	41.138	-121.00	Tr Pit River	1953	335	60	2	4300	5	21	835	11	ERTH	16100
1242-002	CA00949	Albaugh No 2	J E Albaugh	Lassen	41.16	-120.97	Tr Willow Creek	1966	270	35	0.45	4240	4	26	4200	12	ERTH	40000
238-002	CA00955	Antelope	R. C. Roberts Ranches, Llc	Lassen	40.835	-120.48	Madeline Plains	1918	1500	300	4	5300	3.1	15	1185	12	ERTH	
1258-000	CA01147	Beaver Creek	Beaver Creek Ranch	Lassen	41.002	-121.33	Tr Beaver Creek	1978	214	26	0.2	3343	5	22	468	12	ERTH	10670
249-003	CA00524	Branham Flat	Mapes Ranch, Inc	Lassen	40.728	-120.51	Branham Creek	1880	1200	125	8	5500	2.7	20	200	8	ERTH	
238-000	CA00519	Buckhorn	Edgar S. Roberts	Lassen	40.852	-120.1	Buckhorn Creek	1904	2000	300	18.7	5580	8	35	300	12	ERTH	
1243-000	CA00950	Chace Valley	Melvin D Myers	Lassen	41.15	-120.9	Tr Butte Creek	1955	92	30	1.5	4450	4.5	16	910	10	ERTH	13600
107-000	CA01325	Collett Addition	Malacha Hydro Limited Partnership	Lassen	40.9714	-121.21	Tr Pit River	1991	7800	211	1.9	4070	5	40	2900	15	ERRK	580000
107-002	CA01352	Collett Afterbay	Malacha Hydro Limited Partnership	Lassen	40.971	-121.75	Tr Sacramen to Riv	1991	300	27	0.28	3339	4	13	5000	20	ERTH	80000

Lassen County Dam List																		
Dam No.	National ID #	Name	Owner	County	Lat	Long	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Ac)	Drainage Area (mi²)	Crest Elev. (ft)	Freeboard (ft)	Height (ft)	Length (ft)	Width (ft)	Type	Volume (yd^3)
249-000	CA00522	Coon Camp	Mapes Ranch, Inc	Lassen	40.722	-120.48	Tr Horse Lake	1900	548	79	18.1	5191	5	23	1175	10	ERTH	36700
233-000	CA00513	Coyote Flat	John B. Crook	Lassen	40.908	-120.99	Coyote Creek	1928	5250	293	30	4805	10	52	205	12	ERTH	19000
1230-000	CA00940	Cramer Wood Ranch	,Leland Wood Jr	Lassen	40.642	-120.52	Tr Horse Lake	1910	3000	500	2.5	5063	2.8	13	800	7	ERTH	
1241-000	CA00947	Elkins And Lane	William T & Kathleen Deforest	Lassen	41.082	-120.76	Tr Ash Creek	1953	412	74	7	5100	6	22	400	12	ERTH	11430
255-000	CA00526	Emerson	M Mallery And W Mallery	Lassen	40.367	-120.65	Tr Gold Run Crk	UNK	418	42	0.42	4240	4	30	1700	13	ERTH	45000
1-074	CA01174	California Corrections Center	California Department Of Corrections	Lassen	40.408	-120.50	Offstream	1980	280	25	0.1	4086	3	18	4550	15	ERTH	385000
1-089	CA01383	California Corrections Center II	California Department Of Corrections	Lassen	40.4	-120.50	Offstream	1995	368	27	0.04	4093	3	19	7100	12	ERTH	195000
234-000	CA00514	Caribou Lake	Roney Land & Cattle Co, Inc	Lassen	40.503	-121.16	Susan River	1928	460	67	2	6400	3	16	250	5	ERTH	130
249-002	CA00523	Fredonia	Mapes Ranch, Inc	Lassen	40.7	-120.53	Tr Pine Creek	1914	300	20	2	5300	3.2	27	180	6	ERTH	

Lassen County Dam List																		
Dam No.	National ID #	Name	Owner	County	Lat	Long	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Ac)	Drainage Area (mi²)	Crest Elev. (ft)	Freeboard (ft)	Height (ft)	Length (ft)	Width (ft)	Type	Volume (yd^3)
1231-000	CA00941	Gerig	Gerig Dam Association	Lassen	41.153	-121.15	Pit River	1939	110	10	1893	4176	9	10	74		FLBT	
250-004	CA00525	Heath Reservoir	Frank E & George R Heath Jr	Lassen	40.842	-120.78	Slate Creek	1965	6850	448	21.7	5540	5	45	1620	16	ERTH	108000
236-000	CA00515	Hog Flat	Lassen Irrigation Company	Lassen	40.435	-120.91	Tr Susan River	1891	8000	1000	8	5500	4	15	1760	12	ERTH	
1237-000	CA00945	Holbrook	Betty Carrol & Craig Rulison	Lassen	41.077	-120.63	Ash Creek	1952	719	122	14	5400	8	24	455	12	ERTH	13300
245-000	CA00521	Horse Lake	Snow Storm Ranch	Lassen	40.68	-120.39	Snowstor m Creek	1912	75	34	16.65	5109	5.5	12	1200	10	ERTH	40000
97-113	CA00407	Indian Ole	Pacific Gas & Electric Company	Lassen	40.283	-121.03	Hamilton Creek	1924	24800	5800	158	5046	8	26	264		FLBT	
1239-000	CA00946	Iverson	Mcarthur 1989 Trust	Lassen	41.078	-121.05	Tr Juniper Cr	1968	1800	102	1.7	4280	4	45	1854	16	ERTH	154000
236-002	CA00516	Leavitt, Lake	Lassen Irrigation Company	Lassen	40.377	-120.51	Tr Susan River	1891	7482	1142	9.3	4101	5	17	8800	12	ERTH	
1252-000	CA00960	Leonard No 2	Drs Eugene & Ann Breznock	Lassen	41.117	-121.04	Tr Ash Creek	1968	187	25	2.81	4240	5	26	1120	12	ERTH	38000

Lassen County Dam List																		
Dam No.	National ID #	Name	Owner	County	Lat	Long	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Ac)	Drainage Area (mi²)	Crest Elev. (ft)	Freeboard (ft)	Height (ft)	Length (ft)	Width (ft)	Type	Volume (yd^3)
2227-000	CA00954	Madeline	Dennis A. & Rene Daugherty	Lassen	41.057	-120.47	Tr Madeline Plains	1900	400	76	12.1	5349	5.2	22	345	12	ERTH	8000
1228-002	CA00939	Mardis	Barry John Fitzgerald	Lassen	40.423	-120.64	Tr Susan River	1941	113	29	3	4009	3.8	14	600	10	ERTH	6300
236-003	CA00517	Mccoy Flat	Lassen Irrigation Company	Lassen	40.453	-120.94	Susan River	1891	17290	1800	110	5565	4.3	21	650	18	ERTH	
1234-000	CA00942	Mendiboure	Pierre Mendiboure	Lassen	40.997	-120.41	Tr Van Loan Cr	1949	1130	105	8.6	6020	4.3	30	800	12	ERTH	38000
1247-000	CA00953	Myers	Daran V Myers	Lassen	41.127	-120.97	Tr Ash Creek	1957	279	34	1.6	4200	4.3	27	1740	13	ERTH	34500
1245-000	CA00951	Nine Springs	Dan Tankersley	Lassen	41.123	-121.20	Tr Bull Run Slough	1954	125	25	2.75	4200	6.5	16	3600	10	ERTH	47000
1228-000	CA00938	Peconom	John Fitzgerald	Lassen	40.443	-120.60	Antelope Val	1920	173	41	9	4600	5	15	470	10	ERTH	
1256-000	CA00961	Petes Valley	Petes Valley Partners	Lassen	40.542	-120.45	Petes Creek	1954	240	31	18	4610	9	29	1360	12	ERTH	29000
1251-000	CA00959	Rains Creek	Richard W. Callison	Lassen	41.105	-121.31	Fraser Creek	1960	126	40	17.1	3600	5	15	1840	12	ERTH	19000
230-000	CA00510	Red Rock No 1	Edgar S. (Red) Roberts	Lassen	40.968	-120.14	Red Rock Creek	1893	10000	491	43.5	5740	5.1	63	485	8	ERTH	

Lassen County Dam List																		
Dam No.	National ID #	Name	Owner	County	Lat	Long	Stream	Year Built	Capacity (Ac-ft)	Res. Area (Ac)	Drainage Area (mi²)	Crest Elev. (ft)	Freeboard (ft)	Height (ft)	Length (ft)	Width (ft)	Type	Volume (yd^3)
228-000	CA00509	Round Valley	Jack And Thomas Swickard	Lassen	40.517	-120.66	Round Val Cr	1892	5500	420	10	5300	5.6	45	220	14	ERRK	
239-000	CA00520	Shugru	Audrey Egan	Lassen	40.352	-120.56	Tr Susan River	UNK	195	33	0.62	4170	4	20	1110	12	ERTH	
232-000	CA00512	Silva Flat	Rick and Tracy Boggs	Lassen	40.968	-120.92	Juniper Creek	1926	3900	815	15.5	5400	4	11	1250	7	ERTH	
1236-000	CA00944	Smoke Creek	Jackrabbit Properties LLC	Lassen	40.627	-120	Smoke Creek	1949	960	93	115	4610	8.8	36.8	1750	12	ERTH	125400
238-003	CA00952	Spaulding	R. C. Roberts Ranches, LLC	Lassen	40.925	-120.28	Tr Madelin Plains	1954	147	22	7.4	5403	4.8	28	930	16	ERTH	18300
2228-000	CA00957	Spooner	Gary Johns	Lassen	41.015	-120.63	Tr Ash Creek	1906	3123	635	6.6	5500	4.5	17	450	10	ERTH	3531
1257-000	CA00962	Sworinger	John Estill & Lani Estill	Lassen	41.18	-120.1	Tr Silver Creek	1961	4050	291	5.1	5800	4	35	1055	15	ERTH	39000
1249-004	CA00956	Tule Lake	John Hancock Mutual Ins Co	Lassen	41.083	-120.37	Cedar Creek	1904	39500	2650	82	5524	7	16	1100	12	ERTH	10000

Above Ground Water Storage Reservoirs

The probability of reservoir damage is evaluated utilizing a site-specific fragility curve, which correlates the type of damage (minor leaks, pipe shearing, elephant foot buckling, complete loss of contents, etc.) with the magnitude of the earthquake. For storage tanks, fragility curves are based on the probabilistic combination of failure modes using Boolean expressions to describe the relationship of each failure mode to the overall damage state. The Boolean approach involves evaluation of the probability of each component reaching or exceeding different failure modes, as defined by the damage states. These evaluations produce damage state probabilities at various levels of ground motion. The particular damage states defined in HAZUS include the following:

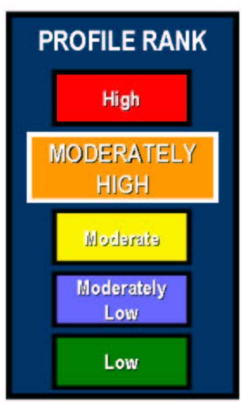
Damage State	Factor	Description
1 – None	0.00	Tank suffers no considerable damage.
2 – Slight	0.20	Tank suffers minor damage without loss of contents or functionality. Minor damage to the tank roof due to water sloshing, minor cracks in concrete tanks, or localized wrinkles in steel tanks.
3 – Moderate	0.40	Tank is considerably damaged, but only minor loss of contents. Elephant foot buckling for steel tanks without loss of contents, or moderate cracking of concrete tanks with minor loss of contents.
4 – Extensive	0.80	Tank is severely damaged with loss of functionality. Elephant foot buckling for steel tanks with loss of contents, stretching of bars for wood tanks, or shearing of wall for concrete tanks.
5 – Complete	1.00	Tank collapses with complete loss of contents.

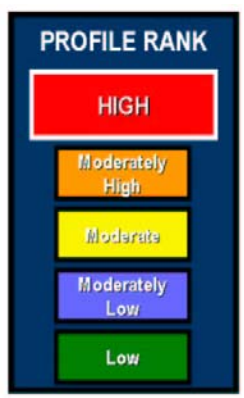
3.11 Hazardous Materials Release Hazard Profile

Hazardous Material Release Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Moderate damage area, moderate secondary impacts	Widespread damage area, significant secondary impacts, no warning time	
Hazard Risk Rank Score:	40	50	50

Profile Rank





3.11.1 Hazardous Material Release Hazard Information and Background

Hazardous materials include hundreds of substances that can potentially pose a significant risk to the general population if released. These substances may be highly toxic, reactive, corrosive, flammable, radioactive or infectious. They are present in nearly every community in the U.S., where they may be manufactured, used, stored, transported, or disposed. Because of their nearly ubiquitous presence, there are hundreds of hazardous material release events annually in the U.S. that contaminate air, soil, and groundwater resources, potentially triggering millions of dollars in clean-up costs, human and wildlife injuries, and occasionally cause human deaths.

Accidents, which result in chemical clouds or release of hazardous materials into public water or sewer systems, may affect outlying neighborhoods or the community at large. Depending upon the scale of the release, large segments of the residential and the business populations may need to be evacuated quickly for extended periods of time. Effective emergency planning with regard to hazardous materials, therefore, requires the concentrated efforts of the Fire and Police Departments as well as other public safety officials and private organizations, such as the Red Cross. Hazardous material releases may occur from any of the following:

Types of Hazardous Material Incidents	
Fixed-Site	Includes all releases involving the production and manufacturing, handling, and storage of a hazardous product at a single facility as well as any releases that may occur at a designated hazardous waste disposal site.
Transportation	Includes all releases that occur while the product is in transit from one facility to another or en-route to be disposed of at a designated hazardous waste disposal site, of which the main conern for Lassen County and the City of Susanville is radioactive contamination.
Intentional Spills and Releases	Includes all criminal acts and acts of terrorism in which a hazardous material is used to intentionally cause injuries and/or fatalities, damage the environment and/or property, or advance a political or social agenda. Weapons of Mass Destruction (WMD) will be discussed in further detail in the Terrorism section of this document.

In response to concerns over the environmental and safety hazards posed by the storage and handling of toxic chemicals in the U.S., Congress passed the Emergency Planning and Community Right to Know Act (EPCRA) in 1986. To reduce the likelihood of hazardous material releases, EPCRA established specific requirements on federal, state and local governments, Indian tribes, and industry to plan for hazardous materials emergencies. EPCRA's Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities working with facilities can use the information to improve chemical safety and protect public health and the environment. Under EPCRA, hazardous materials must be reported to the Environmental Protection Agency (EPA), even if they do not result in human exposure. Hazardous material releases may include the following:

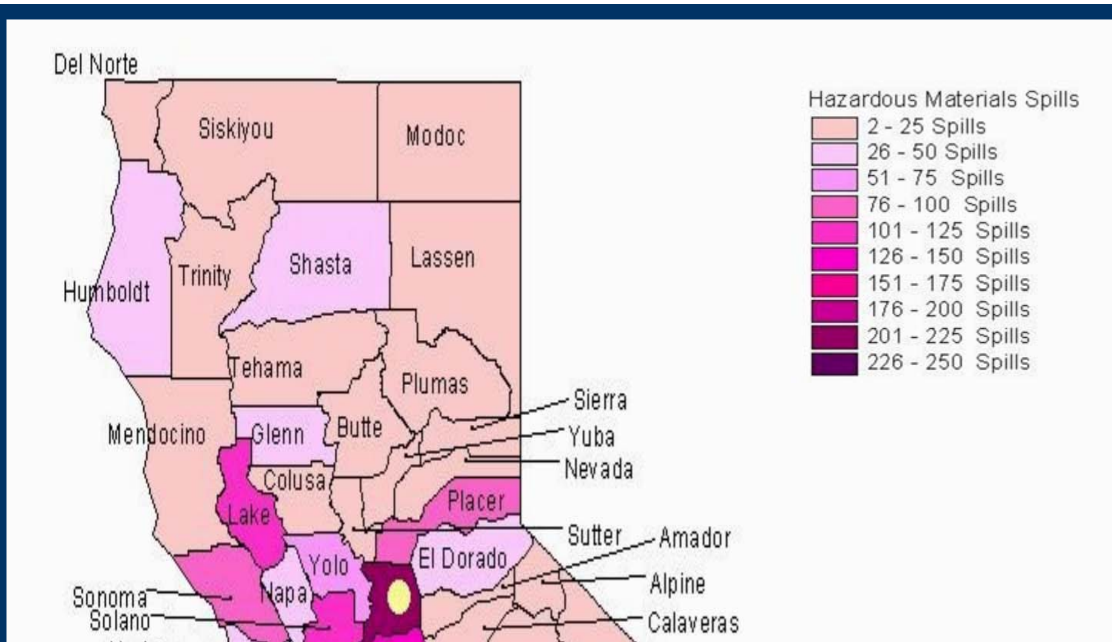
- Air emissions (e.g., pressure relief valves, smokestacks, broken pipes, water or ground emissions with vapors)
- Discharges into bodies of water (e.g., outflows to sewers, spills on land, water runoff, contaminated groundwater)
- Discharges onto land
- Solid waste disposals in onsite landfills
- Transfer of wastewater to public sewage plants
- Transfers of waste to offsite facilities for treatment or storage

In addition to accidental human-caused hazardous material events, natural hazards may cause the release of hazardous materials and complicate response activities. The impact of earthquakes on fixed facilities may be particularly damaging due to the impairment of the physical integrity or even failure of containment facilities. The threat of any hazardous material event may be magnified due to restricted access, reduced fire suppression and spill containment, and even complete cut-off of response personnel and equipment. In addition, the risk of terrorism involving hazardous materials is considered a major threat due to the location of hazardous material facilities and transport routes throughout communities and the frequently limited anti-terrorism security at these facilities.

In recognition of the dangers associated with keeping hazardous substances, the California State legislature has enacted several laws regulating the use and transport of identified hazardous materials. In particular, Chapter 6.95 of the Health and Safety Code requires all businesses using these materials to inform local government agencies of the types and quantities of materials stored on site. This disclosure enables emergency response agencies to respond quickly and appropriately to accidents involving dangerous substances. Chapter 6.95 of the California Health and Safety Code, and Title 19 of the California Code of Regulation, describes the requirements for chemical disclosure, business emergency plans, and community right to know programs. According to these state requirements, a business that uses or handles hazardous materials in amounts equal to or greater than 55 gallons, 500 pounds or 200 cubic feet at any one time must prepare a business emergency plan and chemical inventory. The inventory must be updated annually and the business plan every two years. The chapter also has incorporated certain requirements from Federal SARA Title III for chemicals designated as acutely hazardous.

3.11.2 Hazardous Material Release History

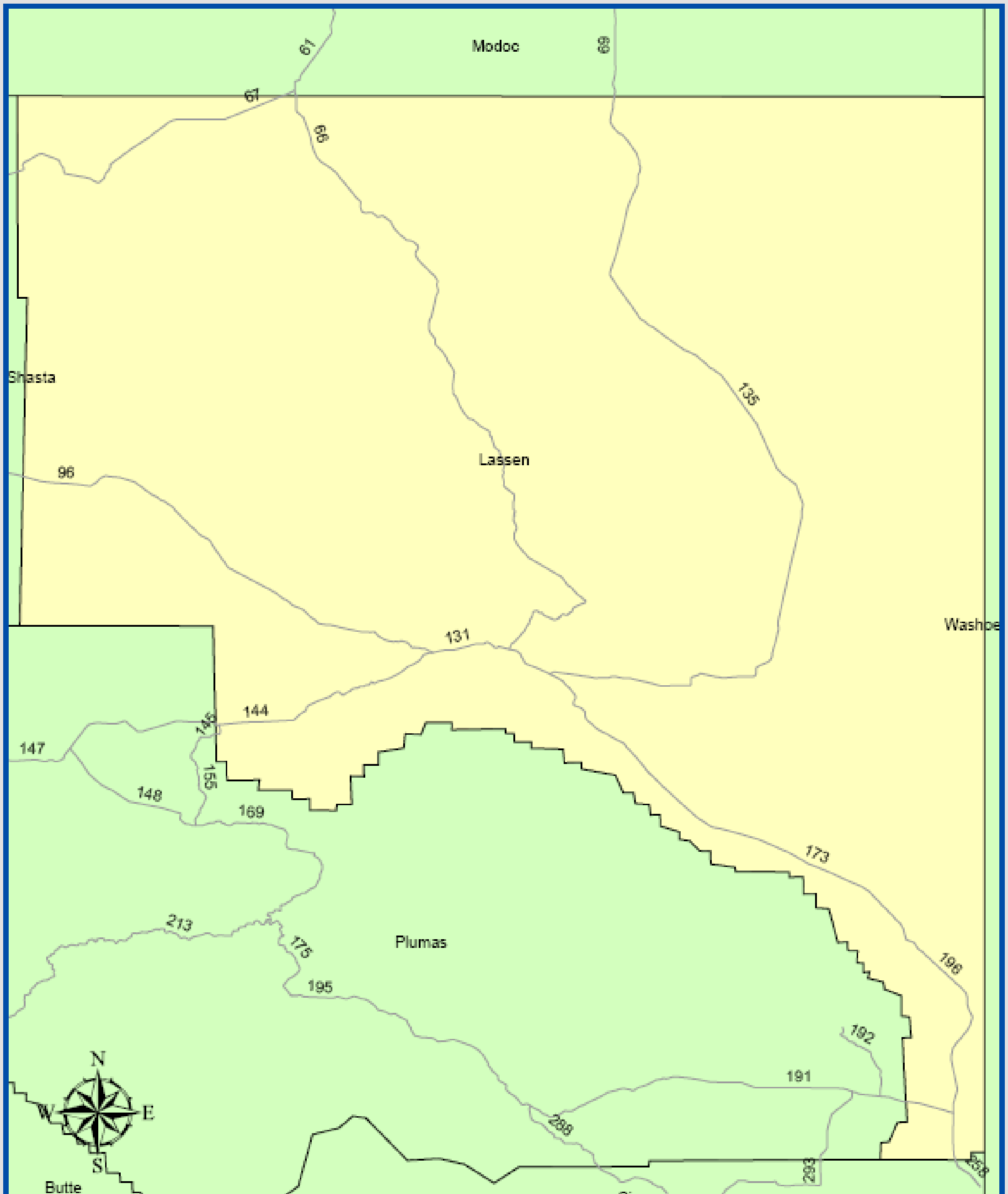
The following Hazardous Material Spill Locations Map classifies Lassen County in a lower category for hazardous material spills within a county. According to the map, Lassen County had between 2-25 spills between January 1, 2002 and August 23, 2002, which categorizes Lassen County as not highly susceptible to hazardous material releases.



Hazardous Material Spill Locations Map

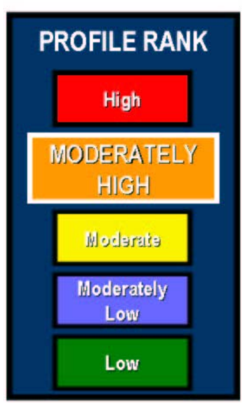
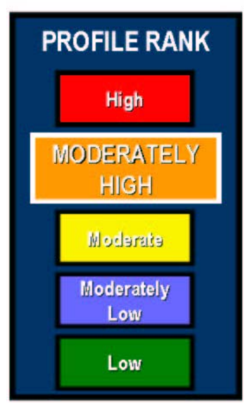
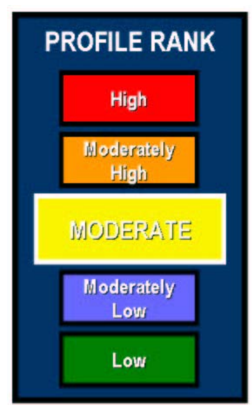
3.11.3 Hazardous Material Release Probability, Frequency, and Magnitude

There are no fixed facility sites that process highly hazardous chemicals within Lassen County, the City of Susanville, or the Susanville Indian Rancheria. Thus, the highest potential for a hazardous material incident is through transportation. Hazardous materials, as well as radioactive materials, are transported across Lassen County, which poses a hazard should there be loss of containment. The map on the following page provides an overview of the transportation corridors throughout the County, including 1-395, which is considered a major shipping and transportation route.

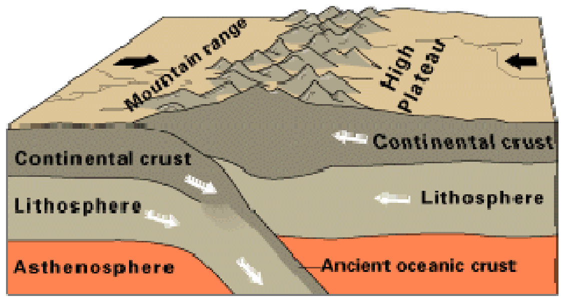


Lassen County
Major Transportation Routes

3.12 Earthquake Hazard Profile

Earthquake Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Extensive building damage, potential widespread loss of lifelines (water, gas, electricity, sanitation, roads), potential loss of life		Moderate building damage, minor loss of lifelines (less than 12 hours)
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	30	30	18
Profile Rank			

3.12.1 Earthquake Hazard Information and Background



Continental-continental convergence

Plate tectonics is a starting point for understanding the forces within the Earth that cause earthquakes. Plates are thick slabs of rock that make up the outermost 100 kilometers of the Earth. The term "tectonics" describes the deformation of the Earth's crust, the forces producing such deformation, and the geologic and structural features that result. The constant motion of the plates causes stress in the brittle upper crust of the earth. These tectonic stresses build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a fault. The rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

Faults are more likely to produce future earthquakes if they have rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. “Active” faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). In contrast, “potentially active” faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is “active” or “potentially active” depends on geologic evidence, which may not be available for every fault.

Shaking

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. An earthquake’s magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The most commonly used scale today is the Moment Magnitude (Mw) Scale. Moment magnitude is related to the total area of the fault that ruptured and the amount of offset (displacement) across the fault. It is a more uniform measure of the energy released during an earthquake.

The other commonly used measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. In general, it decreases with distance from the source of an earthquake, but it may be increased or decreased by a number of factors.

The Modified Mercalli Intensity Scale and Corresponding Richter Scale Magnitudes

Shaking intensity is often described using the Modified Mercalli Intensity Scale, which rates an earthquake's effects based on human observation. While an earthquake has only one magnitude it may have many intensity values, which will generally decrease with distance from the epicenter. The table below lists the Mercalli Scale's various intensity levels and corresponding Richter Scale magnitudes.

Mercalli Intensity		Description	Richter Scale Magnitude
I	Instrumental	Detected only by a seismograph	
II	Feeble	Noticed by sensitive people	0.1 to 3.4
III	Slight	Like the vibrations due to a passing truck	3.5 to 4.2
IV	Moderate	Felt by people while walking; rocking of loose objects, including standing vehicles	4.3 to 4.8
V	Rather Strong	Felt generally; most sleepers are awakened and bells ring	
VI	Strong	Trees sway and all suspended objects swing; damage by over-turning and falling of loose objects	4.9 to 5.4
VII	Very Strong	General alarm; walls crack; plaster falls	
VIII	Destructive	Car drivers seriously disturbed; masonry fissured; chimneys fall; poor constructed buildings damaged	5.5 to 6.1
IX	Ruinous	Some houses collapse where ground begins to crack, and pipes break	6.2 to 6.9
X	Disastrous	Ground cracks badly; many buildings destroyed and railway lines bent; landslides on steep slopes	7.0 to 7.3

Mercalli Intensity		Description	Richter Scale Magnitude
XI	Very disastrous	Few buildings remain standing; bridges destroyed; all services (railway, pipes, and cables) out of action; great landslides and floods	7.4 to 8.1
XII	Catastrophic	Total Destruction; objects thrown into air; ground rises and falls in waves	8.1 +

Amplification of Seismic Shaking

Although seismic waves radiate from their source like ripples on a pond, the radiation is not uniform due to the complex nature of an earthquake rupture, the different paths the waves follow through the earth, and the different rock and soil layers near the earth's surface. Large earthquakes begin to rupture at their hypocenter deep in the earth and the fault ruptures outward from that point. Because the speed of an earthquake rupture on a fault is similar to the speed of seismic waves, waves closer to the epicenter can be compounded by waves from farther along the rupture, creating a pulse of very strong seismic waves that moves along the fault in the direction of the fault rupture. Seismic waves may also be modified as they travel through the earth's crust.

As seismic waves approach the ground surface, they commonly enter areas of loose soils where the waves travel more slowly. As the waves slow down, their amplitude increases, resulting in larger waves with frequencies that are more likely to damage structures. Waves can also be trapped within soft sediments between the ground surface and deep, hard basement rocks, their destructive energy multiplying as they bounce back and forth, producing much greater shaking at the ground surface.

Ground Failure

Fissuring, settlement, and permanent horizontal and vertical shifting of the ground often accompany large earthquakes. Although not as pervasive or as costly as the shaking itself, these ground failures can significantly increase damage and under certain circumstances can be the dominant cause of damage.

Fault Rupture

The sudden sliding of one part of the earth's crust past another releases the vast store of elastic energy in the rocks as an earthquake. The resulting fracture is known as a fault, while the sliding movement of earth on either side of a fault is called fault rupture. Fault rupture begins below the ground surface at the earthquake hypocenter, typically between three and ten miles below the ground surface in California. If an earthquake is large enough, the fault rupture will actually travel all the way to the ground surface, wreaking havoc on structures built across its path. Recent large earthquakes in Turkey and Taiwan have shown that few structures built across the surface traces of faults can withstand the large displacement that occurs during an earthquake.

Liquefaction

In addition to the primary fault rupture that occurs right along a fault during an earthquake, the ground many miles away can also fail during the intense shaking. One common type of failure occurs when soft, water-saturated soil settles, causing the water to eject sediment particles as it works its way to the ground surface. This phenomenon, known as liquefaction, turns the soil into a fluid, causing it to lose the ability to support buildings and other structures. Areas susceptible to liquefaction include places where sandy sediments have been deposited by rivers along their course or by wave action along beaches.

Landslides

Landslides are the result of the down-slope movement of unstable hillside materials under the influence of weathering and gravity over time. Strength of rock and soil, steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas. Weathering and absorption of water can weaken slopes, while the added weight of saturated materials or overlying construction can increase the chances of slope failure. Sudden failure can be triggered by heavy rainfall, excavation of weak slopes, and earthquake shaking, among other factors.

3.12.2 Earthquake History

To indicate the potential for an earthquake event, the following table lists all significant recorded earthquakes in Northern California, and the associated magnitudes (excerpted from the CalEMA California Geological Survey and the USGS Earthquake Hazards Program):

Northern California Historical Earthquakes		
Under magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Location
Magnitude 5.5	1781	Santa Cruz Mountains?
Magnitude 5.5	1808	San Francisco
Magnitude 5.5	1825	Santa Cruz
Magnitude 5.5	1827	San Francisco
Magnitude 7.4	1838	San Francisco to San Juan Bautista
Magnitude 6.0	1855	Seirraville
Magnitude 5.5	1855	Eureka
Magnitude 5.5	1855	Petaluma - San Francisco
Magnitude 5.7	1856	Southwestern San Francisco Peninsula
Magnitude 5.9	1856	San Francisco Peninsula
Magnitude 6.3	1857	Western Nevada or Eastern Sierra Nevada
Magnitude 6.2	1858	San Jose region
Magnitude 6.5	1860	Between Carson City and Pyramid Lake
Magnitude 5.8	1861	San Ramon Valley
Magnitude 6.1	1864	Southeast of San Jose
Magnitude 6.0	1864	East of San Francisco Bay
Magnitude 5.8	1864	South Hayward area
Magnitude 5.9	1865	Santa Cruz Mountains
Magnitude 6.0	1866	Western San Joaquin Valley
Magnitude 6.0	1868	Virginia City, Nevada

Northern California Historical Earthquakes

Under magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Location
Magnitude 5.6	1868	South of Markleeville
Magnitude 7.0	1868	Hayward Fault
Magnitude 6.4	1869	Near Virginia City, Nevada
Magnitude 6.2	1869	Near Carson City, Nevada
Magnitude 5.6	1869	Ukiah
Magnitude 5.9	1870	Los Gatos
Magnitude 5.8	1870	Hayward Fault
Magnitude 6.3	1871	Cape Mendocino
Magnitude 7.3	1873	California-Oregon Coast
Magnitude 6.2	1875	Honey Lake
Magnitude 5.5	1877	Lake Tahoe
Magnitude 6.3	1881	Western San Joaquin Valley
Magnitude 5.8	1882	South Santa Cruz Mountains
Magnitude 6.1	1884	Klamath Mountains
Magnitude 6.1	1885	Susanville
Magnitude 6.5	1887	Carson City, Nevada
Magnitude 5.5	1888	Mendocino-Ukiah
Magnitude 6.2	1888	Mohawk Valley
Magnitude 6.0	1889	Montezuma Hills

Northern California Historical Earthquakes

Under magnitude 4.5 | Magnitude 4.5 - 5.4 | Magnitude 5.5 - 6.4 | Magnitude 6.5 to 7.4 | Magnitude > 7.5

Magnitude	Year	Earthquake Location
Magnitude 5.5	1889	Hayward Fault
Magnitude 6.2	1889	Susanville
Magnitude 6.3	1890	Cape Mendocino
Magnitude 5.8	1891	San Jose
Magnitude 5.8	1891	Napa
Magnitude 6.6	1892	Vacaville
Magnitude 6.4	1892	Winters
Magnitude 5.6	1892	Vacaville
Magnitude 5.6	1893	Santa Rosa
Magnitude 6.5	1894	Cape Mendocino region
Magnitude 6.4	1898	Mare Island
Magnitude 6.7	1898	Fort Bragg - Mendocino
Magnitude 7.0	1899	West of Eureka
Magnitude 5.6	1899	San Francisco area
Magnitude 5.5	1902	Vacaville area
Magnitude 6.1	1903	San Jose
Magnitude 6.2	1903	San Jose
Magnitude 7.8	1906	Great 1906 San Francisco EQ
Magnitude 5.8	1908	Humbolt
Magnitude 5.9	1909	Downieville
Magnitude 6.0	1909	Cape Mendocino

Northern California Historical Earthquakes		
Under magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Location
Magnitude 6.4	1911	Southeast of San Jose
Magnitude 5.6	1914	Reno, Nevada
Magnitude 6.0	1914	Truckee region
Magnitude 7.3	1922	West of Eureka
Magnitude 7.2	1923	Off Cape Mendocino
Magnitude 5.8	1926	Monterey Bay
Magnitude 5.5	1928	Near Alder Springs, ~70km west of Chico
Magnitude 5.5	1930	Arcata
Magnitude 6.4	1932	Eureka
Magnitude 6.1	1933	Yerington, Nevada
Magnitude 6.3	1934	Excelsior Mountain, Nevada
Magnitude 5.5	1939	Nevada State
Magnitude 5.7	1940	Chico vicinity
Magnitude 6.4	1941	West of Cape Mendocino
Magnitude 5.9	1942	West of Wadsworth, Nevada
Magnitude 5.5	1943	Nevada State
Magnitude 6.0	1948	West of Verdi, Nevada
Magnitude 5.5	1950	Mt. Lassen
Magnitude 5.6	1950	North of Reno, Nevada
Magnitude 6.0	1951	Cape Mendocino
Magnitude 6.6	1954	East of Arcata

Northern California Historical Earthquakes

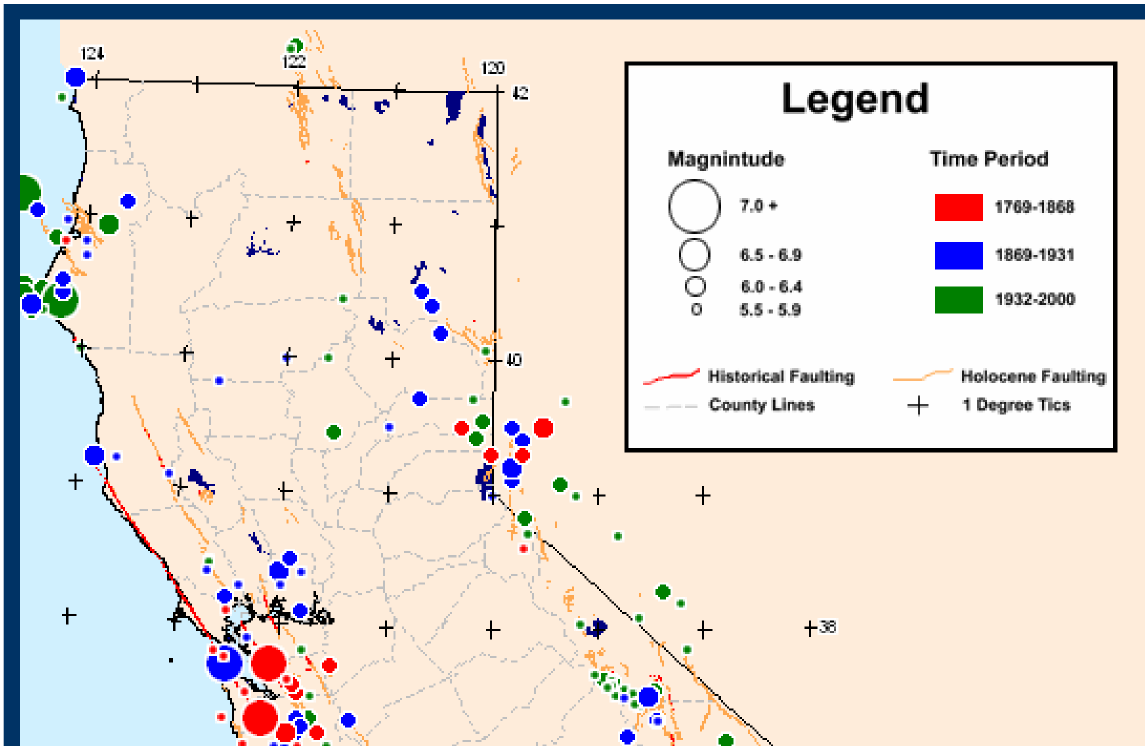
Under magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Location
Magnitude 5.3	1957	Daly City
Magnitude 4.2	1957	Daly City
Magnitude 5.6	1959	North of Reno, Nevada
Magnitude 5.7	1960	Arcata
Magnitude 5.5	1964	Nevada State
Magnitude 6.0	1966	Truckee, West of Reno
Magnitude 5.6	1967	West of Cape Mendocino
Magnitude 5.6	1969	Santa Rosa
Magnitude 5.7	1969	Santa Rosa
Magnitude 6.1	1975	Oroville
Magnitude 5.7	1979	Coyote Lake
Magnitude 5.8	1980	Livermore
Magnitude 5.5	1980	East of Mono Lake
Magnitude 7.4	1980	West of Eureka
Magnitude 7.2	1980	Off Coast of Humboldt County
Magnitude 6.2	1984	Morgan Hill
Magnitude 5.6	1986	Mount Lewis
Magnitude 6.9	1989	Loma Prieta
Magnitude 5.8	1990	Mono County
Magnitude 6.2	1991	11km Southwest of Petrolia
Magnitude 7.0	1991	Honeydew

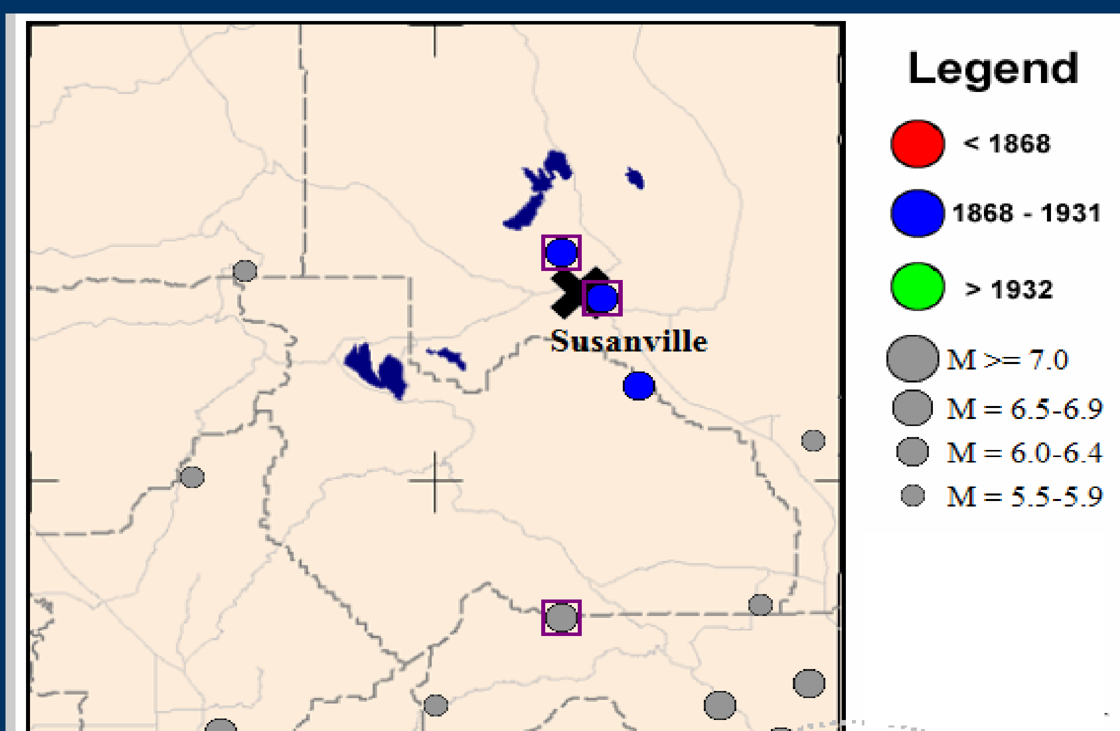
Northern California Historical Earthquakes		
Under magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Location
Magnitude 7.2	1992	Cape Mendocino area
Magnitude 6.6	1992	West of Cape Mendocino
Magnitude 6.6	1992	West of Cape Mendocino
Magnitude 6.2	1994	Southeast of Lake Tahoe, on Nevada State border
Magnitude 7.0	1994	Cape Mendocino
Magnitude 5.5	1995	Kirkwood
Magnitude 5.6	1997	Punta Gorda
Magnitude 5.0	2000	Napa
Magnitude 5.3	2002	Bayview
Magnitude 5.3	2003	Humboldt Hill
Magnitude 6.6	2005	Off Coast of Northern California
Magnitude 4.5	2006	Northern California, 4mi WNW from Cobb
Magnitude 5.2	2007	Offshore Northern California
Magnitude 5.6	2007	San Francisco Bay Area
Magnitude 4.2	2007	San Francisco Bay Area
Magnitude 5.4	2008	East of Blue Lake, CA

A visual representation of the Historical Earthquake Table is depicted on the following pages.



Northern California Historic Earthquakes



City of Susanville Earthquake Map

3.12.3 Earthquake Probability, Frequency, and Magnitude

Peak Ground Acceleration

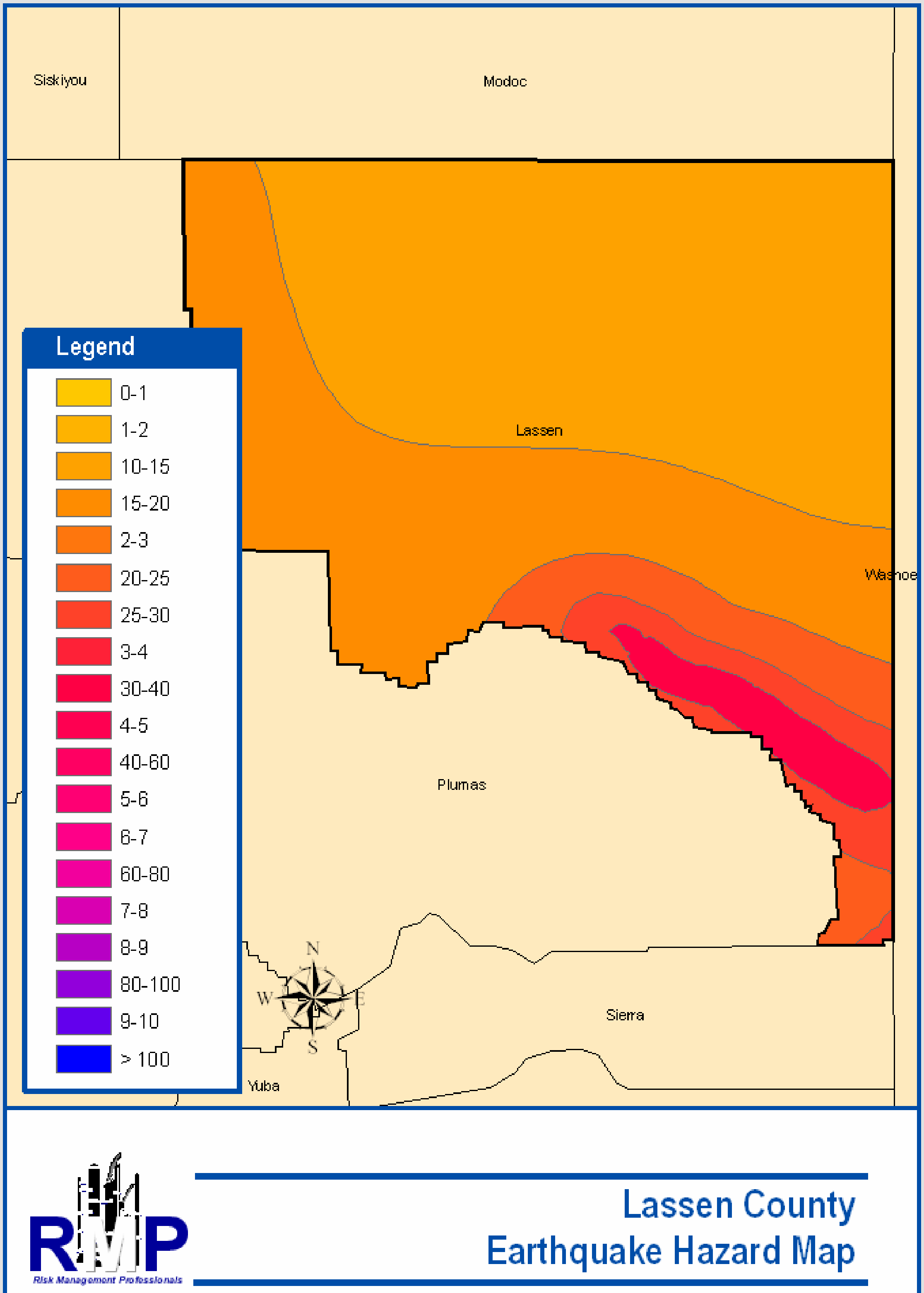
The Peak Ground Acceleration (PGA) mapping represents peak horizontal acceleration of the ground on firm-rock conditions. The approach of representing peak horizontal ground acceleration on firm-rock is a common and widely used method of showing ground accelerations. The development of probabilistic acceleration maps are a result of three types of basic input parameters:

1) Attenuation of ground shaking with distance from the earthquake source;

2) Frequency of earthquakes within an area or region, termed recurrence; and

3) The character and extent of regions and faults that generate earthquakes.

According to the following Probabilistic Seismic Hazard Map, the County, City, and Rancheria are located in an area that will experience a Peak Ground Acceleration (PGA) ranging from 0.10 g to 30 g with 10% exceedance in 50 years (0.0021 annual probability).

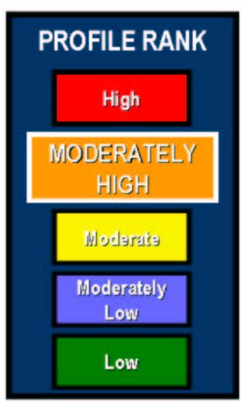
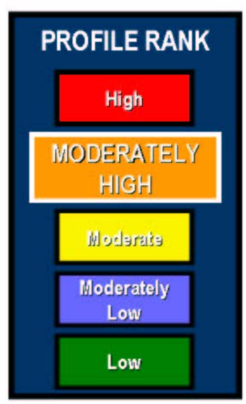
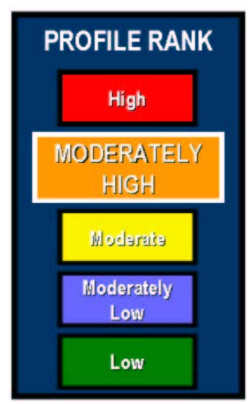


Lassen County - Peak Ground Acceleration Map

According to the table below (provided by the United States Geographic Survey), this PGA Value is typically associated with a range of 3.5 to 6.2 magnitude earthquake. Thus, there is a 0.21% annual possibility of a 3.5 - 6.2 magnitude earthquake affecting Lassen County.

Mercalli Intensity	Richter Intensity	Acceleration (%g)	Velocity (cm/s)	Perceived Shaking	Potential Damage
I	3.5	< 0.17	< 0.1	Not Felt	None
II-III	4.2 – 4.3	0.17 - 1.4	0.1 - 1.1	Weak	None
IV	4.8		1.1 - 3.4	Light	None
V	4.9 – 5.4	3.9 - 9.2	3.4 - 8.1	Moderate	Very light
VI	5.5 – 6.0	9.2 - 18	8.1 - 16	Strong	Light
VII	6.1	18 - 34	16 - 31	Very Strong	Moderate
VIII	6.2	34 - 65	31 - 60	Severe	Moderate to Heavy
IX	6.9	65 - 124	60 - 116	Violent	Heavy
X+	> 7.0	> 124	> 116	Extreme	Very Heavy

3.13 Pandemic Hazard Profile

Pandemic Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	25	25	25
Profile Rank			

3.13.1 Pandemic Hazard Information and Background

A pandemic is an outbreak of an infectious disease that spreads across a large region. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. The disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in very short time.

According to the Department of Health and Human Services, an especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Numerous people in a wide-range of locations will become seriously ill at the same time. Impacts can range from school and business closings to the interruption of basic services such as public transportation and food delivery. Additionally, a substantial percentage of the population will require some form of medical care. Health care facilities can be overwhelmed, creating a shortage of hospital staff, beds, ventilators, and other supplies.

In order to define and prepare for an influenza pandemic, the World Health Organization (WHO) has developed a global influenza preparedness plan, which defines the stages of a pandemic, outlines the role of WHO, and makes recommendations for national measures before and during a pandemic. The pandemic phases are detailed below:

Interpandemic period:

- Phase 1: No new influenza virus subtypes have been detected in humans.
- Phase 2: No new influenza virus subtypes have been detected in humans, but an animal variant threatens human disease.

Pandemic alert period:

- Phase 3: Human infection(s) with a new subtype but no human-to-human spread.
- Phase 4: Small cluster(s) with limited localized human-to-human transmission.
- Phase 5: Larger cluster(s) but human-to-human spread still localized.

Pandemic period:

- Phase 6: Pandemic: increased and sustained transmission in general population.

3.13.2 Pandemic History

Excerpts from the National Institute of Allergy and Infectious Diseases indicate the string of major pandemics over time as well as the appearance of new influenza strain in the human population.

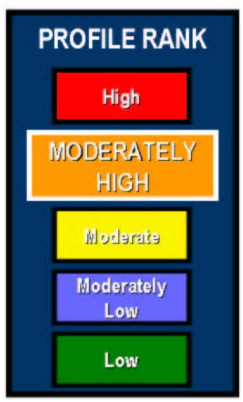
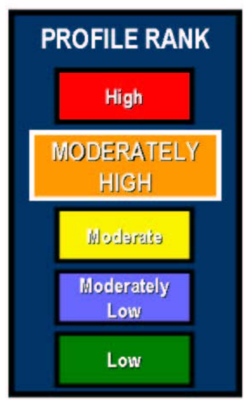
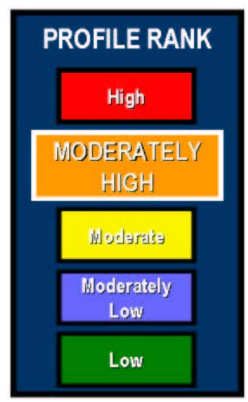
Major Pandemics		
Year(s)	Name/String	Effects
1918	"Spanish Flu" H1N1	The most devastating flu pandemic in recent history, killing more than 500,000 people in the United States, and 20 million to 50 million people worldwide.
1957-58	"Asian Flu" H2N2	First identified in China, this virus caused roughly 70,000 deaths in the United States during the 1957-58 season. Because this strain has not circulated in humans since 1968, no one under 30 years old has immunity to this strain.
1968-69	"Hong Kong Flu" H3N2	First detected in Hong Kong, this virus caused roughly 34,000 deaths in the United States during the 1968-69 season. H3N2 viruses still circulate today.
New Influenza Strain		
Year(s)	String/Name	Effects
1977	"Russian Flu" H1N1	Isolated in northern China, this virus was similar to the virus that spread before 1957. For this reason, individuals born before 1957 were generally protected; however children and young adults born after that year were not because they had no prior immunity.
1997	H5N1	The first time an influenza virus was found to be transmitted directly from birds to people, with infections linked to exposure to poultry markets. Eighteen people in Hong Kong were hospitalized, six of whom died.
1999	H9N2	Appeared for the first time in humans. It caused illness in two children in Hong Kong, with poultry being the probable source.
2002	H7N2	Evidence of infection is found in one person in Virginia following a poultry outbreak.

Major Pandemics		
2003	H5N1	Caused two Hong Kong family members to be hospitalized after a visit to China, killing one of them, a 33-year-old man. (A third family member died while in China of an undiagnosed respiratory illness.)
2004	H5N1	Caused illness in 47 people in Thailand and Vietnam, 34 of whom died. Researchers are especially concerned because this flu strain, which is quite deadly, is becoming endemic in Asia.
2009	H1N1	In April, human infection with a new strain of H1N1 influenza is confirmed in Mexico. Within weeks, human infections spread to the United States and cases begin occurring in other regions around the world.

3.13.3 Pandemic Probability, Frequency, and Magnitude

It is difficult to predict the probability and severity of the next influenza pandemic. According to the Centers for Disease Control and Prevention, the 2009 H1N1 (referred to as “swine flu” early on) is a new influenza virus causing illness in people. This new virus was first detected in people in the United States in April 2009. This virus is spreading from person-to-person worldwide, probably in much the same way that regular seasonal influenza viruses spread. On June 11, 2009, the World Health Organization (WHO) signaled that a pandemic of 2009 H1N1 flu was underway.

3.14 Volcano Hazard Profile

Volcano Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years		
Consequence/Severity:	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life		
Vulnerability:	Widespread damage area, significant secondary impacts, no warning time		
Hazard Risk Rank Score:	25	25	25
Profile Rank			

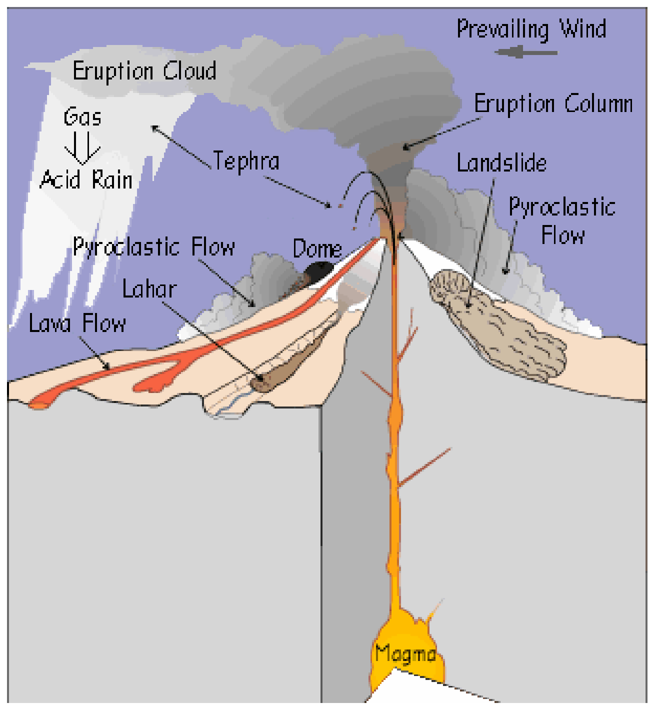
3.14.1 Volcano Hazard Information and Background

More than 50 volcanoes in the United States have erupted one or more times in the past 200 years. The most volcanically active regions of the Nation are in Alaska, Hawaii, California, Oregon, and Washington. Volcanoes produce a wide variety of hazards that can kill people and destroy property. Large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate. Some of the volcano hazards described below, such as landslides, can occur even when a volcano is not erupting.

Volcanoes produce a wide variety of natural hazards that can kill people and destroy property. This simplified sketch shows a volcano typical of those found in the Western United States and Alaska, but many of these hazards also pose risks at other volcanoes, such as those in Hawaii. Some hazards, such as lahars and landslides, can occur even when a volcano is not erupting.

Eruption Columns and Clouds

An explosive eruption blasts solid and molten rock fragments (tephra) and volcanic gases into the air with tremendous force. The largest rock fragments (bombs) usually fall back to the ground within 2 miles of the vent. Small fragments (less than about 0.1 inch across) of volcanic glass, minerals, and rock (ash) rise high into the air, forming a huge, billowing eruption column.



Eruption columns can grow rapidly and reach more than 12 miles above a volcano in less than 30 minutes, forming an eruption cloud. The volcanic ash in the cloud can pose a serious hazard to aviation. During the past 15 years, about 80 commercial jets have been damaged by inadvertently flying into ash clouds, and several have nearly crashed because of engine failure. Large eruption clouds can extend hundreds of miles downwind, resulting in ash fall over enormous areas; the wind carries the smallest ash particles the farthest. Ash from the May 18, 1980, eruption of Mount St. Helens, Washington, fell over an area of 22,000 square miles in the Western United States. Heavy ash fall can collapse buildings, and even minor ash fall can damage crops, electronics, and machinery.

Volcanic Gases

Volcanoes emit gases during eruptions. Even when a volcano is not erupting, cracks in the ground allow gases to reach the surface through small openings called fumaroles. More than ninety percent of all gas emitted by volcanoes is water vapor (steam), most of which is heated ground water (underground water from rain fall and streams). Other common volcanic gases are carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen, and fluorine. Sulfur dioxide gas can react with water droplets in the atmosphere to create acid rain, which causes corrosion and harms vegetation. Carbon dioxide is heavier than air and can be trapped in low areas in concentrations that are deadly to people and animals. Fluorine, which in high concentrations is toxic, can be adsorbed onto volcanic ash particles that later fall to the ground. The fluorine on the particles can poison livestock grazing on ash-coated grass and also contaminate domestic water supplies.

Cataclysmic eruptions, such as the June 15, 1991, eruption of Mount Pinatubo (Philippines), inject huge amounts of sulfur dioxide gas into the stratosphere, where it combines with water to form an aerosol (mist) of sulfuric acid. By reflecting solar radiation, such aerosols can lower the Earth's average surface temperature for extended periods of time by several degrees Fahrenheit (°F). These sulfuric acid aerosols also contribute to the destruction of the ozone layer by altering chlorine and nitrogen compounds in the upper atmosphere.

Lava Flows and Domes

Molten rock (magma) that pours or oozes onto the Earth's surface is called lava and forms lava flows. The higher a lava's content of silica (silicon dioxide, SiO2), the less easily it flows. For example, low-silica basalt lava can form fast-moving (10 to 30 miles per hour) streams or can spread out in broad thin sheets up to several miles wide. Since 1983, Kilauea Volcano on the Island of Hawaii has erupted basalt lava flows that have destroyed more than 200 houses and severed the nearby coastal highway.

In contrast, flows of higher-silica and esite and dacite lava tend to be thick and sluggish, traveling only short distances from a vent. Dacite and rhyolite lavas often squeeze out of a vent to form irregular mounds called lava domes. Between 1980 and 1986, a dacite lava dome at Mount St. Helens grew to about 1,000 feet high and 3,500 feet across.

Pyroclastic Flows

High-speed avalanches of hot ash, rock fragments, and gas can move down the sides of a volcano during explosive eruptions or when the steep side of a growing lava dome collapses and breaks apart. These pyroclastic flows can be as hot as 1,500 °F and move at speeds of 100 to 150 miles per hour. Such flows tend to follow valleys and are capable of knocking down and burning everything in their paths. Lower-density pyroclastic flows, called pyroclastic surges, can easily overflow ridges hundreds of feet high.

Volcano Landslides

A landslide or debris avalanche is a rapid downhill movement of rocky material, snow, and (or) ice. Volcano landslides range in size from small movements of loose debris on the surface of a volcano to massive collapses of the entire summit or sides of a volcano. Steep volcanoes are susceptible to landslides because they are built up partly of layers of loose volcanic rock fragments. Some rocks on volcanoes have also been altered to soft, slippery clay minerals by circulating hot, acidic ground water. Landslides on volcano slopes are triggered when eruptions, heavy rainfall, or large earthquakes cause these materials to break free and move downhill.

Mudflows

Mudflows or debris flows composed mostly of volcanic materials on the flanks of a volcano are called lahars. These flows of mud, rock, and water can rush down valleys and stream channels at speeds of 20 to 40 miles per hour and can travel more than 50 miles. Some lahars contain so much rock debris (60 to 90% by weight) that they look like fast-moving rivers of wet concrete. Close to their source, these flows are powerful enough to rip up and carry trees, houses, and huge boulders miles downstream. Farther downstream they entomb everything in their path in mud.

Historically, lahars have been one of the deadliest volcano hazards. They can occur both during an eruption and when a volcano is quiet. The water that creates lahars can come from melting snow and ice (especially water from a glacier melted by a pyroclastic flow or surge), intense rainfall, or the breakout of a summit crater lake.

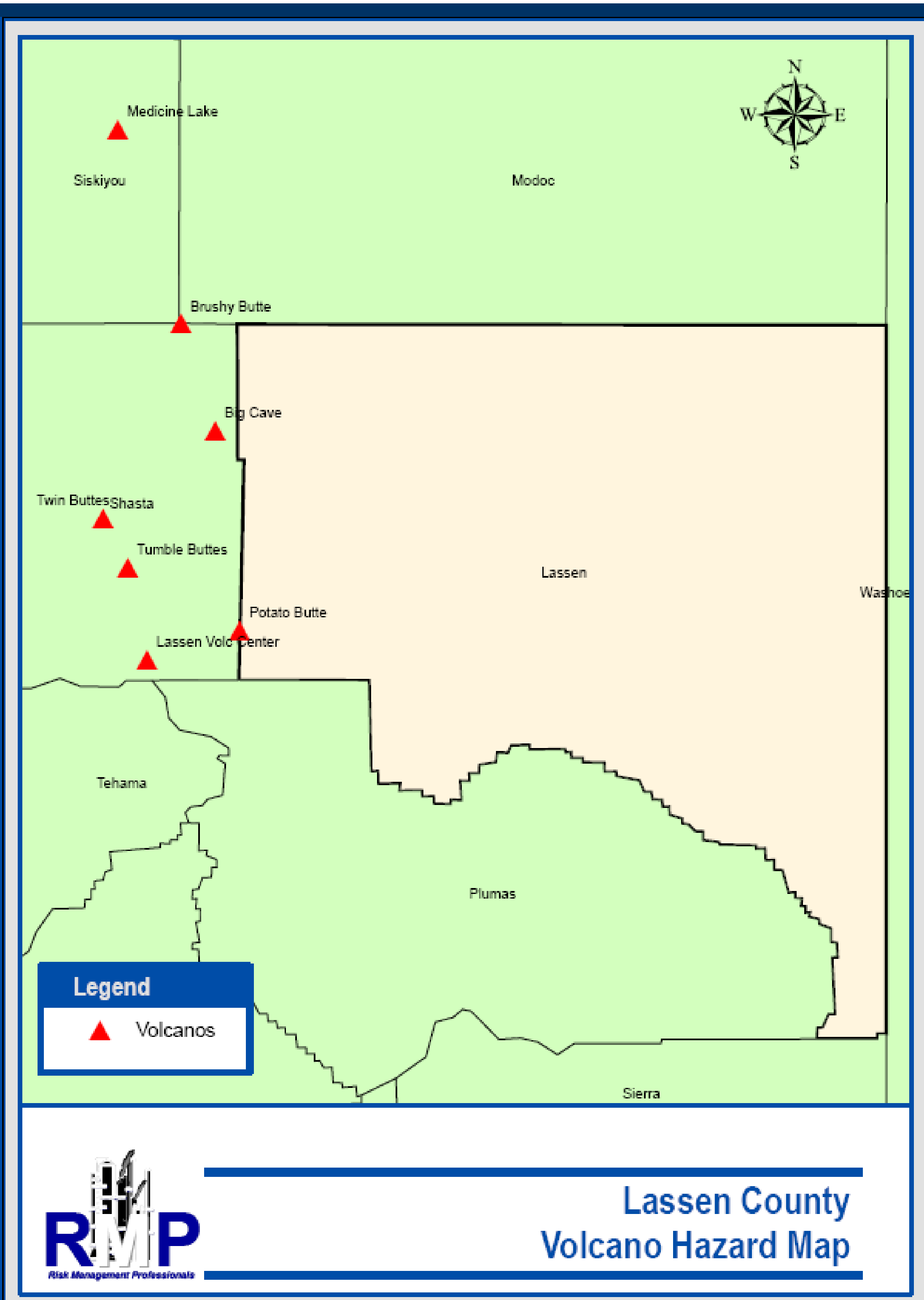
3.14.3 Volcano Hazard History

On May 22, 1915, an explosive eruption at Lassen Peak, the southernmost active volcano in the Cascade Range, devastated nearby areas and rained volcanic ash as far away as 200 miles to the east. This explosion was the most powerful in a 1914-17 series of eruptions that were the last to occur in the Cascades before the 1980 eruption of Mt. St. Helens. Lassen Peak is the largest of a group of more than 30 volcanic domes erupted over the past 300,000 years in Lassen Volcanic National Park. The picture below from the National Park Services provides an illustration of the Lassen Peak eruption.

3.14.3 Volcano Probability, Frequency, and Magnitude

Because geologically recent volcanic activity in an area is the best guide to forecasting future eruptions, scientists study the lava flows, ash, and other deposits from past eruptions. Volcanoes in the Lassen area tend to erupt infrequently, and may be inactive for periods lasting centuries or even millennia. The most recent eruptions in the Lassen area were the relatively small events that occurred at Lassen Peak between 1914 and 1917. The most recent large eruption produced Chaos Crags about 1,100 years ago. Such large eruptions in the Lassen area have an average recurrence interval of about 10,000 years. However, the geologic history of the Lassen area indicates that volcanism there is episodic, having periods of relatively frequent eruptions separated by long quiet intervals. For example, the last large event before the Chaos Crags eruption was the one that built Lassen Peak 27,000 years ago.

After the eruption of Mount St. Helens in 1980, the U.S. Geological Survey (USGS) intensified its monitoring of active and potentially active volcanoes in the Cascade Range. Monitoring of the Lassen area includes periodic measurements of ground deformation and volcanic gas emissions and continuous transmission of data from a local network of nine seismometers to USGS offices in Menlo Park, California. Should indications of a significant increase in volcanic activity be detected, the USGS will immediately deploy scientists and specially designed portable monitoring instruments to evaluate the threat. In addition, the National Park Service (NPS) has developed an emergency response plan that would be activated to protect the public in the event of an impending eruption. The map on the following page provides an overview of the volcanoes located within the vicinity of Lassen County.



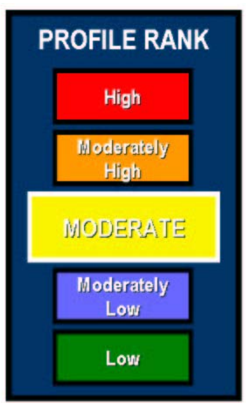
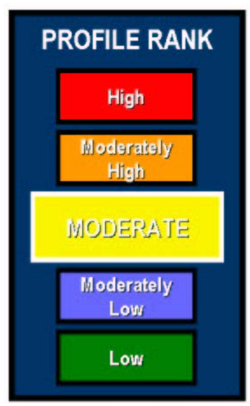
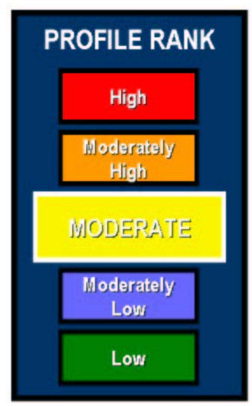
Lassen County – Volcano Hazard Map

In addition, there is a four-tiered Volcano Alert Level that uses the terms Normal, Advisory, Watch, and Warning (from background levels to highest threat). The Volcano Alert Levels are intended to inform people on the ground about a volcano's status and are issued in conjunction with the Aviation Color Code. Notifications are issued for both increasing and decreasing volcanic activity and are accompanied by text with details about the nature of the unrest or eruption and about potential or current hazards and likely outcomes. The table on the following page illustrates the Alert Level as well as the associated volcanic state.

Level	Volcanic State
Normal	Volcano is in typical background, noneruptive state or, after a change from a higher level, volcanic activity has ceased and volcano has returned to noneruptive background state.
Advisory	Volcano is exhibiting signs of elevated unrest above known background level or, after a change from a higher level, volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
Watch	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain, **OR** eruption is underway but poses limited hazards.
Warning	Hazardous eruption is imminent, underway, or suspected.

3.15 Extreme Heat Hazard Profile

Extreme Heat Risk Assessment Summary

	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Frequent event - occurs more than once a year		
Consequence/Severity:	No damage		
Vulnerability:	Moderate damage area, moderate secondary impacts		
Hazard Risk Rank Score:	16	16	16
Profile Rank			

3.15.1 Extreme Heat Hazard Information and Background

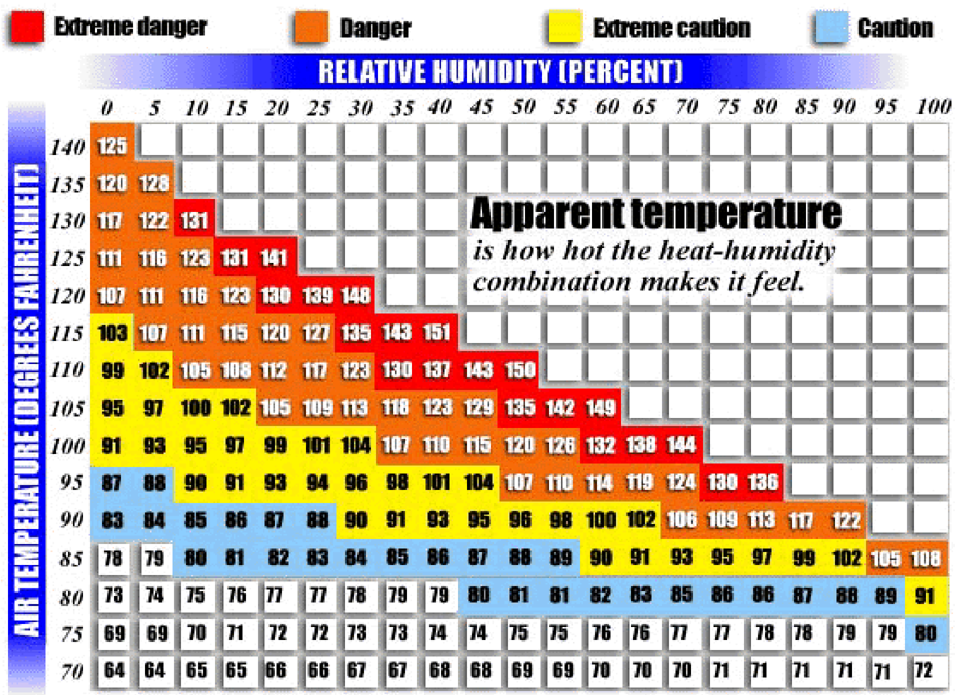
A heat wave is a prolonged period of excessively hot weather, which may be accompanied by excessive humidity. The term is relative to the usual weather in the area. Therefore, temperatures that people from a hotter climate consider normal can be termed a heat wave in a cooler area if they are outside the normal pattern for that area. The term is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century. In California's climate, a heat wave is defined as at least three consecutive days with temperatures of 90 degrees Fahrenhiet or more.

The major human risks associated with extreme heat are as follows:

- Heatstroke - Considered a medical emergency, heatstroke is often fatal. It occurs when the body's responses to heat stress are insufficient to prevent a substantial rise in the body's core temperature. While no standard diagnosis exists, a medical heatstroke condition is usually diagnosed when the body's temperature exceeds 105°F due to environmental temperatures. Rapid cooling is necessary to prevent death, with an average fatality rate of 15 percent even with treatment.
- Heat Exhaustion - While much less serious than heatstroke, heat exhaustion victims may complain of dizziness, weakness, or fatigue. Body temperatures may be normal or slightly/moderately elevated.
- Heat Syncope - This refers to sudden loss of consciousness and is typically associated with people exercising who are not acclimated to warm temperatures.
- Heat Cramps - May occur in people unaccustomed to exercising in the heat and generally ceases to be a problem after acclimatization.

In addition to affecting people, severe heat places significant stress on plants and animals. The effects of severe heat on agricultural products may include reduced yields and even loss of crops.

The heat index combines the effects of heat and humidity. The apparent temperature, which combines the temperature and relative humidity, is a guide to the danger. Below is the heat stress index based on the apparent temperature:



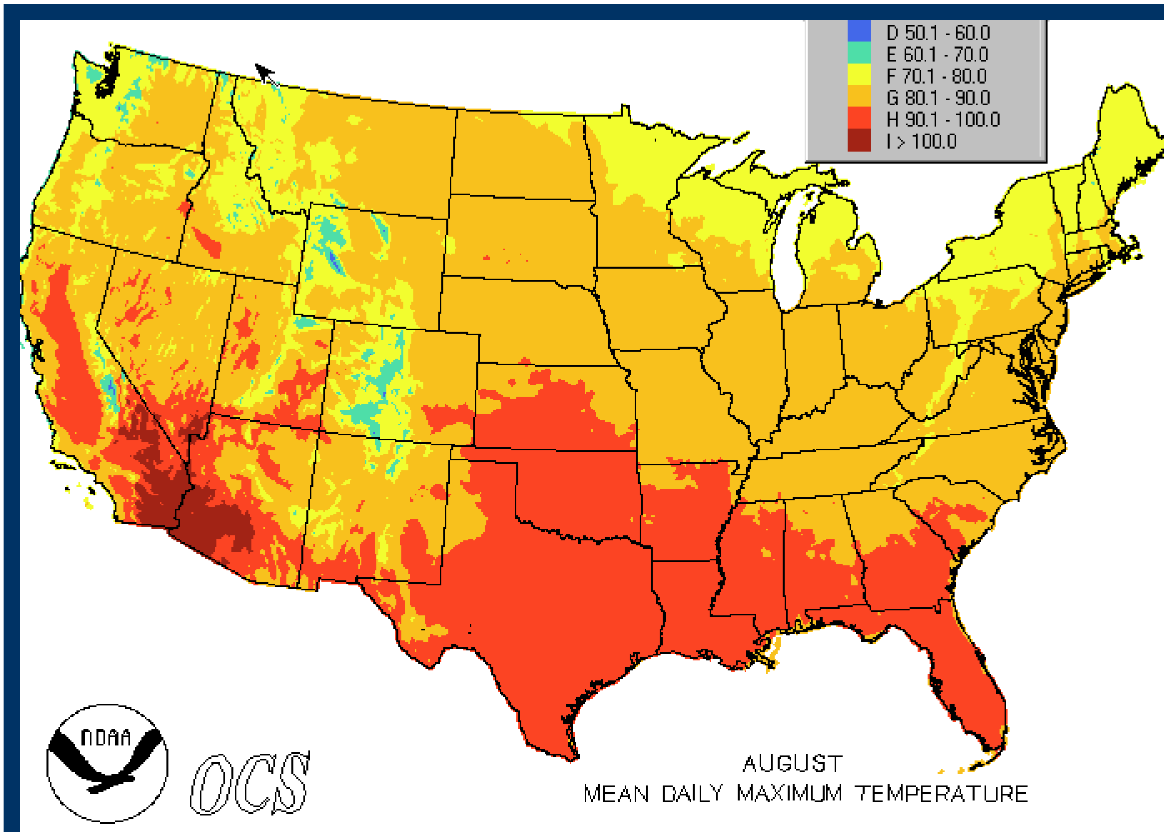
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
140	125																				
135	120	128																			
130	117	122	131																		
125	111	116	123	131	141																
120	107	111	116	123	130	139	148														
115	103	107	111	115	120	127	135	143	151												
110	99	102	105	108	112	117	123	130	137	143	150										
105	95	97	100	102	105	109	113	118	123	129	135	142	149								
100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144						
95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136				
90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122		
85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108
80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	71	71	71	71	71	72

3.15.2 Extreme Heat History

Since a heat wave is classified as three consecutive days above 90 degrees Fahrenheit, extreme heat events can occur within the Lahontan California region. The County, City and Rancheria typically reach heat wave temperatures on an annual basis.

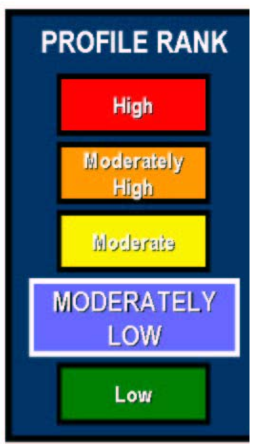
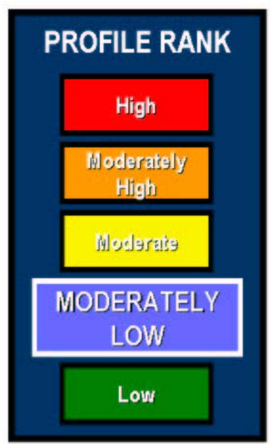
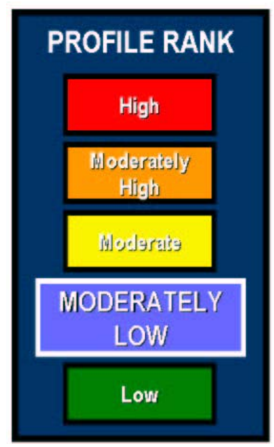
3.15.3 Extreme Heat Probability, Frequency, and Magnitude

The probability and frequency of heat hazards is characterized by a heat index using temperature and humidity readings. According to the heat index for the County service area, the County, City and Rancheria have a relatively high probability of experiencing above average temperatures. The map on the following page illustrates the national heat index during the summer month of August, depicting the County, City and Rancheria temperature range within the 80 degrees to 90 degrees Fahrenheit.



Heat Index Map – August Mean Daily Maximum Temperature

3.16 Terrorism Hazard Profile

Terrorism Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)		
Consequence/Severity:	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability		
Vulnerability:	Localized damage area		
Hazard Risk Rank Score:	12	12	12
Profile Rank			

3.16.1 Terrorism Hazard Information and Background

Terrorism is the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of a political or social objective.

The Federal Bureau of Investigation (FBI) has categorized two types of terrorism in the United States.

> **International Terrorism** involves terrorist activity committed by groups or individuals who are foreign-based and/or directed by countries or groups outside the United States, or whose activities transcend national boundaries.
>
> **Domestic Terrorism** involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction.

Well-known international terrorist groups include Islamic Fundamentalist groups, such as the Iranian Revolutionary Guard; European terrorists, including the Red Brigade in Italy, Spain's ETA, and the Japanese Red Army; separatist groups, such as Sierra Lumenoso, and the so-called "Shining Path" in Peru. Add to these a host of narco-terrorists, such as the Medellien and Cali drug cartels.

In our own country, a number of animal rights activists; environmentalist groups; white supremacists, such as the League of Aryan nations; and groups including the Covenant, Sword and Arm of the Lord, New World Order, and skinheads have been responsible for acts of terrorism on US soil. Added to these are groups like the KKK, survivalists, such as the Freemen in Montana, and doomsday cults, such as David Koresh in Waco, Texas, and Jim Jones in Guyana.

There are a number of methods that a terrorist may use to carry out their objective, including: Chemical, Biological, Radiological, Nuclear, Explosive, Cyber and others such as hijackings, assassinations, armed assaults, kidnappings/hostage taking, arson fires, sabotage of critical infrastructures such as utilities and transportation, and disseminating confidential or otherwise sensitive information for the planning of terrorist attacks.

Chemical

Chemical agents involve the use of chemical compounds to kill or seriously injure its victims. There are numerous kinds of chemical weapons and their effectiveness is determined by a number of factors including age, purity, weather conditions, wind direction, and means of dissemination.

Biological

Biological agents include microbes, such as bacteria or viruses, and toxins derived from plants or animals that can produce illness or death. Illegal facilities that manufacture these substances are difficult to detect because they employ fermentation technology commonly used in the production of legitimate products such as antibiotics, vaccines, wine, and beer.

Radiological and Nuclear

Radiological or nuclear terrorism is the use of radioactive materials and/or nuclear explosives, as well as any terrorist actions against nuclear facilities by individuals or groups, to inflict harm on a population and advance political or social objectives. Sources of radiological material including nuclear fuel cycle waste, medical and dental equipment, military weaponry, and machines used in private industry.

Explosive

The impact of a bombing depends largely on the type, size, and placement of the device used. Additionally, a Weapon of Mass Destruction (WMD) in combination with an explosive device expands the lethality, physical damage, and economic disruption. The use of an explosive device can also inflict significant disruption of society through destruction of critical infrastructure and widespread fear amongst the target population.

Cyber

Cyber terrorism is a premeditated, politically motivated attack against information, computer systems, computer programs, and data which result in violence against noncombatant targets by sub-national groups or clandestine agents. Cyber terrorists can be domestic or international.

Additional Terrorism Methods

These include hijackings, kidnappings, and the taking of hostages, armed assaults and mass shootings, assassinations of public figures, sabotage of transportation systems and utility infrastructure, the dissemination of confidential information that would aid terrorist organizations when planning an attack, arson fires, and many other means of disrupting normal society or endangering lives and property.

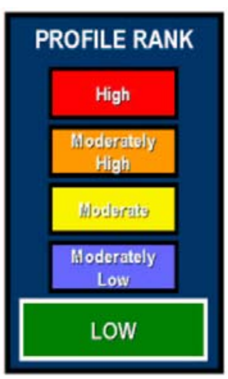
3.16.2 Terrorism History

The United States has proven to be a high priority target for both domestic and international terrorists. Acts of terror have become increasingly alarming in their magnitude in recent years. Examples of this include the bombing of the Alfred P. Murrah Federal Building in Oklahoma City and the attacks of September 11th 2001 on the World Trade Center complex and the Pentagon. Not all attacks, however, are at this level of intensity. The United States has been subject to numerous small scale attacks in the past.

3.16.3 Terrorism Probability, Frequency, and Magnitude

Although Lassen County, the City of Susanville and the Susanville Indian Racheria considers the probability of a terrorist attack to be relatively low, they still recognize the potential for a terrorism event to impact the region. Given the current escalating terrorism trends the threat of a terrorist event within the United States is a credible possibility and the County, City and Rancheria ranked the probability of terrorism accordingly during the Risk Assessment Workshop.

3.18 Avalanche Hazard Profile

Avalanche Risk Assessment Summary			
	Lassen County	City of Susanville	Susanville Indian Rancheria
Probability/Frequency:	Rare event - occurs less than once every 50 years	Infeasible event - not applicable due to geographic location characteristics	
Consequence/Severity:	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability	N/A	N/A
Vulnerability:	Localized damage area	N/A	N/A
Hazard Risk Rank Score:	4	N/A	N/A
Profile Rank		N/A	N/A

3.18.1 Avalanche Hazard Information and Background

An avalanche is a rapid flow of snow down a slope, from either natural triggers or human activity. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope; however avalanches are always initiated in snow, are primarily composed of flowing snow. In mountainous terrain avalanches are among the most serious objective hazards to life and property, with their destructive capability resulting from their potential to carry an enormous mass of snow rapidly over large distances.

Avalanches are classified by their morphological characteristics, and are rated by either their destructive potential, or the mass of the downward flowing snow. Some of the morphological characteristics used to classify avalanches include the type of snow involved, the nature of the failure, the sliding surface, the propagation mechanism of the failure, the trigger of the avalanche, the slope angle, direction, and elevation. Avalanche size, mass, and destructive potential are rated according to the following table:

Size	Destructive Potential
1	Sluff or snow that slides less than 50m (150') of slope distance.
2	Small, relative to path.
3	Medium, relative to path.
4	Large, relative to path.
5	Major or maximum, relative to path.

3.18.2 Avalanche History

The City of Susanville and the Susanville Indian Rancheria are located in relatively flat areas within Lassen County and are therefore not at risk for avalanche hazards; however, areas within rural Lassen County that are in mountainous terrain with snow pack are susceptible to periodic avalanches. While no specific property damage or loss of life have been recorded within the County the potential exists that an avalanche will impact the County. Currently, the power conveyance system is vulnerable to avalanches with the potential to cause power outages for short periods of time.

3.18.3 Avalanche Probability, Frequency, and Magnitude

Avalanches are always caused by an external stress on the snow pack; they are not random or spontaneous events. Natural triggers of avalanches include additional precipitation, radiative and convective heating, rock fall, ice fall, and other sudden impacts; however, even a snow pack held at a constant temperature, pressure, and humidity will evolve over time and develop stresses, often from the downslope creep of the snow pack. Human triggers of avalanches include skiers, snowmobiles, and controlled explosive work. The triggering stress load can be either localized to the failure point, or remote. Localized triggers of avalanches are typified by point releases from solar heated rocks. Remotely triggered avalanches occur when a tensile stress wave is transmitted through the slab to the start zone, once the stress wave reaches the start zone a fracture initiates and propagates the failure. Of exceptional note is that avalanches can not only entrain additional snow within the failing slab, but can also, given the sufficient accumulation of overburden due to a smaller avalanche, step down and trigger deeper slab instabilities that would be more resilient against smaller stresses. The table on the following page illustrates the Avalanche Danger Warning System categories, danger description, and recommended actions.

Avalanche Danger Warning System		
Probability and trigger	**Degree and distribution of danger**	**Recommended action in back country**
Low (green)	Natural avalanches very unlikely. Human triggered avalanches unlikely. Generally stable snow. Isolated areas of instability.	Travel is generally safe. Normal caution advised.
Moderate (yellow)	Natural avalanches unlikely. Human triggered avalanches possible. Unstable slabs possible on steep terrain.	Use caution in steeper terrain
Considerable (orange)	Natural avalanches possible. Human triggered avalanches probable. Unstable slabs probable on steep terrain.	Be increasingly cautious in steeper terrain.
High (red)	Natural and human triggered avalanches likely. Unstable slabs likely on a variety of aspects and slope angles.	Travel in avalanche terrain is not recommended. Safest travel on windward ridges of lower angle slopes without steeper terrain above.
Extreme (red/black border)	Widespread natural or human triggered avalanches certain. Extremely unstable slabs certain on most aspects and slope angles. Large destructive avalanches possible.	Travel in avalanche terrain should be avoided and travel confined to low angle terrain well away from avalanche path run-outs.

3.19 Asset Inventory

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

A critical step required to complete the Risk Assessment is to develop a detailed asset inventory and document potential asset damages due to each identified natural hazard. The calculated loss estimates will be based on the values determined during the initial asset inventory. In order to produce accurate loss estimates, Lassen County developed a comprehensive inventory of all assets, including asset locations. Following the Asset Inventory Summary Tables are maps depicting the asset locations for the County, City and Rancheria.

Future Developments

Currently, there are no planned developments for future buildings within Lassen County, the City of Susanville, or the Susanville Indian Rancheria; however, the hazard maps and loss estimates are dynamic and the calculations will be updated to account for future developments as the potential arises. The hazard maps will also be used as a tool to pre-identify areas that are not conducive for construction.

Asset Inventory Summary – City of Susanville								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
School	Cornerstone Christian	2545 Riverside Drive Susanville, CA 96130	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00
School	Lassen Community College	478-200 State Route 139 Susanville, CA 96130-3781	200000	$114.68	$22,936,000.00	150%	$34,404,000.00	$57,340,000.00
School	Diamond View Elementary	850 Richmond Rd. Susanville, CA 96130-4823	78000	$90.22	$7,037,160.00	100%	$7,037,160.00	$14,074,320.00
School	McKinley Elementary	2005 Fourth St. Susanville, CA 96130-4105	62000	$90.22	$5,593,640.00	100%	$5,593,640.00	$11,187,280.00
School	Meadow View	1200 Paiute Ln. Susanville, CA 96130-4105	50000	$90.22	$4,511,000.00	100%	$4,511,000.00	$9,022,000.00
School	New Horizons Christian	995 Paiute Ln. Susanville, CA 96130	6000	$90.22	$541,320.00	100%	$541,320.00	$1,082,640.00
School	Paiute Creek Community Day	109 South Gilman St. Susanville, CA 96130	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Susan River Community Day	109 South Gilman St. Susanville, CA 96130	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Johnstonville Elementary	704-795 Bangham Ln. Susanville, CA 96130-7716	12000	$90.22	$1,082,640.00	100%	$1,082,640.00	$2,165,280.00
School	Richmond Elementary	700-585 Richmond Rd. Susanville, CA 96130-5026	10000	$90.22	$902,200.00	100%	$902,200.00	$1,804,400.00

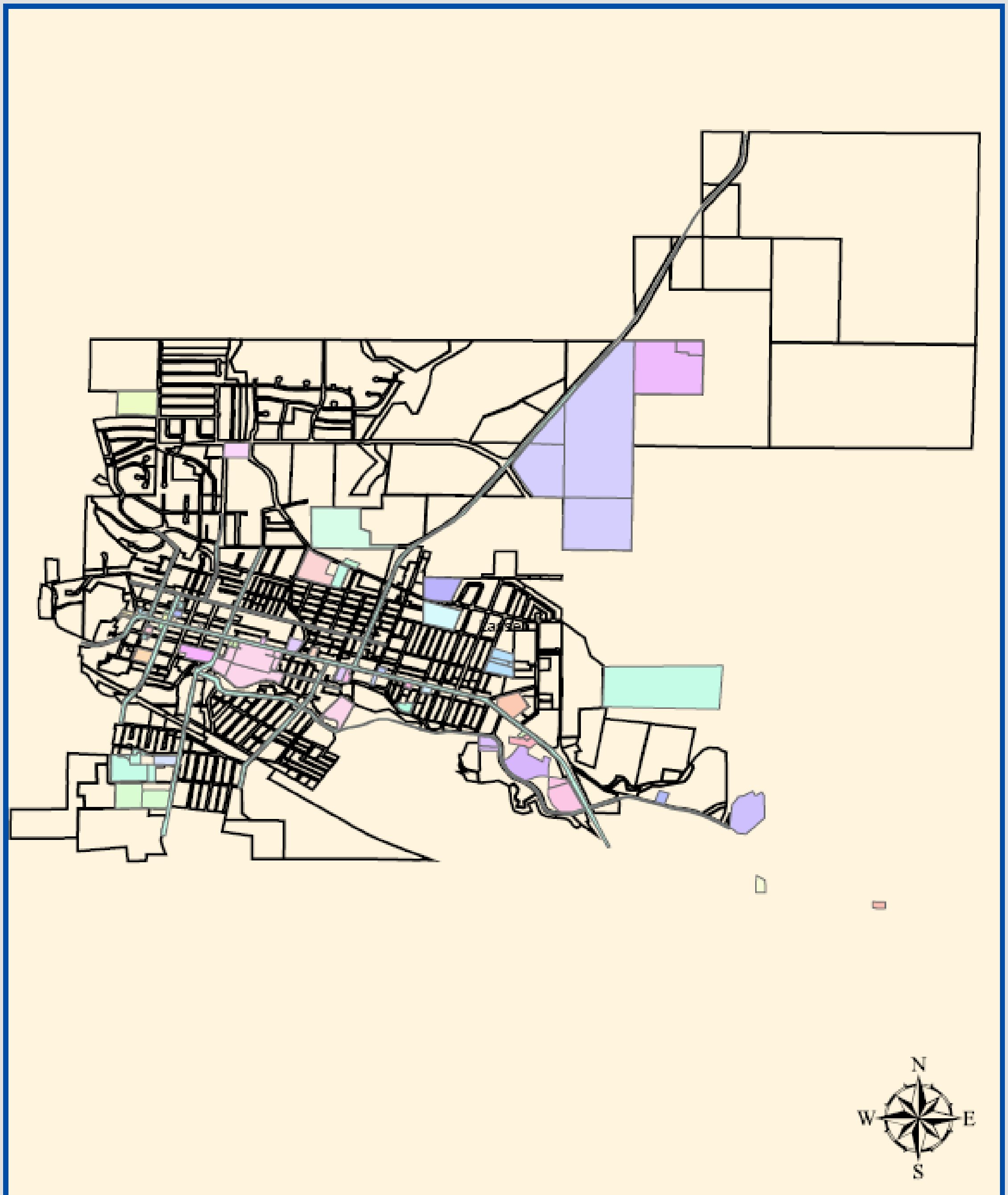
Asset Inventory Summary – City of Susanville								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
School	Credence High	814 Cottage St. Susanville, CA 96130-4403	7000	$92.80	$649,600.00	100%	$649,600.00	$1,299,200.00
School	Diamond Mountain Charter High	55 South Weatherlow St. Susanville, CA 96130	4000	$92.80	$371,200.00	100%	$371,200.00	$742,400.00
School	Lassen Community Day	1405 Sheriff Cady Ln. Susanville, CA 96130	2500	$90.22	$225,550.00	100%	$225,550.00	$451,100.00
School	Lassen High	1110 Main St. Susanville, CA 96130-4421	100000	$92.80	$9,280,000.00	100%	$9,280,000.00	$18,560,000.00
School	Lassen Union High Adult	808 Cottage St. Susanville, CA 96130	500	$92.80	$46,400.00	100%	$46,400.00	$92,800.00
Police Station	Lassen County Sheriff/Coroner's Office	1415 Sheriff Cady Ln. Susanville, CA 96130	8000	$136.10	$1,088,800.00	150%	$1,633,200.00	$2,722,000.00
Police Station	California state government Highway Patrol	472 diamond crest RD 400 Susanville, CA 96127	7500	$136.10	$1,020,750.00	150%	$1,531,125.00	$2,551,875.00
Police Station	Susanville City Police Department	1801 Main St. Susanville , CA 96130	12000	$136.10	$1,633,200.00	150%	$2,449,800.00	$4,083,000.00
Federal Prison	California Correctional Center	711-045 Center Rd. Susanville, CA 96130	NA	NA	NA	NA	NA	NA

Asset Inventory Summary – City of Susanville								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
Federal Prison	High Desert State Prison	475-750 Rice Canyon Rd. Susanville, CA 96127	NA	NA	NA	NA	NA	NA
Fire Station	Lake Forest Fire Department	619-200 Janet Way Susanville, CA 96130	1000	$105.53	$105,530.00	150%	$158,295.00	$263,825.00
Fire Station	Forestry Department Fire Dispatch	5th & Cedar Susanville, CA 96130	10000	$105.53	$1,055,300.00	150%	$1,582,950.00	$2,638,250.00
Fire Station	Susanville Fire Department	1505 Main St. Susanville, CA 96130-4427	9000	$105.53	$949,770.00	150%	$1,424,655.00	$2,374,425.00
Medical	Urgent Care	1850 Spring Ridge Drive Susanville, CA 96130	20000	$118.01	$2,360,200.00	150%	$3,540,300.00	$5,900,500.00
Medical	Lassen Surgery Center	103 Fair Drive Susanville, CA 96130	8000	$118.01	$944,080.00	150%	$1,416,120.00	$2,360,200.00
Medical	Banner Lassen Medical Center	1800 Spring Ridge Susanville, CA 96130	30000	$118.01	$3,540,300.00	150%	$5,310,450.00	$8,850,750.00
Library	Susanville District Library	1618 Main St. Susanville, CA 96130	11000	$103.94	$1,143,340.00	100%	$1,143,340.00	$2,286,680.00
Airport	Susanville Municipal Airport	471-920 Johnstonville Dr Susanville, CA 96130	NA	NA	$2,000,000.00	NA	NA	$2,000,000.00
Public Buildings	Community Center/Chamber of Commerce Center	75 N Weatherlow Street Susanville, CA 96130	2000	$90.30	$180,600.00	100%	$180,600.00	$361,200.00

Asset Inventory Summary – City of Susanville								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
Public Buildings	Lassen Historical Museum	105 North Weatherlow St. Susanville, CA 96130	1500	$90.30	$135,450.00	100%	$135,450.00	$270,900.00
Public Buildings	Lassen County Administration Complex	221 S. Roop St., Ste. 4 Susanville, CA 96130	15000	$90.30	$1,354,500.00	100%	$1,354,500.00	$2,709,000.00
Public Buildings	Public Works	700 South St Susanville, CA 96130	6000	$90.30	$541,800.00	100%	$541,800.00	$1,083,600.00
Public Buildings	City Hall	66 North Lassen Susanville CA	6000	$90.30	$541,800.00	100%	$541,800.00	$1,083,600.00
Public Buildings	Lassen Municipal Utilities District	65 S. Roop St Susanville, CA 96130	7500	$90.30	$677,250.00	100%	$677,250.00	$1,354,500.00
Public Buildings	Susanville Sanitation District	Paul Bunyan Rd. Susanville CA	5000	$90.30	$451,500.00	100%	$451,500.00	$903,000.00
Communication	Frontier Communications	1010 Main St. Susanville, CA 96130	NA	NA	$5,000,000.00	NA	NA	$5,000,000.00
Communication	Sierra Radio Network	4015 Johnstonville Rd. Susanville CA	NA	NA	$2,000,000.00	NA	NA	$2,000,000.00
Water Facilities	Harris Drive Tank	Harris Drive Susanville, CA 96130	1,000,000 Gallons	$1.25 / Gal	$1,250,000.00	NA	NA	$1,250,000.00
Water Facilities	South St Tank	South St Susanville, CA	1,000,000 Gallons	$1.25 / Gal	$1,250,000.00	NA	NA	$1,250,000.00

Asset Inventory Summary – City of Susanville								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
Water Facilities	Spring Ridge Tank	Highway 139 Susanville, CA 96130	1,000,000 Gallons	$1.25 / Gal	$1,250,000.00	NA	NA	$1,250,000.00
Water Facilities	Bagwell Springs Tank	Paiute Lane Susanville, CA	1,000,000 Gallons	$1.25 / Gal	$1,250,000.00	NA	NA	$1,250,000.00
Water Facilities	Skyline and Orlo Well	Skyline and Orlo Susanville, CA 96130	NA	NA	$400,000.00	NA	NA	$400,000.00
Water Facilities	Grove St Well	Grove St Susanville, CA 96130	NA	NA	$400,000.00	NA	NA	$400,000.00
Water Facilities	Johnstonville Tank	Johnstonville Rd Johnstonville, CA	500,000 Gallons	$1.50 / Gal	$750,000.00	NA	NA	$750,000.00
Water Facilities	Susan Hills Water Tank	Susan Hills Dr. Susanville, CA 96130	750,000 Gallons	$1.50 / Gal	$1,125,000.00	NA	NA	$1,125,000.00
							Subtotal	$177,917,685.00

Loss of Function / Continuity Premium (1 day) – City of Susanville				
Population: 14,055				
Category	Value Per Person	Value Per Day	Continuity Premium	Total
Fire Service	-	$3,536.00	10	$35,360.00
Police Service	-	$6,148.00	10	$61,480.00
Water Service	$138.00	$1,939,590.00	-	$1,939,590.00
Electricity	$188.00	$2,642,340.00	-	$2,642,340.00
Wastewater	$33.50	$470,842.50	-	$470,842.50
			Subtotal	$5,149,612.50



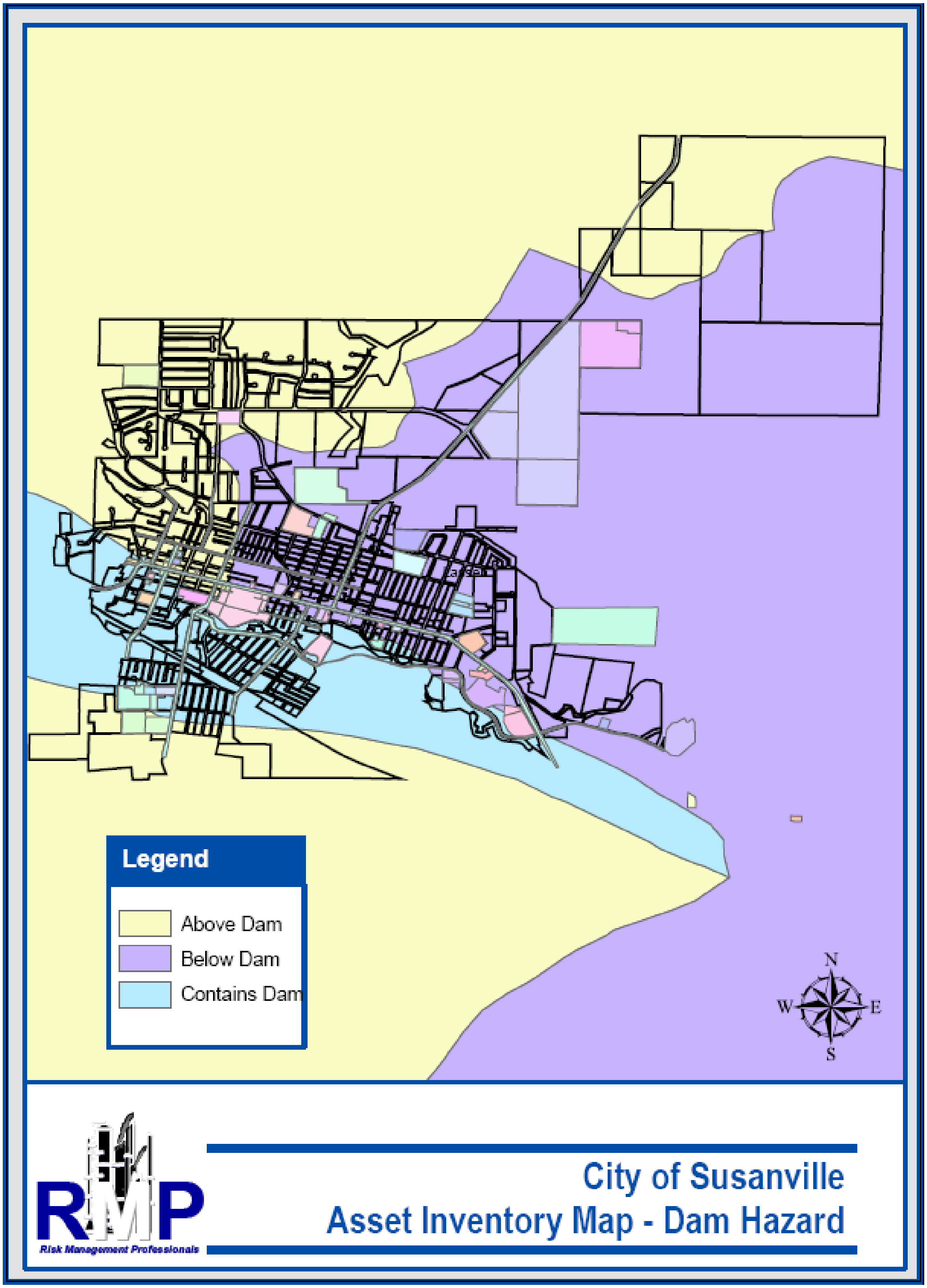
City of Susanville
Asset Inventory Map

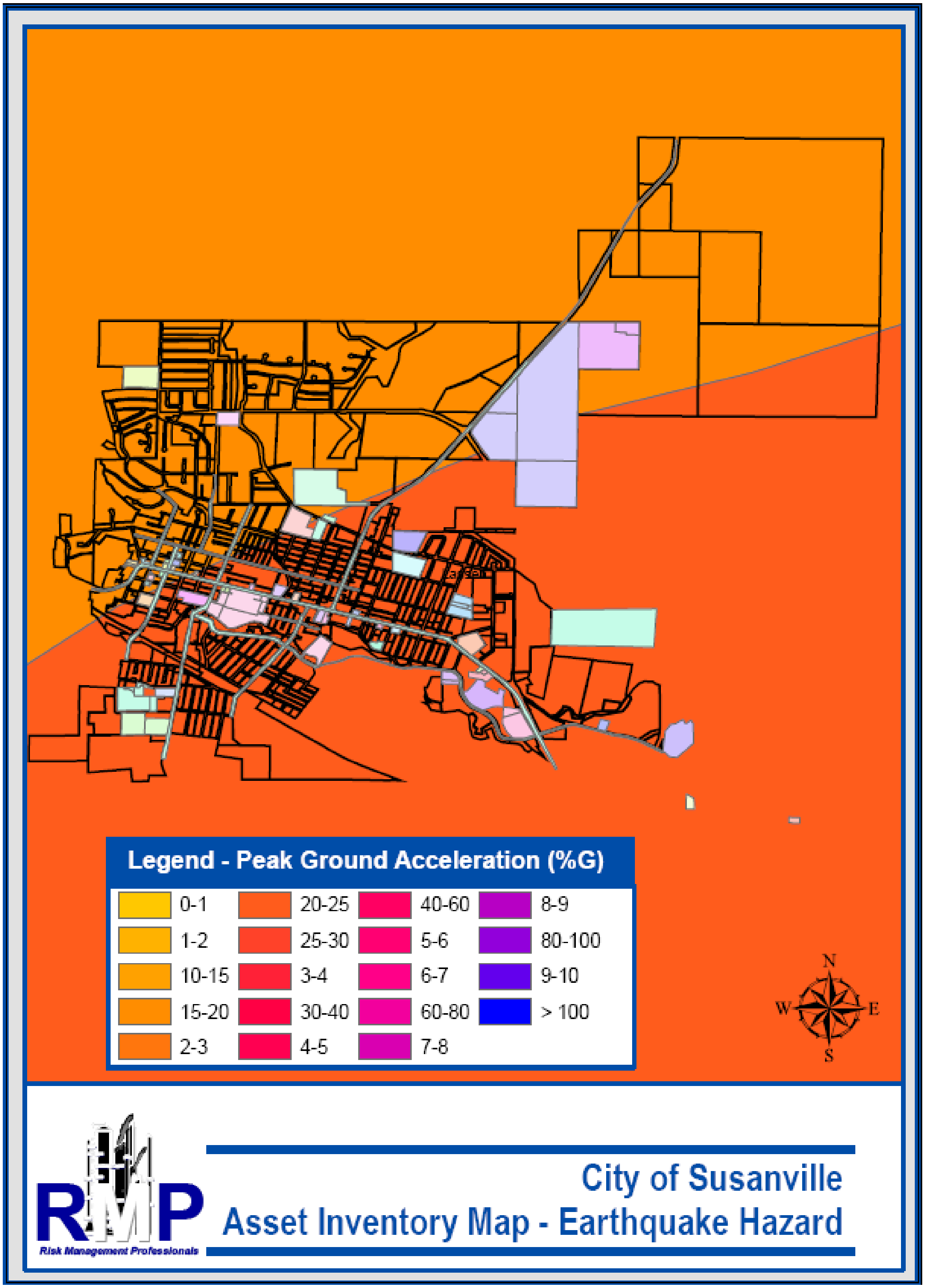
Legend

- Amerigas
- Banner Lassen Medical
- CASHMAN
- City Hall
- County
- Court House
- Credence High School
- Diamond Mt. Hotel
- Diamond View School
- Eagle Lake Village
- Elks Lodge
- Fire Dept.
- Forest Service
- Frontier Building
- Grocery Outlet
- Harris Building
- Jackson Service Center
- Knock Building
- LMUD Office
- LP Gas
- Lassen College
- Lassen County Jail Juvenile Det. Facility
- Lassen High School
- Lassen Library
- Lassen Manor Apts.
- Lassen Shopping Center
- Lincoln School
- Main St Bowl
- Mckinley School
- MeadowView School
- Mt. Lassen
- Payless Gas
- Police Dept.
- Post Office
- Public Health
- SIFC and Federal Yard
- Safeway Shopping Center
- Sanitary Dist.
- Sierra Theatre
- Staub Energy
- Susanville Airport
- Susanville Nursing and Rehab
- Uptown Theatre
- Veterans Building
- Walmart
- Welfare Office

RMP Risk Management Professionals

City of Susanville
Asset Inventory Map Legend


Legend
Above Dam
Below Dam
Contains Dam
N
W
E
S
RMP
Risk Management Professionals
City of Susanville
Asset Inventory Map - Dam Hazard


Legend - Peak Ground Acceleration (%G)
0-1
1-2
10-15
15-20
2-3
20-25
25-30
3-4
30-40
4-5
40-60
5-6
6-7
60-80
7-8
8-9
80-100
9-10
> 100
N
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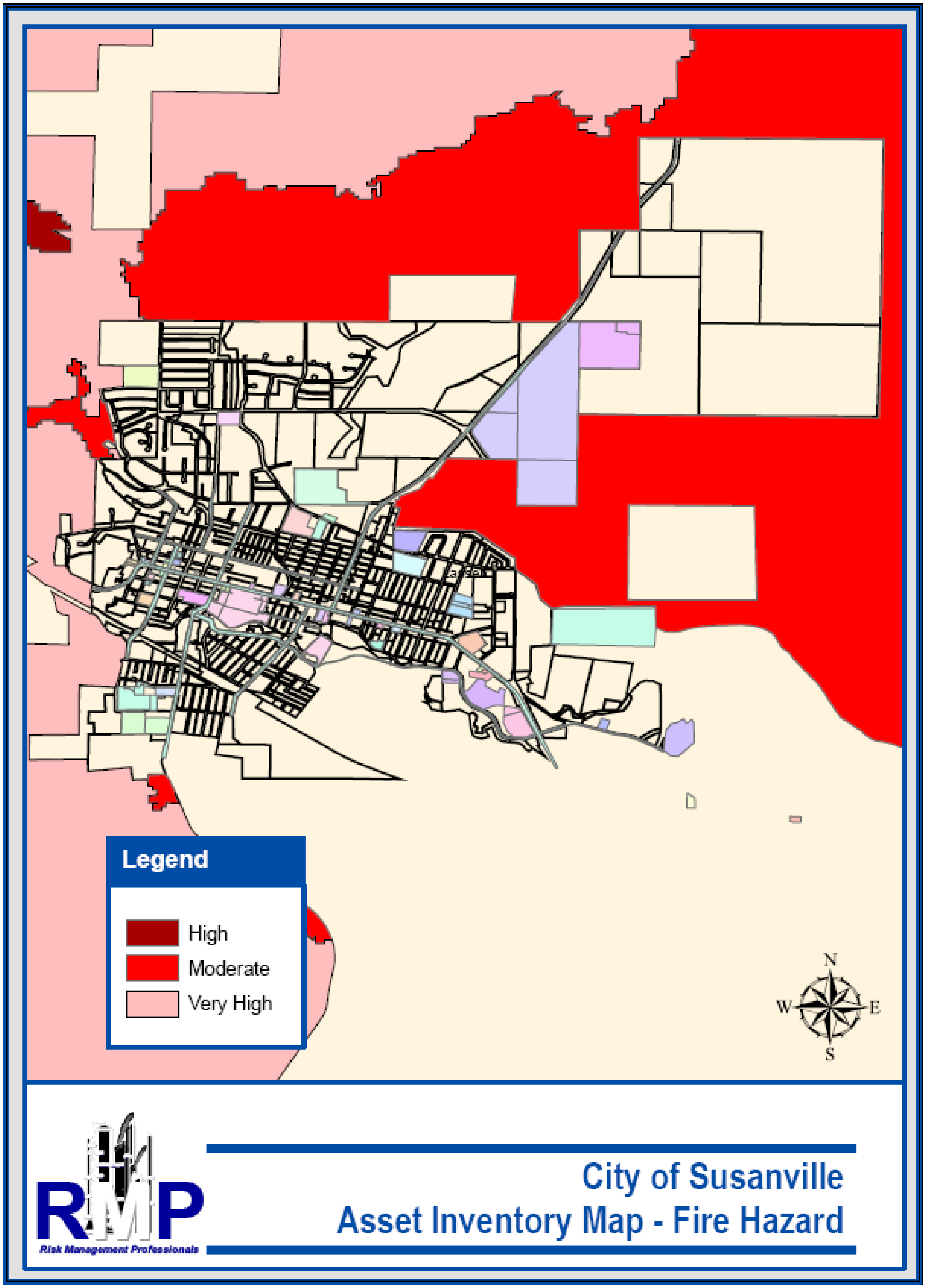
RMP
Risk Management Professionals
City of Susanville
Asset Inventory Map - Earthquake Hazard



Legend
High
Moderate
Very High
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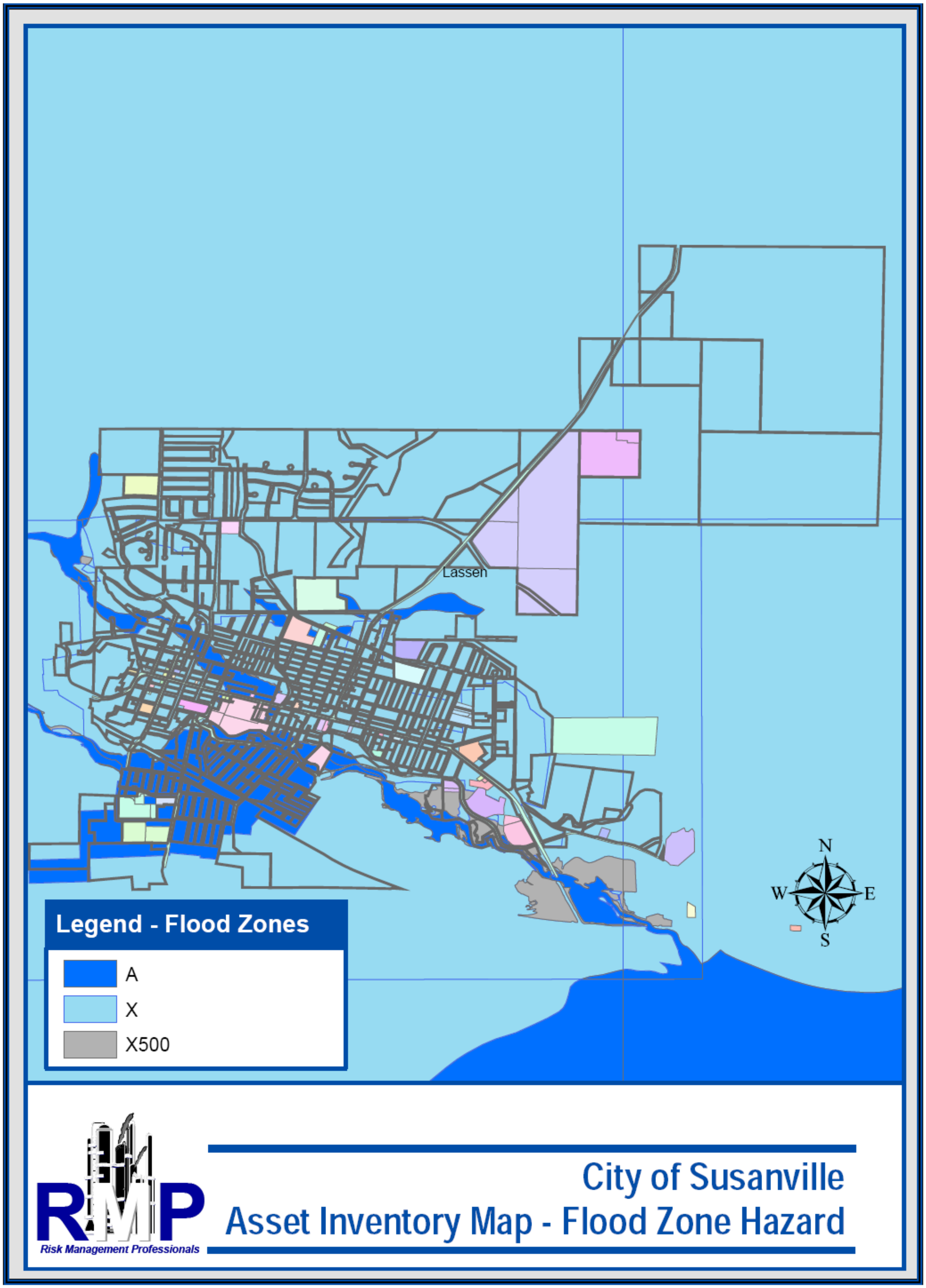
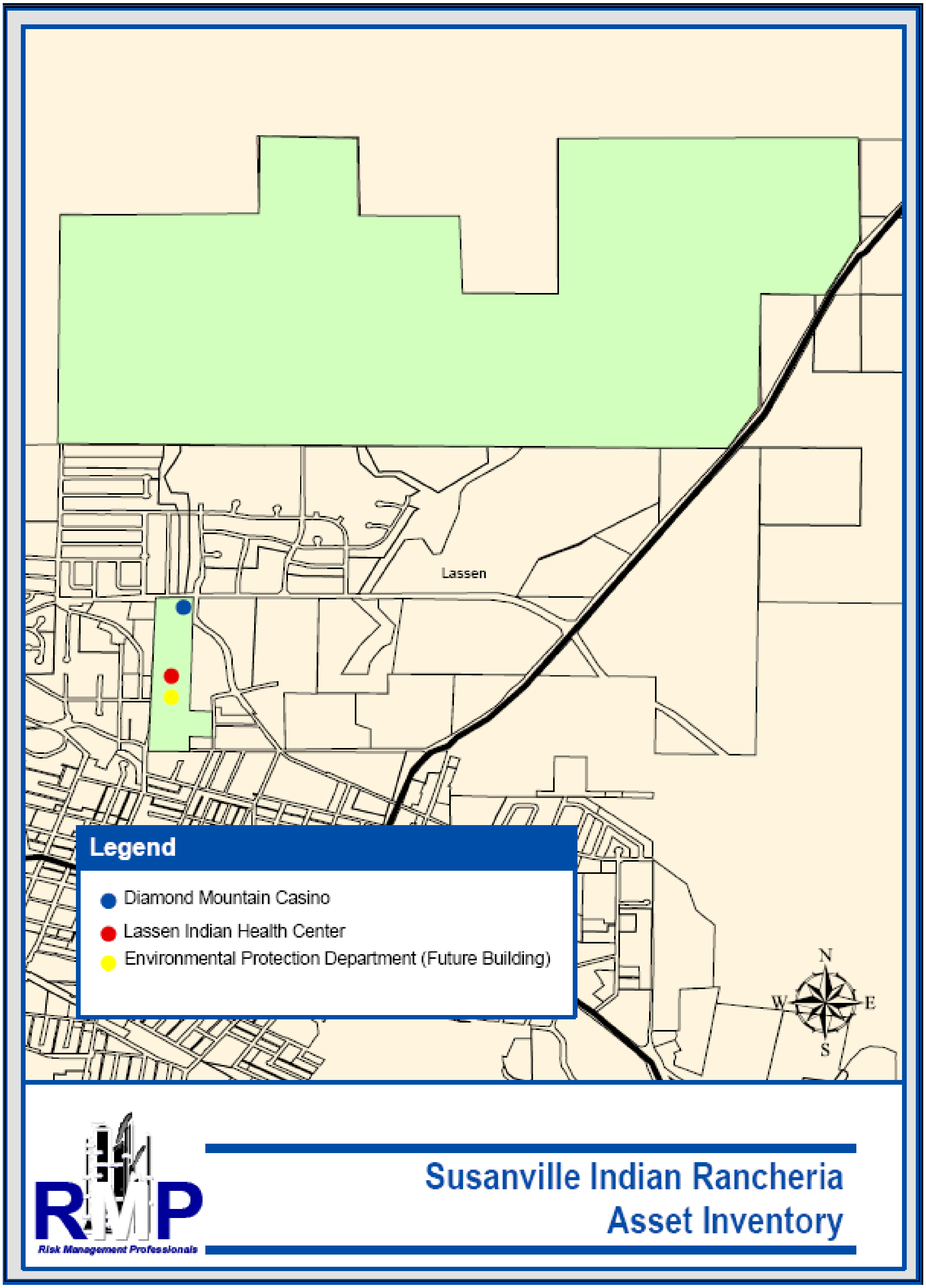
RMP
Risk Management Professionals
City of Susanville
Asset Inventory Map - Fire Hazard


Lassen
Legend - Flood Zones
A
X
X500
N
W
E
S
Risk Management Professionals
City of Susanville
Asset Inventory Map - Flood Zone Hazard

Asset Inventory Summary – Susanville Indian Rancheria								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
Medical	Lassen Indian Health Center	795 Joaquin Street Susanville, CA 96130	11000	$118.01	$1,298,110.00	150%	$1,947,165.00	$3,245,275.00
Public Buildings	Diamond Mountain Casino	900 Skyline Drive Susanville, CA 96130	100000	$90.30	$9,030,000.00	100%	$9,030,000.00	$18,060,000.00
Public Buildings	Gymnasium	845 Joaquin St Susanville, CA 96130	12890	$90.30	$1,163,967.00	100%	$1,163,967.00	$2,327,934.00
Public Buildings	Resource Center	735 Joaquin St Susanville, CA 96130	10000	$90.30	$903,000.00	100%	$903,000.00	$1,806,000.00
Water Facilities	Water Tank	Upper Rancheria	100,000 gallons	$1.50 / Gallon	$150,000.00	NA	NA	$150,000.00
Future Buildings	Tribal Admin. Building	TBD	5000	$90.30	$451,500.00	100%	$451,500.00	$903,000.00
							Subtotal	$26,492,209.00

Loss of Function / Continuity Premium (1 day) – Susanville Indian Rancheria				
Population:	681			
Category	Value Per Person	Value Per Day	Continuity Premium	Total
Fire Service	-	$3,536.00	10	$35,360.00
Police Service	-	$6,148.00	10	$61,480.00
Water Service	$138.00	$93,978.00	-	$93,978.00
Electricity	$188.00	$128,028.00	-	$128,028.00
Wastewater	$33.50	$22,813.50	-	$22,813.50
Casino	-	$27,397.00	10	$273,970.00
			Subtotal	$615,629.50


Lassen
Legend
Diamond Mountain Casino
Lassen Indian Health Center
Environmental Protection Department (Future Building)
N
W
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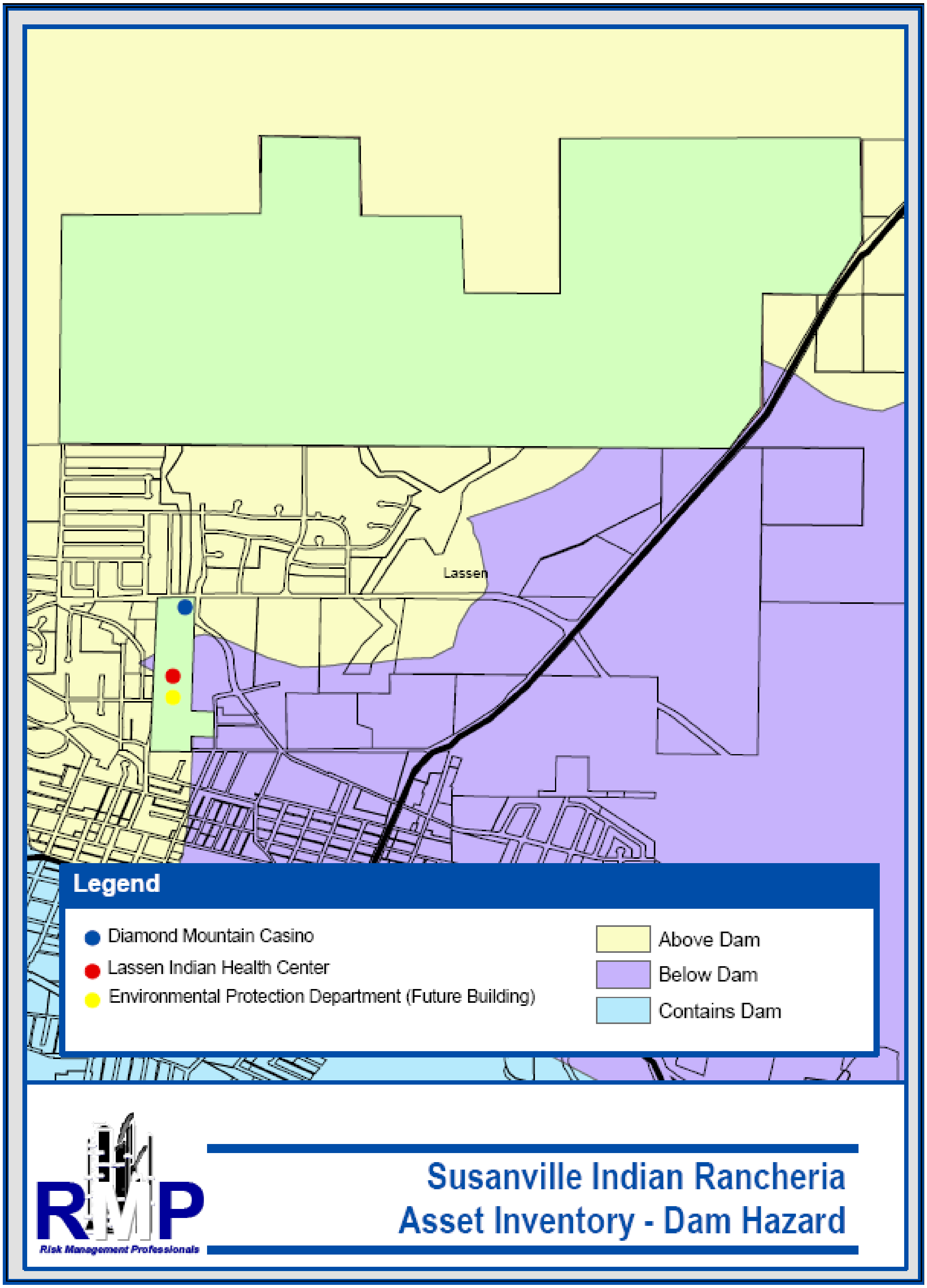
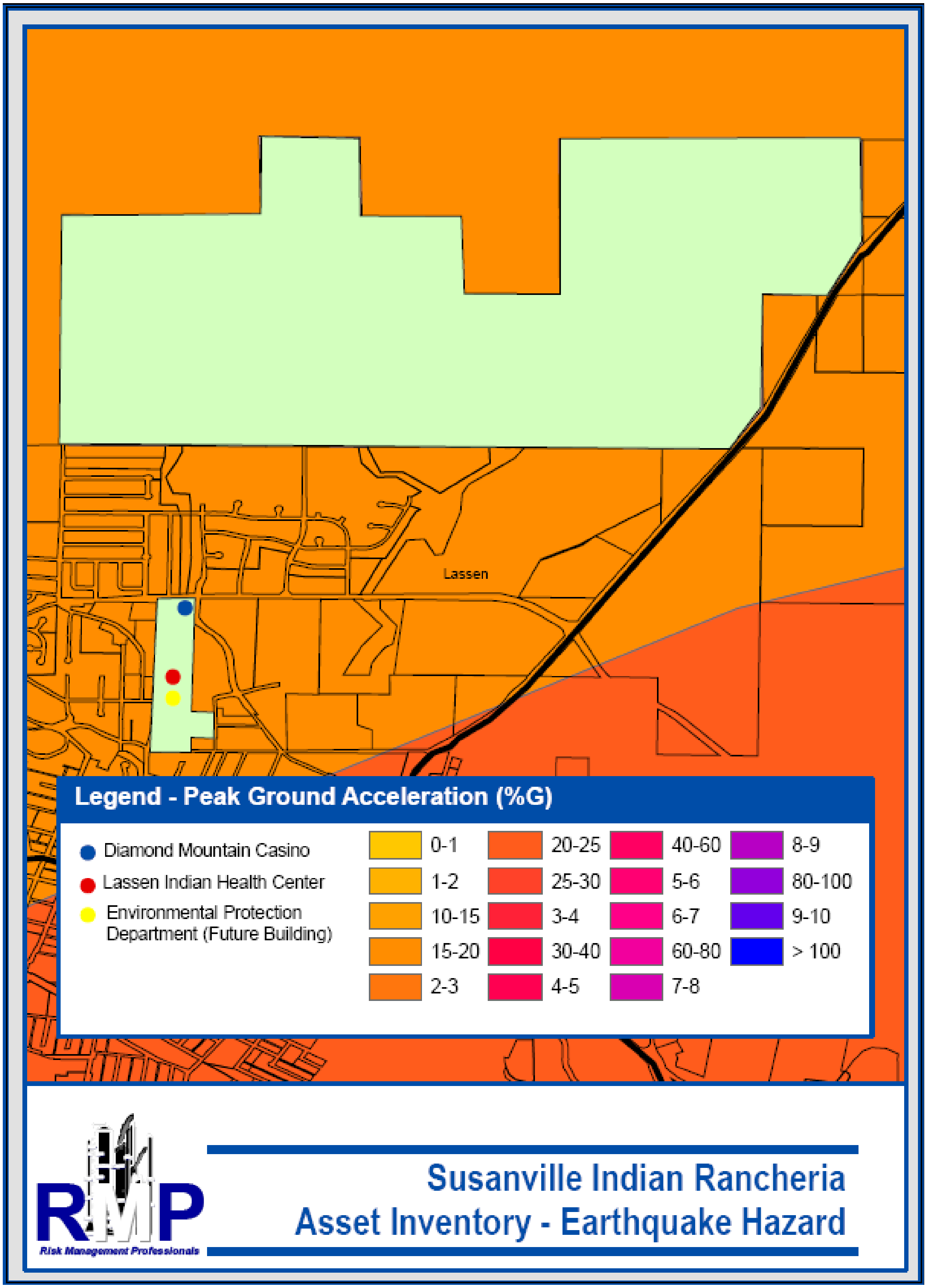
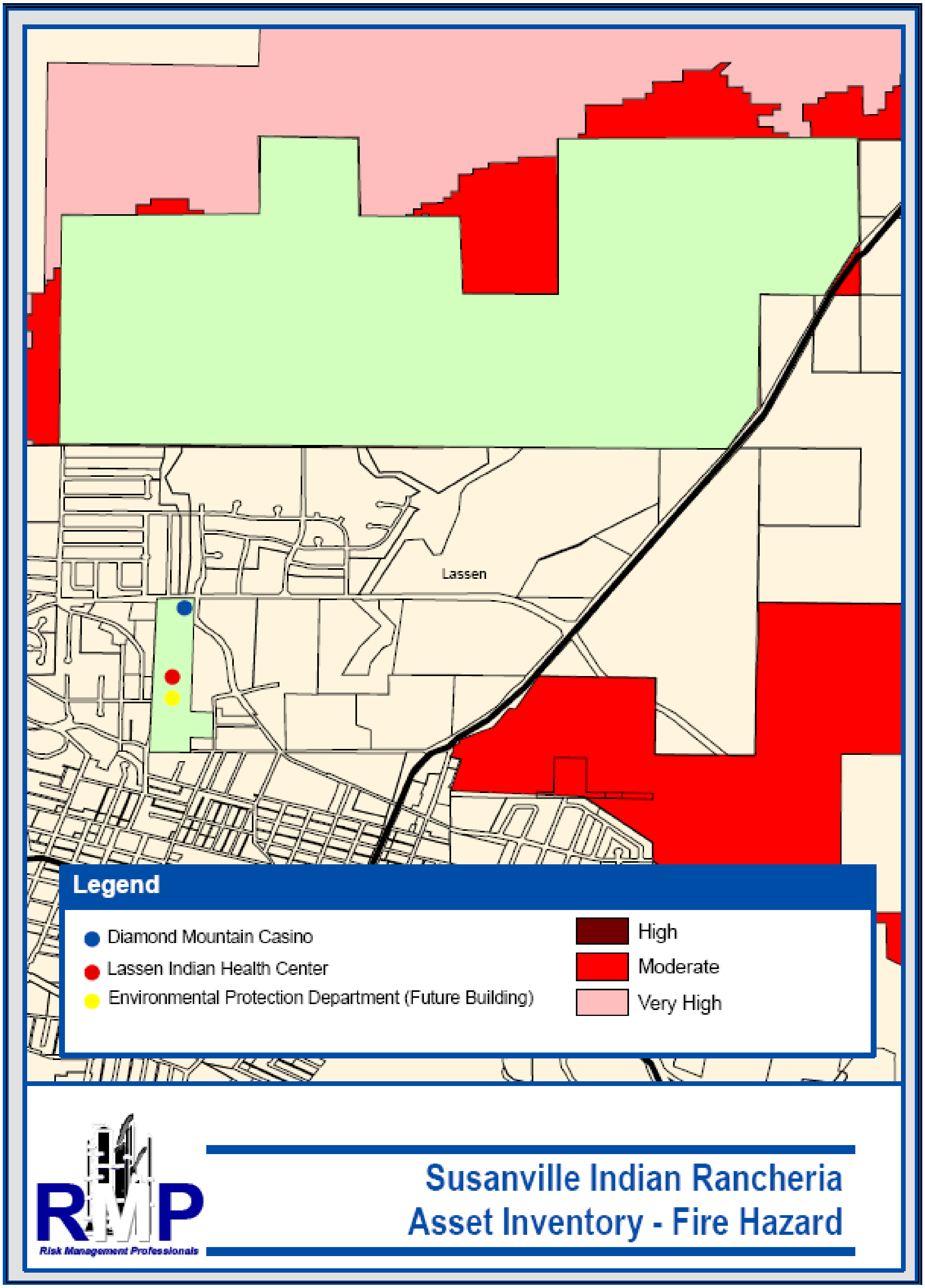
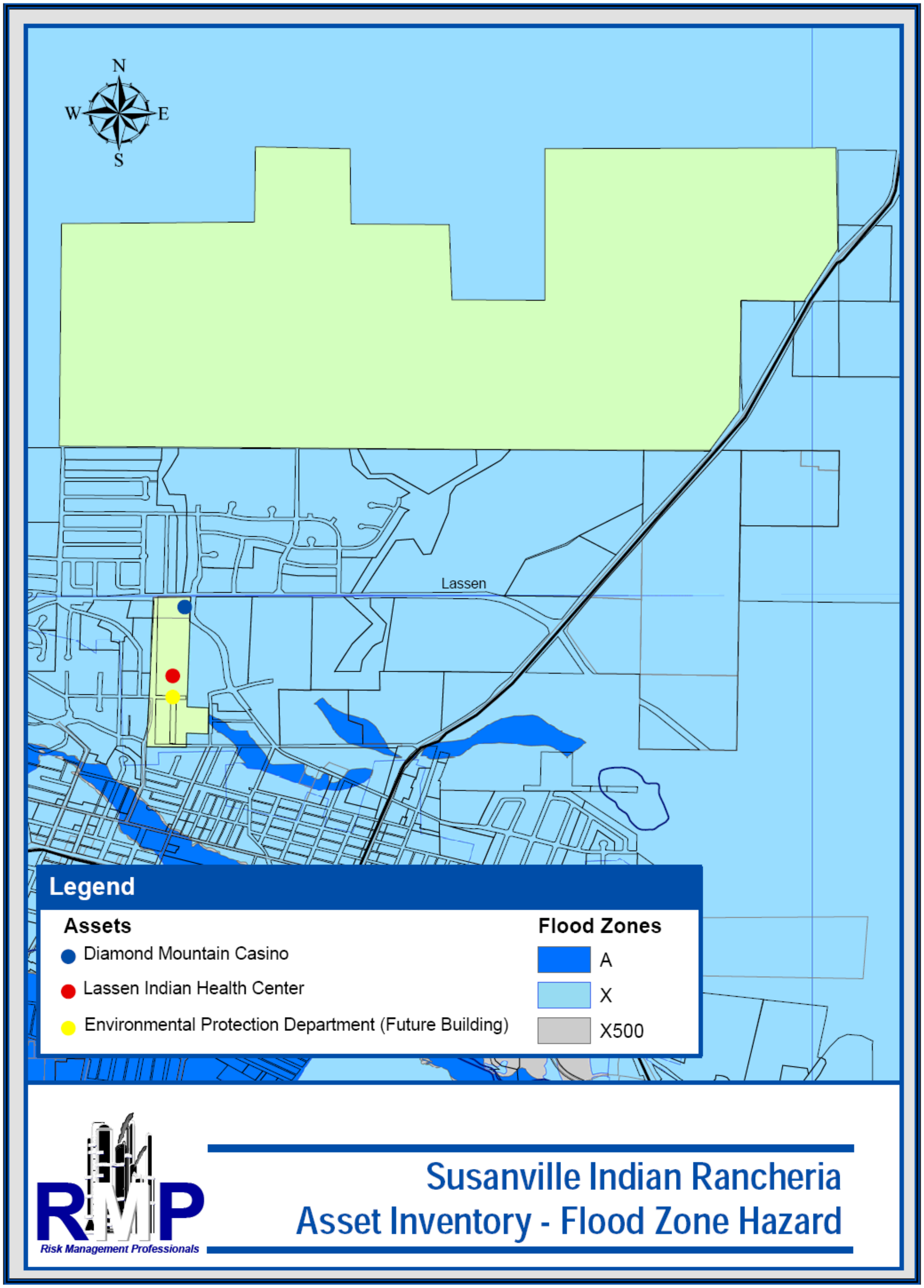
RMP
Risk Management Professionals
Susanville Indian Rancheria
Asset Inventory


Lassen
Legend
Diamond Mountain Casino
Lassen Indian Health Center
Environmental Protection Department (Future Building)
Above Dam
Below Dam
Contains Dam
RMP
Risk Management Professionals
Susanville Indian Rancheria
Asset Inventory - Dam Hazard


Lassen
Legend - Peak Ground Acceleration (%G)
Diamond Mountain Casino
Lassen Indian Health Center
Environmental Protection Department (Future Building)
0-1
1-2
10-15
15-20
2-3
20-25
25-30
3-4
30-40
4-5
40-60
5-6
6-7
60-80
7-8
8-9
80-100
9-10
> 100
RMP
Risk Management Professionals
Susanville Indian Rancheria
Asset Inventory - Earthquake Hazard


Lassen
Legend
Diamond Mountain Casino
Lassen Indian Health Center
Environmental Protection Department (Future Building)
High
Moderate
Very High
RMP
Risk Management Professionals
Susanville Indian Rancheria
Asset Inventory - Fire Hazard


N
W
E
S
Lassen
Legend
Assets
Diamond Mountain Casino
Lassen Indian Health Center
Environmental Protection Department (Future Building)
Flood Zones
A
X
X500
RMP
Risk Management Professionals
Susanville Indian Rancheria
Asset Inventory - Flood Zone Hazard

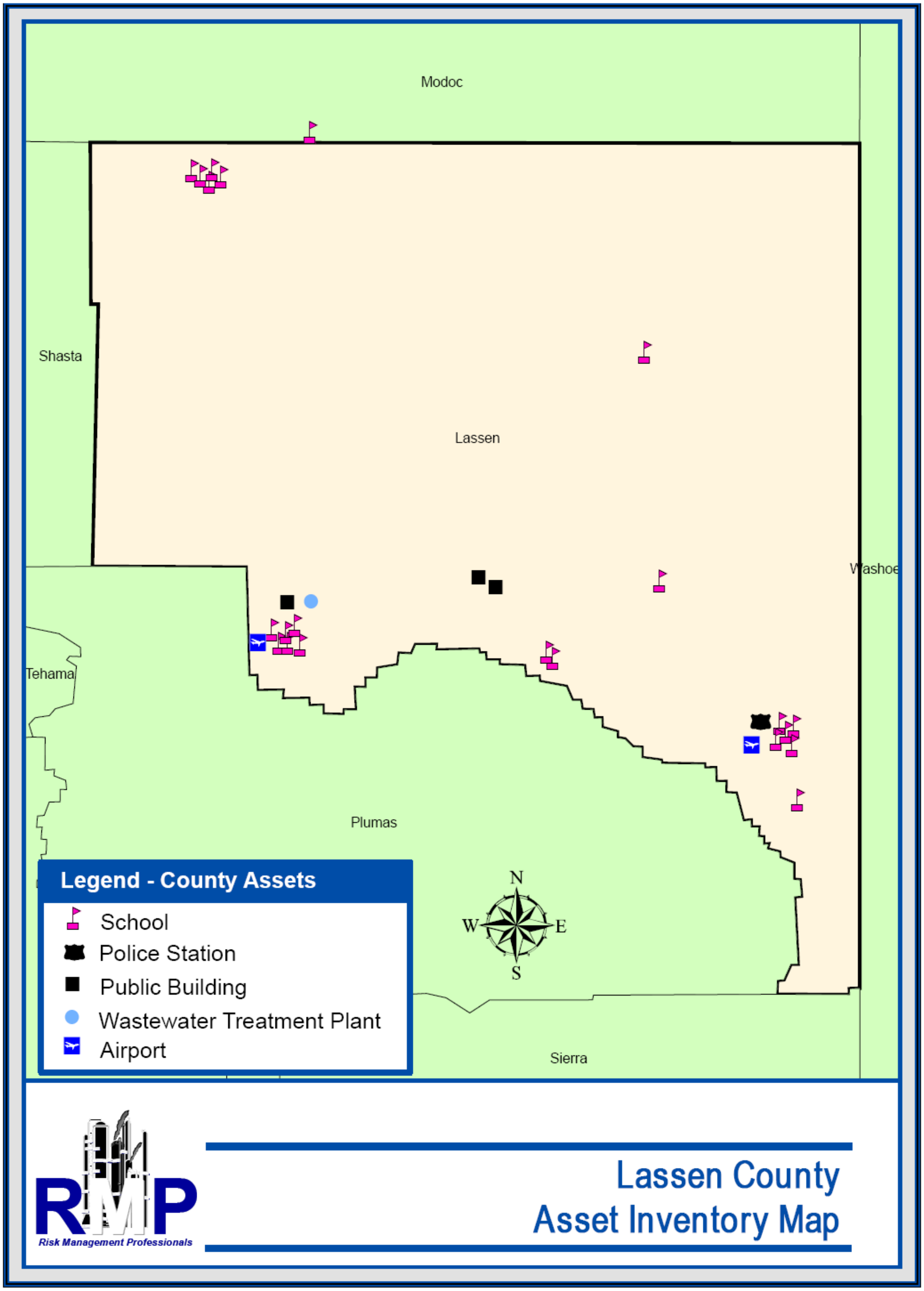
Asset Inventory Summary – Lassen County								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
School	Janesville Elementary	464-555 Main St. Janesville, CA 96114-0280	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00
School	Big Valley Adult	400 Bridge St. Bieber, CA 96009	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Big Valley Community Day	70 First St. Bieber, CA 96009	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Big Valley High	400 Bridge St. Bieber, CA 96009-0157	10000	$92.80	$928,000.00	100%	$928,000.00	$1,856,000.00
School	Big Valley Intermediate	90 First St. Bieber, CA 96009-0157	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Big Valley Primary	205 Ash Valley Rd. Adin, CA 96006-0186	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Gateway High (Continuation)	90 First St. Bieber, CA 96009-	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Fort Sage Community Day	100 Plumas St. Herlong, CA 96113	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Fort Sage Middle	100 DS Hall Herlong, CA 96113	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00

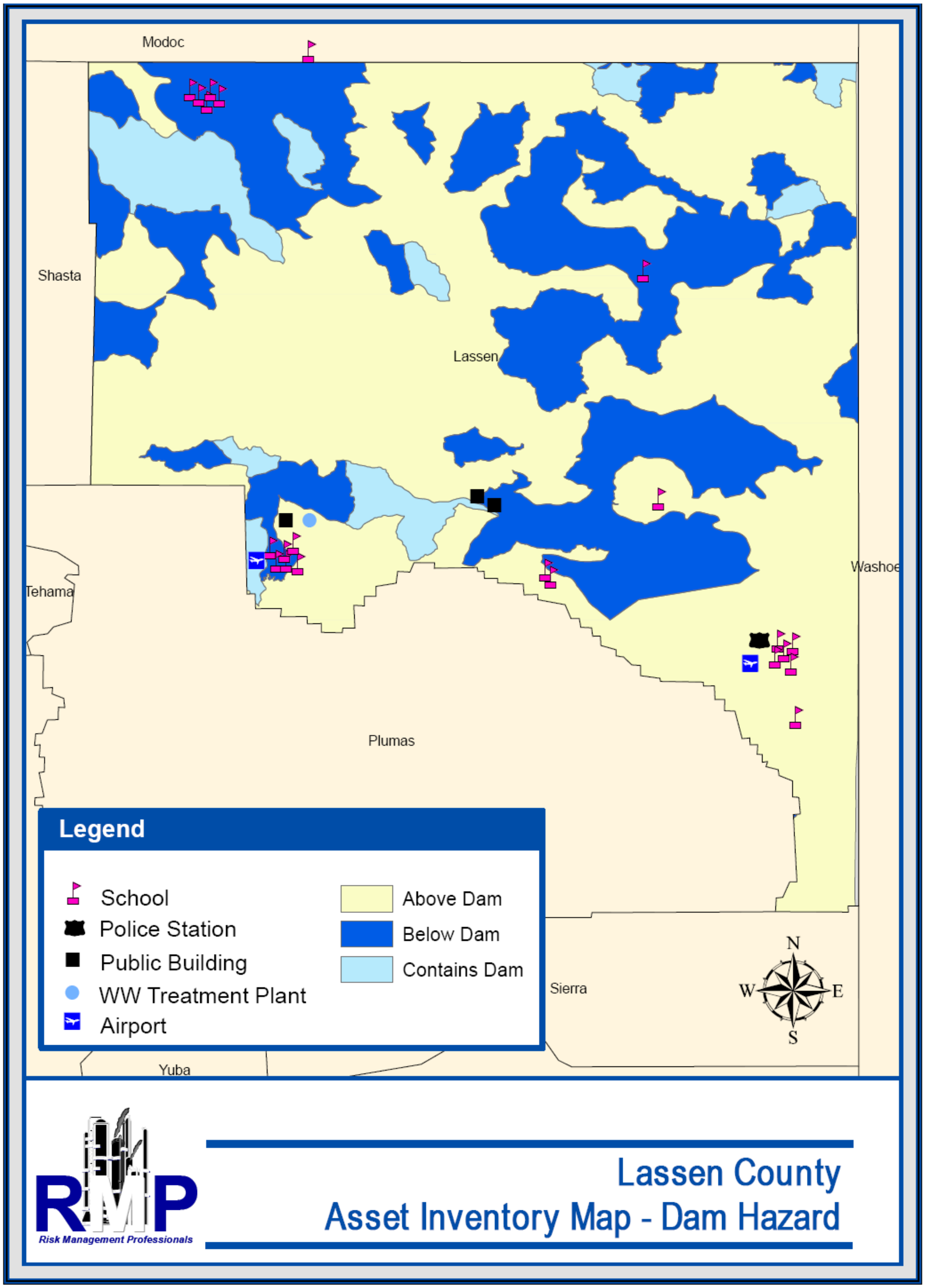
Asset Inventory Summary – Lassen County								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
School	Herlong High	100 DS Hall Herlong, CA 96113	10000	$92.80	$928,000.00	100%	$928,000.00	$1,856,000.00
School	Long Valley Charter	436-965 Susan Dr. Doyle, CA 96109	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Render Continuation High	Sierra Ave. Herlong, CA 96113-0910	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Sierra Primary	100 David S. and Hall Sts. Herlong, CA 96113	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Juniper Ridge Elementary	709-855 Termo-Grasshopper Ravendale, CA 96123	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00
School	Grace Christian School	710-805 Sunnyside Road Janesville, CA 96114	2000	$112.19	$224,380.00	100%	$224,380.00	$448,760.00
School	Shaffer Elementary	Highway 395 Litchfield, CA 96117-0320	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00
School	Fletcher Walker Elementary	Fifth and Delwood Sts. Westwood, CA 96137	5000	$90.22	$451,100.00	100%	$451,100.00	$902,200.00
School	Horizon High (Continuation)	426-725 Highway A-21 Westwood CA 96137	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00

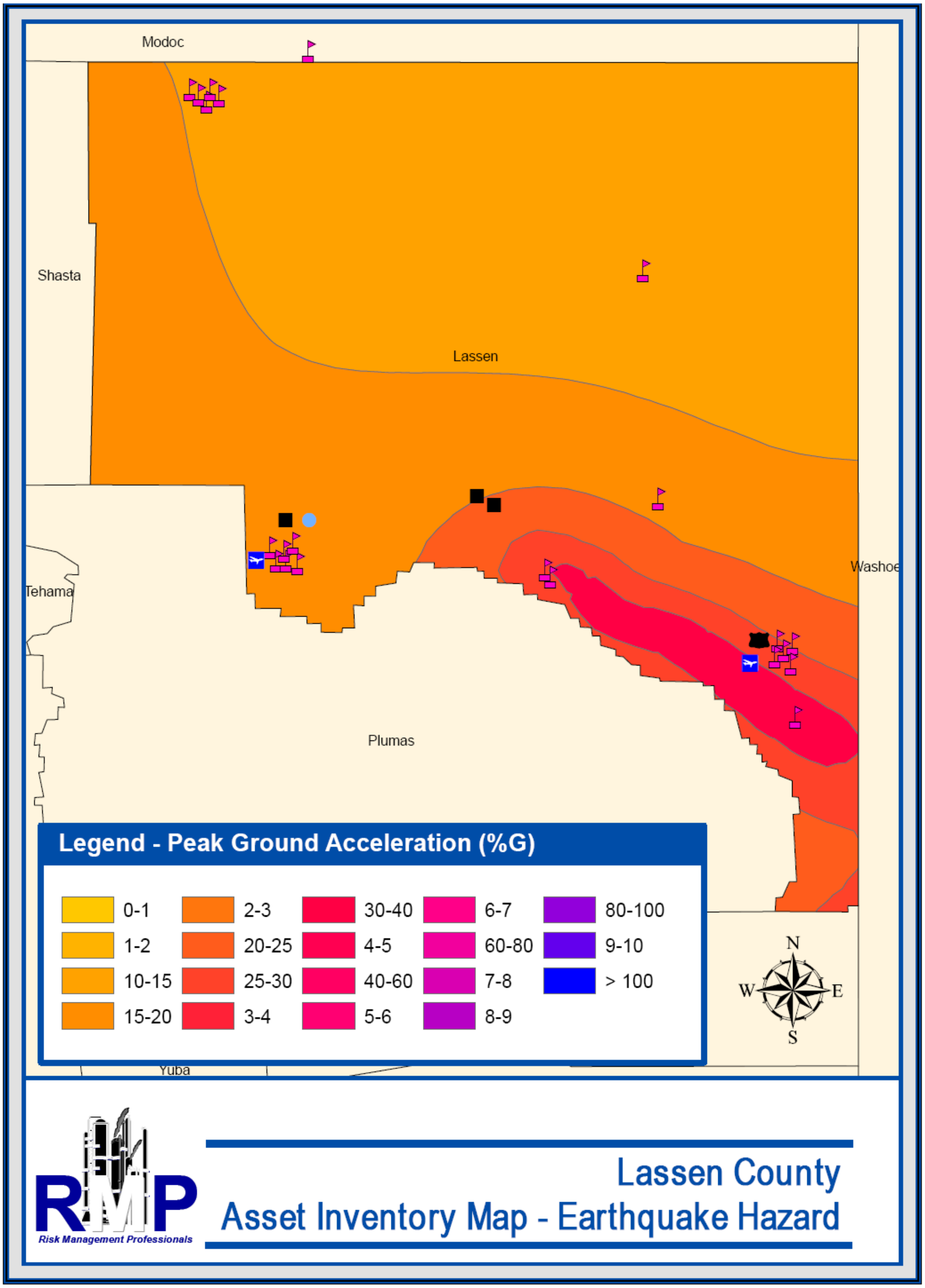
Asset Inventory Summary – Lassen County								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
School	Red River Community Day	511 Delwood St. Westwood, CA 96137	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Westwood Charter	Fourth and Greenwood Sts. Westwood, CA 96137	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Westwood Community	Day 509 Delwood St. Westwood, CA 96137	2000	$90.22	$180,440.00	100%	$180,440.00	$360,880.00
School	Westwood High	Fourth and Greenwood Sts. Westwood, CA 96137	10000	$92.80	$928,000.00	100%	$928,000.00	$1,856,000.00
Police Station	Herlong Police Department	Sierra Army Depot Bldg P-100 Herlong, CA 96113	7500	$136.10	$1,020,750.00	150%	$1,531,125.00	$2,551,875.00
Public Buildings	Westwood Museum	311 Ash St, Westwood, CA	5000	$90.30	$451,500.00	100%	$451,500.00	$903,000.00
Public Buildings	County Administration	707 Nevada St Susanville, CA	8000	$112.94	$903,520.00	100%	$903,520.00	$1,807,040.00
Public Buildings	Lassen County Fairgrounds	195 Russell Ave., Susanville CA	30000	$90.30	$2,709,000.00	100%	$2,709,000.00	$5,418,000.00
Wastewater Treatment Plant	Westwood Community Services District	319 Ash St Westwood, CA 96137	NA	NA	$1,500,000.00	NA	NA	$1,500,000.00

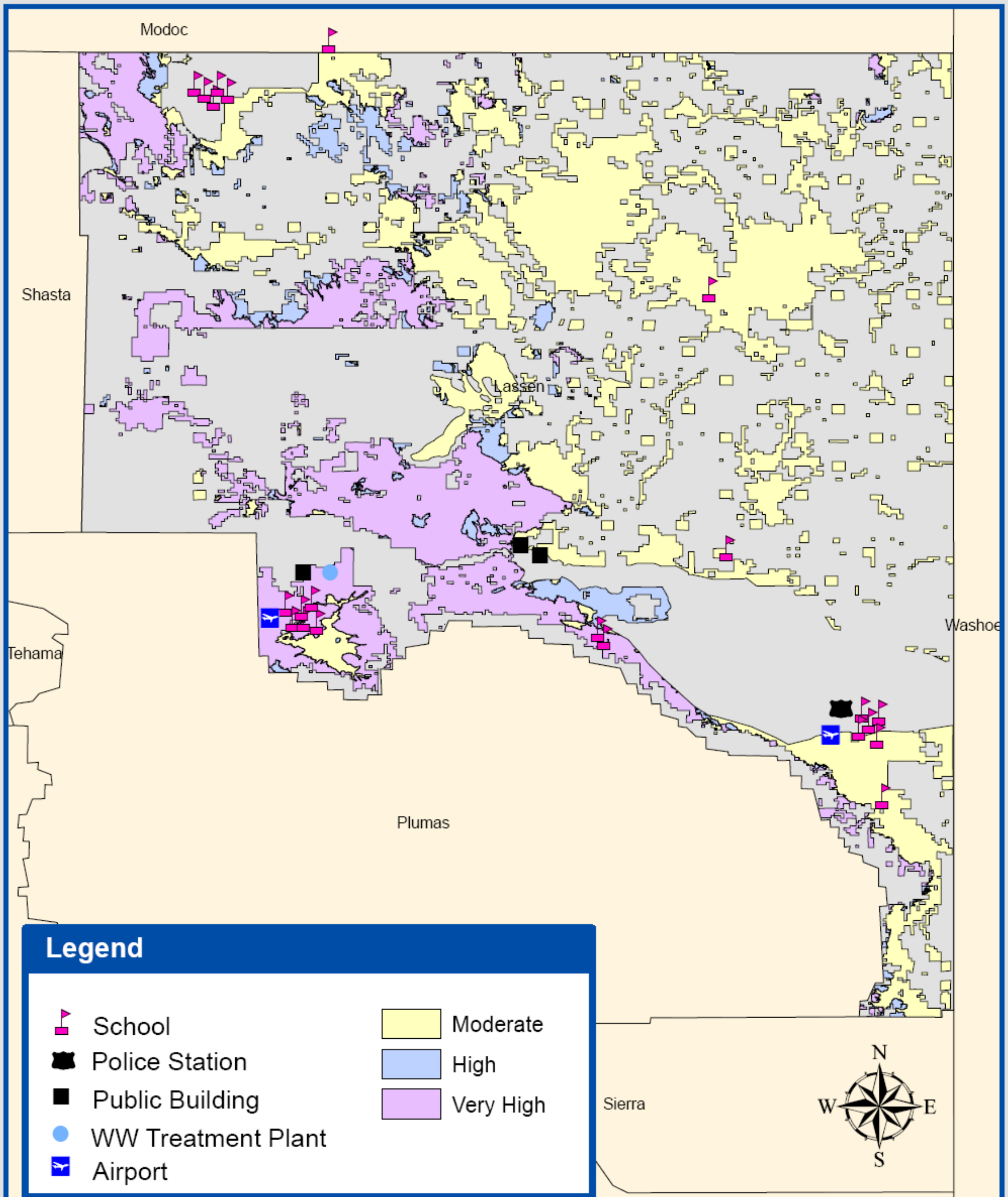
Asset Inventory Summary – Lassen County								
Type	Name	Address	Square Footage	Cost / Square Foot	Structure Value	Contents Value %	Contents Value	TOTAL
Airport	Westwood Airport	Westwood, CA 40.3062771/-121.0360717	NA	NA	$2,000,000.00	NA	NA	$2,000,000.00
Airport	Herlong Airport	Herlong Airport, CA 96109 40.1385137/-120.179653	NA	NA	$2,000,000.00	NA	NA	$2,000,000.00
							Subtotal	$31,399,115.00

Loss of Function / Continuity Premium (1 day)				
Population: 35,031				
Category	Value Per Person	Value Per Day	Continuity Premium	Total
Fire Service	-	$3,536.00	10	$35,360.00
Police Service	-	$6,148.00	10	$61,480.00
Water Service	$138.00	$4,834,278.00	-	$4,834,278.00
Electricity	$188.00	$6,585,828.00	-	$6,585,828.00
Wastewater	$33.50	$1,173,538.50	-	$1,173,538.50
			Subtotal	$12,690,484.50


Modoc
Shasta
Lassen
Washoe
Tehama
Plumas
Sierra
Legend - County Assets
School
Police Station
Public Building
Wastewater Treatment Plant
Airport
N
W
E
S
RMP
Risk Management Professionals
Lassen County
Asset Inventory Map

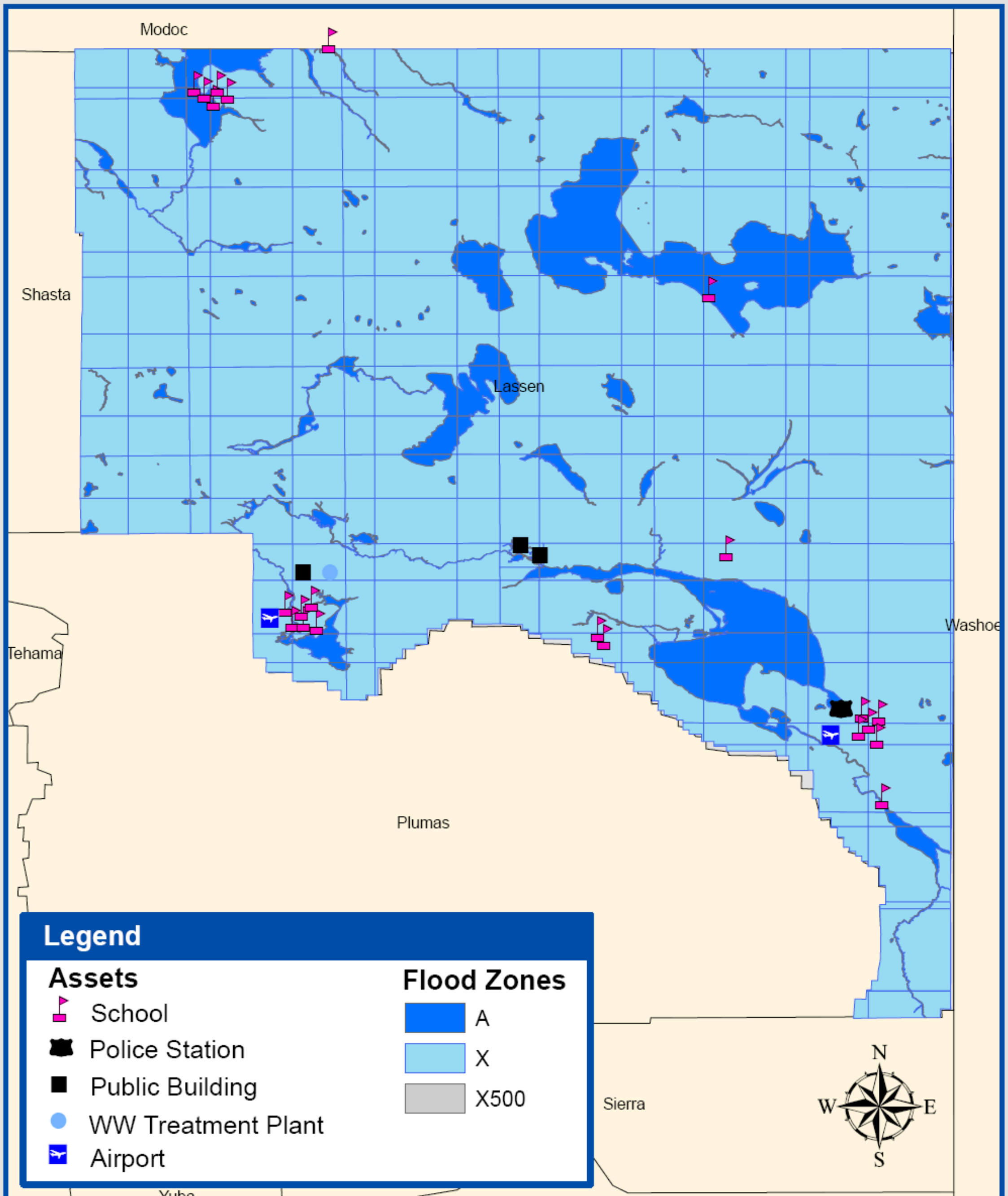

Modoc
Shasta
Lassen
Tehama
Washoe
Plumas
Sierra
Yuba
Legend
School
Police Station
Public Building
WW Treatment Plant
Airport
Above Dam
Below Dam
Contains Dam
N
W
E
S
Risk Management Professionals
Lassen County
Asset Inventory Map - Dam Hazard


Modoc
Shasta
Lassen
Tehama
Washoe
Plumas
Yuba
Legend - Peak Ground Acceleration (%G)
0-1
1-2
10-15
15-20
2-3
20-25
25-30
3-4
30-40
4-5
40-60
5-6
6-7
60-80
7-8
8-9
80-100
9-10
> 100
N
W
E
S
RMP
Risk Management Professionals
Lassen County
Asset Inventory Map - Earthquake Hazard



RMP Risk Management Professionals

Lassen County
Asset Inventory Map- Fire Hazard



RMP
Risk Management Professionals

Lassen County
Asset Inventory Map- Flood Zone Hazard

3.20 Loss Estimates

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

In order to develop loss estimates, specific values were assigned to the critical Lassen County, City of Susanville, and Susanville Indian Rancheria facilities in the asset inventory. The following tables summarize the assigned values, as well as the sources utilized as the basis for the values including the following:

- FEMA's "Multi-hazard Loss Estimation Methodology, Earthquake Model, HAZUS MR4"
- FEMA's guidance document entitled "What is a Benefit? - Guidance on Benefit-Cost Analysis of Hazard Mitigation Projects, Draft. Revision 2.0"
- City of Susanville 2009 -2010 Annual Budget

Structural Replacement Values

The following table provides a mechanism for determining the cost per square foot for replacing assets. Using this table, the Steering Committee reviewed the asset inventory list and discussed and documented approximate square footages (based upon available building plans and expert knowledge) and building descriptions in order to identify the appropriate replacement cost for each asset.

Structural Replacement Values

Facility Category	Facility Sub-Category	Description	Replacement Cost ($/SF)
Hospital	Medium	2-3 Stories, 55,000 SF	$144.60
	Large	4-8 Stories, 200,000 SF	$124.60
Medical Office / Clinic	Small	1 Story, 7,000 SF	$118.01
	Medium	2 Stories, 7,000 SF	$129.82

Structural Replacement Values			
Facility Category	Facility Sub-Category	Description	Replacement Cost ($/SF)
General Government Services	Town Hall, Small	1 Story, 11,000 SF	$90.30
	Town Hall, Medium	2-3 Stories, 18,000 SF	$112.94
	Courthouse, Small	1 Story, 30,000 SF	$130.71
	Courthouse, Medium	2-3 Stories, 60,000 SF	$136.81
	Post Office	13,000 SF	$86.83
Emergency Response	Police Station	2 Stories, 11,000 SF	$136.10
	Fire Station, Small	1 Story, 6,000 SF	$105.53
	Fire Station, Medium	2 Stories, 10,000 SF	$110.34
Schools / Libraries	High School	130,000 SF	$92.80
	Elementary School	45,000 SF	$90.22
	Jr. High School	110,00 SF	$95.21
	Library	2 Stories, 22,000 SF	$103.94
	Religious School	1 Story, 10,000 SF	$112.19
Colleges / Universities	College Classroom	2-3 Stories, 50,000 SF	$114.68
	College Laboratory	1 Story, 45,000 SF	$119.51
	Vocational School	40,000 SF	$93.96
Note: Values were listed from FEMA's "Multi-hazard Loss Estimation Methodology, Earthquake Model, HAZUS MR4"			

Loss of Function Values

In order to provide a mechanism for evaluating the importance of lifelines and critical services, the following tables were used to identify per capita values for each category. Based upon the population in each jurisdiction, the following loss of function values were assigned:

Loss of Function Values – Utilities & Lifelines		
Loss of Electric Power	Cost of Complete Loss of Service	
Reduced Regional Economic Activity1	$87	
Impacts on Residential Customers	$101	
Total Economic Impact	$188	
Loss of Potable Water Service	Cost of Complete Loss of Service	Cost of Water Unsafe for Drinking
Reduced Regional Economic Activity1	$35	$8.75
Impacts on Residential Customers	$68	$34
Total economic impact (all hazards)	$103	$43
Fire Following Earthquake Losses	Cost of Fire Damage	
Dry Climates	$35	
Moderate Climates	$17.50	
Wet Climates	$8.75	
Loss of Wastewater Service	Cost of Complete Loss of Service	Cost of Partial Treatment Only
Reduced Regional Economic Activity1	$33.50	$8.50
Impacts on Residential Customers	None	None
Total Economic Impact	$33.50	$8.50
Road or Bridge Closure	Delay or Detour (per vehicle per hour)	
Economic Impact	$32.23	
Total Economic Impact	$32.23	
Note: The values listed in this table were obtained from FEMA's guidance document entitled "What is a Benefit? - Guidance on Benefit-Cost Analysis of Hazard Mitigation Projects, Draft. Revision 2.0"		

Loss of Function Values – Emergency Services	
Fire Service	
Fire Service Annual Budget	$1,290,695
Daily Service Value	$3,536 per day
Continuity Premium	10
Fire Service Value	$35,360 per day
Police Service	
Police Annual Budget	$2,244,110
Daily Service Value	$6,148 per day
Continuity Premium	10
Police Service Value	$61,480 per day
Note: The values listed in this table were obtained from the City of Susanville 2009 -2010 Annual Budget.	

Contents Value Percentages

When assessing the potential losses, the value of the contents of the buildings were included in the analysis. The following table from FEMA's guidance provides a list of facility categories and the associated contents value percentages allocated:

Contents Value Percentages	
Occupancy Class	Contents Value %
Government – General Services	100
Government – Emergency Response	150
Education – Schools/Libraries	100
Education – Colleges/Universities	150
Note: Values were listed from FEMA's "Multi-hazard Loss Estimation Methodology, Earthquake Model, HAZUS MR4"	

Loss Assessment Calculations

The Steering Committee reviewed each asset category and assigned a potential percentage of damage expected due to each identified hazard. In addition, if there were identified lifeline or emergency service interruptions the loss of function values were also included. The tables of the following pages identify each asset category, name, total value, and the percent damage/damage value for each asset. The damage for each asset are totaled for each hazard to obtain the overall loss estimate for each hazard.

City of Susanville Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Cornerstone Christian	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00
School	Lassen Community College	$57,340,000.00	0%	$0.00	0%	$0.00	3.00%	$1,720,200.00	3.00%	$1,720,200.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Diamond View Elementary	$14,074,320.00	20%	$2,814,864.00	0%	$0.00	3.00%	$422,229.60	3.00%	$422,229.60	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	McKinley Elementary	$11,187,280.00	20%	$2,237,456.00	0%	$0.00	3.00%	$335,618.40	3.00%	$335,618.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Meadow View	$9,022,000.00	20%	$1,804,400.00	0%	$0.00	3.00%	$270,660.00	3.00%	$270,660.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	New Horizons Christian	$1,082,640.00	35%	$378,924.00	0%	$0.00	3.00%	$32,479.20	3.00%	$32,479.20	0.00%	$0.00	3.00%	$32,479.20	3.00%	$32,479.20
School	Paiute Creek Community Day	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Susan River Community Day	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Johnstonville Elementary	$2,165,280.00	20%	$433,056.00	0%	$0.00	3.00%	$64,958.40	3.00%	$64,958.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Richmond Elementary	$1,804,400.00	20%	$360,880.00	0%	$0.00	3.00%	$54,132.00	3.00%	$54,132.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Credence High	$1,299,200.00	0%	$0.00	0%	$0.00	3.00%	$38,976.00	3.00%	$38,976.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Diamond Mountain Charter High	$742,400.00	0%	$0.00	0%	$0.00	3.00%	$22,272.00	3.00%	$22,272.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Lassen Community Day	$451,100.00	35%	$157,885.00	0%	$0.00	3.00%	$13,533.00	3.00%	$13,533.00	0.00%	$0.00	3.00%	$13,533.00	3.00%	$13,533.00
School	Lassen High	$18,560,000.00	0%	$0.00	0%	$0.00	3.00%	$556,800.00	3.00%	$556,800.00	0.00%	$0.00	3.00%	$556,800.00	3.00%	$556,800.00
School	Lassen Union High Adult	$92,800.00	0%	$0.00	0%	$0.00	3.00%	$2,784.00	3.00%	$2,784.00	0.00%	$0.00	3.00%	$2,784.00	3.00%	$2,784.00
Police Station	Lassen County Sheriff/Coroner's Office	$2,722,000.00	10%	$272,200.00	1%	$27,220.00	3.00%	$81,660.00	5.00%	$136,100.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Station	California State government Highway Patrol	$2,551,875.00	10%	$255,187.50	1%	$25,518.75	3.00%	$76,556.25	5.00%	$127,593.75	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Station	Susanville City Police Department	$4,083,000.00	10%	$408,300.00	1%	$40,830.00	3.00%	$122,490.00	5.00%	$204,150.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Federal Prison	California Correctional Center	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Federal Prison	High Desert State Prison	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

City of Susanville Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Fire Station	Lake Forest Fire Department	$263,825.00	10%	$26,382.50	1%	$2,638.25	3.00%	$7,914.75	5.00%	$13,191.25	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Fire Station	Forestry Department Fire Dispatch	$2,638,250.00	10%	$263,825.00	1%	$26,382.50	3.00%	$79,147.50	5.00%	$131,912.50	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Fire Station	Susanville Fire Department	$2,374,425.00	10%	$237,442.50	1%	$23,744.25	3.00%	$71,232.75	5.00%	$118,721.25	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Medical	Urgent Care	$5,900,500.00	0%	$0.00	0%	$0.00	3.00%	$177,015.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Medical	Lassen Surgery Center	$2,360,200.00	0%	$0.00	0%	$0.00	3.00%	$70,806.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Medical	Banner Lassen Medical Center	$8,850,750.00	0%	$0.00	0%	$0.00	3.00%	$265,522.50	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Library	Susanville District Library	$2,286,680.00	0%	$0.00	0%	$0.00	3.00%	$68,600.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Airport	Susanville Municipal Airport	$2,000,000.00	10%	$200,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Community Center/Chamber of Commerce Center	$361,200.00	10%	$36,120.00	0%	$0.00	3.00%	$10,836.00	5.00%	$18,060.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Lassen Historical Museum	$270,900.00	10%	$27,090.00	0%	$0.00	3.00%	$8,127.00	5.00%	$13,545.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Lassen County Administration Complex	$2,709,000.00	10%	$270,900.00	0%	$0.00	3.00%	$81,270.00	5.00%	$135,450.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Public Works	$1,083,600.00	80%	$866,880.00	0%	$0.00	3.00%	$32,508.00	5.00%	$54,180.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	City Hall	$1,083,600.00	10%	$108,360.00	0%	$0.00	3.00%	$32,508.00	5.00%	$54,180.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Lassen Municipal Utilities District	$1,354,500.00	100%	$1,354,500.00	0%	$0.00	3.00%	$40,635.00	5.00%	$67,725.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Susanville Sanitation District	$903,000.00	10%	$90,300.00	0%	$0.00	3.00%	$27,090.00	5.00%	$45,150.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Communication	Frontier Communications	$5,000,000.00	100%	$5,000,000.00	0%	$0.00	5.00%	$250,000.00	5.00%	$250,000.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Communication	Sierra Radio Network	$2,000,000.00	100%	$2,000,000.00	0%	$0.00	5.00%	$100,000.00	5.00%	$100,000.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Harris Drive Tank	$1,250,000.00	10%	$125,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	South St Tank	$1,250,000.00	10%	$125,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Spring Ridge Tank	$1,250,000.00	10%	$125,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00

City of Susanville Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Water Facilities	Bagwell Springs Tank	$1,250,000.00	10%	$125,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Skyline and Orlo Well	$400,000.00	20%	$80,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Grove St Well	$400,000.00	20%	$80,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Johnstonville Tank	$750,000.00	20%	$150,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Susan Hills Water Tank	$1,125,000.00	10%	$112,500.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Fire Service		$35,360.00	10%	$3,536.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Service		$61,480.00	10%	$6,148.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Service		$1,939,590.00	15%	$290,938.50	0%	$0.00	0.00%	$0.00	0.00%	$0.00	100.00%	$1,939,590.00	0.00%	$0.00	0.00%	$0.00
Electricity		$2,642,340.00	100%	$2,642,340.00	100%	$2,642,340.00	20.00%	$528,468.00	15.00%	$396,351.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Wastewater		$470,842.50	15%	$70,626.38	0%	$0.00	0.00%	$0.00	0.00%	$0.00	50.00%	$235,421.25	0.00%	$0.00	0.00%	$0.00
			Wildfire	$24,109,427.38	Power Failure	$2,788,673.75	Wind	$5,715,748.55	Severe Storm	$5,449,671.15	Drought	$2,175,011.25	Flood	$654,315.00	Reservoir Failure	$654,315.00

City of Susanville Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Cornerstone Christian	$902,200.00	0.00%	$0.00	20.00%	$180,440.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Lassen Community College	$57,340,000.00	0.00%	$0.00	20.00%	$11,468,000.00	0.00%	$0.00	1.00%	$573,400.00	0.00%	$0.00	3.00%	$1,720,200.00	0.00%	$0.00
School	Diamond View Elementary	$14,074,320.00	0.00%	$0.00	15.00%	$2,111,148.00	0.00%	$0.00	1.00%	$140,743.20	0.00%	$0.00	3.00%	$422,229.60	0.00%	$0.00
School	McKinley Elementary	$11,187,280.00	0.00%	$0.00	15.00%	$1,678,092.00	0.00%	$0.00	1.00%	$111,872.80	0.00%	$0.00	3.00%	$335,618.40	0.00%	$0.00
School	Meadow View	$9,022,000.00	0.00%	$0.00	15.00%	$1,353,300.00	0.00%	$0.00	1.00%	$90,220.00	0.00%	$0.00	3.00%	$270,660.00	0.00%	$0.00
School	New Horizons Christian	$1,082,640.00	0.00%	$0.00	20.00%	$216,528.00	0.00%	$0.00	1.00%	$10,826.40	0.00%	$0.00	3.00%	$32,479.20	0.00%	$0.00
School	Paiute Creek Community Day	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Susan River Community Day	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Johnstonville Elementary	$2,165,280.00	0.00%	$0.00	15.00%	$324,792.00	0.00%	$0.00	1.00%	$21,652.80	0.00%	$0.00	3.00%	$64,958.40	0.00%	$0.00
School	Richmond Elementary	$1,804,400.00	0.00%	$0.00	15.00%	$270,660.00	0.00%	$0.00	1.00%	$18,044.00	0.00%	$0.00	3.00%	$54,132.00	0.00%	$0.00
School	Credence High	$1,299,200.00	0.00%	$0.00	10.00%	$129,920.00	0.00%	$0.00	1.00%	$12,992.00	0.00%	$0.00	5.00%	$64,960.00	0.00%	$0.00
School	Diamond Mountain Charter High	$742,400.00	0.00%	$0.00	10.00%	$74,240.00	0.00%	$0.00	1.00%	$7,424.00	0.00%	$0.00	5.00%	$37,120.00	0.00%	$0.00
School	Lassen Community Day	$451,100.00	0.00%	$0.00	20.00%	$90,220.00	0.00%	$0.00	1.00%	$4,511.00	0.00%	$0.00	3.00%	$13,533.00	0.00%	$0.00
School	Lassen High	$18,560,000.00	0.00%	$0.00	10.00%	$1,856,000.00	0.00%	$0.00	1.00%	$185,600.00	0.00%	$0.00	5.00%	$928,000.00	0.00%	$0.00
School	Lassen Union High Adult	$92,800.00	0.00%	$0.00	10.00%	$9,280.00	0.00%	$0.00	1.00%	$928.00	0.00%	$0.00	3.00%	$2,784.00	0.00%	$0.00
Police Station	Lassen County Sheriff/Coroner's Office	$2,722,000.00	0.00%	$0.00	25.00%	$680,500.00	0.00%	$0.00	1.00%	$27,220.00	0.00%	$0.00	5.00%	$136,100.00	0.00%	$0.00
Police Station	California State government Highway Patrol	$2,551,875.00	0.00%	$0.00	25.00%	$637,968.75	0.00%	$0.00	1.00%	$25,518.75	0.00%	$0.00	5.00%	$127,593.75	0.00%	$0.00
Police Station	Susanville City Police Department	$4,083,000.00	0.00%	$0.00	25.00%	$1,020,750.00	0.00%	$0.00	1.00%	$40,830.00	0.00%	$0.00	5.00%	$204,150.00	0.00%	$0.00
Federal Prison	California Correctional Center	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

City of Susanville Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Federal Prison	High Desert State Prison	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fire Station	Lake Forest Fire Department	$263,825.00	0.00%	$0.00	25.00%	$65,956.25	0.00%	$0.00	1.00%	$2,638.25	0.00%	$0.00	5.00%	$13,191.25	0.00%	$0.00
Fire Station	Forestry Department Fire Dispatch	$2,638,250.00	0.00%	$0.00	25.00%	$659,562.50	0.00%	$0.00	1.00%	$26,382.50	0.00%	$0.00	5.00%	$131,912.50	0.00%	$0.00
Fire Station	Susanville Fire Department	$2,374,425.00	0.00%	$0.00	25.00%	$593,606.25	0.00%	$0.00	1.00%	$23,744.25	0.00%	$0.00	5.00%	$118,721.25	0.00%	$0.00
Medical	Urgent Care	$5,900,500.00	0.00%	$0.00	10.00%	$590,050.00	0.00%	$0.00	1.00%	$59,005.00	0.00%	$0.00	5.00%	$295,025.00	0.00%	$0.00
Medical	Lassen Surgery Center	$2,360,200.00	0.00%	$0.00	10.00%	$236,020.00	0.00%	$0.00	1.00%	$23,602.00	0.00%	$0.00	5.00%	$118,010.00	0.00%	$0.00
Medical	Banner Lassen Medical Center	$8,850,750.00	0.00%	$0.00	10.00%	$885,075.00	0.00%	$0.00	1.00%	$88,507.50	0.00%	$0.00	5.00%	$442,537.50	0.00%	$0.00
Library	Susanville District Library	$2,286,680.00	0.00%	$0.00	20.00%	$457,336.00	0.00%	$0.00	1.00%	$22,866.80	0.00%	$0.00	2.00%	$45,733.60	0.00%	$0.00
Airport	Susanville Municipal Airport	$2,000,000.00	0.00%	$0.00	5.00%	$100,000.00	0.00%	$0.00	1.00%	$20,000.00	0.00%	$0.00	5.00%	$100,000.00	0.00%	$0.00
Public Buildings	Community Center/Chamber of Commerce Center	$361,200.00	0.00%	$0.00	20.00%	$72,240.00	0.00%	$0.00	1.00%	$3,612.00	0.00%	$0.00	2.00%	$7,224.00	0.00%	$0.00
Public Buildings	Lassen Historical Museum	$270,900.00	0.00%	$0.00	20.00%	$54,180.00	0.00%	$0.00	1.00%	$2,709.00	0.00%	$0.00	2.00%	$5,418.00	0.00%	$0.00
Public Buildings	Lassen County Administration Complex	$2,709,000.00	0.00%	$0.00	20.00%	$541,800.00	0.00%	$0.00	1.00%	$27,090.00	0.00%	$0.00	2.00%	$54,180.00	0.00%	$0.00
Public Buildings	Public Works	$1,083,600.00	0.00%	$0.00	20.00%	$216,720.00	0.00%	$0.00	1.00%	$10,836.00	0.00%	$0.00	2.00%	$21,672.00	0.00%	$0.00
Public Buildings	City Hall	$1,083,600.00	0.00%	$0.00	20.00%	$216,720.00	0.00%	$0.00	1.00%	$10,836.00	0.00%	$0.00	2.00%	$21,672.00	0.00%	$0.00
Public Buildings	Lassen Municipal Utilities District	$1,354,500.00	0.00%	$0.00	20.00%	$270,900.00	0.00%	$0.00	1.00%	$13,545.00	0.00%	$0.00	2.00%	$27,090.00	0.00%	$0.00
Public Buildings	Susanville Sanitation District	$903,000.00	0.00%	$0.00	20.00%	$180,600.00	0.00%	$0.00	1.00%	$9,030.00	0.00%	$0.00	2.00%	$18,060.00	0.00%	$0.00
Communication	Frontier Communications	$5,000,000.00	0.00%	$0.00	20.00%	$1,000,000.00	0.00%	$0.00	1.00%	$50,000.00	0.00%	$0.00	2.00%	$100,000.00	0.00%	$0.00
Communication	Sierra Radio Network	$2,000,000.00	0.00%	$0.00	20.00%	$400,000.00	0.00%	$0.00	1.00%	$20,000.00	0.00%	$0.00	2.00%	$40,000.00	0.00%	$0.00
Water Facilities	Harris Drive Tank	$1,250,000.00	0.00%	$0.00	20.00%	$250,000.00	0.00%	$0.00	1.00%	$12,500.00	0.00%	$0.00	5.00%	$62,500.00	0.00%	$0.00
Water Facilities	South St Tank	$1,250,000.00	0.00%	$0.00	75.00%	$937,500.00	0.00%	$0.00	1.00%	$12,500.00	0.00%	$0.00	5.00%	$62,500.00	0.00%	$0.00

City of Susanville Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Water Facilities	Spring Ridge Tank	$1,250,000.00	0.00%	$0.00	75.00%	$937,500.00	0.00%	$0.00	1.00%	$12,500.00	0.00%	$0.00	5.00%	$62,500.00	0.00%	$0.00
Water Facilities	Bagwell Springs Tank	$1,250,000.00	0.00%	$0.00	75.00%	$937,500.00	0.00%	$0.00	1.00%	$12,500.00	0.00%	$0.00	5.00%	$62,500.00	0.00%	$0.00
Water Facilities	Skyline and Orlo Well	$400,000.00	0.00%	$0.00	20.00%	$80,000.00	0.00%	$0.00	1.00%	$4,000.00	0.00%	$0.00	5.00%	$20,000.00	0.00%	$0.00
Water Facilities	Grove St Well	$400,000.00	0.00%	$0.00	20.00%	$80,000.00	0.00%	$0.00	1.00%	$4,000.00	0.00%	$0.00	5.00%	$20,000.00	0.00%	$0.00
Water Facilities	Johnstonville Tank	$750,000.00	0.00%	$0.00	75.00%	$562,500.00	0.00%	$0.00	1.00%	$7,500.00	0.00%	$0.00	5.00%	$37,500.00	0.00%	$0.00
Water Facilities	Susan Hills Water Tank	$1,125,000.00	0.00%	$0.00	75.00%	$843,750.00	0.00%	$0.00	1.00%	$11,250.00	0.00%	$0.00	5.00%	$56,250.00	0.00%	$0.00
Fire Service		$35,360.00	0.00%	$0.00	25.00%	$8,840.00	0.00%	$0.00	1.00%	$353.60	0.00%	$0.00	5.00%	$1,768.00	0.00%	$0.00
Police Service		$61,480.00	0.00%	$0.00	25.00%	$15,370.00	0.00%	$0.00	1.00%	$614.80	0.00%	$0.00	5.00%	$3,074.00	0.00%	$0.00
Water Service		$1,939,590.00	0.00%	$0.00	50.00%	$969,795.00	0.00%	$0.00	1.00%	$19,395.90	0.00%	$0.00	5.00%	$96,979.50	0.00%	$0.00
Electricity		$2,642,340.00	0.00%	$0.00	50.00%	$1,321,170.00	0.00%	$0.00	1.00%	$26,423.40	0.00%	$0.00	5.00%	$132,117.00	3.00%	$79,270.20
Wastewater		$470,842.50	0.00%	$0.00	50.00%	$235,421.25	0.00%	$0.00	1.00%	$4,708.43	0.00%	$0.00	5.00%	$23,542.13	0.00%	$0.00
			HazMat Release	$0.00	Earthquake	$35,966,303.00	Pandemic	$0.00	Volcano	$1,830,672.98	Extreme Heat	$0.00	Terrorism	$6,664,914.88	Avalanche	$79,270.20

Susanville Indian Rancheria Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Medical	Lassen Indian Health Center	$3,245,275.00	0%	$0.00	0%	$0.00	3.00%	$97,358.25	5.00%	$162,263.75	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Diamond Mountain Casino	$18,060,000.00	10%	$1,806,000.00	0%	$0.00	3.00%	$541,800.00	5.00%	$903,000.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Gymnasium	$2,327,934.00	10%	$232,793.40	0%	$0.00	3.00%	$69,838.02	5.00%	$116,396.70	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Resource Center	$0.00	10%	$0.00	0%	$0.00	3.00%	$0.00	5.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Facilities	Water Tank	$150,000.00	10%	$15,000.00	0%	$0.00	3.00%	$4,500.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Future Buildings	Tribal Admin. Building	$903,000.00	10%	$90,300.00	0%	$0.00	3.00%	$27,090.00	5.00%	$45,150.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Fire Service		$35,360.00	10%	$3,536.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Service		$61,480.00	10%	$6,148.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Service		$93,978.00	15%	$14,096.70	0%	$0.00	0.00%	$0.00	0.00%	$0.00	100.00%	$93,978.00	0.00%	$0.00	0.00%	$0.00
Electricity		$128,028.00	100%	$128,028.00	100%	$128,028.00	20.00%	$25,605.60	15.00%	$19,204.20	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Wastewater		$22,813.50	15%	$3,422.03	0%	$0.00	0.00%	$0.00	0.00%	$0.00	50.00%	$11,406.75	0.00%	$0.00	0.00%	$0.00
Casino		$273,970.00	0%	$0.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
			Wildfire	$2,299,324.13	Power Failure	$128,028.00	Wind	$766,191.87	Severe Storm	$1,246,014.65	Drought	$105,384.75	Flood	$0.00	Reservoir Failure	$0.00

Susanville Indian Rancheria Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
Medical	Lassen Indian Health Center	$3,245,275.00	0.00%	$0.00	10.00%	$324,527.50	0.00%	$0.00	1.00%	$32,452.75	0.00%	$0.00	5.00%	$162,263.75	0.00%	$0.00
Public Buildings	Diamond Mountain Casino	$18,060,000.00	0.00%	$0.00	20.00%	$3,612,000.00	0.00%	$0.00	1.00%	$180,600.00	0.00%	$0.00	3.00%	$541,800.00	0.00%	$0.00
Public Buildings	Gymnasium	$2,327,934.00	0.00%	$0.00	20.00%	$465,586.80	0.00%	$0.00	1.00%	$23,279.34	0.00%	$0.00	5.00%	$116,396.70	0.00%	$0.00
Public Buildings	Resource Center	$0.00	0.00%	$0.00	20.00%	$0.00	0.00%	$0.00	1.00%	$0.00	0.00%	$0.00	5.00%	$0.00	0.00%	$0.00
Water Facilities	Water Tank	$150,000.00	0.00%	$0.00	75.00%	$112,500.00	0.00%	$0.00	1.00%	$1,500.00	0.00%	$0.00	5.00%	$7,500.00	0.00%	$0.00
Future Buildings	Tribal Admin. Building	$903,000.00	0.00%	$0.00	20.00%	$180,600.00	0.00%	$0.00	1.00%	$9,030.00	0.00%	$0.00	5.00%	$45,150.00	0.00%	$0.00
Fire Service		$35,360.00	0.00%	$0.00	25.00%	$8,840.00	0.00%	$0.00	1.00%	$353.60	0.00%	$0.00	5.00%	$1,768.00	0.00%	$0.00
Police Service		$61,480.00	0.00%	$0.00	25.00%	$15,370.00	0.00%	$0.00	1.00%	$614.80	0.00%	$0.00	5.00%	$3,074.00	0.00%	$0.00
Water Service		$93,978.00	0.00%	$0.00	50.00%	$46,989.00	0.00%	$0.00	1.00%	$939.78	0.00%	$0.00	5.00%	$4,698.90	0.00%	$0.00
Electricity		$128,028.00	0.00%	$0.00	50.00%	$64,014.00	0.00%	$0.00	1.00%	$1,280.28	0.00%	$0.00	5.00%	$6,401.40	0.00%	$0.00
Wastewater		$22,813.50	0.00%	$0.00	50.00%	$11,406.75	0.00%	$0.00	1.00%	$228.14	0.00%	$0.00	5.00%	$1,140.68	0.00%	$0.00
Casino		$273,970.00	0.00%	$0.00	10.00%	$27,397.00	0.00%	$0.00	1.00%	$2,739.70	0.00%	$0.00	5.00%	$13,698.50	0.00%	$0.00
			HazMat Release	$0.00	Earthquake	$4,869,231.05	Pandemic	$0.00	Volcano	$253,018.39	Extreme Heat	$0.00	Terrorism	$903,891.93	Avalanche	$0.00

Lassen County Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Janesville Elementary	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00
School	Big Valley Adult	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Big Valley Community Day	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Big Valley High	$1,856,000.00	35%	$649,600.00	0%	$0.00	3.00%	$55,680.00	3.00%	$55,680.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Big Valley Intermediate	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Big Valley Primary	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Gateway High (Continuation)	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Fort Sage Community Day	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Fort Sage Middle	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Herlong High	$1,856,000.00	35%	$649,600.00	0%	$0.00	3.00%	$55,680.00	3.00%	$55,680.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
School	Long Valley Charter	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Render Continuation High	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Sierra Primary	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Juniper Ridge Elementary	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00
School	Grace Christian School	$448,760.00	35%	$157,066.00	0%	$0.00	3.00%	$13,462.80	3.00%	$13,462.80	0.00%	$0.00	3.00%	$13,462.80	3.00%	$13,462.80
School	Shaffer Elementary	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00
School	Fletcher Walker Elementary	$902,200.00	35%	$315,770.00	0%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00	0.00%	$0.00	3.00%	$27,066.00	3.00%	$27,066.00
School	Horizon High (Continuation)	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Red River Community Day	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	NA	3.00%	NA
School	Westwood Charter	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	NA	3.00%	NA

Lassen County Vulnerability Assessment Calculations			Wildfire		Power Failure		Wind		Severe Storm		Drought		Flood		Reservoir Failure	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Westwood Community	$360,880.00	35%	$126,308.00	0%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40	0.00%	$0.00	3.00%	$10,826.40	3.00%	$10,826.40
School	Westwood High	$1,856,000.00	35%	$649,600.00	0%	$0.00	3.00%	$55,680.00	3.00%	$55,680.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Station	Herlong Police Department	$2,551,875.00	10%	$255,187.50	0%	$0.00	3.00%	$76,556.25	5.00%	$127,593.75	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Westwood Museum	$903,000.00	10%	$90,300.00	1%	$9,030.00	3.00%	$27,090.00	5.00%	$45,150.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	County Administration	$1,807,040.00	10%	$180,704.00	0%	$0.00	3.00%	$54,211.20	5.00%	$90,352.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Public Buildings	Lassen County Fairgrounds	$5,418,000.00	10%	$541,800.00	0%	$0.00	3.00%	$162,540.00	5.00%	$270,900.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Wastewater Treatment Plant	Westwood Community Services District	$1,500,000.00	10%	$150,000.00	0%	$0.00	3.00%	$45,000.00	5.00%	$75,000.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Airport	Westwood Airport	$2,000,000.00	5%	$100,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Airport	Herlong Airport	$2,000,000.00	5%	$100,000.00	0%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Fire Service		$35,360.00	10%	$3,536.00	1%	$353.60	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Police Service		$61,480.00	10%	$6,148.00	1%	$614.80	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Water Service		$4,834,278.00	15%	$725,141.70	0%	$0.00	0.00%	$0.00	0.00%	$0.00	100.00%	$4,834,278.00	0.00%	$0.00	0.00%	$0.00
Electricity		$6,585,828.00	100%	$6,585,828.00	100%	$6,585,828.00	20.00%	$1,317,165.60	15.00%	$987,874.20	0.00%	$0.00	0.00%	$0.00	0.00%	$0.00
Wastewater		$1,173,538.50	15%	$176,030.78	0%	$0.00	0.00%	$0.00	0.00%	$0.00	50.00%	$586,769.25	0.00%	$0.00	0.00%	$0.00
			Wildfire	$14,241,395.98	Power Failure	$6,595,826.40	Wind	$2,139,139.05	Severe Storm	$2,053,445.95	Drought	$5,421,047.25	Flood	$208,338.00	Reservoir Failure	$208,338.00

Lassen County Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Janesville Elementary	$902,200.00	0.00%	$0.00	20.00%	$180,440.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Big Valley Adult	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Big Valley Community Day	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Big Valley High	$1,856,000.00	0.00%	$0.00	15.00%	$278,400.00	0.00%	$0.00	1.00%	$18,560.00	0.00%	$0.00	3.00%	$55,680.00	0.00%	$0.00
School	Big Valley Intermediate	$360,880.00	0.00%	$0.00	15.00%	$54,132.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Big Valley Primary	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Gateway High (Continuation)	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Fort Sage Community Day	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Fort Sage Middle	$902,200.00	0.00%	$0.00	30.00%	$270,660.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Herlong High	$1,856,000.00	0.00%	$0.00	15.00%	$278,400.00	0.00%	$0.00	1.00%	$18,560.00	0.00%	$0.00	3.00%	$55,680.00	0.00%	$0.00
School	Long Valley Charter	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Render Continuation High	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Sierra Primary	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Juniper Ridge Elementary	$902,200.00	0.00%	$0.00	20.00%	$180,440.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Grace Christian School	$448,760.00	0.00%	$0.00	20.00%	$89,752.00	0.00%	$0.00	1.00%	$4,487.60	0.00%	$0.00	3.00%	$13,462.80	0.00%	$0.00
School	Shaffer Elementary	$902,200.00	0.00%	$0.00	20.00%	$180,440.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Fletcher Walker Elementary	$902,200.00	0.00%	$0.00	20.00%	$180,440.00	0.00%	$0.00	1.00%	$9,022.00	0.00%	$0.00	3.00%	$27,066.00	0.00%	$0.00
School	Horizon High (Continuation)	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Red River Community Day	$360,880.00	0.00%	$0.00	20.00%	NA	0.00%	$0.00	1.00%	NA	0.00%	$0.00	3.00%	NA	0.00%	$0.00
School	Westwood Charter	$360,880.00	0.00%	$0.00	20.00%	NA	0.00%	$0.00	1.00%	NA	0.00%	$0.00	3.00%	NA	0.00%	$0.00

Lassen County Vulnerability Assessment Calculations			HazMat Release		Earthquake		Pandemic		Volcano		Extreme Heat		Terrorism		Avalanche	
Type	Name	TOTAL	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate	% Damage	Loss Estimate
School	Westwood Community	$360,880.00	0.00%	$0.00	20.00%	$72,176.00	0.00%	$0.00	1.00%	$3,608.80	0.00%	$0.00	3.00%	$10,826.40	0.00%	$0.00
School	Westwood High	$1,856,000.00	0.00%	$0.00	15.00%	$278,400.00	0.00%	$0.00	1.00%	$18,560.00	0.00%	$0.00	3.00%	$55,680.00	0.00%	$0.00
Police Station	Herlong Police Department	$2,551,875.00	0.00%	$0.00	25.00%	$637,968.75	0.00%	$0.00	1.00%	$25,518.75	0.00%	$0.00	5.00%	$127,593.75	0.00%	$0.00
Public Buildings	Westwood Museum	$903,000.00	0.00%	$0.00	20.00%	$180,600.00	0.00%	$0.00	1.00%	$9,030.00	0.00%	$0.00	2.00%	$18,060.00	0.00%	$0.00
Public Buildings	County Administration	$1,807,040.00	0.00%	$0.00	20.00%	$361,408.00	0.00%	$0.00	1.00%	$18,070.40	0.00%	$0.00	2.00%	$36,140.80	0.00%	$0.00
Public Buildings	Lassen County Fairgrounds	$5,418,000.00	0.00%	$0.00	20.00%	$1,083,600.00	0.00%	$0.00	1.00%	$54,180.00	0.00%	$0.00	2.00%	$108,360.00	0.00%	$0.00
Wastewater Treatment Plant	Westwood Community Services District	$1,500,000.00	0.00%	$0.00	75.00%	$1,125,000.00	0.00%	$0.00	1.00%	$15,000.00	0.00%	$0.00	5.00%	$75,000.00	0.00%	$0.00
Airport	Westwood Airport	$2,000,000.00	0.00%	$0.00	2.00%	$40,000.00	0.00%	$0.00	1.00%	$20,000.00	0.00%	$0.00	5.00%	$100,000.00	0.00%	$0.00
Airport	Herlong Airport	$2,000,000.00	0.00%	$0.00	2.00%	$40,000.00	0.00%	$0.00	1.00%	$20,000.00	0.00%	$0.00	5.00%	$100,000.00	0.00%	$0.00
Fire Service		$35,360.00	0.00%	$0.00	25.00%	$8,840.00	0.00%	$0.00	1.00%	$353.60	0.00%	$0.00	5.00%	$1,768.00	0.00%	$0.00
Police Service		$61,480.00	0.00%	$0.00	25.00%	$15,370.00	0.00%	$0.00	1.00%	$614.80	0.00%	$0.00	5.00%	$3,074.00	0.00%	$0.00
Water Service		$4,834,278.00	0.00%	$0.00	50.00%	$2,417,139.00	0.00%	$0.00	1.00%	$48,342.78	0.00%	$0.00	5.00%	$241,713.90	0.00%	$0.00
Electricity		$6,585,828.00	0.00%	$0.00	50.00%	$3,292,914.00	0.00%	$0.00	1.00%	$65,858.28	0.00%	$0.00	5.00%	$329,291.40	3.00%	$197,574.84
Wastewater		$1,173,538.50	0.00%	$0.00	50.00%	$586,769.25	0.00%	$0.00	1.00%	$11,735.39	0.00%	$0.00	5.00%	$58,676.93	0.00%	$0.00
			HazMat Release	$0.00	Earthquake	$12,482,873.00	Pandemic	$0.00	Volcano	$433,678.40	Extreme Heat	$0.00	Terrorism	$1,634,601.98	Avalanche	$197,574.84

The following table summarizes the loss estimates for each hazard, by jurisdiction:

Loss Estimate Summary Table			
Hazard	Jurisdiction		
	Lassen County	City of Susanville	Susanville Indian Rancheria
Wildfire	$14,241,395.98	$24,109,427.38	$2,299,324.13
Power Failure	$6,595,826.40	$2,788,673.75	$128,028.00
Wind	$2,139,139.05	$5,715,748.55	$766,191.87
Severe Storm	$2,053,445.95	$5,449,671.15	$1,246,014.65
Drought	$5,421,047.25	$2,175,011.25	$105,384.75
Flood	$208,338.00	$654,315.00	$0.00
Dam/Reservoir Failure	$208,338.00	$654,315.00	$0.00
Hazardous Material Release	$0.00	$0.00	$0.00
Earthquake	$12,482,873.00	$35,966,303.00	$4,869,231.05
Pandemic	$0.00	$0.00	$0.00
Volcano	$433,678.40	$1,830,672.98	$253,018.39
Extreme Heat	$0.00	$0.00	$0.00
Terrorism	$1,634,601.98	$6,664,914.88	$903,891.93
Avalanche	$197,574.84	$79,270.20	$0.00

3.21 Information Sources

During the report development, the following source provided information regarding historical hazard frequencies and probabilities, detailed hazard descriptions, and raw GIS data for hazard mapping:

University of South Carolina – Spatial Hazard Events and Losses Database for the United States (http://go2.cla.sc.edu/sheldus/db_registration)

Natural Resources Conservation Service (http://www.wcc.nrcs.usda.gov/climate/windrose.html)

National Climactic Data Center (http://www.ncdc.noaa.gov/oa/ncdc.html)

National Lightning Safety Institute (http://www.lightningsafety.com/)

Wind Hazard Reduction Coalition (http://www.windhazards.org/coalition.cfm)

California Department of Forestry and Fire Protection (http://www.fire.ca.gov/php/index.php)

California Fire Alliance (http://www.cafirealliance.org/)

California Geological Survey (http://www.consrv.ca.gov/cgs/)

California Department of Water Resources (http://www.water.ca.gov/)

Earthquake Hazards Program (http://earthquake.usgs.gov/research/hazmaps/)

Department of Health and Human Services (http://www.pandemicflu.gov/)

Fire Information (http://www.ready.gov/america/beinformed/fires.html)

CalFire Historical Fire Archives (http://cdfdata.fire.ca.gov/incidents/incidents_archived)

California Department of Water Resources, Division of Safety of Dams (http://www.water.ca.gov/damsafety/damlisting/index.cfm)

National Oceanic and Atmospheric Administration, National Weather Service, River Observations (http://www.weather.gov/ahps/)

National Park Service (http://www.nps.gov/lavo/naturescience/eruption_lassen_peak.htm)

Wikipedia, for Avalanche content (http://en.wikipedia.org/wiki/Avalanche)

Attachment A – HAZUS Loss Estimates

After a detailed review of the enclosed hazard profiles, loss estimate calculations were completed utilizing advanced HAZUS techniques and supplemental loss estimation methodologies for the following scenarios:

- Susanville Worst-Case Scenario

HAZUS-MH: Earthquake Event Report

Region Name: *Lassen County*

Earthquake Scenario: *Lassen County 7.5 Earthquake (Severe)*

Print Date: *March 02, 2010*

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,713.36 square miles and contains 7 census tracts. There are over 9 thousand households in the region and has a total population of 33,828 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 13 thousand buildings in the region with a total building replacement value (excluding contents) of 2,047 (millions of dollars). Approximately 95.00 % of the buildings (and 82.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,559 and 338 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 13 thousand buildings in the region which have an aggregate total replacement value of 2,047 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 75% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 58 beds. There are 38 schools, 11 fire stations, 3 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 48 dams identified within the region. Of these, 2 of the dams are classified as 'high hazard'. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 2 and 3.

The total value of the lifeline inventory is over 2,897.00 (millions of dollars). This inventory includes over 577 kilometers of highways, 98 bridges, 23,811 kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	98	54.70
	Segments	45	2,004.20
	Tunnels	0	0.00
		Subtotal	**2,058.90**
Railways	Bridges	1	0.00
	Facilities	0	0.00
	Segments	157	315.20
	Tunnels	0	0.00
		Subtotal	**315.30**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	1	1.30
		Subtotal	**1.30**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	3	32.00
	Runways	4	151.90
		Subtotal	**183.80**
		Total	**2,559.30**

Table 3: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	238.10
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**238.10**
Waste Water	Distribution Lines	NA	142.90
	Facilities	1	78.60
	Pipelines	0	0.00
		Subtotal	**221.50**
Natural Gas	Distribution Lines	NA	95.20
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**95.20**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	2	259.60
		Subtotal	**259.60**
Communication	Facilities	3	0.40
		Subtotal	**0.40**
		Total	**814.80**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Lassen County 7.5 Earthquake (Severe)
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-120.70
Latitude of Epicenter	40.44
Earthquake Magnitude	7.50
Depth (Km)	10.00
Rupture Length (Km)	100.00
Rupture Orientation (degrees)	0.00
Attenuation Function	WUS Shallow Crustal Event - Extensional

Building Damage

Building Damage

HAZUS estimates that about 5,470 buildings will be at least moderately damaged. This is over 40.00 % of the total number of buildings in the region. There are an estimated 856 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	17	0.38	13	0.34	15	0.47	10	0.77	8	0.98
Commercial	59	1.28	49	1.32	115	3.52	114	8.48	87	10.10
Education	6	0.13	4	0.11	6	0.19	5	0.39	3	0.41
Government	9	0.20	6	0.15	12	0.36	12	0.90	9	1.10
Industrial	19	0.42	14	0.38	30	0.91	28	2.10	24	2.77
Other Residential	1,041	22.68	889	24.10	1,152	35.24	855	63.64	616	71.97
Religion	7	0.14	7	0.18	11	0.33	9	0.68	7	0.82
Single Family	3,431	74.77	2,709	73.41	1,928	58.98	310	23.04	101	11.85
Total	**4,588**		**3,690**		**3,269**		**1,344**		**857**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4,060	88.48	3311	89.74	2,411	73.74	390	28.99	132	15.39
Steel	37	0.81	24	0.66	66	2.02	77	5.72	55	6.39
Concrete	44	0.96	34	0.93	68	2.09	70	5.22	66	7.72
Precast	22	0.47	12	0.34	34	1.03	40	2.97	31	3.67
RM	93	2.02	42	1.13	95	2.91	98	7.32	59	6.87
URM	13	0.28	9	0.24	17	0.52	18	1.30	27	3.19
MH	320	6.97	257	6.97	578	17.69	652	48.48	486	56.77
Total	**4,588**		**3,690**		**3,269**		**1,344**		**857**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 58 hospital beds available for use. On the day of the earthquake, the model estimates that only 10 hospital beds (19.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 59.00% of the beds will be back in service. By 30 days, 94.00% will be operational.

Table 6: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	1	0	0	0
Schools	38	0	0	18
EOCs	0	0	0	0
PoliceStations	3	0	0	0
FireStations	11	0	0	5

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	45	0	0	45	45
	Bridges	98	0	0	98	98
	Tunnels	0	0	0	0	0
Railways	Segments	157	0	0	157	157
	Bridges	1	0	0	1	1
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	1	0	0	1	1
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	3	1	0	3	3
	Runways	4	0	0	4	4

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	1	0	0	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	2	2	0	0	2
Communication	3	3	0	3	3

Table 9 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,906	7605	1901
Waste Water	7,143	6014	1504
Natural Gas	4,762	6429	1607
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	9,625	6,773	6,666	6,438	4,660	0
Electric Power		2,676	1,585	607	110	4

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 2 ignitions that will burn about 0.04 sq. mi 0.00 % of the region' s total area.) The model also estimates that the fires will displace about 2 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 35.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (271 households to be displaced due to the earthquake. Of these, 69 people (out of a total population of 33,828 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	2	1	0	0
	Industrial	1	0	0	0
	Other-Residential	114	28	3	5
	Single Family	42	7	0	1
	Total	**161**	**36**	**3**	**6**
2 PM	Commercial	107	32	5	11
	Commuting	0	0	0	0
	Educational	51	16	3	5
	Hotels	0	0	0	0
	Industrial	7	2	0	1
	Other-Residential	33	8	1	1
	Single Family	10	2	0	0
	Total	**208**	**60**	**10**	**18**
5 PM	Commercial	90	27	5	9
	Commuting	1	2	2	1
	Educational	7	2	0	1
	Hotels	1	0	0	0
	Industrial	4	1	0	0
	Other-Residential	42	10	1	2
	Single Family	17	3	0	0
	Total	**162**	**46**	**9**	**13**

Economic Loss

The total economic loss estimated for the earthquake is 612.19 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 407.71 (millions of dollars); 13 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 51 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	1.16	21.47	0.23	2.04	24.90
	Capital-Related	0.00	0.50	15.11	0.13	0.25	16.00
	Rental	3.33	4.02	4.37	0.03	0.99	12.73
	Relocation	0.38	0.14	0.47	0.00	0.19	1.18
	Subtotal	**3.71**	**5.82**	**41.42**	**0.39**	**3.47**	**54.81**
Capital Stock Loses							
	Structural	18.61	14.12	18.13	1.20	6.38	58.43
	Non_Structural	80.19	52.63	63.88	4.34	19.29	220.33
	Content	21.84	10.33	30.22	2.35	8.22	72.95
	Inventory	0.00	0.00	0.59	0.49	0.11	1.19
	Subtotal	**120.63**	**77.07**	**112.82**	**8.38**	**33.99**	**352.90**
	Total	**124.35**	**82.90**	**154.24**	**8.76**	**37.46**	**407.71**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,004.22	$0.00	0.00
	Bridges	54.71	$1.53	2.81
	Tunnels	0.00	$0.00	0.00
	Subtotal	**2058.90**	**1.50**	
Railways	Segments	315.23	$0.00	0.00
	Bridges	0.04	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**315.30**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	1.29	$0.34	26.24
	Subtotal	**1.30**	**0.30**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	31.95	$8.30	25.97
	Runways	151.86	$0.00	0.00
	Subtotal	**183.80**	**8.30**	
	Total	**2559.30**	**10.20**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	238.10	$34.22	14.37
	Subtotal	**238.11**	**$34.22**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	78.60	$21.98	27.97
	Distribution Line	142.90	$27.07	18.94
	Subtotal	**221.45**	**$49.04**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	95.20	$28.93	30.38
	Subtotal	**95.24**	**$28.93**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	259.60	$82.03	31.60
	Subtotal	**259.60**	**$82.03**	
Communication	Facilities	0.40	$0.08	23.19
	Subtotal	**0.35**	**$0.08**	
	Total	**814.76**	**$194.31**	

Table 15. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

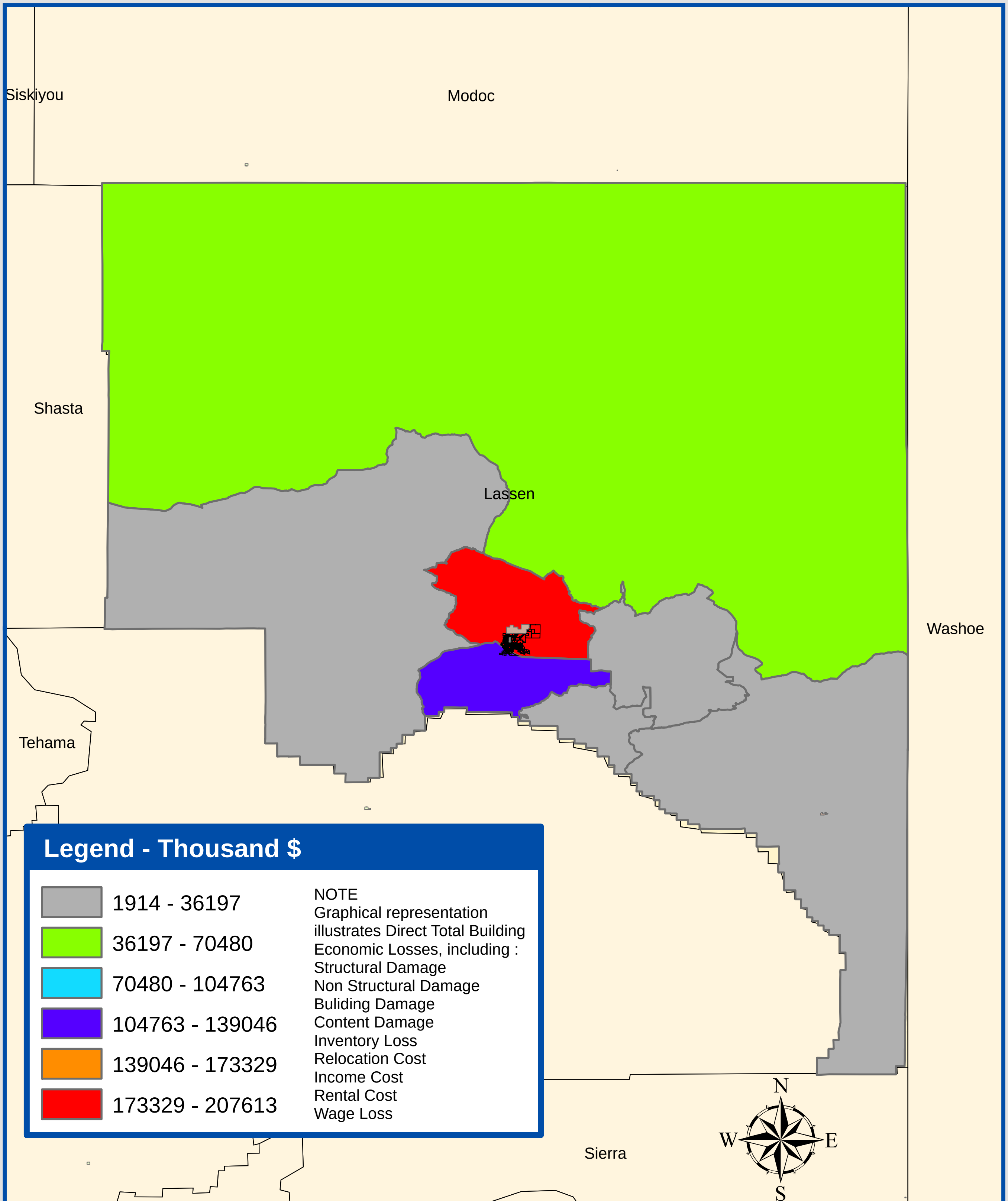
	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(3)	-2.36
Second Year			
	Employment Impact	0	0.00
	Income Impact	(10)	-7.20
Third Year			
	Employment Impact	0	0.00
	Income Impact	(13)	-9.26
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(13)	-9.26
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(13)	-9.26
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(13)	-9.26

Appendix A: County Listing for the Region

Lassen,CA

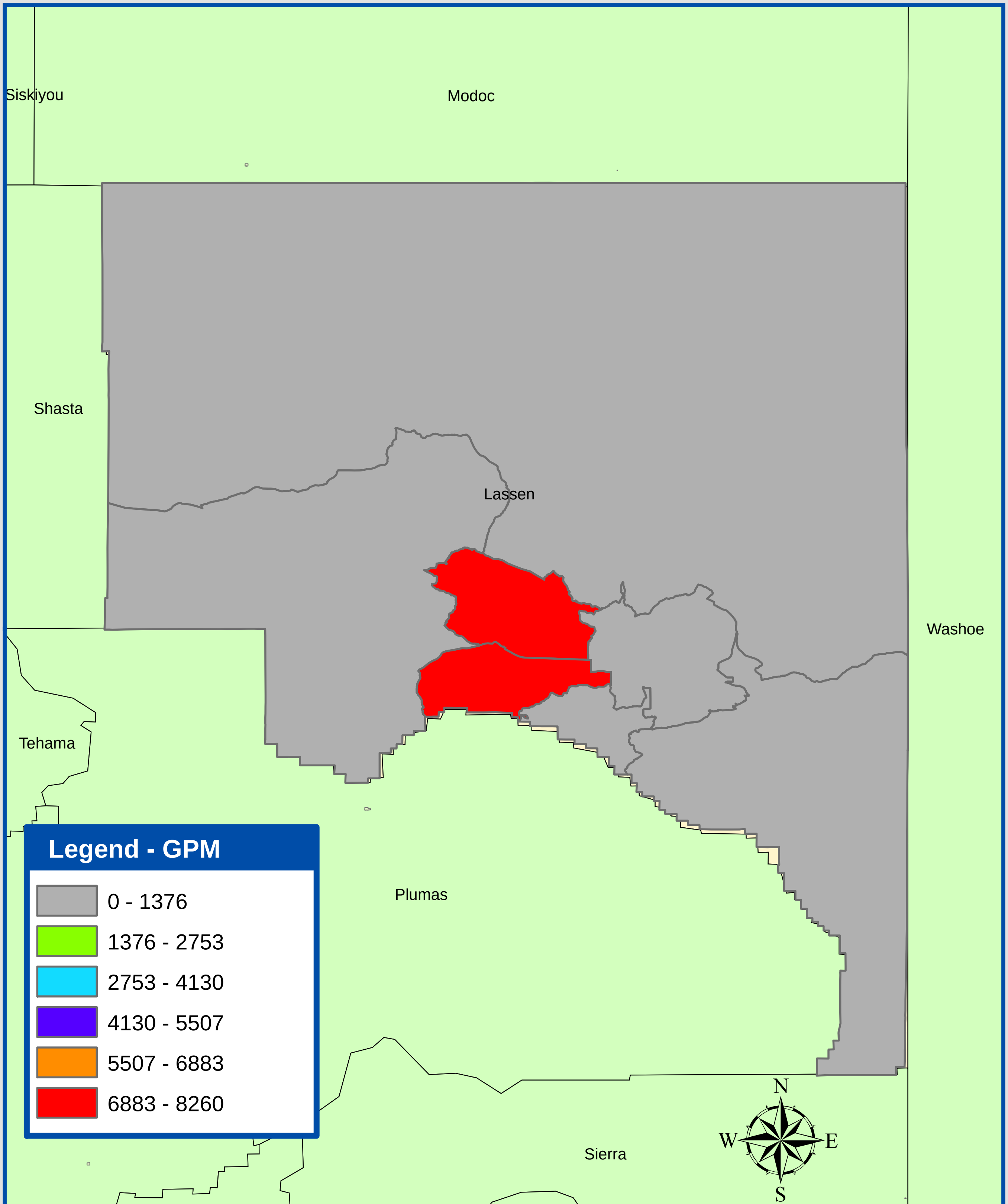
Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Lassen	33,828	1,676	371	2,047
Total State		**33,828**	**1,676**	**371**	**2,047**
Total Region		**33,828**	**1,676**	**371**	**2,047**



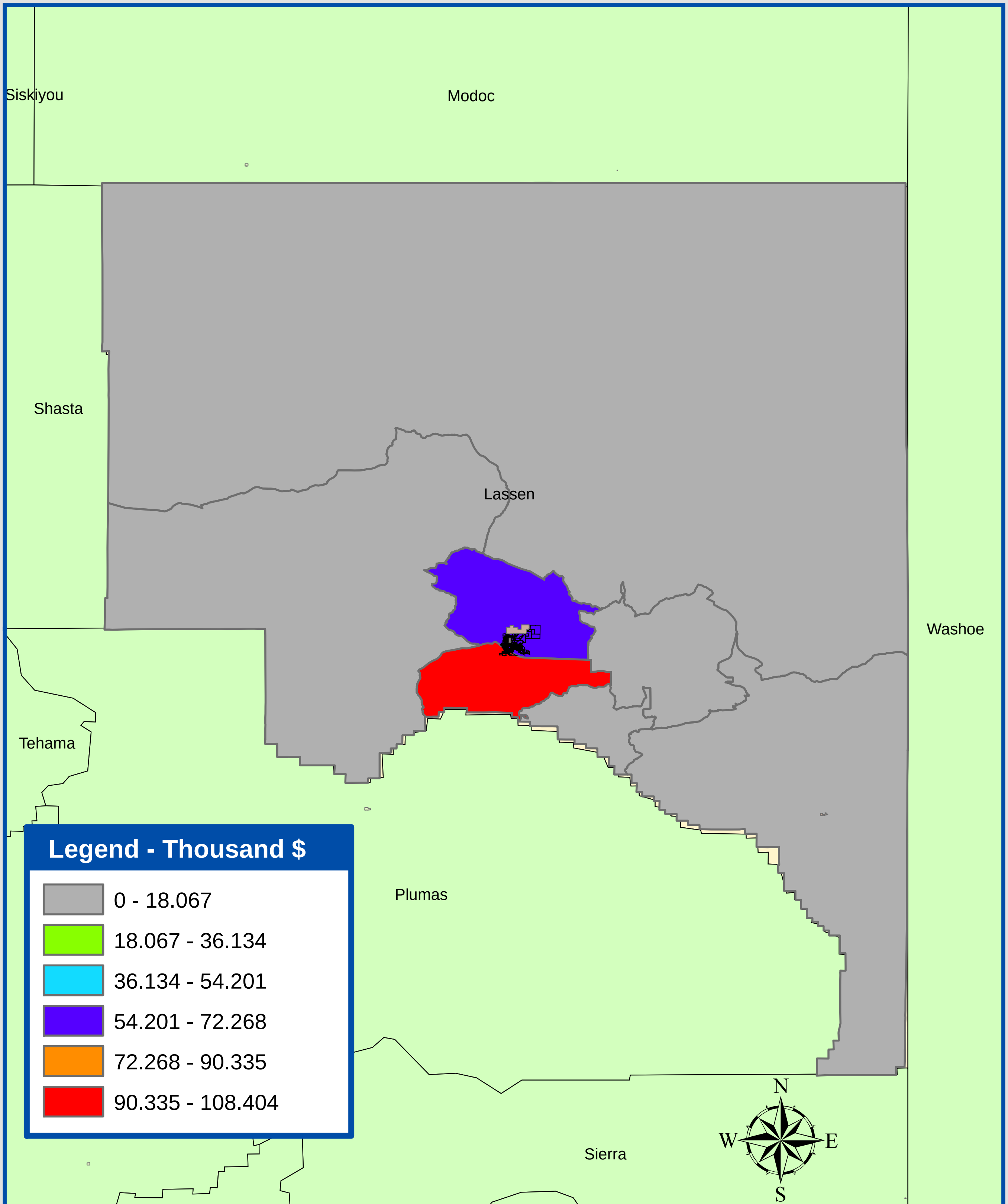
RMP
Risk Management Professionals

Lassen County
Fire Following Earthquake
Building Economic Loss



Risk Management Professionals

Lassen County
Fire Following Earthquake - Fire Demands



RMP
Risk Management Professionals

Lassen County
Fire Following Earthquake - Exposed Value

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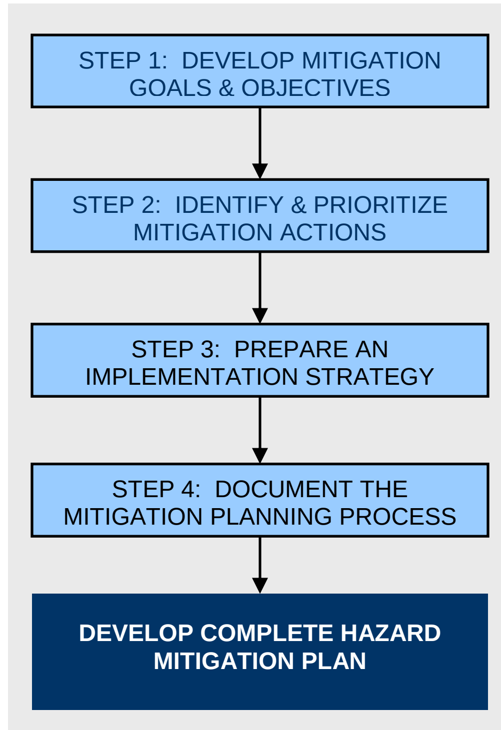
4.1 Mitigation Goals and Objectives

To structure goals and objectives that produce appropriate mitigation actions, the hazard profiles and loss estimates were thoroughly reviewed to identify patterns in the location of potential hazard events and the vulnerability of the infrastructure identified within those locations. This information was used to develop clear goals to mitigate the effects of natural hazard events.

The mitigation goals provide guidelines for developing mitigation projects to provide prioritized hazard reduction. The goals are based on the findings of the Risk Assessment and input from the Steering Committee, and characterize long-term hazard reduction targets and the enhancement of current mitigation capabilities.



§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.

Listed below each goal is a list of corresponding mitigation objectives that specifically identify specific mitigation projects, in the form of Mitigation Actions. These objectives were reviewed and developed by the Steering Committee utilizing knowledge of the local area (including high-hazard areas and sensitive populations), review of past efforts, findings of the risk assessment, and identification of mitigation projects.

GOAL 1: Significantly reduce life loss and injuries.

- *Objective 1.1:* Improve understanding of the locations, potential impacts, and linkages between hazards, vulnerability, and measures needed to protect life safety and health.
- *Objective 1.2:* Provide updated information about hazards, vulnerabilities, and mitigation processes to state and local agencies.

- *Objective 1.3:* Ensure that enforcement of relevant state regulations and local ordinances significantly reduces life loss and injuries.
- *Objective 1.4:* Ensure that structures are modified, as necessary, over time to meet life safety standards.
- *Objective 1.5:* Ensure that mitigation measures are incorporated into repairs, major alterations, new development, and redevelopment practices, especially in areas subject to substantial risk from hazards.
- *Objective 1.6:* Identify and mitigate imminent threats to life safety.
- *Objective 1.7:* Increase and maintain appropriate emergency equipment.
- *Objective 1.8:* Improve warning systems to adequately warn the public in high-risk areas.
- *Objective 1.9:* Improve communication systems to better respond to disasters.
- *Objective 1.10:* Better serve sensitive populations, such as the elderly and disabled and those persons with a limited ability to speak or understand the English language.
- *Objective 1.11:* Provide protection for critical public facilities and services.
- *Objective 1.12:* Promote interagency coordination.
- *Objective 1.13:* Encourage homeowners and businesses to take preventive actions in areas that are especially vulnerable to hazards.
- *Objective 1.14:* Ensure that all development in high-risk areas is protected by mitigation measures that provide for life safety.

GOAL 2: Minimize damage to structures and property, as well as disruption of essential services and human activities.

- *Objective 2.1:* Encourage new development to occur in locations avoiding or minimizing exposure to hazards or enhance design requirements to improve resiliency in future disasters.
- *Objective 2.2:* Encourage life and property protection measures for all communities and structures located in hazard areas.
- *Objective 2.3:* Reduce repetitive property losses due to flood, fire, and earthquake through revised land use, design, and construction policies.

- *Objective 2.4:* Establish and maintain partnerships between all levels of local government, the private sector, the business community, community groups, and institutions of higher learning that improve and implement methods to protect life and property.
- *Objective 2.5:* Local governments to encourage hazard mitigation programs by private sector organizations that own or operate key community facilities.
- *Objective 2.6:* Ensure the protection of vital records to minimize post-disaster disruption and facilitate short-term and long-term recovery.
- *Objective 2.7:* Reduce impact of wildland fire to infrastructure.
- *Objective 2.8:* Protect infrastructure and agriculture from long-term risks of flood.
- *Objective 2.9:* Maintain an inventory of areas prone to a hazard risk.
- *Objective 2.10:* Increase the responsiveness to a volcanic event.
- *Objective 2.11:* Protect infrastructure from seisimic hazard risks.
- *Objective 2.12:* Protect levees, dams, drainage and irrigation systems from severe storm impacts.
- *Objective 2.13:* Protect infrastructure from wind hazards due to falling tree limbs.
- *Objective 2.14:* Retrofit or relocate public water/sewer lines and facilities to ensure their reliability during and after a hazard event.

GOAL 3: Protect the environment.

- *Objective 3.1:* Review all hazard mitigation projects for compliance with all applicable environmental laws.
- *Objective 3.2:* Implement wildfire mitigation and watershed protection strategies that reduce losses of wildlife, habitat, and water.

GOAL 4: Promote public outreach.

- *Objective 4.1:* Promote general public understanding, through implementation of additional education and outreach programs, to increase public awareness of the risks associated with hazards, to educate the public on individual preparedness activities and to inform the public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of business, institutional, and government functions.

- *Objective 4.2:* Continually build operational linkages between hazard mitigation, disaster preparedness, and recovery programs within the public and private sectors.
- *Objective 4.3:* Enhance and integrate public education efforts by local agencies that have mitigation-directed programs.
- *Objective 4.4:* Increase public awareness to gas pipeline hazards.
- *Objective 4.5:* Implement mitigation activities that enhance the technological capabilities of the local agencies to better profile and assess exposure of hazards.
- *Objective 4.6:* Place awareness/protection materials on the Lassen County, City of Susanville, and Susanville Indian Rancheria website.

GOAL 5: Improve Emergency Services/Management Capability

- *Objective 5.1:* Continue to Coordinate jurisdictional responsibilities to various hazards through County and Community Disaster/Emergency Response Plans and Exercises.
- *Objective 5.2:* Develop/Improve warning and evacuation procedures and information for residents and businesses.
- *Objective 5.3:* Identify the need for, and acquire, any special emergency services and equipment to enhance response capabilities for specific hazards.
- *Objective 5.4:* Review and improve, if necessary, emergency traffic routes; communicate such routes to the public and communities.

GOAL 6: Maintain Lassen County, the City of Susanville and the Susanville Indian Rancheria eligibility for, and pursue, multi-objective funding opportunities wherever possible

- *Objective 6.1:* Local governments should seek funding as the lead agency, when necessary, to support local, non-profit; state or federal projects that have hazard mitigation outcomes benefiting Lassen County, City of Susanville, and/or Susanville Indian Rancheria citizens.
- *Objective 6.2:* Local government should maintain its cooperative efforts with other agencies so that combined efforts result in the best conceived projects possible.

4.2 Identification of Mitigation Recommendations

§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.

§201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Mitigation strategies are administrative and engineering project recommendations to reduce the vulnerability to the identified hazards. Vital County, City and Rancheria employees are required in the development strategies and projects that are designed to mitigate the hazard and solve the problem cost-effectively, as well as ensure consistency with each jurisdiction's long-term mitigation goals and capital improvements. A team-based approach will be utilized to brainstorm mitigation projects based on the identified hazards and associated loss estimates. The evaluation and prioritization of the mitigation actions will aid to produce a list of recommended mitigation actions to incorporate into the mitigation plan. Each of the mitigation recommendations will fall into one or more of the following categories:

- Prevention – planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management
- Property Protection – acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass
- Personnel Education and Awareness – outreach projects, real estate disclosure, hazard information centers, and education programs
- Natural Resource Protection – sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation
- Emergency Services – warning systems, emergency response services, and protection of critical facilities
- Structural Projects – dams, levees, floodwalls, seawalls, retaining walls, and safe rooms

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #1: Continue the fuels/vegetation management programs to reduce the wildfire hazard throughout County.	Wildfire	- Lassen County - City of Susanville - Susanville Indian Rancheria	Natural Resource Protection	Goal 1, Objective 1.1 Goal 2, Objective 2.7 Goal 3, Objective 3.2	- Cal Fire - Bureau of Land Management Fire - US Forest Service Fire - Army Fire Department - Susan River Fire Protection District - Janesville Fire Protection District - Susanville Fire Protection District - Rancheria Public Works	- Annual Budget - Grant Programs	Varies	Ongoing	Yes	Yes
Mitigation Action #2: Weed abatement is an important factor in both reducing ignitions and the potential for fire to spread. Continue to enforce the weed abatement requirements to mitigate the risk of wildfires in the County.	Wildfire	- Lassen County - City of Susanville - Susanville Indian Rancheria	Prevention	Goal 1, Objective 1.3 Goal 2, Objective 2.7	- Lassen County Agricultural Commission - Big Valley Pest Abatement - Bureau of Land Management - Lassen County SWAT - Rancheria Natural Resource Department - Susanville Fire Protection District - Susanville Parks and Recreation - CalTrans - City and County Public Works - United States Fire Service - California Dept of Fish and Game	- Annual Budget - Grant Programs	Varies	Ongoing	Yes	Yes

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #3: Continue to identify areas vulnerable to wildfire due to inadequate water supply for firefighting and implement improvements (e.g., expansion of water supply, storage hydrants, etc.).	Wildfire	- Lassen County - City of Susanville - Susanville Indian Rancheria	Structural Projects	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.7 & 2.14 Goal 3, Objective 3.2	- City of Susanville Public Works - Rancheria Public Works - Community Service Districts (Leavitt Lake, Westwood, Adin, Clear Creek) - Herlong Public Utility District - County Service Area #1 and #2	- Annual Budget - Capital Improvement Funds - Grant Programs	Varies	Ongoing	Yes	Yes
Mitigation Action #4: Implement the County Service Area #2 in Johnstonville project create backbone for fire protection in community, as identified in the Lassen County Feasibility Study.	Wildfire	- Lassen County	Structural Projects	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.7 & 2.14 Goal 3, Objective 3.2	- County Service Area	- Resources Identified in the Feasibility Study	TBD	Short-Term (contingent on funding)	Yes	Yes
Mitigation Action #5: Implement the Cady Springs Booster Station and Main line protection project, as identified in the City of Susanville Feasibility Study.	Wildfire	- City of Susanville	Structural Projects	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.7 & 2.14 Goal 3, Objective 3.2	- City of Susanville Public Works	- Resources Identified in the Feasibility Study	1.9 Million	Short-Term (contingent on funding)	Yes	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #6: To increase firefighting capabilities, increase the water storage capacity by constructing a 200,000 gallon storage tank.	Wildfire	- Susanville Indian Rancheria	Structural Projects	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.7 & 2.14 Goal 3, Objective 3.2	- Rancheria Public Works - Indian Health Services	- Resources Identified in the Feasibility Study	$400000	Short-Term (contingent on funding)	Yes	Yes
Mitigation Action #7: Implement the spring rehabilitation program via the installation of spring boxes to protect the spring water from contamination (from surface runoff or contact with human and animals) and to provide a point of collection and a place for sedimentation.	Wildfire Drought	- Susanville Indian Rancheria	Natural Resource Protection	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.7 Goal 3, Objective 3.2	- Rancheria Natural Resources Department	- Grant Programs - Bureau of Indian Affairs - EPA Grants	TBD	Ongoing	Yes	Yes
Mitigation Action #8: Retrofit the Herlong Gymnasium to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Multi-Hazard	- Lassen County	Structural Projects	Goal 1, Objective 1.4, 1.7 & 1.10 Goal 5, Objective 5.2	- Local Reuse Authority	- Grant Programs	TBD	Long-Term	No	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #9: Retrofit the school gymnasiums in the City of Susanville (Lassen High School, Diamond View, Meadowview, and McKinley) to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Multi-Hazard	- City of Susanville	Structural Projects	Goal 1, Objective 1.4, 1.7 & 1.10 Goal 5, Objective 5.2	- Susanville School District - Lassen High School District	- Grant Programs	TBD	Long-Term	No	Yes
Mitigation Action #10: Retrofit the Veterans Memorial Building to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Multi-Hazard	- Lassen County	Structural Projects	Goal 1, Objective 1.4, 1.7 & 1.10 Goal 5, Objective 5.2	- Lassen County Public Works	- Grant Programs	TBD	Long-Term	No	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #11: Retrofit the Joaquin Memorial Gymnasium to accommodate emergency shelter (Generator, Emergency Supply and Kitchen expansion). Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	Multi-Hazard	- Susanville Indian Rancheria	Structural Projects	Goal 1, Objective 1.4, 1.7 & 1.10 Goal 5, Objective 5.2	- Rancheria Public Works	- Grant Programs	$100K	Long-Term	No	Yes
Mitigation Action #12: Identify and designate Domestic Animal evacuation centers.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.4 & 1.7 Goal 5, Objective 5.2	- Various responsible agencies and departments depending upon facility location	- Annual Budget	To Be Determined	Short-Term	No	No
Mitigation Action #13: To ensure a continual power supply, install backup generators at essential key facilities (EOC's, Emergency Services Buildings, Shelters, Water Facilities, etc).	Power failure Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.7 & 1.11 Goal 5, Objective 5.3	- Various responsible agencies and departments depending upon facility location	- Grant Programs - Annual Budget	Varies	Long-term	No	Yes

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #14: Add a redundant fuel system for the (primary and secondary) 911 center backup generator to be both diesel and natural gas.	Multi-Hazard	- Lassen County	Emergency Services	Goal 1, Objective 1.7 & 1.11 Goal 5, Objective 5.3	- Lassen County Office of Emergency Services	- Grant Programs - Annual Budget	28,000/ 40-50Kw generator	Medium-Term	No	Yes
Mitigation Action #15: To improve the consistency of emergency communications and facilitate timely response, implement Firenet/Lawnet Lassen Emergency communication equipment upgrades (backup power, additional repeaters, radios, etc.).	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.8 & 1.9 Goal 5, Objective 5.2	- Firenet/Lawnet Lassen Joint Powers Authority	- Grant Programs - Joint Powers Authority Fees	TBD	Long-Term	Yes	Yes
Mitigation Action #16: Purchase snowplows/blowers and Snow CATs to mitigate the hazards associated with severe storm and snow.	Severe Storm	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.7 Goal 5, Objective 5.3	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works - CalTrans	- Annual Budget - Grant Programs	TBD	Long-Term	Yes	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #17: To facilitate storage for emergency response equipment and resources (e.g., salt, sand, heavy equipment) construct or purchase a dry storage facility.	Severe Storm Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 5, Objective 5.3	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	- Annual Budget - Grant Programs	TBD	Long-Term	Yes	Yes
Mitigation Action #18: To mitigate the impacts of severe storms and subsequent flooding, construct levee upgrades to provide lake shore protection along Honey Lake.	Severe Storm Flooding	- Lassen County	Structural Projects	Goal 2, Objective 2.12 Goal 3, Objective 3.2	- Lassen County Public Works - California Department of Fish and Game - Resource Conservation District	- Grant Programs	TBD	Long-Term	Yes	Yes
Mitigation Action #19: To mitigate the impacts of severe storms and subsequent flooding, implement levee upgrades for waterways throughout the County, including Irrigation Canals.	Severe Storm Flooding	- Lassen County - City of Susanville	Structural Projects	Goal 2, Objective 2.12 Goal 3, Objective 3.2	- Lassen County Public Works - City of Susanville Public Works - California Department of Fish and Game - Resource Conservation District	- Grant Programs	TBD	Long-Term	Yes	Yes
Mitigation Action #20: To mitigate the impacts of severe storms and subsequent flooding, implement upgrades to reservoirs/dams to increase storage capacity.	Severe Storm Flooding	- Lassen County	Structural Projects	Goal 2, Objective 2.12 Goal 3, Objective 3.2	- California Division of Dam Safety - California Department of Fish and Game - Resource Conservation District	- Grant Programs	TBD	Long-Term	Yes	Yes

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #21: To reduce the potential for flooding, develop a levee integrity program that includes inspection and maintenance.	Severe Storm Flooding	- Lassen County - City of Susanville	Prevention	Goal 2, Objective 2.12 Goal 3, Objective 3.2	- Lassen County Public Works - City of Susanville Public Works	- Grant Programs	TBD	Long-Term	Yes	Yes
Mitigation Action #22: To mitigate repetitive flood losses, implement the Carol Street Project Flood Prevention Project, which includes constructing a retaining wall and rip rap and/or property acquisition of Carol Street houses.	Flooding Severe Storm	- City of Susanville	Property Protection	Goal 2, Objective 2.3 & 2.12 Goal 3, Objective 3.2	- City of Susanville Public Works - California Department of Fish and Game	- Grant Programs	0.5 Million	Short-Term (contingent on funding)	N	Yes
Mitigation Action #23: Develop a standardized operational area evacuation plan to streamline emergency response efforts.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Prevention	Goal 1, Objective 1.8 & 1.10 Goal 5, Objective 5.2 & 5.4	- Susanville City Police Dept - Lassen County Sheriff - California Highway Patrol - Sierra Depot Police Department	- Staff Time - Grant Programs	TBD	Ongoing	Yes	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #24: Develop and distribute Wildfire public education materials to increase public awareness of wildfire hazards.	Wildfire	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 4, Objective 4.1 & 4.6	- Cal Fire - Bureau of Land Management Fire - US Forest Service Fire - Army Fire Department - Susan River Fire Protection District - Janesville Fire Protection District - Susanville Fire Protection District - Rancheria Public Works	- Staff Time - Grant Programs	TBD	Ongoing	Yes	Yes
Mitigation Action #25: Conduct EOC mock exercises and incident management position training to prepare for emergency response.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 1, Objective 1.12 Goal 5, Objective 5.1, 5.2, & 5.4	- All Emergency Responders	- Staff Time - Grant Programs	TBD	Ongoing	No	No
Mitigation Action #26: Implement City of Susanville Fire Training Center structural upgrades (e.g., installation of propane props, water supply, etc.) to providing training for emergency response, including wildfire and rescue operations.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.12 Goal 5, Objective 5.1	- City of Susanville Fire Protection District	- Grant Programs	TBD	Long-Term	Yes	Yes

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #27: Implement a public notification system (e.g., reverse 911) to increase alert the public to potential emergency situations and hazards.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 1, Objective 1.8 & 1.9 Goal 5, Objective 5.2	- Susanville City Police Dept - Lassen County Sheriff	- Grant Programs	TBD	Short-Term	Yes	Yes
Mitigation Action #28: Evaluate flooding areas and implement drainage improvements to reduce the potential for residential flooding.	Flooding Severe Storm	- Lassen County - City of Susanville - Susanville Indian Rancheria	Property Protection	Goal 1, Objective 1.1 & 1.2 Goal 2, Objective 2.1, 2.2, 2.3 & 2.12	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	- Grant Programs - Annual Budget	Varies	Ongoing	Yes	Yes
Mitigation Action #29: Implement water shortage contingency measures during drought periods to conserve water supply.	Drought	- City of Susanville - Susanville Indian Rancheria	Prevention	Goal 1, Objective 1.6	- City of Susanville Public Works - Racheria Public Works	- Staff Time	TBD	Ongoing	No	No
Mitigation Action #30: Consider developing on-stream or off-stream water storage to store flood water (e.g., detention basin during periods of high flow) to store water for use during drought conditions.	Flooding Drought	- Lassen County - City of Susanville	Structural Projects	Goal 1, Objective 1.4, 1.5 & 1.14	- Lassen County Public Works - City of Susanville Public Works	- Grant Programs	TBD	Long-Term	Yes	Yes

Mitigation Action Identification

Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #31: Develop additional potable water supplies in communities that currently do not have adequate water supply and storage.	Drought	- Lassen County - City of Susanville - Susanville Indian Rancheria	Structural Projects	Goal 1, Objective 1.4, 1.5 & 1.14	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	- Grant Programs - Capital Improvements	TBD	Long-Term	Yes	Yes
Mitigation Action #32: Train First Responders in hazardous materials (HazMat) response field operations and decontamination, including conducting mock exercises.	HazMat Release	- Lassen County - City of Susanville	Personnel Education and Awareness	Goal 1, Objective 1.12 Goal 5, Objective 5.1	- All Emergency Responders - Agricultural Commission (for pesticides)	- Grant Programs - Staff Time	TBD	Ongoing	No	No
Mitigation Action #33: Develop a commodity flow study to determine flow of hazardous materials through the county.	HazMat Release	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 1, Objective 1.1 & 1.2	- Public Safety Department	- Grant Programs	TBD	Long-Term	No	No
Mitigation Action #34: Assess and implement flexible piping joints at above ground storage reservoirs, as appropriate. Also, ensure new reservoirs are designed with seismic flexible piping joints.	Earthquake	- Lassen County - City of Susanville - Susanville Indian Rancheria	Structural Projects	Goal 1, Objective 1.4 & 1.11	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works - Agricultural Commission - Lassen County Public Health Department	- Grant Programs	Varies	Long-Term	Yes	Yes

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #35: Consider evaluating all pipelines (water, sewer, gas) for seismic event reliability and determining a capital improvements schedule, considering materials of constructing and the age of the pipeline.	Earthquake	- Lassen County - City of Susanville - Susanville Indian Rancheria	Prevention	Goal 1, Objective 1.4 & 1.11	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	- Grant Programs - Capital Improvements	Varies	Long-Term	Yes	Yes
Mitigation Action #36: Provide training on the Pandemic Response Plan to prepare for pandemic events.	Pandemic	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 1, Objective 1.12 Goal 5, Objective 5.1	- Lassen County Public Health Department - Lassen Indian Health Center	- Staff Time - Grant Programs	Varies	Ongoing	No	No
Mitigation Action #37: Purchase pandemic equipment and supplies to prepare for pandemic events.	Pandemic	- Lassen County - City of Susanville - Susanville Indian Rancheria	Emergency Services	Goal 5, Objective 5.3	- Lassen County Public Health Department - Lassen Indian Health Center	- Annual Budget - Grant Programs	TBD	Ongoing	No	No
Mitigation Action #38: Conduct terrorism training and awareness courses to prepare for terrorism events.	Terrorism	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 1, Objective 1.12 Goal 5, Objective 5.1	- Law Enforcement agencies	- Staff time - Grant Programs	TBD	Ongoing	No	No

Mitigation Action Identification										
Mitigation Activity	Hazards Mitigated	Jurisdictions	Mitigation Action Category	Corresponding Goals and Objectives	Responsible Agencies/Departments	Resources	Estimated Project Cost	Timeframe	Protects New Buildings	Protects Existing Buildings
Mitigation Action #39: Update the Lassen County, City of Susanville, and Susanville Indian Rancheria websites to include natural hazard preparedness information and posting the final Hazard Mitigation Plan for public education.	Multi-Hazard	- Lassen County - City of Susanville - Susanville Indian Rancheria	Personnel Education and Awareness	Goal 4, Objective 4.1, 4.2, 4.3 & 4.6	- City of Susanville Administration - Lassen County Administration - Tribal Administration	- Staff time	TBD	Ongoing	No	No

4.3 National Flood Insurance Program Compliance

§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

The National Flood Insurance Program (NFIP) is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. The following table illustrates the Lassen County participants in the program:

NFIP Participation							
CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
060092#	Lassen County	Lassen County	02/28/78	09/04/87	11/21/01	09/04/87	No
060093#	Susanville, City Of	Lassen County	02/01/74	06/19/85	06/19/85	06/19/85	No

Flood Recommendations / Repetitive Loss Properties

Recommendations mitigating flood hazards are identified in the "Mitigation Action Identification" table. Specifically, "Mitigation Action #22: To mitigate repetitive flood losses, implement the Carol Street Project Flood Prevention Project, which includes constructing a retaining wall and rip rap and/or property acquisition of Carol Street houses." Is designed to address the only repetitive loss properties within the County at Carol Street in Susanville. In addition to mitigating flood hazards, Lassen County is currently in the process of updating the NFIP maps to indicate revised flooding locations in order to mitigate flooding in the designated areas.

4.4 Prioritization of Mitigation Recommendations

§201.6(c)(3)(iii): [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

A simplified Benefit-Cost Review was applied in order to prioritize the mitigation recommendations for implementation. The priority for implementing mitigation recommendations depends upon the overall cost effectiveness of the recommendation, when taking into account monetary and non-monetary costs and benefits associated with each action. Additionally, the following questions were considered when developing the Benefit-Cost Review:

- How many people will benefit from the action?
- How large an area is impacted?
- How critical are the facilities that benefit from the action?
- Environmentally, does it make sense to do this project for the overall community?

The table on the following pages provides a detailed benefit-cost review for each mitigation recommendation, as well as a relative priority rank (High, Medium, Low).

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #1: Continue the fuels/vegetation management programs to reduce the wildfire hazard throughout County.	• Avoided Building Damage • Avoided Fire Suppression Costs • Reduced Economic Impact (Loss of Jobs in the Logging Industry) • Energy Production • Avoided Air Quality Issues • Avoided Loss of Life • Avoided Environmental Impacts (Natural Resources)	• Capital Cost (Estimated At $500-1000/Acre) • Time Needed to Implement • If Burned In Place, Air Quality and Environmental Impact	High
Mitigation Action #2: Weed abatement is an important factor in both reducing ignitions and the potential for fire to spread. Continue to enforce the weed abatement requirements to mitigate the risk of wildfires in the County.	• Avoided Building and Infrastructure Damage • Avoided Fire Suppression Costs • Avoided Loss of Life • Avoided Environmental Impacts (Natural Resources) • Increased Property Values	• Staff Time to Inspect and Enforce ($60-70,000/Year Based on Combined Agency Enforcement Efforts) • Weed Abatement Equipment (Mowers, Flail Mowers, Weed Spray Equipment)	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #3: Continue to identify areas vulnerable to wildfire due to inadequate water supply for firefighting and implement improvements (e.g., expansion of water supply, storage hydrants, etc.).	• Avoided Building and Infrastructure Damage • Avoided Fire Suppression Costs • Reduced Economic Impact (Loss of Jobs in the Logging Industry) • Avoided Loss of Life • Avoided Environmental Impacts (Natural Resources) • ISO Ratings (Decreased Insurance Ratings) • Benefit for Homeowner (Increased Property Value)	• Capital Improvement Cost for Water System Expansion (Projected to be Millions of Dollars) • Ongoing Maintenance	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #4: Implement the County Service Area #2 in Johnstonville project create backbone for fire protection in community, as identified in the Lassen County Feasibility Study.	• Avoided Building and Infrastructure Damage • Avoided Fire Suppression Costs • Reduced Economic Impact (Loss of Jobs in the Logging Industry) • Avoided Loss Of Life • Avoided Environmental Impacts (Natural Resources) • ISO Ratings (Decreased Insurance Ratings) • Benefit For Homeowner (Increased Property Value)	• Backbone Estimated at 1.0 Million • Complete Project 5million • Maintenance Costs	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #5: Implement the Cady Springs Booster Station and Main line protection project, as identified in the City of Susanville Feasibility Study.	• Avoided Building and Infrastructure Damage • Avoided Fire Suppression Costs • Reduced Economic Impact (Loss of Jobs in the Logging Industry) • Avoided Loss of Life • Avoided Environmental Impacts (Natural Resources) • ISO Ratings (Decreased Insurance Ratings) • Benefit for Homeowner (Increased Property Value)	• Estimated at 1.9million • Maintenance Costs	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #6: To increase firefighting capabilities, increase the water storage capacity by constructing a 200,000 gallon storage tank.	• Avoided Building And Infrastructure Damage • Avoided Fire Suppression Costs (Not Limited To The Rancheria) • Avoided Loss Of Life • Avoided Environmental Impacts (Natural Resources) • ISO Ratings (Decreased Insurance Ratings) • Benefit For Homeowner (Increased Property Value) • Increased Water System Reliability	• Estimated at $400,000 • Ongoing Maintenance	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #7: Implement the spring rehabilitation program via the installation of spring boxes to protect the spring water from contamination (from surface runoff or contact with human and animals) and to provide a point of collection and a place for sedimentation.	• Improved Water Quality • Increased Water Availability	• Capital Costs Estimated at $10,000 • Ongoing Maintenance	Low
Mitigation Action #8: Retrofit the Herlong Gymnasium to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	• Reduced Loss of Life • Increased Response Capacity • Avoided Emergency Response Costs • Availability of Supplies During the Emergency	• Capital Costs • Service Costs • Replacement Costs for Perishable Food Items	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #9: Retrofit the school gymnasiums in the City of Susanville (Lassen High School, Diamond View, Meadowview, and McKinley) to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	• Reduced Loss of Life • Increased Response Capacity • Avoided Emergency Response Costs • Availability of Supplies During the Emergency	• Capital Costs • Service Costs • Replacement Costs for Perishable Food Items	High
Mitigation Action #10: Retrofit the Veterans Memorial Building to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	• Reduced Loss of Life • Increased Response Capacity • Avoided Emergency Response Costs • Availability of Supplies During the Emergency	• Capital Costs • Service Costs • Replacement Costs for Perishable Food Items	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #11: Retrofit the Joaquin Memorial Gymnasium to accommodate emergency shelter (Generator, Emergency Supply and Kitchen expansion). Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	• Reduced Loss of Life • Increased Response Capacity • Avoided Emergency Response Costs • Availability of Supplies During the Emergency	• Capital Costs • Service Costs • Replacement Costs for Perishable Food Items	Medium
Mitigation Action #12: Identify and designate Domestic Animal evacuation centers.	• Protection of Large Animals • Increased Public Safety • Improved Evacuation Effectiveness	• Capital Cost s • Maintenance Costs • Use Agreements	Medium
Mitigation Action #13: To ensure a continual power supply, install backup generators at essential key facilities (EOC's, Emergency Services Buildings, Shelters, Water Facilities, etc).	• Reduced Loss of Life • Increased Response Capability • Avoided Emergency Response Cost	• Capital Costs Estimated at $28,000/ 40-50Kw Generator • Service Costs	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #14: Add a redundant fuel system for the (primary and secondary) 911 center backup generator to be both diesel and natural gas.	• Reduced Loss of Life • Increased Response Capability • Avoided Emergency Response Costs	• Capital Costs Estimated at $28,000/ 40-50Kw Generator • Service Costs	High
Mitigation Action #15: To improve the consistency of emergency communications and facilitate timely response, implement Firenet/Lawnet Lassen Emergency communication equipment upgrades (backup power, additional repeaters, radios, etc.).	• Increased Communication and Interoperability Capabilities • Improved Emergency Response Capabilities	• Capital Cost Estimated at $20-40k/Repeater Equipment Purchase • Environmental Impact Report Development • Land Lease Agreements • Ongoing Maintenance	Medium
Mitigation Action #16: Purchase snowplows/blowers and Snow CATs to mitigate the hazards associated with severe storm and snow.	• Avoided Deaths/Injuries • Avoided Property Damages (Ie, Vehicle Collision) • Improved Emergency Response Time	• Capital Costs Estimated at $157,000/Snowplow • Capital Costs Estimated at $200,00/Snow CAT • Maintenance and Fuel Costs	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #17: To facilitate storage for emergency response equipment and resources (e.g., salt, sand, heavy equipment) construct or purchase a dry storage facility.	• Increased Equipment Access • Increased Useful Life of Equipment • Improved Emergency Response Time • Decreased Maintenance Costs • Centralized Emergency Response Equipment	• Capital Costs Estimated at $150-200/Square Foot	High
Mitigation Action #18: To mitigate the impacts of severe storms and subsequent flooding, construct levee upgrades to provide lake shore protection along Honey Lake.	• Agricultural Land Preservation and Wildlife Preservation. (Reduced Low Quality Water from the Lake) • Avoided Rehabilitation Costs.	• Capital Costs • Maintenance	Low

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #19: To mitigate the impacts of severe storms and subsequent flooding, implement levee upgrades for waterways throughout the County, including Irrigation Canals.	• Avoided Property Damage • Avoided Loss of Life • Reduced Emergency Service Demand • Avoided Road/Rail Closures (Disruptions)	• Capital Costs • Maintenance	High
Mitigation Action #20: To mitigate the impacts of severe storms and subsequent flooding, implement upgrades to reservoirs/dams to increase storage capacity.	• Avoided Property Damage • Avoided Loss of Life • Reduced Emergency Service Demand • Avoided Road/Rail Closures (Disruptions) • NFIP Compliance	• Capital • Maintenance	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #21: To reduce the potential for flooding, develop a levee integrity program that includes inspection and maintenance.	• Avoided Property Damage • Avoided Loss of Life • Reduce Emergency Service Demand • Avoided Road/Rail Closures (Disruptions) • NFIP Compliance	• Planning and Staff Time • Ongoing Maintenance	High
Mitigation Action #22: To mitigate repetitive flood losses, implement the Carol Street Project Flood Prevention Project, which includes constructing a retaining wall and rip rap and/or property acquisition of Carol Street houses.	• Avoided Property Damage • Avoided Loss of Life • Reduce Emergency Service Demand • Avoided Road Closures (Disruptions) • Reduced Flood Insurance Costs • NFIP Compliance	• Capital Costs • Maintenance	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #23: Develop a standardized operational area evacuation plan to streamline emergency response efforts.	• Increased Evacuation Effectiveness • Reduced Loss of Life • Increased Emergency Response Effectiveness	• Planning And Implementation Costs • Training	High
Mitigation Action #24: Develop and distribute Wildfire public education materials to increase public awareness of wildfire hazards.	• Increased Public Awareness	• Materials And Staff Time	Low
Mitigation Action #25: Conduct EOC mock exercises and incident management position training to prepare for emergency response.	• Increased Emergency Response Capabilities And Competency • Identification of Emergency Response Gaps • Increased Interoperability • Avoided Loss of Life	• Training • Implementation • Personnel Costs	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #26: Implement City of Susanville Fire Training Center structural upgrades (e.g., installation of propane props, water supply, etc.) to providing training for emergency response, including wildfire and rescue operations.	• Increased Emergency Response Capabilities and Competency • Identify Emergency Response Gaps • Increased Interoperability • Avoided Loss of Life	• Capital Costs	Medium
Mitigation Action #27: Implement a public notification system (e.g., reverse 911) to increase alert the public to potential emergency situations and hazards.	• Increased Evacuation Effectiveness • Reduced Loss of Life • Increased Emergency Response Effectiveness • Increased Public Awareness	• Capital Costs • Planning And Implementation Costs • Training	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #28: Evaluate flooding areas and implement drainage improvements to reduce the potential for residential flooding.	• Avoided Property Damage • Reduced Emergency Service Demand • Avoided Road Closures (Disruptions) • Reduced Flood Insurance Costs • NFIP Compliance	• Capital Costs • Maintenance	Low
Mitigation Action #29: Implement water shortage contingency measures during drought periods to conserve water supply.	• Public Health Benefits • Conservation of Water Supply	• Advertisement Costs • Enforcement	Low
Mitigation Action #30: Consider developing on-stream or off-stream water storage to store flood water (e.g., detention basin during periods of high flow) to store water for use during drought conditions.	• Avoided Property Damage • Reduced Emergency Service Demand • Public Health Benefits • Additional Water Supply	• Capital Costs • Maintenance • Environmental Impact Report Development • Permitting	Medium

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #31: Develop additional potable water supplies in communities that currently do not have adequate water supply and storage.	• Public Health Benefits • Additional Water Supply	• Capital Costs • Maintenance	High
Mitigation Action #32: Train First Responders in hazardous materials (HazMat) response field operations and decontamination, including conducting mock exercises.	• Increased Emergency Response Capabilities and Competency • Identification of Emergency Response Gaps • Increased Interoperability • Avoided Loss of Life • Avoided Environmental Impacts	• Training • Implementation • Personnel Costs	Medium
Mitigation Action #33: Develop a commodity flow study to determine flow of hazardous materials through the county.	• Increased Emergency Response Knowledge	• Planning/Study Costs	Low

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #34: Assess and implement flexible piping joints at above ground storage reservoirs, as appropriate. Also, ensure new reservoirs are designed with seismic flexible piping joints.	• Avoided Loss of Life • Avoided Loss of Utility Services • Avoided Property Damage • Avoided Emergency Response	• Planning/Study Costs • Capital Cost Estimated at $100,000/Retrofit, Including Construction	Medium
Mitigation Action #35: Consider evaluating all pipelines (water, sewer, gas) for seismic event reliability and determining a capital improvements schedule, considering materials of constructing and the age of the pipeline.	• Avoided Loss of Life • Avoided Loss of Utility Services • Avoided Property Damage • Avoided Emergency Response	• Planning/Study Costs • Capital Cost (Estimated at Millions of Dollars)	High
Mitigation Action #36: Provide training on the Pandemic Response Plan to prepare for pandemic events.	• Increased Public and Responder Awareness • Avoided Illness and Loss Of Life • Reduced Emergency Response Requirements	• Training	High

Mitigation Action Prioritization: Benefit-Cost Review

Mitigation Project	Benefit (Pros)	Costs (Cons)	Priority
Mitigation Action #37: Purchase pandemic equipment and supplies to prepare for pandemic events.	• Avoided Illness and Loss of Life • Reduced Emergency Response Requirements • Increased Ability to Respond (Mitigate Effects)	• Equipment	High
Mitigation Action #38: Conduct terrorism training and awareness courses to prepare for terrorism events.	• Increased Public and Responder Awareness • Avoided Loss of Life	• Training • Personnel Time	Low
Mitigation Action #39: Update the Lassen County, City of Susanville, and Susanville Indian Rancheria websites to include natural hazard preparedness information and posting the final Hazard Mitigation Plan for public education.	• Increased Public Awareness	• Staff Time	High

4.5 Implementation Strategy

Recommendations classified as high-priority mitigation actions provide the most significant vulnerability reduction, as related to cost and probability, and are typically implemented before lower ranked improvements. Lassen County, the City of Susanville, or the Susanville Indian Rancheria, however, may find that under some circumstances that a recommendation classified as low-priority mitigation actions may need to be implemented before a higher priority recommendation. The priority levels associated with each improvement are indicated on the “Mitigation Action Prioritization: Benefit-Cost Review” table.

4.6 Capability Assessment

4.6.1 City (Human and Technical) Resources and Funding Sources

To implement the recommendations precipitating from the Hazard Mitigation Plan, Lassen County, the City of Susanville, and the Susanville Indian Rancheria generally rely on the resources available within each respective jurisdiction. These resources include personnel (e.g., management, first responders, engineers, public works operators, etc.) and general and capital improvements funds. In addition, Lassen County, the City of Susanville, and the Susanville Indian Rancheria may apply for funding from the following federal and state sources.

4.6.2 Federal Funding Sources

<u>Pre-Disaster Mitigation (PDM) Grant</u> – PDM is administered in California by the Office of Emergency Services (OES), and was created when the Disaster Mitigation Act of 2000 amended the Stafford Act to provide a funding mechanism that is not dependent on a presidential disaster declaration.

<u>Hazard Mitigation Grant Program (HMGP)</u> – HMGP is authorized under Section 404 of the Stafford Act. The program provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. These funds are only available in states following a presidential disaster declaration. Eligible applicants include state and local governments, Native American tribes or other tribal organizations, and certain private non-profit organizations. Eligible projects must be proven to be cost-effective through a benefit – cost analysis.

<u>Fire Protection & Safety (FP&S) Grants</u> – The FP&S Grant Program is administered by FEMA and supports projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations, firefighter safety and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire prevention and public safety education campaigns, juvenile fire setter interventions, media campaigns, and arson prevention and awareness programs.

Flood Mitigation Assistance (FMA) Grant Program – FEMA provides funding to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program.

Urban Area Security Initiative (UASI) Grant Program – The UASI is designed to set a strategic direction for the enhancement of regional response capability and capacity. Through Federal grant funding, UASI is tasked to reduce area vulnerability by strengthening the cycle of response and by ensuring that potential targets are identified, assessed and protected.

Hazardous Materials Emergency Planning (HMEP) Grant Program – The HMEP Grant Program is administered by the US Department of Transportation Pipeline and Hazardous Materials Safety Administration and provides financial and technical assistance as well as national direction and guidance to enhance State, Territorial, Tribal, and local hazardous materials emergency planning and training.

Emergency Operations Center (EOC) Grant Program – Administered by FEMA and is intended to improve emergency management and preparedness capabilities by supporting flexible, sustainable, secure, and interoperable EOCs with a focus on addressing identified deficiencies and needs.

Emergency Management Performance Grant (EMPG) Program - States have the opportunity to use EMPG funds to further strengthen their ability to support emergency management mission areas while simultaneously addressing issues of national concern as identified in the National Priorities of the National Preparedness Guidelines.

4.6.3 State Funding Sources

Fire Safe California Grants Clearinghouse – Various grant opportunities lay within this grant program to improve California's community wildfire preparedness. The California Fire Safe Council (FSC) in cooperation with its fellow member of the California Fire Alliance accomplishes its mission, to preserve and enhance California's manmade and natural resources, through public education programs and by funding community fire safety projects.

4.6.4 Municipal Code & Ordinances

The Lassen County, City of Susanville, and Susanville Indian Rancheria Municipal Codes and Ordinances includes the following elements to support ongoing mitigation activities:

Lassen County

- Lassen County Code, Title 7: Health and Sanitation, Chapter 7.04 – Contagious Diseases
- Lassen County Code, Title 9: Public Pease, Safety, and Morals, Chapter 9.16 – Fire Hazards
- Lassen County Code, Title 12: Buildings and Construction, Article I – Building Code, Chapter 12.19 – Snow Load Design Standards
- Lassen County Code, Title 12: Buildings and Construction, Article I – Building Code, Chapter 12.26 – Flood Damage Prevention
- Lassen County Code, Title 12: Buildings and Construction, Article III – Storage of Hazardous Materials

City of Susanville

- Susanville Municipal Code, Title 8: Health and Safety, Chapter 8.12 – Open Burning
- Susanville Municipal Code, Title 8: Health and Safety, Chapter 8.20 – Standards For Fire Protection Facilities And Water Flow
- Susanville Municipal Code, Title 8: Health and Safety, Chapter 8.28 – Weed and Rubbish Abatement
- Susanville Municipal Code, Title 15: Buildings and Construction, Chapter 15.24 – International Fire Code Adopted
- Susanville Municipal Code, Title 15: Buildings and Construction, Chapter 15.40 – Floodplain Management

Susanville Indian Rancheria

- Tribal Environmental Policy Ordinance No. 2000-003

4.6.5 Ongoing Mitigation Projects and Programs

The Lassen County, City of Susanville, and Susanville Indian Rancheria has implemented several mitigation measures to reduce the impacts of natural hazard events. These mitigation actions are detailed below:

- **Vegetation Management** – Lassen County, the City of Susanville, and the Susanville Indian Rancheria conduct vegetation management (e.g., vegetation removal, buring) to mitigate potential wildfire hazards.
- **Weed Abatement** – In order to minimize the potential for wildfires, Lassen County, the City of Susanville and the Susanville Indian Rancheria implement weed abatement programs.
- **Evacuation Plan** – Lassen County is currently developing an Evacuation Plan to systematically evacuate citizens from hazard areas.
- **Geographic Information Systems (GIS)** - Lassen County, the City of Susanville and the Susanville Indian Rancheria have developed GIS databases to map and evaluate natural hazards (e.g., earthquake, flooding, etc.).
- **Emergency Equipment Inventory** – Lassen County, the City of Susanville and the Susanville Indian Rancheria maintain emergency equipment and resources to enable a timely response and repair of assets to mitigate the overall impact of hazards on operations.
- **Back-up Power Generation** – Lassen County, the City of Susanville and the Susanville Indian Rancheria maintain appropriate back-up power generation at most critical facilities, including County and City Emergency Operations Centers and the Susanville Indian Rancheria Casino.
- **Emergency Response Plan** – Lassen County, the City of Susanville and the Susanville Indian Rancheria maintain current emergency response plans to describe and prepare the response to hazard events.
- **Emergency Preparedness Training** – Lassen County, the City of Susanville and the Susanville Indian Rancheria routinely conduct HazMat, NIMS, and SEMS training for employees, in addition to conducting exercises to simulate the response to a hazard event.
- **Public Outreach** – Lassen County, the City of Susanville and the Susanville Indian Rancheria maintain Public Outreach through various activities and continue to improve and enhance the program.

Chapter 5: Plan Maintenance

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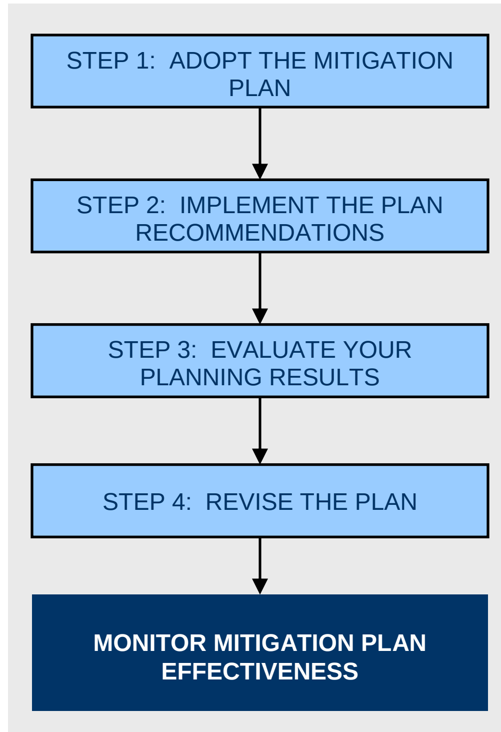
5.1 Mitigation Progress Monitoring

The Mitigation Strategy report in the Hazard Mitigation Plan identifies mitigation actions that have been prioritized based on the loss estimates and the probability of each hazard, which will typically be implemented according to the priority rank. To thoroughly track hazard mitigation status, Lassen County, the City of Susanville, and the Susanville Indian Rancheria must continuously monitor and document the progress of the implementation of the mitigation actions. Though mitigation actions may be delegated to different departments within the County, the Susanville Fire Department will have the responsibility of monitoring overall progress.



§201.6(c)(4)(i): [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.

To facilitate this monitoring process, Table 5-1: "HMP Action Item Implementation" has been developed to provide a mechanism for monitoring the overall implementation progress. The table is designed to monitor mitigation actions according to project managers, project status, and project milestones.

5.2 Planning Mechanisms

§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.

5.2.1 Local Planning Mechanisms Available to Incorporate Mitigation Requirements

The Lassen County, the City of Susanville, and the Susanville Indian Rancheria utilize the following local planning mechanisms for incorporating the mitigation requirements of the mitigation plan:

Websites – The Lassen County Multi-Jurisdictional Hazard Mitigation Plan will be posted on the Lassen County, City of Susanville, and Susanville Indian Rancheria websites to enable citizens to review and provide feedback regarding mitigation objectives and strategies.

Lassen County Board of Supervisors – The Lassen County Board of Supervisors is responsible for approving projects and programs on a County-wide level. By providing mitigation planning concepts to the Board of Supervisors, mitigation actions and concepts will be incorporated into relevant planning efforts.

Susanville City Council – The Susanville City Council is responsible for approving projects and programs on a City-wide level. By providing mitigation planning concepts to the City Council, mitigation actions and concepts will be incorporated into relevant planning efforts.

Tribal Business Council – The Tribal Business Council is the governing body for the Susanville Indian Rancheria and provides oversight for projects and programs implemented throughout the Rancheria. By providing mitigation planning concepts to the Tribal Business Council, mitigation actions and concepts will be incorporated into relevant planning efforts.

Natural Resources Committee – The Susanville Indian Rancheria Natural Resources Committee is responsible for implementing environmental mitigation actions.

Local Emergency Planning Committee Region 3 – Both Lassen County and the City of Susanville are active participants in LEPC Region 3. Through this participation the City and the County can incorporate hazardous materials mitigation action items.

Lassen County Transportation Commission – The Lassen County Transportation Commission provides a mechanism to incorporate mitigation actions relating to transportation.

Lassen County Planning Commission – The Lassen County Planning Commission is generally involved in land use, general planning, developments, and residential projects, thus mitigation can be incorporated into potential projects.

City of Susanville Planning Commission – The City of Susanville Planning Commission is generally involved in land use, general planning, developments, and residential projects, thus mitigation can be incorporated into potential projects.

5.2.2 Process to Incorporate the Mitigation Strategy into Other Planning Mechanisms

The Lassen County, the City of Susanville, and the Susanville Indian Rancheria utilize the following processes to incorporate the mitigation strategy and risk assessment into planning documents:

General Planning – Lassen County, the City of Susanville, and the Susanville Indian Rancheria are responsible for updating and incorporating mitigation actions and concepts into the following plans:

- Susanville Indian Rancheria Master Land Use Plan
- City of Susanville General Plan
- Lassen County County General Plan

Capital Improvements Plan – Lassen County, the City of Susanville, and the Susanville Indian Rancheria each maintain a Capital Improvements Plans (CIP) with projects that are budgeted for at least a five year period. Engineering mitigation projects are included within the Capital Improvements Plan. Additionally, the projects already included within the Capital Improvements Plan are reviewed for mitigation improvements (e.g., areas prone to flooding are configured with mitigation elements, new reservoirs are reviewed to ensure they configured with seismic flexible joints, current seismic design criteria is applied to pipeline construction, facility locations are reviewed for special hazards, etc.).

5.3 Periodic Assessment Requirements

§201.6(c)(4)(i): [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.

Planning is an ongoing process, and as such, the Hazard Mitigation Plan should be treated as a living document that must grow and adapt in order to keep pace with the County's changes. An annual assessment should be completed to document that changes in the bases for the site hazards (e.g., updated FIRM maps, contemporary seismic studies, etc.) or the installation and purchase of new equipment (e.g., back-up generators, emergency response equipment, etc.), do not have any effect on County hazard vulnerabilities that would impact the conclusions or actions associated with the Hazard Mitigation Plan. Prior to the fifth year of the revision cycle, these annual observations should be reviewed to determine what changes should be implemented in the required Hazard Mitigation Plan Update. The results of the annual evaluations should be folded back into each phase of the planning process and should yield decisions on how to update each section of the plan.

The Susanville Fire Department has the responsibility of implementing these annual and five-year requirements. In addition to these periodic requirements, any significant modification to the Lassen County, City of Susanville, or Susanville Indian Rancheria facilities should be considered with respect to a possible impact on the Hazard Mitigation Plan.

5.4 Update Requirements

§201.6(c)(4)(i): [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.

§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 Emergency Management and Assistance regulations (44 CFR Part 201) state that it is the responsibility of local agencies (i.e., Lassen County, City of Susanville, Susanville Indian Rancheria) to "at a minimum, review and, if necessary, update the local mitigation plan every five years from date of plan approval to continue program eligibility". The evaluation procedures listed below will provide insight into the major changes that need to be included in the five year update and resubmission to FEMA:

- Annual Hazard Mitigation Plan review with respect to changes in hazard vulnerability (e.g., additional hazards identified, natural hazard events, etc.)
- Annual Hazard Mitigation Plan review with respect to development of new facilities
- Five year comprehensive update to address the findings of the annual reviews
- Re-submittal of the updated Hazard Mitigation Plan to CalEMA/FEMA

Additionally, the risk assessment portion of the plan will be reviewed to determine if the information should be updated or modified. Each jurisdiction responsible for the various implementation actions will report on:

- Status of their projects
- Implementation processes
- Any difficulties encountered
- How coordination efforts are proceeding
- Which strategies should be revised

When updating the plan, the County, City of Susanville, and Susanville Indian Rancheria will solicit public participation from Steering Committee participants to discuss any issues that need to be addressed in the Hazard Mitigation Plan update. The public participation will be solicited through public notices or advertised in the local newspaper. Additionally, Lassen County, the City of Susanville, and the Susanville Indian Rancheria will post revisions and meeting schedules on the Hazard Mitigation webpage.

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_1	Continue the fuels/vegetation management programs to reduce the wildfire hazard throughout County.	- Cal Fire - Bureau of Land Management Fire - US Forest Service Fire - Army Fire Department - Susan River Fire Protection District - Janesville Fire Protection District - Susanville Fire Protection District - Rancheria Public Works	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_2	Weed abatement is an important factor in both reducing ignitions and the potential for fire to spread. Continue to enforce the weed abatement requirements to mitigate the risk of wildfires in the County.	- Lassen County Agricultural Commission - Big Valley Pest Abatement - Bureau of Land Management - Lassen County SWAT - Rancheria Natural Resource Department - Susanville Fire Protection District - Susanville Parks and Recreation - CalTrans - City and County Public Works - United States Fire Service - California Dept of Fish and Game	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_3	Continue to identify areas vulnerable to wildfire due to inadequate water supply for firefighting and implement improvements (e.g., expansion of water supply, storage hydrants, etc.).	- City of Susanville Public Works - Rancheria Public Works - Community Service Districts (Leavitt Lake, Westwood, Adin, Clear Creek) - Herlong Public Utility District - County Service Area #1 and #2	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_4	Implement the County Service Area #2 in Johnstonville project create backbone for fire protection in community, as identified in the Lassen County Feasibility Study.	- County Service Area	Short-term (contingent on funding)	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_5	Implement the Cady Springs Booster Station and Main line protection project, as identified in the City of Susanville Feasibility Study.	- City of Susanville Public Works	Short-term (contingent on funding)	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_6	To increase firefighting capabilities, increase the water storage capacity by constructing a 200,000 gallon storage tank.	- Rancheria Public Works - Indian Health Services	Short-term (contingent on funding)	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_7	Implement the spring rehabilitation program via the installation of spring boxes to protect the spring water from contamination (from surface runoff or contact with human and animals) and to provide a point of collection and a place for sedimentation.	- Rancheria Natural Resources Department	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_8	Retrofit the Herlong Gymnasium to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	- Local Reuse Authority	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_9	Retrofit the school gymnasiums in the City of Susanville (Lassen High School, Diamond View, Meadowview, and McKinley) to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	- Susanville School District - Lassen High School District	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_10	Retrofit the Veterans Memorial Building to accommodate emergency shelter. Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	- Lassen County Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_11	Retrofit the Joaquin Memorial Gymnasium to accommodate emergency shelter (Generator, Emergency Supply and Kitchen expansion). Also, continue to identify and maintain adequate level of emergency inventory materials including food, blankets, etc.	- Rancheria Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_12	Identify and designate Domestic Animal evacuation centers.	- Various responsible agencies and departments depending upon facility location	Short-Term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_13	To ensure a continual power supply, install backup generators at essential key facilities (EOC's, Emergency Services Buildings, Shelters, Water Facilities, etc).	- Various responsible agencies and departments depending upon facility location	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_14	Add a redundant fuel system for the (primary and secondary) 911 center backup generator to be both diesel and natural gas.	- Lassen County Office of Emergency Services	Medium-Term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_15	To improve the consistency of emergency communications and facilitate timely response, implement Firenet/Lawnet Lassen Emergency communication equipment upgrades (backup power, additional repeaters, radios, etc.).	- Firenet/Lawnet Lassen Joint Powers Authority	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_16	Purchase snowplows/blowers and Snow CATs to mitigate the hazards associated with severe storm and snow.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works - CalTrans	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_17	To facilitate storage for emergency response equipment and resources (e.g., salt, sand, heavy equipment) construct or purchase a dry storage facility.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_18	To mitigate the impacts of severe storms and subsequent flooding, construct levee upgrades to provide lake shore protection along Honey Lake.	- Lassen County Public Works - California Department of Fish and Game - Resource Conservation District	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_19	To mitigate the impacts of severe storms and subsequent flooding, implement levee upgrades for waterways throughout the County, including Irrigation Canals.	- Lassen County Public Works - City of Susanville Public Works - California Department of Fish and Game - Resource Conservation District	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_20	To mitigate the impacts of severe storms and subsequent flooding, implement upgrades to reservoirs/dams to increase storage capacity.	- California Division of Dam Safety - California Department of Fish and Game - Resource Conservation District	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_21	To reduce the potential for flooding, develop a levee integrity program that includes inspection and maintenance.	- Lassen County Public Works - City of Susanville Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_22	To mitigate repetitive flood losses, implement the Carol Street Project Flood Prevention Project, which includes constructing a retaining wall and rip rap and/or property acquisition of Carol Street houses.	- City of Susanville Public Works - California Department of Fish and Game	Short-term (contingent on funding)	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_23	Develop a standardized operational area evacuation plan to streamline emergency response efforts.	- Susanville City Police Dept - Lassen County Sheriff - California Highway Patrol - Sierra Depot Police Department	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_24	Develop and distribute Wildfire public education materials to increase public awareness of wildfire hazards.	- Cal Fire - Bureau of Land Management Fire - US Forest Service Fire - Army Fire Department - Susan River Fire Protection District - Janesville Fire Protection District - Susanville Fire Protection District - Rancheria Public Works	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_25	Conduct EOC mock exercises and incident management position training to prepare for emergency response.	- All Emergency Responders	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_26	Implement City of Susanville Fire Training Center structural upgrades (e.g., installation of propane props, water supply, etc.) to providing training for emergency response, including wildfire and rescue operations.	- City of Susanville Fire Protection District	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_27	Implement a public notification system (e.g., reverse 911) to increase alert the public to potential emergency situations and hazards.	- Susanville City Police Dept - Lassen County Sheriff	Short-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_28	Evaluate flooding areas and implement drainage improvements to reduce the potential for residential flooding.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_29	Implement water shortage contingency measures during drought periods to conserve water supply.	- City of Susanville Public Works - Racheria Public Works	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_30	Consider developing on-stream or off-stream water storage to store flood water (e.g., detention basin during periods of high flow) to store water for use during drought conditions.	- Lassen County Public Works - City of Susanville Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_31	Develop additional potable water supplies in communities that currently do not have adequate water supply and storage.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_32	Train First Responders in hazardous materials (HazMat) response field operations and decontamination, including conducting mock exercises.	- All Emergency Responders - Agricultural Commission (for pesticides)	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_33	Develop a commodity flow study to determine flow of hazardous materials through the county.	- Public Safety Department	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_34	Assess and implement flexible piping joints at above ground storage reservoirs, as appropriate. Also, ensure new reservoirs are designed with seismic flexible piping joints.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works - Agricultural Commission - Lassen County Public Health Department	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_35	Consider evaluating all pipelines (water, sewer, gas) for seismic event reliability and determining a capital improvements schedule, considering materials of constructing and the age of the pipeline.	- Lassen County Public Works - City of Susanville Public Works - Racheria Public Works	Long-term	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_36	Provide training on the Pandemic Response Plan to prepare for pandemic events.	- Lassen County Public Health Department - Lassen Indian Health Center	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_37	Purchase pandemic equipment and supplies to prepare for pandemic events.	- Lassen County Public Health Department - Lassen Indian Health Center	Ongoing	Open	

Table 5-1: Action Item Implementation

Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_38	Conduct terrorism training and awareness courses to prepare for terrorism events.	- Law Enforcement agencies	Ongoing	Open	

Table 5-1: Action Item Implementation					
Action ID	Recommendation Description	Responsible Department	Implementation Timeframe	Status	Details/Status Summary
2009_39	Update the Lassen County, City of Susanville, and Susanville Indian Rancheria websites to include natural hazard preparedness information and posting the final Hazard Mitigation Plan for public education.	- City of Susanville Administration - Lassen County Administration - Tribal Administration	Ongoing	Open	

APPENDIX A: GLOSSARY

Active fault - For implementation of Alquist-Priolo Earthquake Fault Zoning Act (APEFZA) requirements, an active fault is one that shows evidence of, or is suspected of having experienced surface displacement within the last 11,000 years. APEFZA classification is designed for land use management of surface rupture hazards. A more general definition (National Academy of Science, 1988), states "a fault that on the basis of historical, seismological, or geological evidence has the finite probability of producing an earthquake" (see potentially active fault).

Aftershocks - Minor earthquakes following a greater one and originating at or near the same place.

Asset - Any man-made or natural feature that has value, including, but not limited to people, buildings, infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

A zone - Under the National Flood Insurance Program, area subject to inundation by the 100-year flood where wave action does not occur or where waves are less than 3 feet high, designated Zone A, AE, A1-A30, A0, AH, or AR on a Flood Insurance Rate Map (FIRM).

Base flood - Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.

Bedrock - The solid rock that underlies loose material, such as soil, sand, clay, or gravel.

Contour - A line of equal ground elevation on a topographic (contour) map.

Critical facility - Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.

Debris - (Seismic) The scattered remains of something broken or destroyed; ruins; rubble; fragments. (Flooding, Coastal) Solid objects or masses carried by or floating on the surface of moving water.

Debris flow - A saturated, rapidly moving saturated earth flow with 50 percent rock fragments coarser than 2 mm in size which can occur on natural and graded slopes.

Duration - How long a hazard event lasts.

Earthquake - Vibratory motion propagating within the Earth or along its surface caused by the abrupt release of strain from elastically deformed rock by displacement along a fault.

Epicenter - The point at the Earth's surface directly above where an earthquake originated.

Erosion - Under the National Flood Insurance Program, the process of the gradual wearing away of landmasses. In general, erosion involves the detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.

Essential facility - Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.

Extent - The size of an area affected by a hazard or hazard event.

Fault - A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.

Fault slip rate - The average long-term movement of a fault (measured in cm/year or mm/year) as determined from geologic evidence.

Federal Emergency Management Agency (FEMA) - Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.

Flash flood - A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Flood - A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Floodplain - Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.

Frequency - A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Geographic Information Systems (GIS) - A computer software application that relates physical features on the Earth to a database to be used for mapping and analysis.

Ground motion - The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions.

Ground rupture - Displacement of the earth's surface as a result of fault movement associated with an earthquake.

Hailstorm – Storm associated with spherical balls of ice. Hail is a product of thunderstorms or intense showers. It is generally white and translucent, consisting of liquid or snow particles encased with layers of ice. Hail is formed within the higher reaches of a well-developed thunderstorm. When hailstones become too heavy to be caught in an updraft back into the clouds of the thunderstorm (hailstones can be caught in numerous updrafts adding a coating of ice to the original frozen droplet of rain each time), they fall as hail and a hailstorm ensues.

Hazard - A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.

Hazard event - A specific occurrence of a particular type of hazard.

Hazard identification - The process of identifying hazards that threaten an area.

Hazard mitigation - Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.

Hazard Mitigation Grant Program (HMGP) – Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.

Hazard Mitigation Plan – A collaborative document in which hazards affecting the community are identified, vulnerability to hazards assessed, and consensus reached on how to minimize or eliminate the effects of these hazards.

Hazard profile - A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazardous Material Facilities – Facilities housing industrial and hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

HAZUS (Hazards U.S.) - A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.

Hurricane - An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Hydrology - The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.

Infrastructure - Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers and regional dams.

Landslide - A general term covering a wide variety of mass-movement landforms and processes involving the downslope transport, under gravitational influence, of soil and rock material en masse.

Liquefaction - Changing of soils (unconsolidated alluvium) from a solid state to weaker state unable to support structures; where the material behaves similar to a liquid as a consequence of earthquake shaking. The transformation of cohesionless soils from a solid or liquid state as a result of increased pore pressure and reduced effective stress.

Magnitude - A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.

Mitigation plan - A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.

Nor'easter - An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.

Peak Ground Acceleration (PGA) - The greatest amplitude of acceleration measured for a single frequency on an earthquake accelerogram. The maximum horizontal ground motion generated by an earthquake. The measure of this motion is the acceleration of gravity (equal to 32 feet per second squared, or 980 centimeter per second squared), and generally expressed as a percentage of gravity.

Potentially active fault - A fault showing evidence of movement within the last 1.6 million years (750,000 years according to the U.S. Geological Survey) but before about 11,000 years ago, and that is capable of generating damaging earthquakes.

Probability - A statistical measure of the likelihood that a hazard event will occur.

Replacement value - The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

Retrofit - Any change made to an existing structure to reduce or eliminate damage to that structure from flooding, erosion, high winds, earthquakes, or other hazards

Richter scale - A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935. Seismologists no longer use this magnitude scale because of limitations in how it measures large earthquakes, and prefer instead to use moment magnitude as a measure of the energy released during an earthquake.

Risk - The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Seismicity - Describes the likelihood of an area being subject to earthquakes.

Tectonic plate - Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.

Topographic - Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.

Tornado - A violently rotating column of air extending from a thunderstorm to the ground.

Tsunami - Great sea wave produced by a submarine earthquake, landslide, or volcanic eruption.

Vulnerability - Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.

Vulnerability assessment - The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

Wildfire - An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Zone - A geographical area shown on a Flood Insurance Rate Map.

100-year flood – A flood that has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. The term "100-year flood" can be misleading; it is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Therefore, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management to determine the need for flood insurance.

500-year flood – A flood that has a 0.2-percent chance of being equaled or exceeded in any one year.

APPENDIX B: Regulations

The Disaster Mitigation Act of 2000 (P.L. 106-390) facilitates a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). This new section emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. The following pages provide a description of the Disaster Mitigation Act of 2000, as well as the Interim Final Rule for mitigation planning.

PUBLIC LAW 106–390—OCT. 30, 2000

DISASTER MITIGATION ACT OF 2000

Public Law 106–390
106th Congress

An Act

Oct. 30, 2000
[H.R. 707]

To amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act to authorize a program for predisaster mitigation, to streamline the administration of disaster relief, to control the Federal costs of disaster assistance, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Disaster Mitigation Act of 2000.
42 USC 5121 note.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Disaster Mitigation Act of 2000".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

TITLE I—PREDISASTER HAZARD MITIGATION

42 USC 5133 note.

SEC. 101. FINDINGS AND PURPOSE.

(a) FINDINGS.—Congress finds that—

(1) natural disasters, including earthquakes, tsunamis, tornadoes, hurricanes, flooding, and wildfires, pose great danger to human life and to property throughout the United States;

(2) greater emphasis needs to be placed on—

(A) identifying and assessing the risks to States and local governments (including Indian tribes) from natural disasters;

(B) implementing adequate measures to reduce losses from natural disasters; and

(C) ensuring that the critical services and facilities of communities will continue to function after a natural disaster;

(3) expenditures for postdisaster assistance are increasing without commensurate reductions in the likelihood of future losses from natural disasters;

(4) in the expenditure of Federal funds under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.), high priority should be given to mitigation of hazards at the local level; and

(5) with a unified effort of economic incentives, awareness and education, technical assistance, and demonstrated Federal support, States and local governments (including Indian tribes) will be able to—

(A) form effective community-based partnerships for hazard mitigation purposes;

(B) implement effective hazard mitigation measures that reduce the potential damage from natural disasters;

(C) ensure continued functionality of critical services;

(D) leverage additional non-Federal resources in meeting natural disaster resistance goals; and

(E) make commitments to long-term hazard mitigation efforts to be applied to new and existing structures.

(b) PURPOSE.—The purpose of this title is to establish a national disaster hazard mitigation program—

(1) to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters; and

(2) to provide a source of predisaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster.

SEC. 102. PREDISASTER HAZARD MITIGATION.

(a) IN GENERAL.—Title II of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5131 et seq.) is amended by adding at the end the following:

"SEC. 203. PREDISASTER HAZARD MITIGATION.

President.
42 USC 5133.

"(a) DEFINITION OF SMALL IMPOVERISHED COMMUNITY.—In this section, the term 'small impoverished community' means a community of 3,000 or fewer individuals that is economically disadvantaged, as determined by the State in which the community is located and based on criteria established by the President.

"(b) ESTABLISHMENT OF PROGRAM.—The President may establish a program to provide technical and financial assistance to States and local governments to assist in the implementation of predisaster hazard mitigation measures that are cost-effective and are designed to reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities under the jurisdiction of the States or local governments.

"(c) APPROVAL BY PRESIDENT.—If the President determines that a State or local government has identified natural disaster hazards in areas under its jurisdiction and has demonstrated the ability to form effective public-private natural disaster hazard mitigation partnerships, the President, using amounts in the National Predisaster Mitigation Fund established under subsection (i) (referred to in this section as the 'Fund'), may provide technical and financial assistance to the State or local government to be used in accordance with subsection (e).

"(d) STATE RECOMMENDATIONS.—

"(1) IN GENERAL.—

"(A) RECOMMENDATIONS.—The Governor of each State may recommend to the President not fewer than five local governments to receive assistance under this section.

"(B) DEADLINE FOR SUBMISSION.—The recommendations under subparagraph (A) shall be submitted to the President not later than October 1, 2001, and each October 1st thereafter or such later date in the year as the President may establish.

"(C) CRITERIA.—In making recommendations under subparagraph (A), a Governor shall consider the criteria specified in subsection (g).

"(2) USE.—

President.

"(A) IN GENERAL.—Except as provided in subparagraph (B), in providing assistance to local governments under this section, the President shall select from local governments recommended by the Governors under this subsection.

"(B) EXTRAORDINARY CIRCUMSTANCES.—In providing assistance to local governments under this section, the President may select a local government that has not been recommended by a Governor under this subsection if the President determines that extraordinary circumstances justify the selection and that making the selection will further the purpose of this section.

"(3) EFFECT OF FAILURE TO NOMINATE.—If a Governor of a State fails to submit recommendations under this subsection in a timely manner, the President may select, subject to the criteria specified in subsection (g), any local governments of the State to receive assistance under this section.

"(e) USES OF TECHNICAL AND FINANCIAL ASSISTANCE.—

"(1) IN GENERAL.—Technical and financial assistance provided under this section—

"(A) shall be used by States and local governments principally to implement predisaster hazard mitigation measures that are cost-effective and are described in proposals approved by the President under this section; and

"(B) may be used—

"(i) to support effective public-private natural disaster hazard mitigation partnerships;

"(ii) to improve the assessment of a community's vulnerability to natural hazards; or "(iii) to establish hazard mitigation priorities, and an appropriate hazard mitigation plan, for a community.

"(2) DISSEMINATION.—A State or local government may use not more than 10 percent of the financial assistance received by the State or local government under this section for a fiscal year to fund activities to disseminate information regarding cost-effective mitigation technologies.

"(f) ALLOCATION OF FUNDS.—The amount of financial assistance made available to a State (including amounts made available to local governments of the State) under this section for a fiscal year—

"(1) shall be not less than the lesser of—

"(A) $500,000; or

"(B) the amount that is equal to 1.0 percent of the total funds appropriated to carry out this section for the fiscal year;

"(2) shall not exceed 15 percent of the total funds described in paragraph (1)(B); and

"(3) shall be subject to the criteria specified in subsection (g).

"(g) CRITERIA FOR ASSISTANCE AWARDS.—In determining whether to provide technical and financial assistance to a State or local government under this section, the President shall take into account—

"(1) the extent and nature of the hazards to be mitigated;

"(2) the degree of commitment of the State or local government to reduce damages from future natural disasters;

"(3) the degree of commitment by the State or local government to support ongoing non-Federal support for the hazard mitigation measures to be carried out using the technical and financial assistance;

"(4) the extent to which the hazard mitigation measures to be carried out using the technical and financial assistance contribute to the mitigation goals and priorities established by the State;

"(5) the extent to which the technical and financial assistance is consistent with other assistance provided under this Act;

"(6) the extent to which prioritized, cost-effective mitigation activities that produce meaningful and definable outcomes are clearly identified;

"(7) if the State or local government has submitted a mitigation plan under section 322, the extent to which the activities identified under paragraph (6) are consistent with the mitigation plan;

"(8) the opportunity to fund activities that maximize net benefits to society;

"(9) the extent to which assistance will fund mitigation activities in small impoverished communities; and

"(10) such other criteria as the President establishes in consultation with State and local governments. President.

"(h) FEDERAL SHARE.—

"(1) IN GENERAL.—Financial assistance provided under this section may contribute up to 75 percent of the total cost of mitigation activities approved by the President.

"(2) SMALL IMPOVERISHED COMMUNITIES.—Notwithstanding paragraph (1), the President may contribute up to 90 percent of the total cost of a mitigation activity carried out in a small impoverished community.

"(i) NATIONAL PREDISASTER MITIGATION FUND.—

"(1) ESTABLISHMENT.—The President may establish in the Treasury of the United States a fund to be known as the 'National Predisaster Mitigation Fund', to be used in carrying out this section.

"(2) TRANSFERS TO FUND.—There shall be deposited in the Fund—

"(A) amounts appropriated to carry out this section, which shall remain available until expended; and

"(B) sums available from gifts, bequests, or donations of services or property received by the President for the purpose of predisaster hazard mitigation.

"(3) EXPENDITURES FROM FUND.—Upon request by the President, the Secretary of the Treasury shall transfer from the Fund to the President such amounts as the President determines are necessary to provide technical and financial assistance under this section.

"(4) INVESTMENT OF AMOUNTS.—

"(A) IN GENERAL.—The Secretary of the Treasury shall invest such portion of the Fund as is not, in the judgment of the Secretary of the Treasury, required to meet current withdrawals. Investments may be made only in interest-bearing obligations of the United States.

"(B) ACQUISITION OF OBLIGATIONS.—For the purpose of investments under subparagraph (A), obligations may be acquired—

"(i) on original issue at the issue price; or

"(ii) by purchase of outstanding obligations at the market price.

"(C) SALE OF OBLIGATIONS.—Any obligation acquired by the Fund may be sold by the Secretary of the Treasury at the market price.

"(D) CREDITS TO FUND.—The interest on, and the proceeds from the sale or redemption of, any obligations held in the Fund shall be credited to and form a part of the Fund.

"(E) TRANSFERS OF AMOUNTS.—

"(i) IN GENERAL.—The amounts required to be transferred to the Fund under this subsection shall be transferred at least monthly from the general fund of the Treasury to the Fund on the basis of estimates made by the Secretary of the Treasury.

"(ii) ADJUSTMENTS.—Proper adjustment shall be made in amounts subsequently transferred to the extent prior estimates were in excess of or less than the amounts required to be transferred.

"(j) LIMITATION ON TOTAL AMOUNT OF FINANCIAL ASSISTANCE.—The President shall not provide financial assistance under this section in an amount greater than the amount available in the Fund.

"(k) MULTIHAZARD ADVISORY MAPS.—

"(1) DEFINITION OF MULTIHAZARD ADVISORY MAP.—In this subsection, the term 'multihazard advisory map' means a map on which hazard data concerning each type of natural disaster is identified simultaneously for the purpose of showing areas of hazard overlap.

"(2) DEVELOPMENT OF MAPS.—In consultation with States, local governments, and appropriate Federal agencies, the President shall develop multihazard advisory maps for areas, in not fewer than five States, that are subject to commonly recurring natural hazards (including flooding, hurricanes and severe winds, and seismic events). President.

"(3) USE OF TECHNOLOGY.—In developing multihazard advisory maps under this subsection, the President shall use, to the maximum extent practicable, the most cost-effective and efficient technology available.

"(4) USE OF MAPS.—

"(A) ADVISORY NATURE.—The multihazard advisory maps shall be considered to be advisory and shall not require the development of any new policy by, or impose any new policy on, any government or private entity.

"(B) AVAILABILITY OF MAPS.—The multihazard advisory maps shall be made available to the appropriate State and local governments for the purposes of—

"(i) informing the general public about the risks of natural hazards in the areas described in paragraph (2);

"(ii) supporting the activities described in subsection (e); and

"(iii) other public uses.

"(l) REPORT ON FEDERAL AND STATE ADMINISTRATION.—Not later than 18 months after the date of the enactment of this section, the President, in consultation with State and local governments, shall submit to Congress a report evaluating efforts to implement this section and recommending a process for transferring greater authority and responsibility for administering the assistance program established under this section to capable States. Deadline.

"(m) TERMINATION OF AUTHORITY.—The authority provided by this section terminates December 31, 2003.".

(b) CONFORMING AMENDMENT.—Title II of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5131 et seq.) is amended by striking the title heading and inserting the following:

"TITLE II—DISASTER PREPAREDNESS AND MITIGATION ASSISTANCE".

SEC. 103. INTERAGENCY TASK FORCE.

Title II of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5131 et seq.) (as amended by section 102(a)) is amended by adding at the end the following:

"SEC. 204. INTERAGENCY TASK FORCE. 42 USC 5134.

"(a) IN GENERAL.—The President shall establish a Federal interagency task force for the purpose of coordinating the implementation of predisaster hazard mitigation programs administered by the Federal Government.

"(b) CHAIRPERSON.—The Director of the Federal Emergency Management Agency shall serve as the chairperson of the task force.

"(c) MEMBERSHIP.—The membership of the task force shall include representatives of—

"(1) relevant Federal agencies;

"(2) State and local government organizations (including Indian tribes); and

"(3) the American Red Cross.".

SEC. 104. MITIGATION PLANNING; MINIMUM STANDARDS FOR PUBLIC AND PRIVATE STRUCTURES.

(a) IN GENERAL.—Title III of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5141 et seq.) is amended by adding at the end the following:

42 USC 5165.

"SEC. 322. MITIGATION PLANNING.

"(a) REQUIREMENT OF MITIGATION PLAN.—As a condition of receipt of an increased Federal share for hazard mitigation measures under subsection (e), a State, local, or tribal government shall develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government.

"(b) LOCAL AND TRIBAL PLANS.—Each mitigation plan developed by a local or tribal government shall—

"(1) describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan; and

"(2) establish a strategy to implement those actions.

"(c) STATE PLANS.—The State process of development of a mitigation plan under this section shall—

"(1) identify the natural hazards, risks, and vulnerabilities of areas in the State;

"(2) support development of local mitigation plans;

"(3) provide for technical assistance to local and tribal governments for mitigation planning; and

"(4) identify and prioritize mitigation actions that the State will support, as resources become available.

"(d) FUNDING.—

"(1) IN GENERAL.—Federal contributions under section 404 may be used to fund the development and updating of mitigation plans under this section.

"(2) MAXIMUM FEDERAL CONTRIBUTION.—With respect to any mitigation plan, a State, local, or tribal government may use an amount of Federal contributions under section 404 not to exceed 7 percent of the amount of such contributions available to the government as of a date determined by the government.

"(e) INCREASED FEDERAL SHARE FOR HAZARD MITIGATION MEASURES.—

"(1) IN GENERAL.—If, at the time of the declaration of a major disaster, a State has in effect an approved mitigation plan under this section, the President may increase to 20 percent, with respect to the major disaster, the maximum percentage specified in the last sentence of section 404(a).

President.

"(2) FACTORS FOR CONSIDERATION.—In determining whether to increase the maximum percentage under paragraph (1), the President shall consider whether the State has established—

"(A) eligibility criteria for property acquisition and other types of mitigation measures;

"(B) requirements for cost effectiveness that are related to the eligibility criteria;

"(C) a system of priorities that is related to the eligibility criteria; and

"(D) a process by which an assessment of the effectiveness of a mitigation action may be carried out after the mitigation action is complete.

"SEC. 323. MINIMUM STANDARDS FOR PUBLIC AND PRIVATE STRUCTURES. 42 USC 5165a.

"(a) IN GENERAL.—As a condition of receipt of a disaster loan or grant under this Act—

"(1) the recipient shall carry out any repair or construction to be financed with the loan or grant in accordance with applicable standards of safety, decency, and sanitation and in conformity with applicable codes, specifications, and standards; and

"(2) the President may require safe land use and construction practices, after adequate consultation with appropriate State and local government officials.

"(b) EVIDENCE OF COMPLIANCE.—A recipient of a disaster loan or grant under this Act shall provide such evidence of compliance with this section as the President may require by regulation.".

President.

(b) LOSSES FROM STRAIGHT LINE WINDS.—The President shall increase the maximum percentage specified in the last sentence of section 404(a) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5170c(a)) from 15 percent to 20 percent with respect to any major disaster that is in the State of Minnesota and for which assistance is being provided as of the date of the enactment of this Act, except that additional assistance provided under this subsection shall not exceed $6,000,000. The mitigation measures assisted under this subsection shall be related to losses in the State of Minnesota from straight line winds.

(c) CONFORMING AMENDMENTS.—

(1) Section 404(a) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5170c(a)) is amended—

(A) in the second sentence, by striking "section 409" and inserting "section 322"; and

(B) in the third sentence, by striking "The total" and inserting "Subject to section 322, the total".

(2) Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5176) is repealed.

TITLE II—STREAMLINING AND COST REDUCTION

SEC. 201. TECHNICAL AMENDMENTS.

Section 311 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5154) is amended in subsections (a)(1), (b), and (c) by striking "section 803 of the Public Works and Economic Development Act of 1965" each place it appears and inserting "section 209(c)(2) of the Public Works and Economic Development Act of 1965 (42 U.S.C. 3149(c)(2))".

SEC. 202. MANAGEMENT COSTS.

(a) IN GENERAL.—Title III of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5141 et seq.) (as amended by section 104(a)) is amended by adding at the end the following:

42 USC 5165b.

"SEC. 324. MANAGEMENT COSTS.

"(a) DEFINITION OF MANAGEMENT COST.—In this section, the term 'management cost' includes any indirect cost, any administrative expense, and any other expense not directly chargeable to a specific project under a major disaster, emergency, or disaster preparedness or mitigation activity or measure.

Regulations.

"(b) ESTABLISHMENT OF MANAGEMENT COST RATES.—Notwithstanding any other provision of law (including any administrative rule or guidance), the President shall by regulation establish management cost rates, for grantees and subgrantees, that shall be used to determine contributions under this Act for management costs.

Deadline.

"(c) REVIEW.—The President shall review the management cost rates established under subsection (b) not later than 3 years after the date of establishment of the rates and periodically thereafter.".

42 USC 5165b note.

(b) APPLICABILITY.—

(1) IN GENERAL.—Subject to paragraph (2), subsections (a) and (b) of section 324 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (as added by subsection (a)) shall apply to major disasters declared under that Act on or after the date of the enactment of this Act.

(2) INTERIM AUTHORITY.—Until the date on which the President establishes the management cost rates under section 324 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (as added by subsection (a)), section 406(f) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172(f)) (as in effect on the day before the date of the enactment of this Act) shall be used to establish management cost rates.

SEC. 203. PUBLIC NOTICE, COMMENT, AND CONSULTATION REQUIREMENTS.

Title III of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5141 et seq.) (as amended by section 202(a)) is amended by adding at the end the following:

42 USC 5165c.

"SEC. 325. PUBLIC NOTICE, COMMENT, AND CONSULTATION REQUIREMENTS.

"(a) PUBLIC NOTICE AND COMMENT CONCERNING NEW OR MODIFIED POLICIES.—

President.

"(1) IN GENERAL.—The President shall provide for public notice and opportunity for comment before adopting any new or modified policy that—

"(A) governs implementation of the public assistance program administered by the Federal Emergency Management Agency under this Act; and

"(B) could result in a significant reduction of assistance under the program.

"(2) APPLICATION.—Any policy adopted under paragraph (1) shall apply only to a major disaster or emergency declared on or after the date on which the policy is adopted.

"(b) CONSULTATION CONCERNING INTERIM POLICIES.—

"(1) IN GENERAL.—Before adopting any interim policy under the public assistance program to address specific conditions that relate to a major disaster or emergency that has been declared under this Act, the President, to the maximum extent practicable, shall solicit the views and recommendations of grantees and subgrantees with respect to the major disaster or emergency concerning the potential interim policy, if the interim policy is likely—

"(A) to result in a significant reduction of assistance to applicants for the assistance with respect to the major disaster or emergency; or

"(B) to change the terms of a written agreement to which the Federal Government is a party concerning the declaration of the major disaster or emergency.

"(2) NO LEGAL RIGHT OF ACTION.—Nothing in this subsection confers a legal right of action on any party.

"(c) PUBLIC ACCESS.—The President shall promote public access to policies governing the implementation of the public assistance program.". President.

SEC. 204. STATE ADMINISTRATION OF HAZARD MITIGATION GRANT PROGRAM.

Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5170c) is amended by adding at the end the following:

"(c) PROGRAM ADMINISTRATION BY STATES.—

"(1) IN GENERAL.—A State desiring to administer the hazard mitigation grant program established by this section with respect to hazard mitigation assistance in the State may submit to the President an application for the delegation of the authority to administer the program.

"(2) CRITERIA.—The President, in consultation and coordination with States and local governments, shall establish criteria for the approval of applications submitted under paragraph (1). The criteria shall include, at a minimum—

"(A) the demonstrated ability of the State to manage the grant program under this section;

"(B) there being in effect an approved mitigation plan under section 322; and

"(C) a demonstrated commitment to mitigation activities.

"(3) APPROVAL.—The President shall approve an application submitted under paragraph (1) that meets the criteria established under paragraph (2). President.

"(4) WITHDRAWAL OF APPROVAL.—If, after approving an application of a State submitted under paragraph (1), the President determines that the State is not administering the hazard mitigation grant program established by this section in a manner satisfactory to the President, the President shall withdraw the approval.

"(5) AUDITS.—The President shall provide for periodic audits of the hazard mitigation grant programs administered by States under this subsection.". President.

SEC. 205. ASSISTANCE TO REPAIR, RESTORE, RECONSTRUCT, OR REPLACE DAMAGED FACILITIES.

(a) CONTRIBUTIONS.—Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172) is amended by striking subsection (a) and inserting the following:

"(a) CONTRIBUTIONS.—

"(1) IN GENERAL.—The President may make contributions—

"(A) to a State or local government for the repair, restoration, reconstruction, or replacement of a public facility damaged or destroyed by a major disaster and for associated expenses incurred by the government; and

"(B) subject to paragraph (3), to a person that owns or operates a private nonprofit facility damaged or destroyed by a major disaster for the repair, restoration, reconstruction, or replacement of the facility and for associated expenses incurred by the person.

"(2) ASSOCIATED EXPENSES.—For the purposes of this section, associated expenses shall include—

"(A) the costs of mobilizing and employing the National Guard for performance of eligible work;

"(B) the costs of using prison labor to perform eligible work, including wages actually paid, transportation to a worksite, and extraordinary costs of guards, food, and lodging; and

"(C) base and overtime wages for the employees and extra hires of a State, local government, or person described in paragraph (1) that perform eligible work, plus fringe benefits on such wages to the extent that such benefits were being paid before the major disaster.

"(3) CONDITIONS FOR ASSISTANCE TO PRIVATE NONPROFIT FACILITIES.—

"(A) IN GENERAL.—The President may make contributions to a private nonprofit facility under paragraph (1)(B) only if—

"(i) the facility provides critical services (as defined by the President) in the event of a major disaster; or

"(ii) the owner or operator of the facility—

"(I) has applied for a disaster loan under section 7(b) of the Small Business Act (15 U.S.C. 636(b)); and

"(II)(aa) has been determined to be ineligible for such a loan; or

"(bb) has obtained such a loan in the maximum amount for which the Small Business Administration determines the facility is eligible.

"(B) DEFINITION OF CRITICAL SERVICES.—In this paragraph, the term 'critical services' includes power, water (including water provided by an irrigation organization or facility), sewer, wastewater treatment, communications, and emergency medical care.

"(4) NOTIFICATION TO CONGRESS.—Before making any contribution under this section in an amount greater than $20,000,000, the President shall notify—

"(A) the Committee on Environment and Public Works of the Senate;

"(B) the Committee on Transportation and Infrastructure of the House of Representatives;

"(C) the Committee on Appropriations of the Senate; and

"(D) the Committee on Appropriations of the House of Representatives.".

(b) FEDERAL SHARE.—Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172) is amended by striking subsection (b) and inserting the following:

"(b) FEDERAL SHARE.—

"(1) MINIMUM FEDERAL SHARE.—Except as provided in paragraph (2), the Federal share of assistance under this section shall be not less than 75 percent of the eligible cost of repair, restoration, reconstruction, or replacement carried out under this section.

"(2) REDUCED FEDERAL SHARE.—The President shall promulgate regulations to reduce the Federal share of assistance under this section to not less than 25 percent in the case of the repair, restoration, reconstruction, or replacement of any eligible public facility or private nonprofit facility following an event associated with a major disaster— President. Regulations.

"(A) that has been damaged, on more than one occasion within the preceding 10-year period, by the same type of event; and

"(B) the owner of which has failed to implement appropriate mitigation measures to address the hazard that caused the damage to the facility.".

(c) LARGE IN-LIEU CONTRIBUTIONS.—Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172) is amended by striking subsection (c) and inserting the following:

"(c) LARGE IN-LIEU CONTRIBUTIONS.—

"(1) FOR PUBLIC FACILITIES.—

"(A) IN GENERAL.—In any case in which a State or local government determines that the public welfare would not best be served by repairing, restoring, reconstructing, or replacing any public facility owned or controlled by the State or local government, the State or local government may elect to receive, in lieu of a contribution under subsection (a)(1)(A), a contribution in an amount equal to 75 percent of the Federal share of the Federal estimate of the cost of repairing, restoring, reconstructing, or replacing the facility and of management expenses.

"(B) AREAS WITH UNSTABLE SOIL.—In any case in which a State or local government determines that the public welfare would not best be served by repairing, restoring, reconstructing, or replacing any public facility owned or controlled by the State or local government because soil instability in the disaster area makes repair, restoration, reconstruction, or replacement infeasible, the State or local government may elect to receive, in lieu of a contribution under subsection (a)(1)(A), a contribution in an amount equal to 90 percent of the Federal share of the Federal estimate of the cost of repairing, restoring, reconstructing, or replacing the facility and of management expenses.

"(C) USE OF FUNDS.—Funds contributed to a State or local government under this paragraph may be used—

"(i) to repair, restore, or expand other selected public facilities;

"(ii) to construct new facilities; or

"(iii) to fund hazard mitigation measures that the State or local government determines to be necessary to meet a need for governmental services and functions in the area affected by the major disaster.

"(D) LIMITATIONS.—Funds made available to a State or local government under this paragraph may not be used for—

"(i) any public facility located in a regulatory floodway (as defined in section 59.1 of title 44, Code of Federal Regulations (or a successor regulation)); or

"(ii) any uninsured public facility located in a special flood hazard area identified by the Director of the Federal Emergency Management Agency under the National Flood Insurance Act of 1968 (42 U.S.C. 4001 et seq.).

"(2) FOR PRIVATE NONPROFIT FACILITIES.—

"(A) IN GENERAL.—In any case in which a person that owns or operates a private nonprofit facility determines that the public welfare would not best be served by repairing, restoring, reconstructing, or replacing the facility, the person may elect to receive, in lieu of a contribution under subsection (a)(1)(B), a contribution in an amount equal to 75 percent of the Federal share of the Federal estimate of the cost of repairing, restoring, reconstructing, or replacing the facility and of management expenses.

"(B) USE OF FUNDS.—Funds contributed to a person under this paragraph may be used—

"(i) to repair, restore, or expand other selected private nonprofit facilities owned or operated by the person;

"(ii) to construct new private nonprofit facilities to be owned or operated by the person; or

"(iii) to fund hazard mitigation measures that the person determines to be necessary to meet a need for the person's services and functions in the area affected by the major disaster.

"(C) LIMITATIONS.—Funds made available to a person under this paragraph may not be used for—

"(i) any private nonprofit facility located in a regulatory floodway (as defined in section 59.1 of title 44, Code of Federal Regulations (or a successor regulation)); or

"(ii) any uninsured private nonprofit facility located in a special flood hazard area identified by the Director of the Federal Emergency Management Agency under the National Flood Insurance Act of 1968 (42 U.S.C. 4001 et seq.).".

(d) ELIGIBLE COST.—

(1) IN GENERAL.—Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172) is amended by striking subsection (e) and inserting the following:

"(e) ELIGIBLE COST.—

"(1) DETERMINATION.—

"(A) IN GENERAL.—For the purposes of this section, the President shall estimate the eligible cost of repairing, restoring, reconstructing, or replacing a public facility or private nonprofit facility—

"(i) on the basis of the design of the facility as the facility existed immediately before the major disaster; and

"(ii) in conformity with codes, specifications, and standards (including floodplain management and hazard mitigation criteria required by the President or under the Coastal Barrier Resources Act (16 U.S.C. 3501 et seq.)) applicable at the time at which the disaster occurred.

"(B) COST ESTIMATION PROCEDURES.—

"(i) IN GENERAL.—Subject to paragraph (2), the President shall use the cost estimation procedures established under paragraph (3) to determine the eligible cost under this subsection.

"(ii) APPLICABILITY.—The procedures specified in this paragraph and paragraph (2) shall apply only to projects the eligible cost of which is equal to or greater than the amount specified in section 422.

"(2) MODIFICATION OF ELIGIBLE COST.—

"(A) ACTUAL COST GREATER THAN CEILING PERCENTAGE OF ESTIMATED COST.—In any case in which the actual cost of repairing, restoring, reconstructing, or replacing a facility under this section is greater than the ceiling percentage established under paragraph (3) of the cost estimated under paragraph (1), the President may determine that the eligible cost includes a portion of the actual cost of the repair, restoration, reconstruction, or replacement that exceeds the cost estimated under paragraph (1).

"(B) ACTUAL COST LESS THAN ESTIMATED COST.—

"(i) GREATER THAN OR EQUAL TO FLOOR PERCENTAGE OF ESTIMATED COST.—In any case in which the actual cost of repairing, restoring, reconstructing, or replacing a facility under this section is less than 100 percent of the cost estimated under paragraph (1), but is greater than or equal to the floor percentage established under paragraph (3) of the cost estimated under paragraph (1), the State or local government or person receiving funds under this section shall use the excess funds to carry out cost-effective activities that reduce the risk of future damage, hardship, or suffering from a major disaster.

"(ii) LESS THAN FLOOR PERCENTAGE OF ESTIMATED COST.—In any case in which the actual cost of repairing, restoring, reconstructing, or replacing a facility under this section is less than the floor percentage established under paragraph (3) of the cost estimated under paragraph (1), the State or local government or person receiving assistance under this section shall reimburse the President in the amount of the difference.

"(C) NO EFFECT ON APPEALS PROCESS.—Nothing in this paragraph affects any right of appeal under section 423.

"(3) EXPERT PANEL.—

"(A) ESTABLISHMENT.—Not later than 18 months after the date of the enactment of this paragraph, the President, acting through the Director of the Federal Emergency Management Agency, shall establish an expert panel, which shall include representatives from the construction industry and State and local government.

"(B) DUTIES.—The expert panel shall develop recommendations concerning—

"(i) procedures for estimating the cost of repairing, restoring, reconstructing, or replacing a facility consistent with industry practices; and

"(ii) the ceiling and floor percentages referred to in paragraph (2).

President.

"(C) REGULATIONS.—Taking into account the recommendations of the expert panel under subparagraph (B), the President shall promulgate regulations that establish—

"(i) cost estimation procedures described in subparagraph (B)(i); and

"(ii) the ceiling and floor percentages referred to in paragraph (2).

Deadline.

"(D) REVIEW BY PRESIDENT.—Not later than 2 years after the date of promulgation of regulations under subparagraph (C) and periodically thereafter, the President shall review the cost estimation procedures and the ceiling and floor percentages established under this paragraph.

Deadline.

"(E) REPORT TO CONGRESS.—Not later than 1 year after the date of promulgation of regulations under subparagraph (C), 3 years after that date, and at the end of each 2-year period thereafter, the expert panel shall submit to Congress a report on the appropriateness of the cost estimation procedures.

"(4) SPECIAL RULE.—In any case in which the facility being repaired, restored, reconstructed, or replaced under this section was under construction on the date of the major disaster, the cost of repairing, restoring, reconstructing, or replacing the facility shall include, for the purposes of this section, only those costs that, under the contract for the construction, are the owner's responsibility and not the contractor's responsibility.".

42 USC 5172 note.

(2) EFFECTIVE DATE.—The amendment made by paragraph (1) takes effect on the date of the enactment of this Act and applies to funds appropriated after the date of the enactment of this Act, except that paragraph (1) of section 406(e) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (as amended by paragraph (1)) takes effect on the date on which the cost estimation procedures established under paragraph (3) of that section take effect.

(e) CONFORMING AMENDMENT.—Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172) is amended by striking subsection (f).

SEC. 206. FEDERAL ASSISTANCE TO INDIVIDUALS AND HOUSEHOLDS.

(a) IN GENERAL.—Section 408 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5174) is amended to read as follows:

"SEC. 408. FEDERAL ASSISTANCE TO INDIVIDUALS AND HOUSEHOLDS.

"(a) IN GENERAL.—

"(1) PROVISION OF ASSISTANCE.—In accordance with this section, the President, in consultation with the Governor of a State, may provide financial assistance, and, if necessary, direct services, to individuals and households in the State who, as a direct result of a major disaster, have necessary expenses and serious needs in cases in which the individuals and households are unable to meet such expenses or needs through other means.

"(2) RELATIONSHIP TO OTHER ASSISTANCE.—Under paragraph (1), an individual or household shall not be denied assistance under paragraph (1), (3), or (4) of subsection (c) solely on the basis that the individual or household has not applied for or received any loan or other financial assistance from the Small Business Administration or any other Federal agency.

"(b) HOUSING ASSISTANCE.—

"(1) ELIGIBILITY.—The President may provide financial or other assistance under this section to individuals and households to respond to the disaster-related housing needs of individuals and households who are displaced from their predisaster primary residences or whose predisaster primary residences are rendered uninhabitable as a result of damage caused by a major disaster.

"(2) DETERMINATION OF APPROPRIATE TYPES OF ASSISTANCE.—

President.

"(A) IN GENERAL.—The President shall determine appropriate types of housing assistance to be provided under this section to individuals and households described in subsection (a)(1) based on considerations of cost effectiveness, convenience to the individuals and households, and such other factors as the President may consider appropriate.

"(B) MULTIPLE TYPES OF ASSISTANCE.—One or more types of housing assistance may be made available under this section, based on the suitability and availability of the types of assistance, to meet the needs of individuals and households in the particular disaster situation.

"(c) TYPES OF HOUSING ASSISTANCE.—

"(1) TEMPORARY HOUSING.—

"(A) FINANCIAL ASSISTANCE.—

"(i) IN GENERAL.—The President may provide financial assistance to individuals or households to rent alternate housing accommodations, existing rental units, manufactured housing, recreational vehicles, or other readily fabricated dwellings.

"(ii) AMOUNT.—The amount of assistance under clause (i) shall be based on the fair market rent for the accommodation provided plus the cost of any transportation, utility hookups, or unit installation not provided directly by the President.

"(B) DIRECT ASSISTANCE.—

"(i) IN GENERAL.—The President may provide temporary housing units, acquired by purchase or lease, directly to individuals or households who, because of a lack of available housing resources, would be unable to make use of the assistance provided under subparagraph (A).

"(ii) PERIOD OF ASSISTANCE.—The President may not provide direct assistance under clause (i) with respect to a major disaster after the end of the 18-month period beginning on the date of the declaration of the major disaster by the President, except that the President may extend that period if the President determines that due to extraordinary circumstances an extension would be in the public interest.

"(iii) COLLECTION OF RENTAL CHARGES.—After the end of the 18-month period referred to in clause (ii), the President may charge fair market rent for each temporary housing unit provided.

"(2) REPAIRS.—

"(A) IN GENERAL.—The President may provide financial assistance for—

"(i) the repair of owner-occupied private residences, utilities, and residential infrastructure (such as a private access route) damaged by a major disaster to a safe and sanitary living or functioning condition; and

"(ii) eligible hazard mitigation measures that reduce the likelihood of future damage to such residences, utilities, or infrastructure.

"(B) RELATIONSHIP TO OTHER ASSISTANCE.—A recipient of assistance provided under this paragraph shall not be required to show that the assistance can be met through other means, except insurance proceeds.

"(C) MAXIMUM AMOUNT OF ASSISTANCE.—The amount of assistance provided to a household under this paragraph shall not exceed $5,000, as adjusted annually to reflect changes in the Consumer Price Index for All Urban Consumers published by the Department of Labor.

"(3) REPLACEMENT.—

"(A) IN GENERAL.—The President may provide financial assistance for the replacement of owner-occupied private residences damaged by a major disaster.

"(B) MAXIMUM AMOUNT OF ASSISTANCE.—The amount of assistance provided to a household under this paragraph shall not exceed $10,000, as adjusted annually to reflect changes in the Consumer Price Index for All Urban Consumers published by the Department of Labor.

"(C) APPLICABILITY OF FLOOD INSURANCE REQUIREMENT.—With respect to assistance provided under this paragraph, the President may not waive any provision of Federal law requiring the purchase of flood insurance as a condition of the receipt of Federal disaster assistance.

"(4) PERMANENT HOUSING CONSTRUCTION.—The President may provide financial assistance or direct assistance to individuals or households to construct permanent housing in insular areas outside the continental United States and in other remote locations in cases in which—

"(A) no alternative housing resources are available; and

"(B) the types of temporary housing assistance described in paragraph (1) are unavailable, infeasible, or not cost-effective.

"(d) TERMS AND CONDITIONS RELATING TO HOUSING ASSISTANCE.—

"(1) SITES.—

"(A) IN GENERAL.—Any readily fabricated dwelling provided under this section shall, whenever practicable, be located on a site that—

"(i) is complete with utilities; and

"(ii) is provided by the State or local government, by the owner of the site, or by the occupant who was displaced by the major disaster.

"(B) SITES PROVIDED BY THE PRESIDENT.—A readily fabricated dwelling may be located on a site provided by the President if the President determines that such a site would be more economical or accessible.

"(2) DISPOSAL OF UNITS.—

"(A) SALE TO OCCUPANTS.—

"(i) IN GENERAL.—Notwithstanding any other provision of law, a temporary housing unit purchased under this section by the President for the purpose of housing disaster victims may be sold directly to the individual or household who is occupying the unit if the individual or household lacks permanent housing.

"(ii) SALE PRICE.—A sale of a temporary housing unit under clause (i) shall be at a price that is fair and equitable.

"(iii) DEPOSIT OF PROCEEDS.—Notwithstanding any other provision of law, the proceeds of a sale under clause (i) shall be deposited in the appropriate Disaster Relief Fund account.

"(iv) HAZARD AND FLOOD INSURANCE.—A sale of a temporary housing unit under clause (i) shall be made on the condition that the individual or household purchasing the housing unit agrees to obtain and maintain hazard and flood insurance on the housing unit.

"(v) USE OF GSA SERVICES.—The President may use the services of the General Services Administration to accomplish a sale under clause (i).

"(B) OTHER METHODS OF DISPOSAL.—If not disposed of under subparagraph (A), a temporary housing unit purchased under this section by the President for the purpose of housing disaster victims—

"(i) may be sold to any person; or

"(ii) may be sold, transferred, donated, or otherwise made available directly to a State or other governmental entity or to a voluntary organization for the sole purpose of providing temporary housing to disaster victims in major disasters and emergencies if, as a condition of the sale, transfer, or donation, the State, other governmental agency, or voluntary organization agrees—

"(I) to comply with the nondiscrimination provisions of section 308; and

"(II) to obtain and maintain hazard and flood insurance on the housing unit.

"(e) FINANCIAL ASSISTANCE TO ADDRESS OTHER NEEDS.—

"(1) MEDICAL, DENTAL, AND FUNERAL EXPENSES.—The President, in consultation with the Governor of a State, may provide financial assistance under this section to an individual or household in the State who is adversely affected by a major disaster to meet disaster-related medical, dental, and funeral expenses.

"(2) PERSONAL PROPERTY, TRANSPORTATION, AND OTHER EXPENSES.—The President, in consultation with the Governor of a State, may provide financial assistance under this section to an individual or household described in paragraph (1) to address personal property, transportation, and other necessary expenses or serious needs resulting from the major disaster.

"(f) STATE ROLE.—

"(1) FINANCIAL ASSISTANCE TO ADDRESS OTHER NEEDS.—

"(A) GRANT TO STATE.—Subject to subsection (g), a Governor may request a grant from the President to provide financial assistance to individuals and households in the State under subsection (e).

"(B) ADMINISTRATIVE COSTS.—A State that receives a grant under subparagraph (A) may expend not more than 5 percent of the amount of the grant for the administrative costs of providing financial assistance to individuals and households in the State under subsection (e).

"(2) ACCESS TO RECORDS.—In providing assistance to individuals and households under this section, the President shall provide for the substantial and ongoing involvement of the States in which the individuals and households are located, including by providing to the States access to the electronic records of individuals and households receiving assistance under this section in order for the States to make available any additional State and local assistance to the individuals and households.

"(g) COST SHARING.—

"(1) FEDERAL SHARE.—Except as provided in paragraph (2), the Federal share of the costs eligible to be paid using assistance provided under this section shall be 100 percent.

"(2) FINANCIAL ASSISTANCE TO ADDRESS OTHER NEEDS.—In the case of financial assistance provided under subsection (e)—

"(A) the Federal share shall be 75 percent; and

"(B) the non-Federal share shall be paid from funds made available by the State.

"(h) MAXIMUM AMOUNT OF ASSISTANCE.—

"(1) IN GENERAL.—No individual or household shall receive financial assistance greater than $25,000 under this section with respect to a single major disaster.

"(2) ADJUSTMENT OF LIMIT.—The limit established under paragraph (1) shall be adjusted annually to reflect changes in the Consumer Price Index for All Urban Consumers published by the Department of Labor.

President.

"(i) RULES AND REGULATIONS.—The President shall prescribe rules and regulations to carry out this section, including criteria, standards, and procedures for determining eligibility for assistance.".

(b) CONFORMING AMENDMENT.—Section 502(a)(6) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5192(a)(6)) is amended by striking "temporary housing".

(c) ELIMINATION OF INDIVIDUAL AND FAMILY GRANT PROGRAMS.—Section 411 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5178) is repealed.

(d) EFFECTIVE DATE.—The amendments made by this section take effect 18 months after the date of the enactment of this Act. 42 USC 5174 note.

SEC. 207. COMMUNITY DISASTER LOANS.

Section 417 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5184) is amended—

(1) by striking "(a) The President" and inserting the following:

"(a) IN GENERAL.—The President";

(2) by striking "The amount" and inserting the following:

"(b) AMOUNT.—The amount";

(3) by striking "Repayment" and inserting the following:

"(c) REPAYMENT.—

"(1) CANCELLATION.—Repayment";

(4) by striking "(b) Any loans" and inserting the following:

"(d) EFFECT ON OTHER ASSISTANCE.—Any loans";

(5) in subsection (b) (as designated by paragraph (2))—

(A) by striking "and shall" and inserting "shall"; and

(B) by inserting before the period at the end the following: ", and shall not exceed $5,000,000"; and

(6) in subsection (c) (as designated by paragraph (3)), by adding at the end the following:

"(2) CONDITION ON CONTINUING ELIGIBILITY.—A local government shall not be eligible for further assistance under this section during any period in which the local government is in arrears with respect to a required repayment of a loan under this section.".

SEC. 208. REPORT ON STATE MANAGEMENT OF SMALL DISASTERS INITIATIVE. 42 USC 5121 note.

Deadline.

Not later than 3 years after the date of the enactment of this Act, the President shall submit to Congress a report describing the results of the State Management of Small Disasters Initiative, including—

(1) identification of any administrative or financial benefits of the initiative; and

(2) recommendations concerning the conditions, if any, under which States should be allowed the option to administer parts of the assistance program under section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5172).

SEC. 209. STUDY REGARDING COST REDUCTION. 42 USC 5121 note.

Deadline.

Not later than 3 years after the date of the enactment of this Act, the Director of the Congressional Budget Office shall complete a study estimating the reduction in Federal disaster assistance that has resulted and is likely to result from the enactment of this Act.

TITLE III—MISCELLANEOUS

SEC. 301. TECHNICAL CORRECTION OF SHORT TITLE.

The first section of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 note) is amended to read as follows:

"SECTION 1. SHORT TITLE.

"This Act may be cited as the 'Robert T. Stafford Disaster Relief and Emergency Assistance Act'.".

SEC. 302. DEFINITIONS.

Section 102 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122) is amended—

(1) in each of paragraphs (3) and (4), by striking "the Northern" and all that follows through "Pacific Islands" and inserting "and the Commonwealth of the Northern Mariana Islands";

(2) by striking paragraph (6) and inserting the following:

"(6) LOCAL GOVERNMENT.—The term 'local government' means—

"(A) a county, municipality, city, town, township, local public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government;

"(B) an Indian tribe or authorized tribal organization, or Alaska Native village or organization; and

"(C) a rural community, unincorporated town or village, or other public entity, for which an application for assistance is made by a State or political subdivision of a State."; and

(3) in paragraph (9), by inserting "irrigation," after "utility,".

SEC. 303. FIRE MANAGEMENT ASSISTANCE.

(a) IN GENERAL.—Section 420 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5187) is amended to read as follows:

"SEC. 420. FIRE MANAGEMENT ASSISTANCE.

"(a) IN GENERAL.—The President is authorized to provide assistance, including grants, equipment, supplies, and personnel, to any State or local government for the mitigation, management, and control of any fire on public or private forest land or grassland that threatens such destruction as would constitute a major disaster.

President.

"(b) COORDINATION WITH STATE AND TRIBAL DEPARTMENTS OF FORESTRY.—In providing assistance under this section, the President shall coordinate with State and tribal departments of forestry.

"(c) ESSENTIAL ASSISTANCE.—In providing assistance under this section, the President may use the authority provided under section 403.

"(d) RULES AND REGULATIONS.—The President shall prescribe such rules and regulations as are necessary to carry out this section.". President.

(b) EFFECTIVE DATE.—The amendment made by subsection (a) takes effect 1 year after the date of the enactment of this Act. 42 USC 5187 note.

SEC. 304. DISASTER GRANT CLOSEOUT PROCEDURES. 42 USC 5205.

Title VII of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5101 et seq.) is amended by adding at the end the following:

"SEC. 705. DISASTER GRANT CLOSEOUT PROCEDURES.

"(a) STATUTE OF LIMITATIONS.—

"(1) IN GENERAL.—Except as provided in paragraph (2), no administrative action to recover any payment made to a State or local government for disaster or emergency assistance under this Act shall be initiated in any forum after the date that is 3 years after the date of transmission of the final expenditure report for the disaster or emergency.

"(2) FRAUD EXCEPTION.—The limitation under paragraph (1) shall apply unless there is evidence of civil or criminal fraud.

"(b) REBUTTAL OF PRESUMPTION OF RECORD MAINTENANCE.—

"(1) IN GENERAL.—In any dispute arising under this section after the date that is 3 years after the date of transmission of the final expenditure report for the disaster or emergency, there shall be a presumption that accounting records were maintained that adequately identify the source and application of funds provided for financially assisted activities.

"(2) AFFIRMATIVE EVIDENCE.—The presumption described in paragraph (1) may be rebutted only on production of affirmative evidence that the State or local government did not maintain documentation described in that paragraph.

"(3) INABILITY TO PRODUCE DOCUMENTATION.—The inability of the Federal, State, or local government to produce source documentation supporting expenditure reports later than 3 years after the date of transmission of the final expenditure report shall not constitute evidence to rebut the presumption described in paragraph (1).

"(4) RIGHT OF ACCESS.—The period during which the Federal, State, or local government has the right to access source documentation shall not be limited to the required 3-year retention period referred to in paragraph (3), but shall last as long as the records are maintained.

"(c) BINDING NATURE OF GRANT REQUIREMENTS.—A State or local government shall not be liable for reimbursement or any other penalty for any payment made under this Act if—

"(1) the payment was authorized by an approved agreement specifying the costs;

"(2) the costs were reasonable; and

"(3) the purpose of the grant was accomplished.".

SEC. 305. PUBLIC SAFETY OFFICER BENEFITS FOR CERTAIN FEDERAL AND STATE EMPLOYEES.

(a) IN GENERAL.—Section 1204 of the Omnibus Crime Control and Safe Streets Act of 1968 (42 U.S.C. 3796b) is amended by striking paragraph (7) and inserting the following:

"(7) 'public safety officer' means—

"(A) an individual serving a public agency in an official capacity, with or without compensation, as a law enforcement officer, as a firefighter, or as a member of a rescue squad or ambulance crew;

"(B) an employee of the Federal Emergency Management Agency who is performing official duties of the Agency in an area, if those official duties—

"(i) are related to a major disaster or emergency that has been, or is later, declared to exist with respect to the area under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.); and

"(ii) are determined by the Director of the Federal Emergency Management Agency to be hazardous duties; or

"(C) an employee of a State, local, or tribal emergency management or civil defense agency who is performing official duties in cooperation with the Federal Emergency Management Agency in an area, if those official duties—

"(i) are related to a major disaster or emergency that has been, or is later, declared to exist with respect to the area under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.); and

"(ii) are determined by the head of the agency to be hazardous duties.".

42 USC 3796b note.

(b) EFFECTIVE DATE.—The amendment made by subsection (a) applies only to employees described in subparagraphs (B) and (C) of section 1204(7) of the Omnibus Crime Control and Safe Streets Act of 1968 (as amended by subsection (a)) who are injured or who die in the line of duty on or after the date of the enactment of this Act.

42 USC 5206.

SEC. 306. BUY AMERICAN.

(a) COMPLIANCE WITH BUY AMERICAN ACT.—No funds authorized to be appropriated under this Act or any amendment made by this Act may be expended by an entity unless the entity, in expending the funds, complies with the Buy American Act (41 U.S.C. 10a et seq.).

(b) DEBARMENT OF PERSONS CONVICTED OF FRAUDULENT USE OF "MADE IN AMERICA" LABELS.—

Deadline.

(1) IN GENERAL.—If the Director of the Federal Emergency Management Agency determines that a person has been convicted of intentionally affixing a label bearing a "Made in America" inscription to any product sold in or shipped to the United States that is not made in America, the Director shall determine, not later than 90 days after determining that the person has been so convicted, whether the person should be debarred from contracting under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.).

(2) DEFINITION OF DEBAR.—In this subsection, the term "debar" has the meaning given the term in section 2393(c) of title 10, United States Code.

SEC. 307. TREATMENT OF CERTAIN REAL PROPERTY.

(a) IN GENERAL.—Notwithstanding the National Flood Insurance Act of 1968 (42 U.S.C. 4001 et seq.), the Flood Disaster

Protection Act of 1973 (42 U.S.C. 4002 et seq.), or any other provision of law, or any flood risk zone identified, delineated, or established under any such law (by flood insurance rate map or otherwise), the real property described in subsection (b) shall not be considered to be, or to have been, located in any area having special flood hazards (including any floodway or floodplain).

(b) REAL PROPERTY.—The real property described in this subsection is all land and improvements on the land located in the Maple Terrace Subdivisions in the City of Sycamore, DeKalb County, Illinois, including—

(1) Maple Terrace Phase I;
(2) Maple Terrace Phase II;
(3) Maple Terrace Phase III Unit 1;
(4) Maple Terrace Phase III Unit 2;
(5) Maple Terrace Phase III Unit 3;
(6) Maple Terrace Phase IV Unit 1;
(7) Maple Terrace Phase IV Unit 2; and
(8) Maple Terrace Phase IV Unit 3.

(c) REVISION OF FLOOD INSURANCE RATE LOT MAPS.—As soon as practicable after the date of the enactment of this Act, the Director of the Federal Emergency Management Agency shall revise the appropriate flood insurance rate lot maps of the agency to reflect the treatment under subsection (a) of the real property described in subsection (b).

SEC. 308. STUDY OF PARTICIPATION BY INDIAN TRIBES IN EMERGENCY MANAGEMENT. 42 USC 5121 note.

(a) DEFINITION OF INDIAN TRIBE.—In this section, the term "Indian tribe" has the meaning given the term in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b).

(b) STUDY.—

(1) IN GENERAL.—The Director of the Federal Emergency Management Agency shall conduct a study of participation by Indian tribes in emergency management.

(2) REQUIRED ELEMENTS.—The study shall—

(A) survey participation by Indian tribes in training, predisaster and postdisaster mitigation, disaster preparedness, and disaster recovery programs at the Federal and State levels; and

(B) review and assess the capacity of Indian tribes to participate in cost-shared emergency management programs and to participate in the management of the programs.

(3) CONSULTATION.—In conducting the study, the Director shall consult with Indian tribes.

(c) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Director shall submit a report on the study under subsection (b) to— Deadline.

(1) the Committee on Environment and Public Works of the Senate;

(2) the Committee on Transportation and Infrastructure of the House of Representatives;

(3) the Committee on Appropriations of the Senate; and

(4) the Committee on Appropriations of the House of Representatives.

Approved October 30, 2000.

LEGISLATIVE HISTORY—H.R. 707 (S. 1691):

HOUSE REPORTS: No. 106–40 (Comm. on Transportation and Infrastructure).
SENATE REPORTS: No. 106–295 accompanying S. 1691 (Comm. on Environment and Public Works).
CONGRESSIONAL RECORD:
Vol. 145 (1999): Mar. 4, considered and passed House.
Vol. 146 (2000): July 19, considered and passed Senate, amended.
Oct. 3, House concurred in Senate amendment with an amendment.
Oct. 5, Senate concurred in House amendment with an amendment.
Oct. 10, House concurred in Senate amendment.

Federal Register

Tuesday,

February 26, 2002

Part III

Federal Emergency Management Agency

44 CFR Parts 201 and 206

Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule

FEDERAL EMERGENCY MANAGEMENT AGENCY

44 CFR Parts 201 and 206

RIN 3067–AD22

Hazard Mitigation Planning and Hazard Mitigation Grant Program

AGENCY: Federal Emergency Management Agency.

ACTION: Interim final rule.

SUMMARY: This rule addresses State mitigation planning, identifies new local mitigation planning requirements, authorizes Hazard Mitigation Grant Program (HMGP) funds for planning activities, and increases the amount of HMGP funds available to States that develop a comprehensive, enhanced mitigation plan. This rule also requires that repairs or construction funded by a disaster loan or grant must be carried out in accordance with applicable standards and says that FEMA may require safe land use and construction practices as a condition of grantees receiving disaster assistance under the Stafford Act.

DATES: *Effective Date:* February 26, 2002.

Comment Date: We will accept written comments through April 29, 2002.

ADDRESSES: Please send written comments to the Rules Docket Clerk, Office of the General Counsel, Federal Emergency Management Agency, 500 C Street, SW., room 840, Washington, DC 20472, (facsimile) 202–646–4536, or (email) *rules@fema.gov.*

FOR FURTHER INFORMATION CONTACT: Margaret E. Lawless, Federal Insurance and Mitigation Administration, Federal Emergency Management Agency, 500 C Street, SW., Washington, DC, 20472, 202–646–3027, (facsimile) 202–646–3104, or (email) *margaret.lawless@fema.gov.*

SUPPLEMENTARY INFORMATION:

Introduction

Throughout the preamble and the rule the terms ''we'', ''our'' and ''us'' refer to FEMA.

Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S.C. 5165, enacted under § 104 the Disaster Mitigation Act of 2000, (DMA 2000) P.L. 106–390, provides new and revitalized approaches to mitigation planning. This section: (1) Continues the requirement for a Standard State Mitigation plan as a condition of disaster assistance; (2) provides for States to receive an increased percentage of HMGP funds (from 15 to 20 percent of the total estimated eligible Federal assistance) if, at the time of the declaration of a major disaster, they have in effect a FEMA-approved Enhanced State Mitigation Plan that meets the factors listed in this rule; (3) establishes a new requirement for local mitigation plans; and (4) authorizes up to 7 percent of the HMGP funds available to a State to be used for development of State, tribal, and local mitigation plans. We will give Indian tribal governments the opportunity to fulfill the requirements of § 322 either as a grantee or a subgrantee. An Indian tribal government may choose to apply for HMGP funding directly to us and would then serve as a grantee, meeting the State level responsibilities, or it may apply through the State, meeting the local government or subgrantee responsibilities.

Section 322, in concert with other sections of the Act, provides a significant opportunity to reduce the Nation's disaster losses through mitigation planning. In addition, implementation of planned, pre-identified, cost-effective mitigation measures will streamline the disaster recovery process. The Act provides a framework for linking pre- and post-disaster mitigation planning and initiatives with public and private interests to ensure an integrated, comprehensive approach to disaster loss reduction. The language in the Act, taken as a whole, emphasizes the importance of strong State and local planning processes and comprehensive program management at the State level. The new planning criteria also support State administration of the HMGP, and contemplate a significant State commitment to mitigation activities, comprehensive State mitigation planning, and strong program management.

The planning process also provides a link between State and local mitigation programs. Both State level and local plans should address strategies for incorporating post-disaster early mitigation implementation strategies and sustainable recovery actions. We also recognize that governments are involved in a range of planning activities and that mitigation plans may be linked to or reference hazardous materials and other non-natural hazard plans. Improved mitigation planning will result in a better understanding of risks and vulnerabilities, as well as to expedite implementation of measures and activities to reduce those risks, both pre- and post-disaster.

Section 409 of the Stafford Act, 42 U.S.C. 5176, which required mitigation plans and the use of minimum codes and standards, was repealed by the DMA 2000. These issues are now addressed in two separate sections of the law: mitigation planning is in section 322 of the Act, and minimum codes and standards are in section 323 of the Act. We previously implemented section 409 through 44 CFR Part 206, Subpart M. Since current law now distinguishes the planning from the codes and standards in separate sections, we will address them in different sections of the CFR. We address the new planning regulations in Part 201 to reflect the broader relevance of planning to all FEMA mitigation programs, while the minimum standards remain in Part 206, Federal Disaster Assistance, Subpart M. The regulations implementing the Hazard Mitigation Grant Program are in Part 206, Subpart N. This rule also contains changes to Subpart N, to reflect the new planning criteria identified in section 322 of the Act.

The administration is considering changes to FEMA's mitigation programs in the President's Budget for FY 2003. However, States and localities still would be required to have plans in effect, which meet the minimum requirements under this rule, as a condition of receiving mitigation assistance after November 1, 2003.

Implementation Strategy. States must have an approved hazard mitigation plan in order to receive Stafford Act assistance, excluding assistance provided pursuant to emergency provisions. These regulations provide criteria for the new two-tiered State mitigation plan process: Standard State Mitigation Plans, which allow a State to receive HMGP funding based on 15 percent of the total estimated eligible Stafford Act disaster assistance, and Enhanced State Mitigation Plans, which allow a State to receive HMGP funds based on 20 percent of the total estimated eligible Stafford Act disaster assistance. Enhanced State Mitigation Plans must demonstrate that the State has developed a comprehensive mitigation program, that it effectively uses available mitigation funding, and that it is capable of managing the increased funding. All State Mitigations Plans must be reviewed, revised, and re-approved by FEMA every three years. An important requirement of the legislation is that we must approve a completed enhanced plan *before* a disaster declaration, in order for the State to be eligible for the increased funding.

We will no longer require States to revise their mitigation plan after every disaster declaration, as under former section 409 of the Act, 42 U.S.C. 5176. We recommend, however, that States consider revising their plan if a disaster or other circumstances significantly affect its mitigation priorities. States with existing mitigation plans, approved under former section 409, will continue to be eligible for the 15 percent HMGP funding until November 1, 2003, when all State mitigation plans must meet the requirements of these regulations. If State plans are not revised and approved to meet the Standard State Mitigation Plan requirements by that time, they will be ineligible for Stafford Act assistance, excluding emergency assistance.

Indian tribal governments may choose to apply directly to us for HMGP funding, and would therefore be responsible for having an approved State level mitigation plan, and would act as the grantee. If an Indian tribal government chooses to apply for HMGP grants through the State, they would be responsible for having an approved local level mitigation plan, and would serve as a subgrantee accountable to the State as grantee.

This rule also establishes local planning criteria so that these jurisdictions can actively begin the hazard mitigation planning process. This requirement is to encourage the development of comprehensive mitigation plans before disaster events. Section 322 requires local governments to have an approved local mitigation plan to be eligible to receive an HMGP project grant; however, this requirement will not fully take effect until November 1, 2003. FEMA Regional Directors may grant an exception to this requirement in extenuating circumstances. Until November 1, 2003, local governments will be able to receive HMGP project grant funds and may prepare a mitigation plan concurrently with implementation of their project grant. We anticipate that the Predisaster Mitigation program authorized by section 203 of the Act, 42 U.S.C. 5133, will also support this local mitigation planning by making funds available for the development of comprehensive local mitigation plans. Managing States that we approve under new criteria established under section 404 of the Act, 42 U.S.C. 5170c(c), as amended by section 204 of DMA 2000 will have approval authority for local mitigation plans. This provision does not apply to States that we approved under the Managing State program in effect before enactment of DMA 2000.

Our goal is for State and local governments to develop comprehensive and integrated plans that are coordinated through appropriate State, local, and regional agencies, as well as non-governmental interest groups. To the extent feasible and practicable, we would also like to consolidate the planning requirements for different FEMA mitigation programs. This will ensure that one local plan will meet the minimum requirements for all of the different FEMA mitigation programs, such as the Flood Mitigation Assistance Program (authorized by sections 553 and 554 of the National Flood Insurance Reform Act of 1994, 42 U.S.C. 4104c and 42 U.S.C. 4104d), the Community Rating System (authorized by section 541 of the National Flood Insurance Reform Act of 1994, 42 U.S.C. 4022), the Pre-Disaster Mitigation Program (authorized by section 203 of the Stafford Act), the Hazard Mitigation Grant Program (authorized by section 404 of the Stafford Act), and the mitigation activities that are based upon the provisions of section 323 and subsections 406(b) and (e) of the Stafford Act. The mitigation plans may also serve to integrate documents and plans produced under other emergency management programs. State level plans should identify overall goals and priorities, incorporating the more specific local risk assessments, when available, and including projects identified through the local planning process.

Under section 322(d), up to 7 percent of the available HMGP funds may now be used for planning, and we encourage States to use these funds for local plan development. In a memorandum to FEMA Regional Directors dated December 21, 2000, we announced that this provision of section 322 was effective for disasters declared on or after October 30, 2000, the date on which the Disaster Mitigation Act of 2000 became law. Regional Directors are encouraging States to make these funds immediately available to local and Indian tribal governments, although the funds can be used for plan development and review at the State level as well.

As discussed earlier in this Supplementary Information, subsection 323(a) of the Stafford Act, 42 U.S.C. 5166(a), requires as a precondition to receiving disaster assistance under the Act that State and local governments, as well as eligible private nonprofit entities, must agree to carry out repair and reconstruction activities ''in accordance with applicable standards of safety, decency, and sanitation and in conformity with applicable codes, specifications, and standards.'' In addition, that subsection authorizes the President (FEMA, by virtue of Executive Order 12148, as amended) to ''require safe land use and construction practices, after adequate consultation with appropriate State and local officials'' in the course of the use of Federal disaster assistance by eligible applicants to repair and restore disaster-damaged facilities.

At the same time that we implement the planning mandates of section 322 of the Stafford Act, we are also implementing the Minimum Standards for Public and Private Structures provision of section 323 of the Act. This rule appears at Subpart M of Part 206 of Title 44 of the Code of Federal Regulations. As mentioned earlier, the section 322 planning regulations are in Part 201, while Part 206, Subpart M includes only the minimum codes and standards regulations mandated in § 323. The rule to implement § 323 of the Act reinforces the link between pre-disaster planning, building and construction standards, and post-disaster reconstruction efforts.

We encourage comments on this interim final rule, and we will make every effort to involve all interested parties prior to the development of the Final Rule.

Justification for Interim Final Rule

In general, FEMA publishes a rule for public comment before issuing a final rule, under the Administrative Procedure Act, 5 U.S.C. 533 and 44 CFR 1.12. The Administrative Procedure Act, however, provides an exception from that general rule where the agency for good cause finds the procedures for comment and response contrary to public interest. Section 322 of the Stafford Act allows States to receive increased post-disaster grant funding for projects designed to reduce future disaster losses. States will only be eligible for these increased funds if they have a FEMA-approved Enhanced State Mitigation Plan.

This interim final rule provides the criteria for development and approval of these plans, as well as criteria for local mitigation plans required by this legislation. In order for State and local governments to be positioned to receive these mitigation funds as soon as possible, these regulations must be in effect. The public benefit of this rule will be to assist States and communities assess their risks and identify activities to strengthen the larger community and the built environment in order to become less susceptible to disasters. Planning serves as the vital foundation to saving lives and protecting properties, having integrated plans in place can serve to both streamline recovery efforts and lessen potential future damages. Therefore, we believe it is contrary to the public interest to delay the benefits of this rule. In accordance with the Administrative Procedure Act, 5 U.S.C. 553(d)(3), we find that there is good cause for the interim final rule to take effect immediately upon publication in the **Federal Register** in order to meet the needs of States and communities by identifying criteria for mitigation plans in order to reduce risks nationwide, establish criteria for minimum codes and standards in post-disaster reconstruction, and to allow States to adjust their mitigation plans to receive the increase in mitigation funding.

In addition, we believe that, under the circumstances, delaying the effective date of this rule until after the comment period would not further the public interest. Prior to this rulemaking, FEMA hosted a meeting where interested parties provided comments and suggestions on how we could implement these planning requirements. Participants in this meeting included representatives from the National Emergency Management Association, the Association of State Floodplain Managers, the National Governors' Association, the International Association of Emergency Managers, the National Association of Development Organizations, the American Public Works Association, the National League of Cities, the National Association of Counties, the National Conference of State Legislatures, the International City/County Management Association, and the Bureau of Indian Affairs. We took comments and suggestions provided at this meeting into account in developing this interim final rule. Therefore, we find that prior notice and comment on this rule would not further the public interest. We actively encourage and solicit comments on this interim final rule from interested parties, and we will consider them in preparing the final rule. For these reasons, we believe we have good cause to publish an interim final rule.

National Environmental Policy Act

44 CFR 10.8(d)(2)(ii) excludes this rule from the preparation of an environmental assessment or environmental impact statement, where the rule relates to actions that qualify for categorical exclusion under 44 CFR 10.8(d)(2)(iii), such as the development of plans under this section.

Executive Order 12866, Regulatory Planning and Review

We have prepared and reviewed this rule under the provisions of E.O. 12866, Regulatory Planning and Review. Under Executive Order 12866, 58 FR 51735, October 4, 1993, a significant regulatory action is subject to OMB review and the requirements of the Executive Order. The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

The purpose of this rule is to implement section 322 of the Stafford Act which addresses mitigation planning at the State, tribal, and local levels, identifies new local planning requirements, allows Hazard Mitigation Grant Program (HMGP) funds for planning activities, and increases the amount of HMGP funds available to States that develop a comprehensive, enhanced mitigation plan. The rule identifies local mitigation planning requirements before approval of project grants, and requires our approval of an Enhanced State Mitigation plan as a condition for increased mitigation funding. The rule also implements section 323 of the Stafford Act, which requires that repairs or construction funded by disaster loans or grants must comply with applicable standards and safe land use and construction practices. As such the rule itself will not have an effect on the economy of more than $100,000,000.

Therefore, this rule is a significant regulatory action and is not an economically significant rule under Executive Order 12866. The Office of Management and Budget (OMB) has reviewed this rule under Executive Order 12866.

Executive Order 12898, Environmental Justice

Under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 59 FR 7629, February 16, 1994, we incorporate environmental justice into our policies and programs. The Executive Order requires each Federal agency to conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that those programs, policies, and activities do not have the effect of excluding persons from participation in our programs, denying persons the benefits of our programs, or subjecting persons to discrimination because of their race, color, or national origin.

No action that we can anticipate under the final rule will have a disproportionately high or adverse human health and environmental effect on any segment of the population. Section 322 focuses specifically on mitigation planning to: Identify the natural hazards, risks, and vulnerabilities of areas in States, localities, and tribal areas; support development of local mitigation plans; provide for technical assistance to local and tribal governments for mitigation planning; and identify and prioritize mitigation actions that the State will support, as resources become available. Section 323 requires compliance with applicable codes and standards in repair and construction, and use of safe land use and construction standards. Accordingly, the requirements of Executive Order 12898 do not apply to this interim final rule.

Paperwork Reduction Act of 1995

As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) and concurrent with the publication of this interim final rule, we have submitted a request for review and approval of a new collection of information, which is contained in this interim final rule. Under the Paperwork Reduction Act of 1995, a person may not be penalized for failing to comply with an information collection that does not display a currently valid Office of Management and Budget (OMB) control number. The request was submitted to OMB for approval under the emergency processing procedures in OMB regulation 5 CFR 1320.1. OMB has approved this collection of information for use through August 31, 2002, under OMB Number 3067–0297.

We expect to follow this emergency request with a request for OMB approval to continue the use of the collection of information for a term of three years. The request will be processed under OMB's normal clearance procedures in accordance with provisions of OMB regulation 5 CFR 1320.10. To help us with the timely processing of the emergency and normal clearance submissions to OMB, we invite the general public to comment on the collection of information. This notice and request for comments complies with the provisions of the Paperwork

Reduction Act of 1995 (44 U.S.C. 3506(c)(2)(A)).

Collection of Information

Title: State/Local/Tribal Hazard Mitigation Plans under Section 322 of the Disaster Mitigation Act of 2000.

Abstract: Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act, as amended by Section 104 of the Disaster Mitigation Act of 2000, provides new and revitalized approaches to mitigation planning. To obtain Federal assistance, new planning provisions require that each state, local, and tribal government prepare a hazard mitigation plan to include sections that describe the planning process, an assessment of the risks, a mitigation strategy, and identification of the plan maintenance and updating process. The Act provides a framework for linking pre- and post-disaster mitigation planning and initiatives with public and private interests to ensure an integrated, comprehensive approach to disaster loss reduction. Under Section 322 there is a two-tiered State mitigation plan process. State mitigation plans must be reviewed, revised, and submitted to us every 3 years.

(1) A *Standard State Mitigation Plan* must be approved by us in order for States to be eligible to receive Hazard Mitigation Grant Program (HGMP) funding based on 15 percent of the total estimated eligible Federal disaster assistance. This plan demonstrates the State's goals, priorities, and commitment to reduce risks from natural hazards and serves as a guide for State and local decision makers as they commit resources to reducing the effects of natural hazards.

(2) An *Enhanced State Mitigation Plan* must be approved by us for a State to be eligible to receive HMGP funds based on 20 percent of the total estimated eligible Federal disaster assistance. This plan must be approved by us within the 3 years prior to the current major disaster declaration. It must demonstrate that a State has developed a comprehensive mitigation program, is effectively using available mitigation funding, and is capable of managing the increased funding.

To be eligible to receive HMGP project grants, *local governments* must develop Local Mitigation Plans that include a risk assessment and mitigation strategy to reduce potential losses and target resources. Plans must be reviewed, revised, and submitted to us for approval every 5 years.

To receive HMGP project grants, *tribal governments* may apply as a grantee or subgrantee, and will be required to meet the planning requirements of a State or local government.

Estimated Total Annual Burden:

Type of collection/forms	No. of respondents	Hours per response	Annual burden hours
Update state or tribal mitigation plans (standard state mitigation plans)	18	320	5,760
State review of local plans	500 local plans	8	4,000
States develop Enhanced State Mitigation Plans	7	100	700
Local or tribal governments develop mitigation plans	500 local plans	300	150,000
Total burden			160,460

Comments: We are soliciting written comments to: (a) Evaluate whether the proposed data collection is necessary for the proper performance of the agency, including whether the information shall have practical utility; (b) evaluate the accuracy of the agency's estimate of the burden of the proposed collection of information; (c) obtain recommendations to enhance the quality, utility, and clarity of the information to be collected; and (d) evaluate the extent to which automated, electronic, mechanical, or other technological collection techniques may further reduce the respondents' burden. FEMA will accept comments through April 29, 2002.

Addressee: Interested persons should submit written comments to Muriel B. Anderson, Chief, Records Management Section, Program Services and Systems Branch, Facilities Management and Services Division, Administration and Resource Planning Directorate, Federal Emergency Management Agency, 500 C Street, Street, SW., Washington, DC 20472.

FOR FURTHER INFORMATION CONTACT: You may obtain copies of the OMB paperwork clearance package by contacting Ms. Anderson at (202) 646–2625 (voice), (202) 646–3347 (facsimile), or by e-mail at *muriel.anderson@fema.gov.*

Executive Order 13132, Federalism

Executive Order 13132, Federalism, dated August 4, 1999, sets forth principles and criteria that agencies must adhere to in formulating and implementing policies that have federalism implications, that is, regulations that have substantial direct effects on the States, or on the distribution of power and responsibilities among the various levels of government. Federal agencies must closely examine the statutory authority supporting any action that would limit the policymaking discretion of the States, and to the extent practicable, must consult with State and local officials before implementing any such action.

We have reviewed this rule under E.O.13132 and have concluded that the rule does not have federalism implications as defined by the Executive Order. We have determined that the rule does not significantly affect the rights, roles, and responsibilities of States, and involves no preemption of State law nor does it limit State policymaking discretion.

However, we have consulted with State and local officials. In order to assist us in the development of this rule, we hosted a meeting to allow interested parties an opportunity to provide their perspectives on the legislation and options for implementation of § 322. Stakeholders who attended the meeting included representatives from the National Emergency Management Association, the Association of State Floodplain Managers, the National Governors' Association, the International Association of Emergency Managers, the National Association of Development Organizations, the American Public Works Association, the National League of Cities, the National Association of Counties, the National Conference of State Legislatures, the International City/County Management Association, and the Bureau of Indian Affairs. We received valuable input from all parties at the meeting, which we took into account in the development of this rule. Additionally, we actively encourage and solicit comments on this interim final rule from interested parties, and we will consider them in preparing the final rule.

Executive Order 13175, Consultation and Coordination With Indian Tribal Governments

We have reviewed this interim final rule under Executive Order 13175, which became effective on February 6, 2001. Under the Hazard Mitigation Grant Program (HMGP), Indian tribal governments will have the option to apply for grants directly to us and to serve as ''grantee'', carrying out ''State'' roles. If they choose this option, tribal governments may submit either a State-level Standard Mitigation Plan for the 15 percent HMGP funding or a State-level Enhanced Mitigation Plan for 20 percent HMGP funding. In either case, Indian tribal governments would be able to spend up to 7 percent of those funds on planning. Before developing this rule, we met with representatives from State and local governments and the Bureau of Indian Affairs, to discuss the new planning opportunities and requirements of § 322 of the Stafford Act. We received valuable input from all parties, which helped us to develop this interim final rule.

In reviewing the interim final rule, we find that it does not have ''tribal implications'' as defined in Executive Order 13175 because it will not have a substantial direct effect on one or more Indian tribes, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes. Moreover, the interim final rule does not impose substantial direct compliance costs on tribal governments, nor does it preempt tribal law, impair treaty rights or limit the self-governing powers of tribal governments.

Congressional Review of Agency Rulemaking

We have sent this interim final rule to the Congress and to the General Accounting Office under the Congressional Review of Agency Rulemaking Act, Public Law 104–121. The rule is a not ''major rule'' within the meaning of that Act. It is an administrative action in support of normal day-to-day mitigation planning activities required by section 322 and compliance under section 323 of the Stafford Act, as enacted in DMA 2000.

The rule will not result in a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions. It will not have ''significant adverse effects'' on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises. This final rule is subject to the information collection requirements of the Paperwork Reduction Act, and OMB has assigned Control No. 3067–0297. The rule is not an unfunded Federal mandate within the meaning of the Unfunded Mandates Reform Act of 1995, Public Law 104–4, and any enforceable duties that we impose are a condition of Federal assistance or a duty arising from participation in a voluntary Federal program.

List of Subjects in 44 CFR Part 201 and Part 206

Administrative practice and procedure, Disaster assistance, Grant programs, Mitigation planning, Reporting and recordkeeping requirements.

Accordingly, Amend 44 CFR, Subchapter D—Disaster Assistance, as follows:

1. Add Part 201 to read as follows:

PART 201—MITIGATION PLANNING

Sec.

Authority: Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121–5206; Reorganization Plan No. 3 of 1978, 43 FR 41943, 3 CFR, 1978 Comp., p. 329; E.O. 12127, 44 FR 19367, 3 CFR, 1979 Comp., p. 376; E.O. 12148, 44 FR 43239, 3 CFR, 1979 Comp., p. 412; and E.O. 12673, 54 FR 12571, 3 CFR, 1989 Comp., p. 214.

§ 201.1 Purpose.

(a) The purpose of this part is to provide information on the polices and procedures for mitigation planning as required by the provisions of section 322 of the Stafford Act, 42 U.S.C. 5165.

(b) The purpose of mitigation planning is for State, local, and Indian tribal governments to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources.

§ 201.2 Definitions.

Grantee means the government to which a grant is awarded, which is accountable for the use of the funds provided. The grantee is the entire legal entity even if only a particular component of the entity is designated in the grant award document. Generally, the State is the grantee. However, after a declaration, an Indian tribal government may choose to be a grantee, or may act as a subgrantee under the State. An Indian tribal government acting as grantee will assume the responsibilities of a ''state'', as described in this part, for the purposes of administering the grant.

Hazard mitigation means any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Hazard Mitigation Grant Program means the program authorized under section 404 of the Stafford Act, 42 U.S.C 5170c and implemented at 44 CFR Part 206, Subpart N, which authorizes funding for certain mitigation measures identified through the evaluation of natural hazards conducted under section 322 of the Stafford Act 42 U.S.C 5165.

Indian tribal government means any Federally recognized governing body of an Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of Interior acknowledges to exist as an Indian tribe under the Federally Recognized Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Local government is any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Managing State means a State to which FEMA has delegated the authority to administer and manage the HMGP under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c). FEMA may also delegate authority to tribal governments to administer and manage the HMGP as a Managing State.

Regional Director is a director of a regional office of FEMA, or his/her designated representative.

Small and impoverished communities means a community of 3,000 or fewer individuals that is identified by the State as a rural community, and is not a remote area within the corporate boundaries of a larger city; is economically disadvantaged, by having an average per capita annual income of residents not exceeding 80 percent of national, per capita income, based on best available data; the local unemployment rate exceeds by one percentage point or more, the most recently reported, average yearly national unemployment rate; and any other factors identified in the State Plan in which the community is located.

The Stafford Act refers to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93–288, as amended (42 U.S.C. 5121–5206).

State is any State of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

State Hazard Mitigation Officer is the official representative of State government who is the primary point of contact with FEMA, other Federal agencies, and local governments in mitigation planning and implementation of mitigation programs and activities required under the Stafford Act.

Subgrantee means the government or other legal entity to which a subgrant is awarded and which is accountable to the grantee for the use of the funds provided. Subgrantees can be a State agency, local government, private non-profit organizations, or Indian tribal government. Indian tribal governments acting as a subgrantee are accountable to the State grantee.

§ 201.3 Responsibilities.

(a) *General.* This section identifies the key responsibilities of FEMA, States, and local/tribal governments in carrying out section 322 of the Stafford Act, 42 U.S.C. 5165.

(b) *FEMA.* The key responsibilities of the Regional Director are to:

(1) Oversee all FEMA related pre- and post-disaster hazard mitigation programs and activities;

(2) Provide technical assistance and training to State, local, and Indian tribal governments regarding the mitigation planning process;

(3) Review and approve all Standard and Enhanced State Mitigation Plans;

(4) Review and approve all local mitigation plans, unless that authority has been delegated to the State in accordance with § 201.6(d);

(5) Conduct reviews, at least once every three years, of State mitigation activities, plans, and programs to ensure that mitigation commitments are fulfilled, and when necessary, take action, including recovery of funds or denial of future funds, if mitigation commitments are not fulfilled.

(c) *State.* The key responsibilities of the State are to coordinate all State and local activities relating to hazard evaluation and mitigation and to:

(1) Prepare and submit to FEMA a Standard State Mitigation Plan following the criteria established in § 201.4 as a condition of receiving Stafford Act assistance (except emergency assistance).

(2) In order to be considered for the 20 percent HMGP funding, prepare and submit an Enhanced State Mitigation Plan in accordance with § 201.5, which must be reviewed and updated, if necessary, every three years from the date of the approval of the previous plan.

(3) At a minimum, review and, if necessary, update the Standard State Mitigation Plan by November 1, 2003 and every three years from the date of the approval of the previous plan in order to continue program eligibility.

(4) Make available the use of up to the 7 percent of HMGP funding for planning in accordance with § 206.434.

(5) Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans.

(6) For Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c), review and approve local mitigation plans in accordance with § 201.6(d).

(d) *Local governments.* The key responsibilities of local governments are to:

(1) Prepare and adopt a jurisdiction-wide natural hazard mitigation plan as a condition of receiving project grant funds under the HMGP, in accordance with § 201.6.

(2) At a minimum, review and, if necessary, update the local mitigation plan every five years from date of plan approval to continue program eligibility.

(e) *Indian tribal governments.* Indian tribal governments will be given the option of applying directly to us for Hazard Mitigation Grant Program funding, or they may choose to apply through the State. If they apply directly to us, they will assume the responsibilities of the State, or grantee, and if they apply through the State, they will assume the responsibilities of the local government, or subgrantee.

§ 201.4 Standard State Mitigation Plans.

(a) *Plan requirement.* By November 1, 2003, States must have an approved Standard State Mitigation plan meeting the requirements of this section, in order to receive assistance under the Stafford Act, although assistance authorized under disasters declared prior to November 1, 2003 will continue to be made available. In any case, emergency assistance provided under 42 U.S.C. 5170a, 5170b, 5173, 5174, 5177, 5179, 5180, 5182, 5183, 5184, 5192 will not be affected. The mitigation plan is the demonstration of the State's commitment to reduce risks from natural hazards and serves as a guide for State decision makers as they commit resources to reducing the effects of natural hazards. States may choose to include the requirements of the HMGP Administrative Plan in their mitigation plan.

(b) *Planning process.* An effective planning process is essential in developing and maintaining a good plan. The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.

(c) *Plan content.* To be effective the plan must include the following elements:

(1) Description of the *planning process* used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.

(2) *Risk assessments* that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following:

(i) An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;

(ii) An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed;

(iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

(3) A *Mitigation Strategy* that provides the State's blueprint for reducing the losses identified in the risk assessment. This section shall include:

(i) A description of State goals to guide the selection of activities to mitigate and reduce potential losses.

(ii) A discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

(iii) An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.

(iv) Identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.

(4) A section on the *Coordination of Local Mitigation Planning* that includes the following:

(i) A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.

(ii) A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.

(iii) Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.

(5) A *Plan Maintenance Process* that includes:

(i) An established method and schedule for monitoring, evaluating, and updating the plan.

(ii) A system for monitoring implementation of mitigation measures and project closeouts.

(iii) A system for reviewing progress on achieving goals as well as activities and projects identified in the Mitigation Strategy.

(6) A *Plan Adoption Process.* The plan must be formally adopted by the State prior to submittal to us for final review and approval.

(7) *Assurances.* The plan must include assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

(d) *Review and updates.* Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Director every three years. The Regional review will be completed within 45 days after receipt from the State, whenever possible. We also encourage a State to review its plan in the post-disaster timeframe to reflect changing priorities, but it is not required.

§ 201.5 Enhanced State Mitigation Plans.

(a) A State with a FEMA approved Enhanced State Mitigation Plan at the time of a disaster declaration is eligible to receive increased funds under the HMGP, based on twenty percent of the total estimated eligible Stafford Act disaster assistance. The Enhanced State Mitigation Plan must demonstrate that a State has developed a comprehensive mitigation program, that the State effectively uses available mitigation funding, and that it is capable of managing the increased funding. In order for the State to be eligible for the 20 percent HMGP funding, FEMA must have approved the plan within three years prior to the disaster declaration.

(b) Enhanced State Mitigation Plans must include all elements of the Standard State Mitigation Plan identified in § 201.4, as well as document the following:

(1) Demonstration that the plan is integrated to the extent practicable with other State and/or regional planning initiatives (comprehensive, growth management, economic development, capital improvement, land development, and/or emergency management plans) and FEMA mitigation programs and initiatives that provide guidance to State and regional agencies.

(2) Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including:

(i) Established eligibility criteria for multi-hazard mitigation measures.

(ii) A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular A–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, and to rank the measures according to the State's eligibility criteria.

(iii) Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following:

(A) Meeting HMGP and other mitigation grant application timeframes and submitting complete, technically feasible, and eligible project applications with appropriate supporting documentation;

(B) Preparing and submitting accurate environmental reviews and benefit-cost analyses;

(C) Submitting complete and accurate quarterly progress and financial reports on time; and

(D) Completing HMGP and other mitigation grant projects within established performance periods, including financial reconciliation.

(iv) A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action.

(3) Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals.

(4) Demonstration that the State is committed to a comprehensive state mitigation program, which might include any of the following:

(i) A commitment to support local mitigation planning by providing workshops and training, State planning grants, or coordinated capability development of local officials, including Emergency Management and Floodplain Management certifications.

(ii) A statewide program of hazard mitigation through the development of legislative initiatives, mitigation councils, formation of public/private partnerships, and/or other executive actions that promote hazard mitigation.

(iii) The State provides a portion of the non-Federal match for HMGP and/or other mitigation projects.

(iv) To the extent allowed by State law, the State requires or encourages local governments to use a current version of a nationally applicable model building code or standard that addresses natural hazards as a basis for design and construction of State sponsored mitigation projects.

(v) A comprehensive, multi-year plan to mitigate the risks posed to existing buildings that have been identified as necessary for post-disaster response and recovery operations.

(vi) A comprehensive description of how the State integrates mitigation into its post-disaster recovery operations.

(c) *Review and updates.* (1) A State must review and revise its plan to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities, and resubmit it for approval to the appropriate Regional Director every three years. The Regional review will be completed within 45 days after receipt from the State, whenever possible.

(2) In order for a State to be eligible for the 20 percent HMGP funding, the Enhanced State Mitigation plan must be approved by FEMA within the three years prior to the current major disaster declaration.

§ 201.6 Local Mitigation Plans.

The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

(a) *Plan requirement.* (1) For disasters declared after November 1, 2003, a local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants. Until November 1, 2003, local mitigation plans may be developed concurrent with the implementation of the project grant.

(2) Regional Directors may grant an exception to the plan requirement in extraordinary circumstances, such as in a small and impoverished community, when justification is provided. In these cases, a plan will be completed within 12 months of the award of the project grant. If a plan is not provided within this timeframe, the project grant will be terminated, and any costs incurred after notice of grant's termination will not be reimbursed by FEMA.

(3) Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan. State-wide plans will not be accepted as multi-jurisdictional plans.

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

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

(c) *Plan content.* The plan shall include the following:

(1) Documentation of 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.

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

(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;

(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

(3) *A mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

(ii) 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.

(iii) An action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

(iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

(4) A *plan maintenance process* that includes:

(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

(ii) 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.

(iii) Discussion on how the community will continue public participation in the plan maintenance process.

(5) *Documentation* that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

(d) *Plan review.* (1) Plans must be submitted to the State Hazard Mitigation Officer for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval.

(2) The Regional review will be completed within 45 days after receipt from the State, whenever possible.

(3) Plans must be reviewed, revised if appropriate, and resubmitted for approval within five years in order to continue to be eligible for HMGP project grant funding.

(4) Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c) will be delegated approval authority for local mitigation plans, and the review will be based on the criteria in this part. Managing States will review the plans within 45 days of receipt of the plans, whenever possible, and provide a copy of the approved plans to the Regional Office.

PART 206—FEDERAL DISASTER ASSISTANCE FOR DISASTERS DECLARED ON OR AFTER NOVEMBER 23, 1988

2. The authority citation for part 206 is revised to read as follows:

Authority: Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121–5206; Reorganization Plan No. 3 of 1978, 43 FR 41943, 3 CFR, 1978 Comp., p. 329; E.O. 12127, 44 FR 19367, 3 CFR, 1979 Comp., p. 376; E.O. 12148, 44 FR 43239, 3 CFR, 1979 Comp., p. 412; and E.O. 12673, 54 FR 12571, 3 CFR, 1989 Comp., p. 214.

2a. Revise Part 206, Subpart M to read as follows:

Subpart M—Minimum Standards

§ 206.400 General.

(a) As a condition of the receipt of any disaster assistance under the Stafford Act, the applicant shall carry out any repair or construction to be financed with the disaster assistance in accordance with applicable standards of safety, decency, and sanitation and in conformity with applicable codes, specifications and standards.

(b) Applicable codes, specifications, and standards shall include any disaster resistant building code that meets the minimum requirements of the National Flood Insurance Program (NFIP) as well as being substantially equivalent to the recommended provisions of the National Earthquake Hazards Reduction Program (NEHRP). In addition, the applicant shall comply with any requirements necessary in regards to Executive Order 11988, Floodplain Management, Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, and any other applicable Executive orders.

(c) In situations where there are no locally applicable standards of safety, decency and sanitation, or where there are no applicable local codes, specifications and standards governing repair or construction activities, or where the Regional Director determines that otherwise applicable codes, specifications, and standards are inadequate, then the Regional Director may, after consultation with appropriate State and local officials, require the use of nationally applicable codes, specifications, and standards, as well as safe land use and construction practices in the course of repair or construction activities.

(d) The mitigation planning process that is mandated by section 322 of the Stafford Act and 44 CFR part 201 can assist State and local governments in determining where codes, specifications, and standards are inadequate, and may need to be upgraded.

§ 206.401 Local standards.

The cost of repairing or constructing a facility in conformity with minimum codes, specifications and standards may be eligible for reimbursement under section 406 of the Stafford Act, as long as such codes, specifications and standards meet the criteria that are listed at 44 CFR 206.226(b).

§ 206.402 Compliance.

A recipient of disaster assistance under the Stafford Act must document for the Regional Director its compliance with this subpart following the completion of any repair or construction activities.

Subpart N—Hazard Mitigation Grant Program

3. Revise § 206.431 to read as follows:

§ 206.431 Definitions.

Activity means any mitigation measure, project, or action proposed to reduce risk of future damage, hardship, loss or suffering from disasters.

Applicant means a State agency, local government, Indian tribal government, or eligible private nonprofit organization, submitting an application to the grantee for assistance under the HMGP.

Enhanced State Mitigation Plan is the hazard mitigation plan approved under 44 CFR part 201 as a condition of receiving increased funding under the HMGP.

Grant application means the request to FEMA for HMGP funding, as outlined in § 206.436, by a State or tribal government that will act as grantee.

Grant award means total of Federal and non-Federal contributions to complete the approved scope of work.

Grantee means the government to which a grant is awarded and which is accountable for the use of the funds provided. The grantee is the entire legal entity even if only a particular component of the entity is designated in the grant award document. Generally, the State is the grantee. However, an Indian tribal government may choose to be a grantee, or it may act as a subgrantee under the State. An Indian tribal government acting as a grantee will assume the responsibilities of a ''state'', under this subpart, for the purposes of administering the grant.

Indian tribal government means any Federally recognized governing body of an Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of Interior acknowledges to exist as an Indian tribe under the Federally Recognized Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Local Mitigation Plan is the hazard mitigation plan required of a local or Indian tribal government acting as a subgrantee as a condition of receiving a project subgrant under the HMGP as outlined in 44 CFR 201.6.

Standard State Mitigation Plan is the hazard mitigation plan approved under 44 CFR part 201, as a condition of receiving Stafford Act assistance as outlined in § 201.4.

State Administrative Plan for the Hazard Mitigation Grant Program means the plan developed by the State to describe the procedures for administration of the HMGP.

Subgrant means an award of financial assistance under a grant by a grantee to an eligible subgrantee.

Subgrant application means the request to the grantee for HMGP funding by the eligible subgrantee, as outlined in § 206.436.

Subgrantee means the government or other legal entity to which a subgrant is awarded and which is accountable to the grantee for the use of the funds provided. Subgrantees can be a State agency, local government, private non-profit organizations, or Indian tribal government as outlined in § 206.433.

Indian tribal governments acting as a subgrantee are accountable to the State grantee.

4. Revise § 206.432(b) to read as follows:

§ 206.432 Federal grant assistance.

* * * * *

(b) *Amounts of assistance.* The total of Federal assistance under this subpart shall not exceed either 15 or 20 percent of the total estimated Federal assistance (excluding administrative costs) provided for a major disaster under 42 U.S.C. 5170b, 5172, 5173, 5174, 5177, 5178, 5183, and 5201 as follows:

(1) *Fifteen (15) percent.* Effective November 1, 2003, a State with an approved Standard State Mitigation Plan, which meets the requirements outlined in 44 CFR 201.4, shall be eligible for assistance under the HMGP not to exceed 15 percent of the total estimated Federal assistance described in this paragraph. Until that date, existing, approved State Mitigation Plans will be accepted.

(2) *Twenty (20) percent.* A State with an approved Enhanced State Mitigation Plan, in effect prior to the disaster declaration, which meets the requirements outlined in 44 CFR 201.5 shall be eligible for assistance under the HMGP not to exceed 20 percent of the total estimated Federal assistance described in this paragraph.

(3) The estimates of Federal assistance under this paragraph (b) shall be based on the Regional Director's estimate of all eligible costs, actual grants, and appropriate mission assignments.

* * * * *

5. Section 206.434 is amended by redesignating paragraphs (b) through (g) as paragraphs (c) through (h), respectively; adding a new paragraph (b); revising redesignated paragraphs (c) introductory text and (c)(1); and revising redesignated paragraph (d) to read as follows:

§ 206.434 Eligibility.

* * * * *

(b) *Plan requirement.* (1) For all disasters declared on or after November 1, 2003, local and tribal government applicants for subgrants, must have an approved local mitigation plan in accordance with 44 CFR 201.6 prior to receipt of HMGP subgrant funding. Until November 1, 2003, local mitigation plans may be developed concurrent with the implementation of subgrants.

(2) Regional Directors may grant an exception to this requirement in extraordinary circumstances, such as in a small and impoverished community when justification is provided. In these cases, a plan will be completed within 12 months of the award of the project grant. If a plan is not provided within this timeframe, the project grant will be terminated, and any costs incurred after notice of grant's termination will not be reimbursed by FEMA.

(c) *Minimum project criteria.* To be eligible for the Hazard Mitigation Grant Program, a project must:

(1) Be in conformance with the State Mitigation Plan and Local Mitigation Plan approved under 44 CFR part 201;

* * * * *

(d) *Eligible activities.* (1) *Planning.* Up to 7% of the State's HMGP grant may be used to develop State, tribal and/or local mitigation plans to meet the planning criteria outlined in 44 CFR part 201.

(2) *Types of projects.* Projects may be of any nature that will result in protection to public or private property. Eligible projects include, but are not limited to:

(i) Structural hazard control or protection projects;

(ii) Construction activities that will result in protection from hazards;

(iii) Retrofitting of facilities;

(iv) Property acquisition or relocation, as defined in paragraph (e) of this section;

(v) Development of State or local mitigation standards;

(vi) Development of comprehensive mitigation programs with implementation as an essential component;

(vii) Development or improvement of warning systems.

* * * * *

6. Revise § 206.435(a) to read as follows:

§ 206.435 Project identificaiton and selection criteria.

(a) *Identification.* It is the State's responsibility to identify and select eligible hazard mitigation projects. All funded projects must be consistent with the State Mitigation Plan. Hazard Mitigation projects shall be identified and prioritized through the State, Indian tribal, and local planning process.

* * * * *

7. Revise § 206.436 to read as follows:

§ 206.436 Application procedures.

(a) *General.* This section describes the procedures to be used by the grantee in submitting an application for HMGP funding. Under the HMGP, the State or Indian tribal government is the grantee and is responsible for processing subgrants to applicants in accordance with 44 CFR part 13 and this part 206. Subgrantees are accountable to the grantee.

(b) *Governor's Authorized Representative.* The Governor's Authorized Representative serves as the grant administrator for all funds provided under the Hazard Mitigation Grant Program. The Governor's Authorized Representative's responsibilities as they pertain to procedures outlined in this section include providing technical advice and assistance to eligible subgrantees, and ensuring that all potential applicants are aware of assistance available and submission of those documents necessary for grant award.

(c) *Hazard mitigation application.* Upon identification of mitigation measures, the State (Governor's Authorized Representative) will submit its Hazard Mitigation Grant Program application to the FEMA Regional Director. The application will identify one or more mitigation measures for which funding is requested. The application must include a Standard Form (SF) 424, Application for Federal Assistance, SF 424D, Assurances for Construction Programs, if appropriate, and an narrative statement. The narrative statement will contain any pertinent project management information not included in the State's administrative plan for Hazard Mitigation. The narrative statement will also serve to identify the specific mitigation measures for which funding is requested. Information required for each mitigation measure shall include the following:

(1) Name of the subgrantee, if any;

(2) State or local contact for the measure;

(3) Location of the project;

(4) Description of the measure;

(5) Cost estimate for the measure;

(6) Analysis of the measure's cost-effectiveness and substantial risk reduction, consistent with § 206.434(c);

(7) Work schedule;

(8) Justification for selection;

(9) Alternatives considered;

(10) Environmental information consistent with 44 CFR part 9, Floodplain Management and Protection of Wetlands, and 44 CFR part 10, Environmental Considerations.

(d) *Application submission time limit.* The State's application may be amended as the State identifies and selects local project applications to be funded. The State must submit all local HMGP applications and funding requests for the purpose of identifying new projects to the Regional Director within 12 months of the date of disaster declaration.

(e) *Extensions.* The State may request the Regional Director to extend the application time limit by 30 to 90 day increments, not to exceed a total of 180 days. The grantee must include a justification in its request.

(f) *FEMA approval.* The application and supplement(s) will be submitted to the FEMA Regional Director for approval. FEMA has final approval authority for funding of all projects.

(g) *Indian tribal grantees.* Indian tribal governments may submit a SF 424 directly to the Regional Director.

Subpart H—Public Assistance Eligibility

* * * * *

8. Revise § 206.220 to read as follows:

§ 206.220 General.

This subpart provides policies and procedures for determinations of eligibility of applicants for public assistance, eligibility of work, and eligibility of costs for assistance under sections 402, 403, 406, 407, 418, 419, 421(d), 502, and 503 of the Stafford Act. Assistance under this subpart must also conform to requirements of 44 CFR part 201, Mitigation Planning, and 44 CFR part 206, subparts G—Public Assistance Project Administration, I—Public Assistance Insurance Requirements, J—Coastal Barrier Resources Act, and M—Minimum Standards. Regulations under 44 CFR part 9—Floodplain Management and 44 CFR part 10—Environmental Considerations, also apply to this assistance.

9. Section 206.226 is amended by redesignating paragraphs

(b) through (j) as paragraphs (c) through (k), respectively; adding a new paragraph (b); and revising redesignated paragraph (g)(5) to read as follows:

§ 206.226 Restoration of damaged facilities.

* * * * *

(b) *Mitigation planning.* In order to receive assistance under this section, as of November 1, 2003, the State must have in place a FEMA approved State Mitigation Plan in accordance with 44 CFR part 201.

* * * * *

(g) * * *

(5) If relocation of a facility is not feasible or cost effective, the Regional Director shall disapprove Federal funding for the original location when he/she determines in accordance with 44 CFR parts 9, 10, 201, or subpart M of this part 206, that restoration in the original location is not allowed. In such cases, an alternative project may be applied for.

* * * * *

Dated: February 19, 2002.

Michael D. Brown,

General Counsel.

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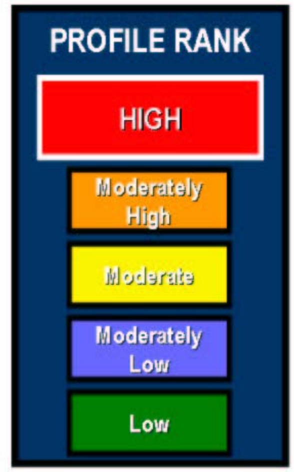
BILLING CODE 6718–05–P

APPENDIX C: Hazard Analysis

The hazard identification and ranking was obtained primarily from the Lassen County, City of Susanville, and Susanville Indian Rancheria Hazard Identification Workshop. The Hazard Identification Workshop was conducted as a participatory Steering Committee workshop to identify the potential hazards within the County. The Hazard Identification Workshop was facilitated utilizing an automated interactive software spreadsheet program that asks specific questions on potential hazards and then rates them accordingly. These questions guide the team in the correct facilitation and application of the program. The following spreadsheet summarizes the Hazard Identification Workshop risk ranking results, including the descriptions of each hazard factor, and provides the specific descriptor choices for each risk factor and description. Additionally, a risk ranking matrix is provided to designate the overall ranking score and categorization of each hazard.

Hazard Identification and Risk Ranking



Each hazard profile will include a profile ranking of the hazard (ranging from low risk to high risk). The Steering Committee determined this initial profile ranking based on all of the hazard identification and profile research summarized and group discussion and evaluation of all of the data, including numerical rankings (1-5) of the following criteria:

- **Consequence/Severity** – How wide spread is the impact area?
- **Secondary Effects** – Could the event trigger another event and separate response?
- **Probability/Frequency** – Historical view of how often this type of event occurs locally and projected recurrence intervals.
- **Warning/Onset** – Advance warning of the event, or none.
- **Duration** – Length of elapsed time where response resources are active.
- **Recovery** – Length of time until lives and property return to normal.

Thus, the Hazard Identification Workshop is conducted as a participatory Steering Committee workshop to identify the potential hazards within the respective jurisdiction. The Hazard Identification Workshop is facilitated utilizing an automated interactive software spreadsheet program that asks specific questions on potential hazards and then rates them accordingly. These questions guide the team in the correct facilitation and application of the program. The table on the following page summarizes the Hazard Identification Workshop risk factors, lists the descriptions of each factor, and provides the specific descriptor choices for each risk factor and description. Additionally, a risk ranking matrix is provided to illustrate the relative risk for each ranking set.

Risk Factor	Description	Descriptors
Probability / Frequency	Prediction of how often a hazard will occur in the future	Infeasible event - not applicable due to geographic location characteristics
		Rare event - occurs less than once every 50 years
		Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)
		Regular event - occurs between once a year and once every 7 years
		Frequent event - occurs more than once a year
Consequence / Severity	Physical Damage - structures and lifelines Economic Impact – loss of function for power, water, sanitation, roads, etc.	No damage
		Minor/slight damage to buildings and structures, no loss of lifelines
		Moderate building damage, minor loss of lifelines (less than 12 hours)
		Moderate building damage, lifeline loss (less than 24 hours)
		Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life
Vulnerability	Impact Area - area impacted by a hazard event Secondary Impacts - Capability of triggering additional hazards Onset - Period of time between initial recognition of an approaching hazard and when the hazard begins to impact the community	No physical damage, no secondary impacts
		Localized damage area
		Localized damage area, minor secondary impacts, delayed hazard onset
		Moderate damage area, moderate secondary impacts, moderate warning time
		Widespread damage area, significant secondary impacts, no warning time

Risk Ranking Matrix

Probability/Frequency Description	Risk Ranking Matrix
Rare Event: Occurs less than once every 50 years	**Probability/Frequency Value: 1** — Consequence/Severity 1–5 × Vulnerability 1–5 (see below)
Infrequent Event: Occurs between once every 8 years and once every 50 years (inclusive)	**Probability/Frequency Value: 2**
Regular Event: Occurs between once a year and once every 7 years	**Probability/Frequency Value: 3**
Frequent Event: Occurs more than once a year	**Probability/Frequency Value: 4**

Probability/Frequency Value: 1

Vulnerability	Consequence/Severity 1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Probability/Frequency Value: 2

Vulnerability	Consequence/Severity 1	2	3	4	5
1	2	4	6	8	10
2	4	8	12	16	20
3	6	12	18	24	30
4	8	16	24	32	40
5	10	20	30	40	50

Probability/Frequency Value: 3

Vulnerability	Consequence/Severity 1	2	3	4	5
1	3	6	9	12	15
2	6	12	18	24	30
3	9	18	27	36	45
4	12	24	36	48	60
5	15	30	45	60	75

Probability/Frequency Value: 4

Vulnerability	Consequence/Severity 1	2	3	4	5
1	4	8	12	16	20
2	8	16	24	32	40
3	12	24	36	48	60
4	16	32	48	64	80
5	20	40	60	80	100

Risk Rank Categorization	
High Hazard	75 to 100
Moderately High Hazard	50 to 74
Moderate Hazard	25 to 49
Moderately Low Hazard	5 to 24
Low Hazard	1 to 4

HAZARD IDENTIFICATION AND RISK RANKING

Earthquake

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability/Frequency	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence/Severity	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	Moderately High	30
Comments		

City of Susanville

Hazard Rank Factors	Hazard Factor Description	Rank
Probability/Frequency	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence/Severity	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	Moderately High	30
Comments		

Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability/Frequency	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence/Severity	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	3
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	Moderate	18
Comments		

Wildfire

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	100
Comments		

City of Susanville

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	High	60
Comments		

HAZARD IDENTIFICATION AND RISK RANKING

Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a yeaı	4
Vulnerability	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Consequence	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	100
Comments		

Flood

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Regular event - occurs between once a year and once every 7 years	3
consequence	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	4
vulnerability	Moderate damage area, moderate secondary impacts, moderate warning time	4
Risk	Moderately High	48
Comments		

City of Susanville

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Regular event - occurs between once a year and once every 7 years	3
Consequence	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	4
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	Moderately High	36
Comments		

Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Rare event - occurs less than once every 50 years	1
Consequence	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability	2
Vulnerability	Localized damage area	2
Risk	Low	4
Comments		

HAZARD IDENTIFICATION AND RISK RANKING

Severe Storm

Lassen County / City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Regular event - occurs between once a year and once every 7 years	3
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	75
Comments		

Wind/Tornado

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	4
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	80
Comments		

City of Susanville

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	3
Vulnerability	Localized damage area, minor secondary impacts, delayed hazard onse	3
Risk	Moderately High	36
Comments		

Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Moderate building damage, lifeline loss (less than 24 hours), severe injury or disability	4
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	80
Comments		

HAZARD IDENTIFICATION AND RISK RANKING

Extreme Heat

Lassen County / City of Susanville / Susanville Indian Rancheria	Hazard Rank Factors	Hazard Factor Description	Rank
	Probability	Frequent event - occurs more than once a yeai	4
	Consequence	No damage	1
	Vulnerability	Moderate damage area, moderate secondary impacts, moderate warning time	4
	Risk	Moderate	16
	Comments		

Hazardous Material Release

Lassen County / City of Susanville / Susanville Indian Rancheria	Hazard Rank Factors	Hazard Factor Description	Rank
	Probability	Regular event - occurs between once a year and once every 7 years	3
	Consequence	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	3
	Vulnerability	Localized damage area	2
	Risk	Moderate	18
	Comments		

Pandemic

Lassen County / City of Susanville / Susanville Indian Rancheria	Hazard Rank Factors	Hazard Factor Description	Rank
	Probability	Rare event - occurs less than once every 50 years	1
	Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
	Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
	Risk	Moderately High	25
	Comments		

Drought

Lassen County	Hazard Rank Factors	Hazard Factor Description	Rank
	Probability	Regular event - occurs between once a year and once every 7 years	3
	Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
	Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
	Risk	High	75
	Comments		

HAZARD IDENTIFICATION AND RISK RANKING

City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Regular event - occurs between once a year and once every 7 years	3
Consequence	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability	2
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	Moderately High	30
Comments		

Nuclear Release

Lassen County / City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Rare event - occurs less than once every 50 years	1
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	Moderately High	25
Comments		

Power Failure

Lassen County / City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Frequent event - occurs more than once a year	4
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	100
Comments		

Dam/Reservoir Failure

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Moderate damage area, moderate secondary impacts, moderate warning time	4
Risk	Moderately High	40
Comments		

HAZARD IDENTIFICATION AND RISK RANKING

City of Susanville

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Rare event - occurs less than once every 50 years	1
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	Moderately High	25
Comments		

Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infeasible event - not applicable due to geographic location characteristics	0
Consequence		0
Vulnerability		0
Risk	Not a Hazard	0
Comments		

Terrorism

Lassen County / City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)	2
Consequence	Moderate building damage, minor loss of lifelines (less than 12 hours), lost time injury but no disability	3
Vulnerability	Localized damage area	2
Risk	Moderately Low	12
Comments		

Gas Pipeline Failure

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Moderate damage area, moderate secondary impacts, moderate warning time	4
Risk	Moderately High	40
Comments		

HAZARD IDENTIFICATION AND RISK RANKING

City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infrequent event - occurs between once every 8 years and once every 50 years (inclusive	2
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	High	50
Comments		

Avalanche

Lassen County

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Rare event - occurs less than once every 50 years	1
Consequence	Minor/slight damage to buildings and structures, no loss of lifelines, first aid injury and no disability	2
Vulnerability	Localized damage area	2
Risk	Low	4
Comments		

City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Infeasible event - not applicable due to geographic location characteristics	0
Consequence		0
Vulnerability		0
Risk	Not a Hazard	0
Comments		

Volcano

Lassen County / City of Susanville / Susanville Indian Rancheria

Hazard Rank Factors	Hazard Factor Description	Rank
Probability	Rare event - occurs less than once every 50 years	1
Consequence	Extensive building damage, widespread loss of lifelines (water, gas, electricity, sanitation, roads), loss of life	5
Vulnerability	Widespread damage area, significant secondary impacts, no warning time	5
Risk	Moderately High	25
Comments		

APPENDIX E: Benefit-Cost Analysis

Benefits can be classified as avoided damages and losses. To calculate the benefit of implementing mitigation recommendations, one would first calculate the likely damage without the mitigation action. Next, one would calculate the likely damage after the implementation of the mitigation recommendation. Then, the losses after mitigation are subtracted from the losses without mitigation to calculate net benefits. Finally, the useful life of the building and the time value of money (discount rate) are used to convert those average annual losses to their present value using the following Net Present Value (NPV) equation:

$$NPV = -M + B*[(1-(1 + i)^{-T}) / i]$$

Where M is the cost of the mitigation measure, B is the net benefit (loss without mitigation - loss with mitigation), T is the useful life of the asset (50 years), and i is the interest rate to calculate the present day value (7%).

The net benefits of mitigation are compared to the direct costs of implementing the mitigation action. This relationship is expressed as the ratio of benefits to costs.

Benefit / Cost = (NPV of expected benefit) / (mitigation cost)

A ratio of greater than 1.0 is considered a worthwhile mitigation investment.

Since the Benefit-Cost Analysis is an integral part of obtaining grant money from the Federal Emergency Management Agency for mitigation efforts, this appendix includes the requirements for classifying benefits for select mitigation projects, include FEMA's *What is a Benefit* and *Using Benefit-Cost Review in Mitigation Planning*.

Using Benefit-Cost Review in Mitigation Planning

State and Local Mitigation Planning
How-To Guide Number Five
FEMA 386-5 *May 2007*

FEMA

U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472

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List of Exhibits

INTRODUCTION

The **Disaster Mitigation Act of 2000** (DMA 2000) provides an opportunity for States, Tribal governments, and local jurisdictions to significantly reduce their vulnerability to natural hazards. It also allows them to streamline the receipt and use of Federal disaster assistance through pre-disaster hazard mitigation planning. DMA 2000 places new emphasis on State, Tribal, and local mitigation planning by requiring these entities to develop and submit mitigation plans as a condition of receiving various types of pre- and post-disaster assistance (such as the Pre-Disaster Mitigation [PDM] program and the Hazard Mitigation Grant Program [HMGP]) under the Stafford Act.

On February 26, 2002, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published an **Interim Final Rule** (the Rule) to implement the mitigation planning requirements of DMA 2000. The Rule outlines the requirements for State, Tribal and local mitigation plans.

FEMA has developed a series of guides, called the **Mitigation Planning "How-To" Guides**, to provide State, Tribal, and local governments with easy-to-understand information needed to initiate and maintain a hazard mitigation planning process and meet the requirements of the Rule. The guides can be ordered free of cost by calling 1-800-480-2520, or they can be downloaded from http://www.fema.gov/plan/mitplanning/planning_resources.shtm#1.

The first four How-To Guides are known as the "core four" guides. They provide the basic instructions for preparing a natural hazard mitigation plan. They are:

- *Getting Started: Building Support for Mitigation Planning* (FEMA 386-1)
- *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2)
- *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies* (FEMA 386-3)
- *Bringing the Plan to Life: Implementing the Hazard Mitigation Plan* (FEMA 386-4)

This How-To Guide, Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5), supplements FEMA 386-3 and focuses on guidance for using Benefit-Cost Review when prioritizing mitigation actions in a hazard mitigation plan.

About This Document

Purpose

The purpose of a mitigation plan is to reduce the community's vulnerability to hazards. After assessing its risks, a community may consider many mitigation options. However, due to monetary as well as other limitations, it is often impossible to implement all mitigation actions. Hence, the Planning Team needs to select the most cost-effective actions for implementation first, not only to use resources efficiently, but to make a realistic start toward mitigating risks.

The Rule supports the principle of cost-effectiveness by requiring hazard mitigation plans to have an action plan that includes a prioritization process that demonstrates a special emphasis on maximization of benefits over costs. The requirement states:

> *The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs. [§201.6(c)(3)(iii)]*

The purpose of this guide is to help local jurisdictions understand how to apply the concepts of Benefit-Cost Review to the prioritization of mitigation actions, and thereby meet the requirement of the Rule.

Benefit-Cost Review vs. Benefit-Cost Analysis

The Benefit-Cost Review for mitigation planning differs from the benefit-cost analysis (BCA) used for specific projects. BCA is a method for determining the potential positive effects of a mitigation action and comparing them to the cost of the action. To assess and demonstrate the cost-effectiveness of mitigation actions, FEMA has developed a suite of BCA software, including hazard-specific modules. The analysis determines whether a mitigation project is technically cost-effective.

The principle behind the BCA is that the benefit of an action is a reduction in future damages. The Benefit-Cost Review method described in this guide is based on the same principle, but this guide does NOT explain how to conduct a BCA. DMA 2000 does not require hazard mitigation plans to include BCAs for specific projects.

A Benefit-Cost Review can satisfy the DMA 2000 requirements even if it is relatively simple. Remember that a Benefit-Cost Review can be broad and need not be complex. It needs to be comprehensive so that it covers monetary as well as non-monetary costs and benefits associated with each action. Some projects can be extremely cost-effective but not as beneficial for the community at large. The Planning Team should think through a wide variety of questions, such as: How many people will benefit from the action? How large an area is impacted? How critical are the facilities that benefit from the action (e.g., is it more beneficial to protect the fire station than the administrative building, even though it costs more)? Environmentally, does it make sense to do this project for the overall community?

A hazard mitigation plan must demonstrate that a process was employed that emphasized a review of costs and benefits when prioritizing the mitigation actions. This requirement allows the Planning Team flexibility in determining which method to use. Four methods are described in this document, ranging from qualitative to more quantitative. These examples are intended to be illustrative of acceptable processes, but do not cover all possible methods that are approvable under DMA 2000.

How to Use This How-To Guide

The Rule states, “The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of mitigation actions.” However, no specific methodology for the analysis is specified or required. FEMA 386-3 discusses some ways to conduct an analysis. This How-To Guide, Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5), provides methods and examples to review benefits and costs, prioritize actions and document the entire process.

This guide is organized as follows:

Part 1 - Review Benefits and Costs – This section explains how to review benefits and costs for each action.

Part 2 A - Prioritize Actions – Qualitative Methods – This section provides two qualitative methods to prioritize actions (Methods A and B).

Part 2 B - Prioritize Actions – Quantitative Methods – This section provides two quantitative methods to prioritize actions (Methods C and D).

Part 3 - Document the Review and Prioritization Process – This section discusses documentation of the Benefit-Cost Review process in the plan to meet DMA 2000 requirements.

Worksheets (Review Tools) like the ones in Part 1 can be used to summarize the costs and benefits. After the review of benefits and costs for each action, the Planning Team will be able to prioritize the actions.

They can then use one of the four methods (A to D), which range from simple to complex. See Figure 1 for an illustration of how to use this guide. Blank worksheets are included in Appendix A, Exhibits. The worksheets can be duplicated and used to record the progress of prioritizing mitigation actions for the hazard mitigation plan.

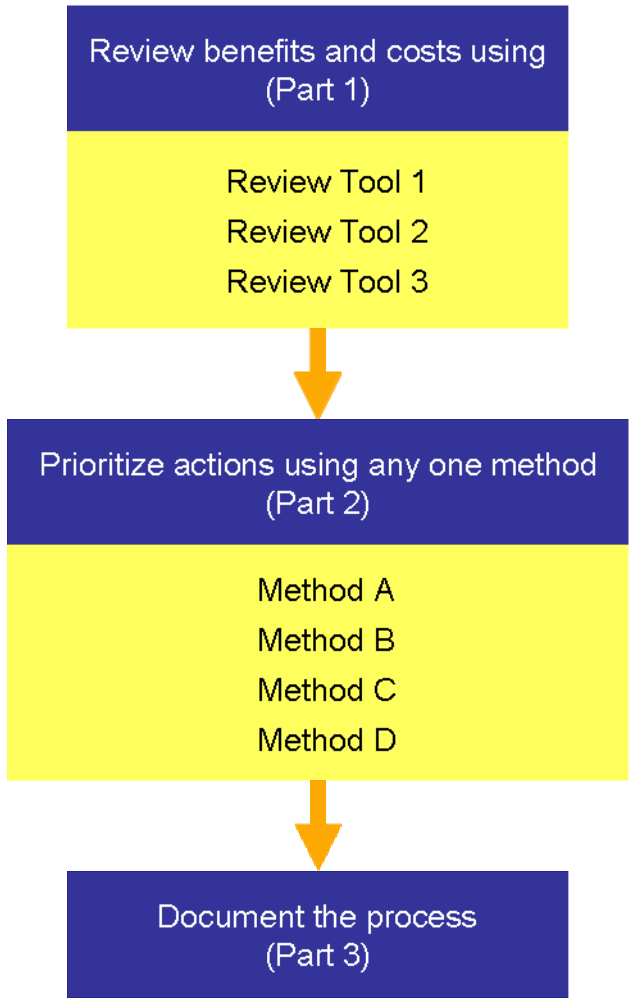

Figure 1. How to Use This How-To Guide

Therefore, a hazard mitigation plan will meet the requirements of the Rule by:

- Using Review Tools 1, 2, and 3 from Part 1,
- Using any one prioritization method from Part 2 (Method A, B, C, or D), and
- Documenting the process (as described in Part 3).

To assess the measurable and non-measurable benefits and costs associated with each action, use Review Tools 1, 2, and 3. Then, summarize the analysis of each action's benefits and costs and use this review later when prioritizing the actions.

Review Tool 1: Measuring Vulnerability Before and After Mitigation

Action: ____

Vulnerability	Before the Action is implemented*	After the Action is implemented*	Difference
Number of people affected by the hazard			
Area affected (acreage) by the hazard			
Number of properties affected by the hazard			
Property damage (amount in $)			
Loss of use (number of properties/physical assets [e.g., bridges] in number of days)			
Loss of life (number of people)			
Injury (number of people)			
**			

*Include measurable items, where possible, based on experience, professional estimate, or judgment.
**Add more categories of risk as appropriate for the specific community's plan.

Sample Exhibit 1: Measuring Vulnerability Before and After Mitigation

(Exhibit 1 shows Review Tool 1 filled out for one action)

Action: Floodproof 10 businesses in the downtown area

Vulnerability	Before the Action is implemented	After the Action is implemented	Difference
Number of people affected by the hazard	Almost entire community (because downtown is affected)	Same as before but they will be less affected if businesses are able to remain open	Less impact
Area affected (acreage) by the hazard	1 acre	1 acre	Area still affected but less impact
Number of properties affected by the hazard	15	5	10
Property damage (amount in $)	$100,000 every year	$10,000 every year	$90,000 every year
Loss of use (number of properties/physical assets [e.g., bridges] in number of days)	10 properties for 5 days every year	0	Completely eliminated
Loss of life (number of people)	2 every 20 years	1 every 20 years	Reduced by half
Injury (number of people)	0	0	0

PART 1: REVIEW BENEFITS AND COSTS

A simple listing of other costs and benefits (that do not fit into the quantitative format of Review Tool 1) can supplement Review Tool 1, as shown in Review Tools 2 and 3. Fill out as many items as possible.

Review Tool 2: Benefits

Action: ______________________________

Benefits
Risk reduction (short- or long-term)
If other community goals are achieved, explain
If easy to implement, explain
If funding is available, explain
If politically/socially acceptable, explain

Sample Exhibit 2: Benefits

Action: Floodproof 10 businesses in the downtown area

Benefits
City's cost to repair flooded properties reduced by 80%; approximate saving of $5,000 per year
Flooding problem in downtown area solved for the long-term; community's problem of business interruption solved
Federal grants like Flood Mitigation Assistance (FMA) and PDM can be applied for to implement the proposed floodproofing
Will help improve CRS rating in the long term (so entire community's flood insurance premium will be reduced)
More than half the members of the City Council are opposed to buy-outs; it might be easier to get their support for an alternative to buy-outs

Review Tool 3: Costs

Action: ______________________________

Costs*
Construction cost (amount in $)
Programming cost (amount in $, # of people needed to administer)
Time needed to implement
If unfair to a certain social group, explain
If there is public/political opposition, explain
If there are any adverse effects on the environment, explain

*If precise costs are not available, use costs based on experience, professional estimate, or judgment.

Sample Exhibit 3: Costs

Action: Floodproof 10 businesses in the downtown area

Costs
Floodproofing cost = $10,000 X 10 = $100,000
Need at least 3 people to administer (after technical assistance from the State)
Need a year to implement

PART 1: REVIEW BENEFITS AND COSTS

After reviewing benefits and costs for all the actions using the Review Tools, go on to prioritize the actions. Note that there are many ways of prioritizing actions; however, DMA 2000 mandates an emphasis on Benefit-Cost Review as part of the prioritization process. Directly linking the prioritization process to the Benefit-Cost Review clearly shows that costs and benefits were emphasized. Therefore, when the review of benefits and costs of actions in Part 1 is used to prioritize the actions using one of the methods from Part 2, the process meets DMA 2000 requirements.

PART 2A: PRIORITIZE ACTIONS - QUALITATIVE METHODS

Based on the review completed in Part 1, use Part 2 to prioritize or rank the actions.

The two qualitative methods described in this section rely on a holistic response or common sense ranking. The two quantitative approaches in Part 2B rely more on comparative analysis that can be translated into mathematical scores. When the number of actions is relatively small, a subjective or qualitative process may be used. The greater the number of actions, the more likely it is that a more quantitative approach will be useful in assigning priority.

Method A: Simple Listing

The qualitative method described below helps the Planning Team judge the priorities of actions based on perceived pros and cons (i.e., benefits and costs).

The method is best used when it is not possible, or appropriate, to identify a quantitative measure of benefits and costs. Each action can have a unique advantage or disadvantage that can subsequently be used for prioritization.

Using this method ensures that special emphasis is given to Benefit-Cost Review by categorizing prioritization criteria (e.g., ease of implementation, technical effectiveness) as either benefits or costs.

Step 1: List identified actions

For each hazard, list the actions identified earlier in the plan.

Step 2: Identify benefits and costs

Identify all expected benefits (i.e., positive effects) and costs (i.e., perceived obstacles) of the actions and write these down in the benefits and costs columns, respectively. Use Review Tools 1, 2, and 3 (see Exhibits 1, 2, and 3) from Part 1.

Step 3: Assign priority

As a result of the Benefit-Cost Review, the Planning Team assigns a priority to each action. Priority can be expressed in many ways, such as:

- High, medium, low, accompanied by an explanation of what each term means.
- Priority 1, Priority 2, etc.
- Immediate, short-term, and long-term, accompanied by an explanation of what each category means (e.g., immediate = within a month, short-term = within 6 months, long-term = within 2 years).

Sample Exhibit 4: Prioritization by Listing Benefits and Costs

Actions	Benefits (Pros)	Costs (Cons)	Priority
Floodproof 10 businesses in the downtown area	- Avoidance of 1 loss of life every 20 years (casualties reduced by half) - Saving of $90,000 in private damages and $5,000 in public cost - Loss of use of 10 downtown businesses completely eliminated - Community's problem of business interruption solved - Federal grants like FMA and PDM can be applied for to implement the proposed floodproofing - Will help improve CRS rating in the long term (so entire community's flood insurance premium will be reduced) - More than half the members of the City Council are opposed to buy-outs; it might be easier to get their support for an alternative to buy-outs	- Floodproofing cost = $10,000 X 10 = $100,000 - Need at least 3 people to administer (after obtaining technical assistance from the State) - Need a year to implement	High (Priority no. 1)
Build safe rooms for a neighborhood of 50 homes without basements	- Avoidance of 5 lives lost every 20 years (casualties reduced by half) - Public and political support for mitigating this hazard exists (due to regular recurrence of tornadoes)	- City will share 50% of the cost per existing home = $2,000 X 50 = $100,000 - Administrative cost per home = $1,000 X 50 = $50,000 - Need 3 years to complete - Tornadoes are unpredictable; they may never strike this exact area again	Medium (Priority no. 2)
Broadcast educational video on local channel on hazard mitigation	- Local channel might be willing to broadcast free of cost - Publicity would spread awareness about mitigation methods as well as what to do in an emergency	- Cost of preparing video = $5,000 - Only 5% of population might notice the broadcast - Only 5% of that 5% might actually consider acting on individual mitigation methods	Low (Priority no. 3)

Method B: Relative Rating

A second approach is to assign relative scores to the actions based on qualitative factors. By rating costs and benefits as High, Medium, and Low, this method clearly emphasizes the Benefit-Cost Review. Exhibit 5 uses a set of factors commonly called STAPLEE, which stands for **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental factors. They are typically used for evaluating planning alternatives. For details on using STAPLEE, refer to FEMA 386-3.

Sample Exhibit 5: Prioritization Using STAPLEE and Qualitative Scores

Actions → / Criteria ↓	Floodproof 10 properties in the downtown area		Build safe rooms in a neighborhood of 50 homes without basements		Broadcast educational video about hazard mitigation on local channel	
	Cost	**Benefit**	**Cost**	**Benefit**	**Cost**	**Benefit**
Social	-	-	L	-	-	-
Technical	M	H	M	M	L	L
Administrative	M	-	M	-	L	-
Political	-	L	-	H	-	-
Legal	-	-	-	-	-	-
Economic	M	H	H	-	-	-
Environmental	-	-	-	-	-	-
Priority	High (priority 1)		Medium (priority 2)		Low (priority 3)	

Definition of rating scale: H=High, M=Medium, L=Low, - None/Not applicable

Use the Review Tools completed in Part 1 to help rate the costs and benefits. For help on how to rank High, Medium, Low, None, or NA, see the explanation about STAPLEE in FEMA 386-3.

Quantitative methods typically assign numerical values to concepts like high, medium, and low. The Planning Team needs to review the scores and make sure they make sense.

Method C: Simple Score

A simple way of using scores based on the STAPLEE criteria is shown in Exhibit 6. After the table is completed, the scores can be added to determine priority.

Sample Exhibit 6: Prioritization Using STAPLEE and Simple Scores

Actions → / Criteria ↓	Floodproof 10 properties in the downtown area		Build safe rooms in a neighborhood of 50 homes without basements		Broadcast educational video about hazard mitigation on local channel	
	Cost	**Benefit**	**Cost**	**Benefit**	**Cost**	**Benefit**
Social	0	1	-1	1	0	0
Technical	-1	2	-1	2	-1	1
Administrative	-1	0	-1	0	-1	0
Political	0	1	0	1	0	0
Legal	0	0	0	0	0	0
Economic	-1	2	-1	0	0	0
Environmental	0	0	0	0	0	0
Sub-total of cost/benefit	-3	6	-4	4	-2	1
Total Score	-3+6 = 3		-4+4 = 0		-2+1 = -1	
Priority	**No. 1**		**No. 2**		**No. 3**	

Definition of rating scale: 2=Very beneficial, 1=Favorable, 0=None/Not applicable, -1=Not Favorable

The Planning Team should be careful when assigning criteria, scores, and weights to avoid the problem inherent in comparing different types of actions. In the example above, the scores allowed the participants to objectively compare the various actions. The weakness of such a simple method is that very different kinds of actions may score similarly, and if not given qualitative consideration (a common-sense check), may yield a questionable ranking. In this example, the safe-room action's total score is very low compared to the floodproofing action, but the Relative Rating method (Method B in Part 2A) showed that for floodproofing and safe rooms, the actions were similar in how their benefits measured up against the costs, and for both actions the benefits exceeded the costs. The Simple Score method shown above, however, results in a greater difference in the final priority scores (3 vs. 0), indicating a large difference in these actions' cost-effectiveness. A formal Benefit-Cost Analysis for each project would verify whether this large difference is accurate, although it is not required for the plan.

Method D: Weighted Score

As noted in the Simple Score method (Method C), a common-sense adjustment may be necessary to adapt the prioritization to the plan. The weighted score method attempts to compensate for the limitations of the Simple Score method by adding emphasis to those factors judged to be more important.

An example of weighted scores using STAPLEE follows.

Sample Exhibit 7: Prioritization Using STAPLEE and Weighted Scores

Actions → / Criteria ↓	Floodproof 10 properties in the downtown		Build safe rooms in a neighborhood of 50 homes without basements		Broadcast educational video about hazard mitigation on local channel	
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social (weight = 1)	0	1	-1	1	0	0
Technical (weight = 2)	-1x2=-2	2x2=4	-1x2=-2	2x2=4	-1x2=-2	1x2=2
Administrative (weight = 1)	-1	0	-1	0	-1	0
Political (weight = 1)	0	1	0	1	0	0
Legal (weight = 1)	0	0	0	0	0	0
Economic (weight = 2)	-1x2=-2	2x2=4	-1x2=-2	0	0	0
Environmental (weight = 1)	0	0	0	0	0	0
Sub-total of cost/benefit	-5	10	-6	6	-3	2
Total Score	-5+10 = 5		-6+6 = 0		-3+2 = -1	
Priority	**No. 1**		**No. 2**		**No. 3**	

Definition of rating scale: 2=Very beneficial, 1=Favorable, 0=None/Not applicable, -1=Not Favorable

Assigning weights to some factors over others can become challenging for the Planning Team. Local knowledge and values should guide the process to achieve the priorities most appropriate for the local situation.

PART 3: DOCUMENT THE REVIEW AND PRIORITIZATION PROCESS

Remember to document in the plan the Benefit-Cost Review process and prioritization method used. Include the Review Tools and prioritization worksheets from this How-To Guide in the plan. Clearly explain how the scores and priorities were assigned.

Be sure to explicitly state that Benefit-Cost Review was **emphasized** in the prioritization process. Using the Review Tools and one of the methods for prioritization from this guide ensures the emphasis on the maximization of benefits over costs. This approach demonstrates that the actions are being evaluated in terms of their pros and cons, which are represented as costs and benefits.

The intention of DMA 2000 is for the hazard mitigation plan to be useful and unique for each community; therefore, an impartial review and ranking of the mitigation actions is key. It is not so important which method is used, but rather that the method chosen is logical and clearly documented.

Remember that the Benefit-Cost Review is an important element of the community's hazard mitigation plan. Keep it simple, and focus on your community's needs and values.

Appendix A

Exhibits

Exhibit 1: Measuring Vulnerability Before and After Mitigation

Action: ____

Vulnerability	Before the Action is implemented*	After the Action is implemented*	Difference
Number of people affected by the hazard			
Area affected (acreage) by the hazard			
Number of properties affected by the hazard			
Property damage (amount in $)			
Loss of use (number of properties/physical assets [e.g., bridges] in number of days)			
Loss of life (number of people)			
Injury (number of people)			
**			

*Include measurable items, where possible, based on experience, professional estimate, or judgment.

**Add more categories of risk as appropriate for the specific community's plan.

Exhibit 2: Benefits

Action: ______________________________

Benefits
Risk reduction (short- or long-term)
If other community goals are achieved, explain
If easy to implement, explain
If funding is available, explain
If politically/socially acceptable, explain

Exhibit 3: Costs

Action: ______________________________

Costs*
Construction cost (amount in $)
Programming cost (amount in $, # of people needed to administer)
Time needed to implement
If unfair to a certain social group, explain
If there is public/political opposition, explain
If there are any adverse effects on the environment, explain

*If precise costs are not available, use costs based on experience, professional estimate, or judgment.

Exhibit 4: Prioritization by Listing Benefits and Costs

Actions	Benefits (Pros)	Costs (Cons)	Priority

Exhibit 5: Prioritization Using STAPLEE and Qualitative Scores

Actions → / Criteria ↓						
	Cost	**Benefit**	**Cost**	**Benefit**	**Cost**	**Benefit**
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Priority						

Definition of rating scale: ______________________________

Exhibit 6: Prioritization Using STAPLEE and Simple Scores

Actions → / Criteria ↓						
	Cost	**Benefit**	**Cost**	**Benefit**	**Cost**	**Benefit**
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale: ______________________________

Exhibit 7: Prioritization Using STAPLEE and Weighted Scores

Actions → **Criteria** ↓						
	Cost	**Benefit**	**Cost**	**Benefit**	**Cost**	**Benefit**
Social (weight = __)						
Technical (weight = __)						
Administrative (weight = __)						
Political (weight = __)						
Legal (weight = __)						
Economic (weight = __)						
Environmental (weight = __)						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale: ______________________________

WHAT IS A BENEFIT?

GUIDANCE ON BENEFIT-COST ANALYSIS

OF HAZARD MITIGATION PROJECTS

DRAFT

REVISION 2.0

(Supersedes Revision 1.0)

Federal Emergency Management Agency
Flood Insurance and Mitigation Administration
500 C Street, SW
Washington, DC 20472

May 1, 2001

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There is little doubt that flood-proofing a school, installing hurricane shutters on a beachside home, or seismically retrofitting a heavily-traveled bridge can bring substantial benefits to a community. Reducing the risk of damage from a natural disaster has the potential to save lives, significantly lower cleanup and recovery costs, and minimize the amount of time it takes for a community to return to normal among many other benefits.

While it may seem clear that activities that reduce the damage caused by natural disasters would bring a host of benefits, it is far less obvious how we would actually categorize and quantify these benefits. What kinds of benefits *do* activities like flood-proofing a school or upgrading a drainage channel provide? The purpose of this analysis is to help answer this question by identifying the benefits associated with hazard mitigation projects; demonstrating ways to quantify benefits for use in the benefit-cost analysis (BCA) of hazard mitigation projects; and presenting several applied examples of calculating the benefits of mitigation.

1.1 What is Mitigation?

Mitigation is an action taken specifically to reduce ***future*** damages and losses from natural disasters. Most Hazard Mitigation Grant Program (HMGP) mitigation projects are construction projects that are designed to avoid or reduce damages to buildings or infrastructure in future disasters. In addition to reducing damages to a facility or building structure, many mitigation projects also reduce the broader negative impacts that disasters have on affected communities, such as the economic effects of regional loss of power.

Examples of common mitigation projects include:

Acquiring flood-prone structures to remove them from the floodplain,

Elevating flood-prone structures,

Improving storm water drainage systems,

Adding hurricane shutters to improve building wind resistance,

Strengthening buildings or infrastructure to resist earthquakes, and

Bracing building contents to resist earthquakes.

Mitigation projects may also include education programs, publications or videos, building code enhancements, and mitigation planning activities, but only if such projects demonstrably result in actions which reduce future damages and losses. These types of "soft" mitigation projects are sometimes excluded by FEMA policies or priorities and are generally more difficult to evaluate than the more common types of "hard" mitigation projects listed above.

Mitigation is conceptually distinct from repair of damaged facilities. After disasters, many damaged facilities are simply repaired to their pre-disaster condition. Such repair actions are not mitigation because they do not reduce the potential for future damages and losses. However, after a disaster some projects may include both repair and mitigation. In this case, the costs of repair and mitigation must be separated. The guidance for benefit-cost analysis in this document applies only to mitigation projects, or only to the mitigation portion of projects that include both repair and mitigation elements.

1.2 What are Benefits?

The benefits of a mitigation project are the elimination and/or reduction of future damages and losses. In other words:

Benefits are simply avoided damages and losses.

For every mitigation project, benefits are calculated by estimating future damages and losses under two circumstances: with and without undertaking the mitigation project. As a simple example, consider a mitigation project to elevate a single flood-prone residential structure. Assume that future damages and losses for this home are estimated as $5,000 per year for the as-is situation (without mitigation). After elevation, future damages and losses are estimated as $500 per year. In this example, the benefits of the mitigation project are $4,500 per year. The $4,500 in annual benefits is calculated as the difference in estimated future damages and losses before and after mitigation ($5,000 minus $500).

For benefit-cost analysis, much of the effort is focused on estimating damages and losses. This focus on damages and losses is sometimes confusing to novices. However, as illustrated by the example above, mitigation project benefits can only be calculated by estimating damages and losses both before and after the mitigation project and then taking the difference between the two.

There are two aspects of counting benefits that are particularly important to keep in mind when conducting benefit-cost analyses of mitigation projects. First, mitigation projects reduce future damages and losses, but generally do not completely eliminate future damages and losses. Acquisition is the only type of mitigation project that completely eliminates future damages and losses. All other mitigation projects reduce future damages and losses but do not completely eliminate them. For example, mitigation projects to elevate structures for floods or to strengthen structures for hurricanes or earthquakes may greatly reduce future damages, but some level of damages will still occur, especially in major disasters. Thus, except for acquisition projects, it will always be necessary to estimate damages and losses after mitigation.

Second, for every mitigation project, the greater the damages and losses are before mitigation, the greater are the potential benefits.

For example, if damages before mitigation are estimated as $10,000 per year for one house and only $500 per year for another house, then the maximum possible benefit for the first house is $10,000 per year and only $500 per year for the second house. The maximum level of benefit can be achieved only if the estimated damages and losses are completely eliminated by a mitigation project (i.e., by acquiring and demolishing the house). The relationship between damages and losses before mitigation and the maximum possible benefit achieved after mitigation is very important. The best mitigation projects are often those where the damages and losses are greatest before mitigation is undertaken. In other words, the greater the damage and losses are prior to mitigation project, the greater the potential benefits of mitigation. Conversely, when the damages and losses before mitigation are minor, the maximum possible benefits are limited. This relationship is very important for mitigation planning. Mitigation projects providing the highest level of benefit can be identified simply by finding the structures or facilities with the highest risk for future damages and losses.

1.3 What Benefits Should Be Counted?

The goal of FEMA's hazard mitigation program is to reduce the impacts of natural disasters on affected communities. In this context, it is very important to note:

The benefits considered in benefit-cost analysis are the benefits to the community, not just the benefits to FEMA or the federal government. The Office of Management and Budget (OMB) Advisory Circular A-94 (Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs) provides explicit guidance on what benefits to count:

> *Analyses should include comprehensive estimates of the expected benefits and costs to society based on established definitions and practices for program and policy evaluation. Social net benefits, and not the benefits and costs to the federal government, should be the basis for evaluating Government programs or policies that have effects on private citizens or other levels of Government.*

This OMB guidance means that benefits must always be counted from the perspective of the affected community, not from the perspective of FEMA or the federal government. Thus, for benefit-cost analysis of hazard mitigation projects, a broad range of benefits may legitimately be counted, even if Federal programs do not address actually compensate for the damages when they occur.

Some of the benefits to be counted are covered by government programs. Examples of such benefits include avoided damages to public buildings or infrastructure, and emergency management costs (including debris removal) which may be covered under the Public Assistance Program. Other damages and recovery costs may be partially covered by government programs. Examples include avoided damages to private residences and displacement costs for temporary housing, which may be partially covered under FEMA's Individual and Family Grant Program. Other damages, such as deaths and injuries, do not involve any real exchange of money and are not compensated by any government program. Regardless of whether government agencies actually compensate the damages and losses, the OMB guidance directs Federal agencies such as FEMA to count the full direct benefits of hazard mitigation projects. As an example, consider a city hall building damaged in an earthquake. Federal programs may reimburse the city for damages to the city hall and contents, for cleanup costs, and add something else that FEMA would cover or delete, but the Federal government does not provide life insurance for occupants of public buildings. From a community perspective, however, casualties from the earthquake are obviously a major negative effect of the disaster, and hence it is correct and necessary to count the casualties as damages.

The goal of benefit-cost analysis of hazard mitigation projects is always to count ***all*** of the benefits of each mitigation project whether or not the categories of benefits are covered by FEMA programs or programs of other federal agencies.

The broad categories of benefits to be counted are summarized in Section 1.4 below.

1.4 Categories of Benefits

Mitigation projects may be undertaken to reduce the extent of damage from natural disaster for a wide variety of facilities. Mitigation projects may apply to private residential and commercial buildings as well as many types of public buildings from city halls and schools, hospitals, to more specialized buildings providing medical, police, or fire services. Mitigation projects may also cover utilities providing electric power, water and other services as well as a wide range of infrastructure from drainage systems, to roads and bridges, to dams and other specialized structures.

The specific benefits to be counted for each mitigation project depend on the type of facility covered by the mitigation project. Different benefits may be counted for different types of projects. However, conceptually, most of the benefits to be counted for any mitigation project can be sorted into four main categories, as summarized below in Table 1.1.

Table 1.1 Categories of Avoided Damages

Avoided Physical Damages	▪ Buildings ▪ Contents ▪ Infrastructure ▪ Landscaping ▪ Site Contamination ▪ Vehicles ▪ Equipment
Avoided Loss-of-Function Costs	▪ Displacement costs for temporary quarters ▪ Loss of rental income ▪ Loss of business income ▪ Lost wages ▪ Disruption time for residents ▪ Loss of public services ▪ Economic impact of loss of utility services ▪ Economic impact of road/bridge closures
Avoided Casualties	▪ Deaths ▪ Injuries ▪ Illnesses
Avoided Emergency Management Costs	▪ Emergency operations center costs ▪ Evacuation or rescue costs ▪ Security costs ▪ Temporary protective measure costs ▪ Debris removal and cleanup costs ▪ Other management costs

These categories are briefly described below and are discussed more fully in Section 2 of this report. Examples, case studies and guidance on how to count each type of benefit are provided in Sections 3 and 4.

Physical damages are probably the easiest category of damages and losses and benefits to understand. Buildings, contents, infrastructure, landscaping, vehicles and equipment are damaged by a flood or other disaster event. The monetary damages are simply the cost to repair or replace the damaged property. For physical damages, benefits are simply the avoided damages; that is, the reduction in future damages attributable to a mitigation project.

Loss of function economic impacts are losses and costs that are incurred when facilities are damaged to the point that the normal function of the facility is disrupted. Many loss-of-function economic impacts are extra costs incurred by occupants of damaged buildings. For example, occupants of residential, commercial or public buildings may incur displacement costs for temporary quarters when damage levels render buildings unoccupiable after a disaster. The loss of function of buildings may also result in other direct economic impacts to occupants such as loss of rental income, loss of business income, or lost wages as well as disruption time (time spent in cleanup, repair, and replacement of damaged property and so on).

In addition, loss of function of some types of facilities may have negative impacts on the community as a whole. For public buildings, loss of function also means loss of the public service provided from the building; such loss of public service has a direct impact on the community. Similarly, loss of utility or transportation services may have large direct economic impacts on affected communities as a whole.

Mitigation projects that reduce physical damages to buildings and other facilities also reduce the loss of function of the facilities, so benefits from mitigation projects often include reducing loss-of-function impacts. The types of reduced loss-of-function benefits to be counted vary, depending on the type of facility, but these benefits can be large and important to count in benefit-cost analysis. For some types of mitigation projects, especially for utilities, roads, bridges, and critical facilities such as hospitals, the benefits of avoiding the loss-of-function impacts are *always* important and may be larger than the benefits of avoiding physical damages. Indeed, many mitigation projects for these types of facilities are undertaken primarily to preserve the critical function of the facility, with reduction of physical damages being an important, but secondary consideration.

> **For important community operations, loss of function is often the most severe impact of a hazard event, so it is critically important to correctly count the losses and the benefits of avoiding some or all of them.**

Casualties include deaths, injuries and illnesses. For some types of mitigation projects, such as seismic retrofit of buildings, reducing casualties is often the main reason a project is undertaken. Whenever a specific mitigation project demonstrably reduces the future potential for casualties, it is proper and necessary to count the benefits of reduced casualties.

Emergency management costs include a range of disaster response and recovery costs that may be incurred by communities during and immediately after a disaster. In many disasters, these costs are much smaller than physical damages or loss-of-function economic impacts. Furthermore, many common mitigation projects have little or no significant impact on a community's emergency management costs. However, in circumstances where a project affects a large part of a community and may significantly reduce future emergency management costs; counting the benefits of reduced emergency management costs is proper. For most projects, however, the benefits in this category are negligible or very small. Thus, in most cases it may not be necessary to make the effort to estimate the benefits of reduced emergency management costs. In cases where a project has a benefit-cost ratio very close to 1.0 and has significant potential benefits in reducing future emergency management costs, it may be worthwhile to calculate the damages from this source, and the benefits of reducing or eliminating them.

1.5 What Benefits Cannot Be Counted?

As summarized above, the intent of benefit-cost analysis is to count all benefits for each hazard mitigation project, whether or not FEMA or other Federal government programs cover the benefit category. . However, OMB Circular A-94 does place one important limit on the types of benefits than can be counted. In simple terms, the OMB guidance is to NOT count indirect or secondary benefits. The technical language in Circular A-94 is:

> *Employment or output multipliers that purport to measure the secondary impacts of government expenditures on employment and output should not be included in measured social benefits or costs*

In simpler terms, this means that the possible impact of a mitigation project on local or regional employment or on overall economic output or economic activity should not be counted. Therefore, changes in employment levels, economic growth or development, tourism, or future tax revenues should not be considered in benefit-cost analysis.

The focus of OMB guidance on benefit-cost analysis is thus to count direct benefits; that is, to count the damages and losses that would be incurred in the future if the mitigation project were not completed. Such direct benefits include: avoided physical damages, avoided loss-of-function costs incurred by the affected community, avoided casualties, and avoided emergency management costs. Other, more indirect or secondary impacts should not be counted.

This policy guidance from OMB applies to FEMA and to all other federal agencies that do benefit-cost analysis except for the U.S. Army Corps of Engineers (USACE). USACE benefit-cost analysis of projects for navigable waterways is separately mandated by legislation to include a broader range of long-term regional economic impacts, reflecting the large scale and long-term regional economic impact of many Corps projects. Thus, USACE benefit-cost analysis may include benefits that are not countable for most other Federal benefit-cost analysis.

Detailed guidance on what direct benefits to count for particular types of projects, with examples and case studies are given later in this report.

1.6 What is Benefit-Cost Analysis?

Benefit-cost analysis is a standardized, systematic way to count the benefits of a mitigation project and to compare these benefits to the costs of mitigation. A complete benefit-cost analysis counts ***all*** of the significant direct benefits of a mitigation project.

A benefit-cost analysis always involves looking at damages and losses twice: first, before mitigation (the as-is situation) and second, after mitigation. The benefits of a mitigation project are simply the difference in expected damages and losses before and after the mitigation project are completed.

In more technical detail, a benefit-cost analysis also takes into account:

1. The probabilities of various levels of natural hazard events and damages
2. The useful lifetime of the mitigation project
3. The time value of money (the discount rate)

As a quick review, the underlying principles of benefit-cost analysis are illustrated by one simplified example. Consider a mitigation project to elevate a single flood-prone residential structure. Annualized damages are calculated for each flood depth by estimating each damage category and then taking into account the annual probability of each flood depth. First, annualized damages are estimated before mitigation by combining the probability of each level of flooding with the estimated damages and losses at each flood depth. For a residential structure, the damages considered typically include building damages, damages to contents, and displacement costs for temporary housing (refer to Table 1.2).

Table 1.2
Example Showing Principles of Benefit-Cost Analysis
Damages Before Mitigation

Flood Depth (feet)	Annual Probability of Flooding	Scenario Damages and Losses (per flood event)	Annualized Damages and Losses
0	0.2050	$6,400	$1,312
1	0.1234	$14,300	$1,765
2	0.0867	$24,500	$2,124
3	0.0233	$28,900	$673
4	0.0098	$32,100	$315
5	0.0034	$36,300	$123
Total Annualized Damages and Losses (Before Mitigation)			**$6,312**

In the Table 1.2, the scenario damages (damages per flood event) increase with increasing flood depth in the home, as expected. However, the annualized damages, which also take into account the probability of flooding, are lower at high flood depths because such floods are very infrequent at this site.

The total annualized damages and losses, $6,312 in the above example, indicates the level of risk faced by the property. The greater the frequency and depth of flooding for a given home, the higher the annualized damages and losses. To the extent that a mitigation project reduces or eliminates these damages and losses, the greater the potential benefits of the mitigation project.

For benefit-cost analysis, a similar calculation is done after mitigation, and then benefits are calculated as the difference between annualized damages with and without undertaking the mitigation project (as shown in Table 1.3).

Table 1. 3
Example Showing Principles of Benefit-Cost Analysis
Summary Calculation

Flood Depth (feet)	Before Mitigation Annualized Damages (from Table 1.2)	After Mitigation Annualized Damages	Annualized Benefits (Avoided Damages) "Before Mitigation" – "After Mitigation"
0	$1,312	$0	$1,312
1	$1,765	$0	$1,765
2	$2,124	$0	$2,124
3	$673	$0	$673
4	$315	$63	$252
5	$123	$49	$74
Totals	**$6,312**	**$112**	**$6,200**
Present Value Coefficient (7% discount rate, 30 year project lifetime)			12.41
Net Present Value of Future Benefits			$76,942
Mitigation Project Costs			$20,000
Benefit-Cost Ratio (Net Present Value of Future Benefits ÷ Project Costs)			**3.85**

In this example, the annualized benefits are calculated as the difference in the annualized damages before and after mitigation. The benefits of this mitigation project are assumed to occur over a 30-year useful lifetime of the mitigation project. To compare this future stream of statistical (probabilistic) benefits to the present cost of the mitigation projects, a present value calculation is done. The present value calculation depends on the project useful lifetime and on the discount rate that accounts for the time value of money. For FEMA projects, the discount rate is specified by OMB Circular A-94 as 7%. The present value coefficient, which depends on the project useful lifetime and the discount rate, is a multiplier that converts the annualized benefits to net present value.

In this example, the annual benefit of $6,200 corresponds to a net present value of benefits of $76,942. The benefit-cost ratio of 3.85 indicates that the benefits are 3.85 times the costs. In other words, for each dollar spent on mitigation there is an expected return of $3.85 in reduced damages and losses.

1.7 Why Does FEMA Do Benefit-Cost Analysis?

There are four primary reasons why FEMA does benefit-cost analysis of hazard mitigation projects:

1. To meet the statutory and regulatory requirement eligibility requirement, as specified in the Stafford Act and in 44 CFR. To be eligible for FEMA funding under the HMGP or Flood Mitigation Assistance (FMA) program, each mitigation project must be shown to be cost-effective. As defined in the regulations, cost-effective means that the benefits of each project must exceed the costs (i.e., that the benefit-cost ratio exceeds 1.0).
2. To determine whether or not a mitigation project is worth doing.
3. To provide a common basis with which to compare and prioritize mitigation projects and to help ensure that limited mitigation funds result in the greatest possible reduction in future damages and losses.
4. To demonstrate that mitigation works. Benefit-cost analysis can be a powerful tool to help sell the concept of mitigation and to convince individuals and communities that mitigation investments are in their own self interest. For the HMGP and FMA program overall, benefit-cost analysis helps to demonstrate that the programs and their actions are fiscally sound.

The statutory and regulatory basis of FEMA's benefit-cost analyses is outlined in the Stafford Act and in the program regulations in the Code of Federal Regulations.

1.7.1 The Stafford Act

FEMA's disaster assistance activities, including the HMGP, are enabled by the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The intent and purpose of the Stafford Act is spelled out in Section 102 (2):

> *to supplement the efforts and available resources of States, local governments and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused by major disasters.*

Hazard mitigation activities, which by their nature are designed to alleviate the damage, loss, hardship, and suffering caused by natural disasters, are addressed in Section 404 of the Stafford Act:

> *The President may contribute up to 50 percent of the cost of hazard mitigation measures which the President has determined are cost-effective and which substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a major disaster.*

1.7.2 44 CFR, Emergency Management and Assistance

The requirement that each mitigation project must be cost-effective is described in Section 44 206.434 Eligibility (Code of Federal Regulations, 44 Emergency Management and Assistance, Revised as of October 1, 1998). Section 206.434 specifies the eligibility requirements for Hazard Mitigation Program Grants:

> *"(b) Minimum project criteria. To be eligible for the Hazard Mitigation Grant Program a project must:*
>
> *(5) Be cost effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster. The grantee must demonstrate this by documenting that the project;*
>
> > *(i)Addresses a problem that has been repetitive or a problem that poses a significant risk to public health and safety if left unsolved,*
> >
> > *(ii) Will not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future disasters were to occur. Both costs and benefits will be computed on a net present value basis,*
> >
> > *(iii) Has been determined to be the most practical, effective and environmentally sound alternative after consideration of a range of options,*
> >
> > *(iv) Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address,*
> >
> > *(v) Considers long-term changes to the areas and entities it protects, and has manageable future maintenance and modification requirements.*

The goal of benefit-cost analysis of hazard mitigation projects is always to count the benefits of each mitigation project whether or not the categories of benefits are covered by FEMA programs or programs of other federal agencies.

The OMB Guidance to count the social net benefits, not only the benefits to the federal government, also applies on the cost side of benefit-cost analysis. Thus, it is always the total cost of the project that is included in the analysis, not the FEMA share of the cost. For example, consider a mitigation project with a total cost of $500,000 and calculated benefits of $300,000 (i.e., a benefit-cost ratio of 0.60). This project fails the cost-effectiveness criterion. From the perspective of the community as a whole, the benefits are less than the cost of the project. This conclusion does not depend on what fraction of the project is FEMA funded, even if FEMA funds less than $300,000 of the project cost, because the OMB guidance for benefit-cost analysis requires the entire project be cost-effective in order to be eligible for funding.

As discussed in Section 1, the benefits of mitigation projects are future damages and losses avoided by undertaking the mitigation project. Damages and losses become benefits when they are avoided by a mitigation project. This section describes the major categories of damages and losses estimated before and after mitigation; the estimates of damages and losses are then used to calculate the benefits of avoided such damages and losses.

In most cases, FEMA's goal is to count fully all of the benefits of each mitigation project. There are four major categories of benefits:

1. Avoided physical damages
2. Avoided loss-of-function impacts
3. Avoided casualties,
4. Avoided emergency management costs

A brief summary of how to count each of these four categories is provided in this section.

2.1 Avoided Physical Damages

Physical damages are the most direct kind of damages and usually are the easiest to count. Physical damages are simply the costs to repair or replace damaged facilities, including buildings, building contents, and infrastructure. Physical damages may also include repair or replacement costs for landscaping, site contamination restoration, vehicles, and equipment. The most common sub-categories of avoided physical damages are:

Buildings

Contents

Infrastructure

Landscaping

Outbuildings

Site Contamination

Vehicles

Equipment

Physical damage estimates (before and after mitigation) are expressed in dollars. For benefit-cost analysis of hazard mitigation projects, damages are often expressed as a percentage of the replacement value of the damaged element (e.g., a building, the contents of a building, a utility component or a bridge). Damage functions are used to express the percentage damage expected as a function of flood depth for floods, wind speed for hurricanes or level of ground shaking for earthquakes.

For buildings and infrastructure, facilities are generally deemed a complete loss and replaced rather than repaired whenever the damage percentage exceeds a value known as the demolition threshold. For buildings, a 50% demolition threshold is often assumed. For outdated or marginal buildings, much lower demolition thresholds are sometimes appropriate. Similar concepts apply to infrastructure damages.

Guidance for evaluating physical damages is summarized below in Table 2.1. FEMA has developed typical or default damage functions that express the expected percentage damage for buildings and contents. These damage functions are most useful for ordinary residential, commercial or public buildings and may have to be modified for more specialized buildings, using historical damage data, professional judgment, or both.

There are no typical or default damage functions available for estimating the other sub-categories of physical damages. For these categories, historical data and professional judgment are used to make damage estimates.

Table 2.1
Summary Guidance for Physical Damage Estimates

Type of Facility	Level of Technical Expertise Required	Typical Data Sources
Residential buildings	Low	Historical damage data Professional judgment
Commercial buildings	Low	Historical damage data Professional judgment
Public buildings	Low	Historical damage data Professional judgment DSRs if available
Specialized buildings for police, fire, and medical facilities	Moderate	Historical damage data Professional judgment Default damage functions may need to be adjusted
Contents, ordinary or specialized buildings	Low to moderate	Historical damage data Professional judgment

Type of Facility	Level of Technical Expertise Required	Typical Data Sources
Infrastructure (including utility and transportation elements)	Moderate to high	Historical damage data Specialized engineering experience with these type of facilities is essential
Landscaping damages and yard cleanup	Low to moderate	Historical data Professional judgment
Site contamination restoration	Moderate to high	Historical data Specialized engineering experience helpful
Vehicles and equipment	Moderate to high	Historical data Professional judgment

2.2 Loss-of-Function Impacts

The negative impacts of a disaster on a community often go far beyond the physical damages alone. Loss-of-function impacts are the losses, costs and direct economic impacts that occur when physical damages are severe enough to interrupt the function of a building or other facility. For a building, loss-of-function impacts may include the costs for temporary quarters while repairs are made, as well as losses in rental income, business income, or public services provided from the building. For utilities, loss of function means a loss of service or a reduction in the level of service. For a road or bridge, loss of function means closures of a road or bridge, or delays arising from a reduction in traffic capacity of a damaged road or bridge.

Loss-of-function impacts are sometimes as important as or even more important than the direct physical damages. For example, the loss of function of a hospital or fire station or other facility critical to the emergency response and recovery during and immediately after a disaster may have a much greater economic impact on the community than simply the repair costs for the physical damages. Similarly, loss of electric power or potable water service has a much larger economic impact on a community than simply the costs to repair damage to the electric power or water systems. Thus, to fully count the benefits of each hazard mitigation project it is very important to count all of the benefits of avoiding loss-of-function impacts.

The type of loss-of-function impacts to be counted varies depending on the type of facility under evaluation. Some of the sub-categories of loss-of-function impacts are somewhat more difficult to understand and to calculate than the more self-evident physical damage sub-categories. As a result, loss-of-function impacts have often been only partially counted or not counted at all when conducting benefit-cost analyses of hazard mitigation projects. Undercounting loss-of-function impacts is a serious error that may result in highly meritorious and highly cost-effective mitigation projects being improperly rejected. The most common sub-categories of loss-of-function impacts are:

- Displacement costs for temporary quarters
- Loss of rental income
- Loss of business income
- Lost wages
- Disruption time for residents
- Loss of public services
- Economic impact of loss of utility services
- Economic impact of road/bridge closures

2.2.1 Displacement Time and Functional Downtime

Estimating loss-of-function economic impacts for a building or other facility always requires two steps. First, the time duration of the interruption of function must be estimated, and second, the economic value per unit time of interruption of service must be estimated.

For purposes of benefit-cost analysis, displacement time and functional downtime must be considered. **Displacement time** is the time period during which occupants are displaced from a building so repairs can be made. For low levels of damage, displacement time is generally zero; that is, minor repairs can be made without displacing occupants. **Functional downtime** is the time period during which services are lost.

Functional downtime may be much shorter than displacement time. For example, consider a city hall building that is badly damaged in a disaster. The occupants of the building may be displaced to temporary quarters for six months - this is the displacement time. Displacement costs are estimated from the displacement time and the daily or monthly cost of displacement. However, in this simple example, the functional downtime is much less than six months. If the services are re-established in the temporary quarters in two weeks, then the functional downtime is only two weeks, not six months.

Functional downtime can also be fractional. One day of functional downtime can be one day of complete loss of service, or two days of 50% loss of service, or 10 days of 10% loss of service, and so on.

For utility and transportation systems, there are generally no displacement costs because such service generally can't simply be moved to temporary quarters. Thus for these systems the loss-of-function economic impacts are calculated from the estimated functional downtime and the value of the service per day.

2.2.2 Loss-of-Function Impacts for Buildings

For buildings, loss-of-function impacts may include the following categories: displacement costs, loss of rental income, loss of business income, loss of wages, loss of public services, and disruption time.

Displacement costs are the extra costs incurred when occupants of a building are displaced to temporary quarters. Displacement costs may be incurred for residential, commercial, or public buildings. Displacement occurs only when damages to a building are sufficiently severe that the building cannot be repaired with occupants in place. At lower levels of damage, repairs are commonly made with occupants remaining in the building during the repair process.

Displacement costs include the following sub-categories of costs:

1. Rental costs for temporary quarters
2. Other monthly costs of displacement such as furniture rental, other costs of being in temporary space, extra commuting costs, etc.
3. One-time costs such as utility hookup fees, round-trip moving costs, etc.

Displacement costs are the most commonly counted loss-of-function impact. The necessary data is straightforward and relatively easy to obtain. Rental costs for temporary quarters can be obtained from local officials or real estate firms. Estimates for other monthly costs and one-time moving costs can be provided by applicants or estimated using common sense.

Rental income losses are incurred by owners when tenants vacate premises because of damages, resulting in a loss of rental income for the owner. Rental income losses may apply to any building that is rented (residential, commercial, or public).

Analysts should be aware of the potential for double-counting rental income losses. Consider an example where two homes are damaged by floods and the occupants are displaced to temporary quarters for several months while repairs are made. If one home is owner-occupied, the owner is still responsible for mortgage and tax payments on the home in addition to paying rent and other expenses for temporary quarters. In this case, the full displacement costs for temporary quarters are additional expenses and should be counted. However, for a rented home, the economics are different. If a renter is displaced to temporary quarters, then he/she no longer pays rent for the damaged facility. This loss of rental income is a loss to the owner and may be counted as part of the loss-of-function impacts for the building. However, in this case, the displacement costs for the renter must be adjusted to consider only the possible increase in rent above the previous rent, rather than the total cost of rent at the temporary quarters. Counting the displacement costs for the renter and the full loss of rental income for the owner is double-counting and must be avoided.

The simplest way to avoid potential double-counting is to not count rental income losses. If this is done, then the full displacement costs should be counted for both owners and renters. Counting the full displacement costs for renters, does, in effect, count the lost rental income. This approach has the additional advantage that it is no longer necessary to determine whether occupants of buildings are owners or renters.

Loss of business income may occur for commercial buildings when damage is severe enough to result in temporary loss of function of a building. For benefit-cost analysis, the proper measure of loss of business income is the net income, not the gross income since expenses as well as receipts are lower when a business is closed.

Estimates of net business income losses can generally be obtained from applicants, the owners, or local officials. In making estimates of net business income losses, it is important to remember that some lost business income can be made up. For example, a business that is closed for two weeks because of hurricane damage does not necessarily lose two weeks of net business income. In many cases, some of the lost sales or income will be made up after the business reopens.

FEMA considers relatively few mitigation projects for commercial buildings. In most cases, the loss of business income constitutes only a very small fraction of total damages and losses. Thus, the benefits of avoiding or reducing loss of business income are generally only a small fraction of total damages and losses. For projects that are clearly cost-effective, it may not be necessary to consider business income losses to demonstrate cost-effectiveness. However, to count fully the benefits of hazard mitigation projects for commercial buildings, it is necessary to consider loss of business income.

Loss of wage income may also occur for commercial buildings, when damage is severe enough to result in temporary loss of function of a building. When a business closes temporarily due to damages, loss of wages for employees is analogous to the loss of business income for the owner. Historically, loss of wage income has not been considered in FEMA's benefit-cost analysis. In economic theory, wages are considered fungible, that is, movable or transferable, and it is commonly assumed that wage earners who lose one job find another. However, since loss of wages due to disaster damage is short-term and not predictable, the assumption of fundability does not appear to apply.

The intent of the Stafford Act is to alleviate the "damage, loss, hardship, and suffering" caused by major disasters. In this context and for consistency with regard to counting losses in net business income, counting loss of wage income is appropriate for benefit-cost analysis of hazard mitigation projects. For purposes of benefit-cost analysis, wage income losses to be counted are only short-term losses due to temporary business closes. The wage losses to be counted are primarily those for hourly workers. Wage losses for salaried workers should not be counted unless these workers are also laid off without pay. Wage losses should be counted as business income losses only to the extent that they are not likely to be made up later after the business reopens.

Situations where a business may leave town with permanent loss of wages (if, for example, some flood protection improvements are not made) should not be counted because such impacts fall under the type of secondary impacts on employment or output that are excluded from consideration under OMB guidance.

Loss of wages for public employees should not be counted for two reasons: 1) most public employees are likely to continue to receive wages during and after disasters, and 2) the value of public sector wages is already included in evaluating the loss of public services.

Loss of hourly wages due to temporary business closures due to disaster damage should include the full value to employees, wages plus benefits. Local data on wages and benefits are generally available from local officials. If not, national average data may be used. As discussed in Section 7 of this report (Roads and Bridges), the current national average for wages and benefits is $21.16 per hour.

Economic value of disruption time for residents is the value of lost time incurred by residents for pre-disaster preventative measures, evacuation time, cleanup and repair of flood damages, replacement of damaged property, dealing with insurance claims and other disaster-related matters. The key economic concept is that personal time has value, whether or not the time is formally compensated by employment. Outlined below is an approach closely analogous to that adopted by the U.S. Department of Transportation (DOT) in calculating the benefits of reducing travel time delays. The simplest assumption consistent with economic theory is that each hour of time is worth the same amount, whether such time is personal or business, compensated or not. In other words, the last hour of work time and the first hour of leisure time are assumed to have equal value. This is the assumption suggested in Section 7 (Roads and Bridges) for placing a value on delay or detour times due to closures of roads and bridges. The same economic principles apply to personal time lost due to disaster damages to residential structures. Placing an economic value on personal disruption time is consistent with the DOT's approach and with the intent of the Stafford Act to alleviate the "damage, loss, hardship, and suffering" caused by major disasters.

The economic value of disruption time for residents is estimated at $21.16 per hour, the national average value for wages and benefits.

Loss of Public Services may occur for public buildings when damage is severe enough to result in temporary loss of function of the building. For purposes of benefit-cost analysis, private non-profit organizations providing what are essentially public services (e.g., the Red Cross, schools, and hospitals) are evaluated in exactly the same manner as public buildings. For commercial buildings, the loss of net business income is a measure of the economic impact of loss of function of the building. For public buildings, the measure of the economic impact of loss of function is the value of the services provided to the community by the agencies operating in the building.

To value public services, FEMA makes the very simple and direct assumption that public services are worth what it costs to provide the services to the public. For example, if a public service costs $1,000 per day to provide, then the value is assumed to be $1,000 per day. If the service is lost because of damage to the building, the loss is assumed to be $1,000 per day. If the loss of service is avoided because of a hazard mitigation project, then the benefit is assumed to be $1,000 per day.

The daily cost of services is estimated from the annual operating budget for the agencies occupying a building. The annual operating budget includes all of the direct costs necessary to provide the public services, including salaries and benefits, materials, supplies, utilities, equipment costs, and rent or the annual cost of owning the building. The only exclusion is for transfer payments. For example, if a public office distributes pension checks, the value of the service is not the value of the checks distributed, but rather the cost of providing the service.

This method for valuing the loss of public services applies to all public services, including administrative functions, schools, as well as more specialized services such as public works, police, fire and medical services. For ordinary (non-disaster related) public services, the annual operating budget is used directly as a proxy to determine the daily value of services to the community. For services which are essential to immediate disaster response and recovery, a continuity premium is added to reflect the greater impact of losing services when they are most in demand and most critical to the community.

The continuity premium is a multiplier on the normal daily cost of service that is applied only to services, such as police, fire and medical that are directly related to emergency response and recovery. The continuity premium reflects the greater demand for such services during disasters and, in effect, is an estimate of how much more than the normal cost a community would be willing to pay to maintain these services during disasters. Determining an appropriate continuity premium for public services that are critical to disaster response and recovery is difficult and requires a great deal of judgment and experience. Guidance on appropriate continuity premiums for police, fire, and hospital services is given in Section 4 of this report. Guidance on appropriate continuity premiums for emergency operations centers and emergency shelters is given in Section 5 of this report.

2.2.3 Economic Impact of Loss of Utility Services

Utility services such as electric power, potable water, and wastewater are often referred to as "lifelines" because these utility services are so critical to the functioning of modern cities. Mitigation projects for utilities are often motivated primarily by the desire to maintain function of these critical services. The economic impacts of loss of utility services are generally many times larger than the physical damages alone. For example, loss of electric power affects not only the utility itself but impacts economic activity in the entire community.

Since the loss-of-function impacts (economic impact of loss of utility services) for utility systems are almost always much larger than physical damages alone, benefit-cost analysis for utility systems must always include loss-of-function impacts. Because of the complex, technical nature of most utility systems, evaluating mitigation projects for these systems usually requires specialized expertise.

Detailed technical guidance on how to evaluate mitigation projects for electric power, potable water, and wastewater utility systems is given in Section 6 of this report. The economic impacts of loss of utility services are calculated by first estimating the functional downtime (i.e., the time period for which utility service is lost), then the per capita economic impacts per day of lost service are estimated by the summing the impact of lost service on local economic activity and the economic impacts on residents, and finally, the economic impact of loss of utility services is calculated as the product of the functional downtime and the economic impact per day of lost service.

2.2.4 Economic Impact of Road and Bridge Closures

Roads and bridges, like utilities, are commonly considered lifelines for communities because they are so critical to the functioning of modern cities. Mitigation projects for roads and bridges are often motivated primarily by the desire to maintain function of these critical transportation system links. The economic impacts of road and bridge closures are often many times larger than the physical damages alone.

Since the loss-of-function impacts for roads and bridges (economic impact of road and bridge closures) are often larger than physical damages alone, benefit-cost analysis for hazard mitigation projects must always include the loss-of-function impacts.

Detailed technical guidance on how to evaluate mitigation projects for roads and bridges is given in Section 7 of this report. The economic impacts of road and bridge closures are calculated by first estimating the functional downtime (i.e., the duration of road or bridge closures), then, calculating the number of person hours of delay or detour time from the daily traffic volume and the expected duration of delays or detours, and finally, calculating the economic impact using the number of person hours of delay or detour times the average value of wages and benefits.

This section has reviewed the major types of loss-of-function impacts and how to calculate each one. A summary of loss-of-function impacts is given below in Table 2.2.

Table 2.2
Loss-of-Function Impacts

Type of Facility	Loss-of-Function Impact	Data Inputs
Building (residential, commercial, public)	Displacement costs	▪ Displacement time ▪ Rent for temporary quarters ▪ Other monthly costs ▪ One-time costs
Building (residential, commercial)	Rental income losses	▪ Displacement time ▪ Monthly rent
Building (commercial)	Business income losses Wage income losses	▪ Functional downtime ▪ Net business income per month ▪ Wages and benefits per month
Building (residential)	Disruption costs	▪ Disruption time ▪ Economic value per person per hour
Building (public, ordinary services))	Loss of public services	▪ Functional downtime ▪ Operating budget
Building (public, critical services))	Economic Impact of Loss of public services	▪ Functional downtime ▪ Operating budget ▪ Continuity premium (sometimes)
Utilities	Economic Impact of Loss of public services	▪ Functional downtime ▪ Economic impact per capita per day
Roads and Bridges	Economic impact of road and bridge closures	▪ Functional downtime ▪ Delay or detour time ▪ Daily traffic load ▪ Economic value per person per hour

2.3 Casualties

Natural disasters commonly result in casualties, including deaths, injuries, and illnesses. Casualties are the most devastating impact of disasters. Some mitigation projects are designed to reduce casualties in future disasters. Almost all earthquake projects are designed to reduce casualties, as are some hurricanes, wind, and flood mitigation projects.

For some mitigation projects, the benefits of reduced casualties can be a large fraction of the total benefits, or even the largest category of benefits. Thus, for some mitigation projects, it is very important to count the benefits of reduced casualties.

Like other benefits, the benefits of avoided casualties are calculated as the difference in casualties occurring before mitigation and after mitigation. FEMA uses statistical values to place a monetary value on the benefits of avoided casualties. In the most recent FEMA benefit-cost analysis software, statistical values of $1,250, $12,500 and $2,200,000 are assigned to minor injuries, major injuries and deaths, respectively. Minor injuries are defined as those requiring medical treatment, excluding minor bruises or scrapes. Major injuries are defined as those requiring hospitalization for treatment. Minor and major illnesses can be defined similarly, using the same statistical values.

When adjusted to year 2001, these statistical values for casualties are approximately $1,560, $15,600, and $2,710,000 for minor injuries, major injuries, and deaths, respectively. For economic correctness, these adjusted values are suggested for benefit-cost analysis of FEMA hazard mitigation projects.

As reviewed in Section 1.3, OMB guidance for benefit-cost analysis mandates that the benefits to be considered in FEMA's benefit-cost analyses are social net benefits, not the benefits to FEMA or to the federal government. Even though neither FEMA nor any other Federal Agency provides compensation for disaster casualties, the perspective of benefit-cost analysis is always that of the affected community. Thus, it is proper and indeed necessary to count the benefits of avoided casualties, whenever a mitigation project directly and demonstrably will reduce future casualties.

Counting the benefits of avoided casualties is necessary for nearly all earthquake mitigation projects. Reducing casualties is often the primary motivation for earthquake mitigation projects.

For many common types of mitigation projects, life safety benefits are non-existent or negligible. For example, except for situations with flash flooding or dam failures, most flood hazard mitigation projects do not significantly reduce casualties. Similarly, except for shelter projects, most hurricane mitigation projects do not significantly reduce casualties. Assuming that a mitigation project for floods or hurricanes will increase life safety may actually increase casualties by given a potentially false sense of safety and reducing people's motivation to evacuate when necessary.

For some mitigation projects life safety benefits are very important and must be included. Calculation of life safety benefits must always be done carefully, by experienced analysts. Including spurious life safety benefits has the potential to greatly distort benefit-cost results and lead to erroneous decisions about mitigation projects.

2.4 Emergency Management Costs

Disasters commonly result in a range of emergency management costs for affected communities. Emergency management costs include emergency operations center costs, evacuation or rescue costs, security costs, temporary protective measure costs, debris removal, pumping costs and other cleanup costs, and other costs for disaster response and recovery.

If a mitigation project under evaluation significantly reduces these emergency management costs, then the benefits of reduced emergency management costs should be counted. However, many FEMA hazard mitigation projects deal with single structures or a few scattered structures in a larger community. In this case, the reduction in emergency management cost is non-existent or negligible and should not be counted.

For example, elevating or acquiring a single structure or a few scattered structures in a community does not significantly impact a community's overall emergency management costs. However, acquisition of an entire flood prone neighborhood of homes might significantly reduce emergency management costs.

Determining whether or not a specific mitigation project significantly reduces a community's emergency management costs requires considerable judgment and experience. Calculation of such benefits must be done carefully, with full documentation of data and assumptions.

The most common subcategories of emergency management costs are:

Emergency operations center costs

Evacuation or rescue costs

Security costs

Temporary protective measure costs

Debris removal and cleanup costs

- Other management costs

2.5 Summary

The above sections provide summary guidance for four main categories of benefits, including avoided physical damages, avoided loss-of-function costs, avoided casualties, and avoided emergency management costs. For every type of benefit to be counted the procedure is the same: damages and losses are estimated both before and after undertaking a mitigation project. Then, benefits are calculated as the difference between damages and losses before and after mitigation, taking into account the time value of money (mitigation project useful lifetime and discount rate).

Within these four major categories of benefits, more than 20 subcategories of benefits were described briefly. However, once the basic procedure for calculating benefits for the major categories is mastered, calculating additional benefits for the subcategories is relatively straightforward.

Counting some of the less commonly used subcategories of benefits requires a little more ingenuity. In some cases, it may be convenient to do a side calculation and then add these benefits to those calculated in the module. For example, the modules for hurricane and flood projects to do not include spaces for calculating the benefits of reduced casualties. If counting the benefits of avoided casualties is necessary for a particular mitigation project (e.g., a hurricane shelter, or acquisition of properties subject to flash flooding), then a side calculation is probably the easiest way to include these benefits in the module.

As a caveat, it is important to do note that evaluating some types of projects, for example mitigation projects for utility systems, requires a moderate- to high-level of technical understanding of utility systems and thus should not be attempted by analysts lacking this expertise. Similarly, performing estimates of avoided casualty benefits and estimates of some of the other less commonly calculated benefits requires a considerable amount of experience and expertise and should not be attempted by novice analysts. Throughout the process of counting applicable benefits, care must also be taken to avoid double-counting benefits in more than one place or more than one subcategory.

This section provides examples of how to count benefits for “ordinary” buildings. In the present context, “ordinary” buildings are those that are not critical facilities for emergency response and recovery. Ordinary buildings include residential and commercial buildings, and public buildings used for non-critical functions, such as schools and administrative buildings. Public buildings used to provide services that are critical to disaster response and recovery, such as police, fire and medical facilities, emergency operations centers, and emergency shelters are addressed separately in Section 4.

Mitigation projects for ordinary buildings are the most common type of FEMA mitigation project. Most of the guidance below is applicable to mitigation projects for all types of hazards and for all types of mitigation projects. However, some categories of benefits may be applicable only to certain types of mitigation projects and/or only for some types of hazards. For example, counting the benefits of avoided casualties is almost always very important for seismic hazard mitigation projects, but generally not applicable to most other types of projects.

3.1 Single Residential Buildings

This section describes benefits to be counted for mitigation projects for single residential buildings, small groups of residential buildings, or a group of residential buildings at scattered locations. The benefits to be counted for mitigation projects for an entire neighborhood of residential buildings, which are somewhat different than for single buildings, are addressed in Section 3.2.

The categories of benefits to be counted for mitigation projects for single residential buildings are summarized below in Table 3.1.

For mitigation projects for residential buildings, the suggested benefit-cost analysis strategy is to first count the largest and most easily counted benefits. For this type of project, these benefits include building damages, contents damages, and displacement costs. For seismic projects, casualties should also be counted. If the project is cost-effective, it may not be necessary to count other benefits. If the project is not cost-effective, the categories of other physical damages and disruption costs are generally the most significant additional benefits to count. The other benefit categories generally contribute only minor benefits or aren’t applicable.

Table 3.1
Categories of Benefits to be Counted
Single Residential Buildings[1]

Type of Benefits to Consider	When to Count
1. Physical Damages	
Building damages	Always counted
Contents damages	Always counted
Other physical damages[2] - Landscaping - Outbuildings - vehicles, equipment - site contamination	Applicable to acquisition or flood control infrastructure projects only[3]. Consider counting if significant, especially for projects that are close to being cost-effective without counting these categories.
2. Loss-of-Function Impacts	
Displacement costs	Always counted
Rental income losses	Can count if appropriate, but easier to include in displacement costs[4]
Business income losses	For home business, consider counting, but generally constitutes only a very small fraction of benefits
Disruption time costs[5]	Consider counting, especially for projects that are close to being cost-effective, can add significantly to benefits
3. Casualties	Always counted for seismic projects, rarely applicable to other projects[6]
4. Emergency Management Costs	Not applicable to single residential structures[7]

Notes:

[1] Guidance in table applies to single residential structures, small groups of residential structures, and groups of structures at scattered locations.

[2] Other physical damages can be counted by adding appropriate damage percentages to the damage function for building or contents. These damages may be significant and thus counting them may add significantly to the total benefits. This type of mitigation project does not reduce damages to off-site utilities or transportation systems and no benefits should be counted for such other physical damages.

[3] Other physical damages are applicable only to acquisition projects or flood control

infrastructure projects because mitigation projects to elevate or retrofit the primary structure have no impact on these other categories of damages - thus, there are no additional benefits.

[4] Rental income losses are not necessary to count if the full costs of temporary quarters are included in displacement costs for both owners and renters. Double-counting must be avoided.

[5] Disruption costs may be significant and thus counting them may add significantly to the total benefits.

[6] Casualties may be important for seismic hazard mitigation projects. Counting the benefits of avoided casualties may be a substantial fraction of total benefits and thus they should always be counted. For most other mitigation projects, benefits of casualties avoided are non-existent or negligible and thus should be counted only in special circumstances.

[7] Acquisition, elevation or retrofit of single residential structures, small groups of structures, or groups at scattered locations does not significantly reduce a community's emergency management costs because the area affected by a disaster is not decreased, and the total population affected by disaster is not decreased or not decreased significantly.

Counting Other Physical Damage. This simplified example is for floods, but the same principles apply for other hazards as well. Consider a one-story home without basement, with a replacement value of $100,000. Building damage estimates, before and after mitigation, are calculated as percentages of building replacement value. If other physical damages are to be added to building damages, these damages must also be expressed as percentages of building replacement value (not as percentages of their replacement value). For example, if landscaping damages at -2 feet flood depth are estimated as $500, then this damage is entered as 0.5% of the building replacement value (refer to Table 3.2).

Table 3.2
Example Showing How to Count Other Physical Damages

Flood Depth (feet)	Building Damage %	Landscaping and Outbuilding Damage %	Vehicle and Equipment Damage %	Adjusted Total Damage %
-2	0.0%	0.5%	0.0%	0.5%
-1	0.0%	1.0%	1.0%	2.0%
0	9.0%	1.5%	2.0%	12.5%
1	14.0%	2.0%	3.0%	19.0%
2	22.0%	2.5%	4.0%	28.5%
3	27.0%	3.0%	5.0%	35.0%

In this example, the building damage percentages are the typical or default values for a one-story structure without basement. Dollar damage estimates were made, using common sense and professional judgment, for the two other categories of physical damages. The dollar estimates were then converted to percentages of building replacement value. The sum of these damage percentages then represents the total damage estimates for the building, for landscaping and outbuildings, vehicles and equipment.

In making estimates of expected dollar damages for landscaping, outbuildings, vehicles, and equipment, historical damage data can be used, along with common sense. Structures with different types of landscaping may have different levels of damage. Not all homes have outbuildings and not all vehicles and equipment will be damaged in floods, because many owners will move such items to higher ground before floods. Whenever adjustments are made as shown above in the simplified example, full documentation of data sources and assumptions are essential.

If adjustments for other physical damages are made, it is very important to make appropriate, consistent adjustments in damage estimates both before and after mitigation. For example, damages to landscaping, outbuildings, vehicles and equipment are eliminated by acquisition. However, elevation or retrofit of the primary structure does not reduce these other types of damages. Thus, estimating these types of damages makes sense only for acquisition projects.

Counting Reduced Disruption Costs. To count the benefits of disruption, disruption time estimates must be made for each damage level (e.g., flood depth or wind speed bin). Then the dollar value of disruption time is calculated by multiplying the number of adults per house by the national average value of wages and benefits ($21.16) to get a dollar value of disruption time. This dollar value for disruption time can be converted to a percentage of building replacement value and added to the building damage percentage in the same manner as discussed above for other physical damages. This approach is mathematically correct, and reasonably straightforward, albeit perhaps confusing to the novice. As always, whenever such adjustments are made, full documentation of data sources and assumptions is essential.

3.2 Groups of Residential Buildings

Counting benefits for groups of residential buildings is very similar to counting benefits for single residential buildings. All of the categories of benefits discussed above in Section 3.1 for single residential buildings apply to groups of residential buildings. For groups of buildings, these benefits can be calculated for each building and then summed.

In some cases, groups of very similar buildings can be combined for purposes of benefit-cost analysis. However, this type of aggregation has to be done carefully. Groups of buildings can be combined if and only if they are the same structure type and have very similar frequencies and severities of disaster events. For flood mitigation projects this means that the structures must have very closely similar first floor elevations, and be close enough geographically so that they have very closely similar flood hazard data. For hurricane, wind, or earthquake projects, this means that the structures must be geographically close.

In addition to the benefits countable for single residential structures, mitigation projects for groups of residential may have two additional categories of benefits in some cases: avoided infrastructure damages and avoided emergency management costs. These additional benefits are generally only applicable to certain types of flood hazard mitigation projects.

If a mitigation project, such as improvements in flood control infrastructure, affects an entire town or an entire neighborhood, the damages to infrastructure will generally be reduced along with damages to the structures themselves. For example, there will be reduced damages to roads and utilities as well as to buildings. Similarly, if an acquisition project removes all of the homes from a neighborhood, then much of the infrastructure supporting the homes can be “retired” and is no longer subject to damage.

Likewise, if improvements in flood control infrastructure or acquisition of all homes in a neighborhood significantly reduces the level of flood risk for a community, then there is expected to be a proportional reduction in future emergency management costs.

All of the categories of benefits discussed above in Section 3.1 for single residential structures also apply to groups of residential structures. The additional categories of benefits that may be applicable for some flood hazard mitigation projects for groups of residential structures are summarized below in Table 3.3.

Table 3.3
Additional Categories of Benefits to be Counted for Groups of Residential Buildings[1,2]

Additional Types of Benefits to Consider	When to Count
1. Physical Damages	
Other physical damages: - infrastructure	Applicable only to some flood mitigation projects
2. Emergency Management Costs	
Emergency operations center costs Evacuation or rescue costs Security costs Temporary protective measure costs Debris removal and cleanup costs Other emergency management costs	Applicable only to some flood mitigation projects

Notes:

[1] These possible additional categories of benefits apply only when a mitigation project such as improvements in flood control infrastructure affects an entire town or entire neighborhood or when an acquisition project affects an entire neighborhood.

[2] These possible additional categories of benefits generally apply only to flood hazard mitigation projects. Mitigation projects for hurricanes and earthquakes generally affect only individual structures and do not reduce a community's infrastructure damages or emergency management costs.

3.3 Commercial Buildings

Most of the benefit categories counted for commercial buildings are the same as for residential buildings discussed above. One exception is that disruption costs, which may be counted for residential buildings, are not applicable to commercial buildings. The equivalent of disruption time for commercial businesses is already implicitly included in estimates of functional downtime and lost business income. To count disruption time for commercial structures would be double-counting.

For mitigation projects for commercial buildings, the suggested benefit-cost analysis strategy is to count first the largest and most easily counted benefits. For this type of project, these benefits include building damages, contents damages, and displacement costs. In addition, for seismic projects, casualties should always be counted. If the project is cost-effective, it may not be necessary to count additional benefits. If not, the categories of other physical damages, business income losses and wage losses are generally the most significant additional benefits to count. The other categories are likely to contribute only minor benefits or to not be applicable.

The categories of benefits to be counted for mitigation projects for single commercial buildings (or small groups of commercial buildings or a group of commercial buildings at scattered locations) are summarized below in Table 3.4.

Table 3.4
Categories of Benefits to be Counted for
Commercial Buildings[1]

Type of Benefits to Consider	When to Count
1. Physical Damages	
Building damages	Always counted
Contents damages	Always counted
Other physical damages[2] - landscaping - outbuildings - vehicles, equipment - site contamination	Applicable to acquisition or flood control infrastructure projects only[3]. Consider counting if significant, especially for projects that are close to being cost-effective without counting these categories
2. Loss-of-Function Impacts	
Displacement costs	Always counted
Rental income losses	Can count if appropriate, but easier to include in displacement costs[4]
Business income losses[5]	Consider counting, but generally constitutes only a small fraction of benefits
Wage income losses[5]	Consider counting, especially for projects that are close to being cost-effective, can add significantly to benefits

Type of Benefits to Consider	When to Count
3. Casualties	Always counted for seismic projects, rarely applicable to other projects[6]
4. Emergency Management Costs	Not applicable to single commercial structures[7]

Notes:

[1] Guidance in table applies to single commercial structures, small groups of commercial structures, and groups of structures at scattered locations.

[2] Other physical damages can be counted by adding appropriate damage percentages to the damage function for building or contents. These damages may be significant and thus counting them may add significantly to the total benefits. This type of mitigation project does not reduce damages to off-site utilities or transportation systems and no benefits should be counted for such other physical damages.

[3] Other physical damages are applicable only to acquisition or flood control infrastructure projects because mitigation projects to elevate or retrofit the primary structure have no impact on these other categories of damages - thus, there are no additional benefits.

[4] Rental income losses are not necessary to count if the full costs of temporary quarters are included in displacement costs for both owners and renters. Double-counting must be avoided.

[5] Business income losses and especially wage losses may be significant for commercial structures and thus counting them may add significantly to the total benefits.

[6] Casualties may be important for seismic hazard mitigation projects. Counting the benefits of avoided casualties may be a substantial fraction of total benefits and thus they should always be counted. For most other mitigation projects, benefits of casualties avoided are non-existent or negligible and thus should be counted only in special circumstances.

[7] Acquisition, elevation or retrofit of single commercial structures, small groups of structures, or groups at scattered locations does not significantly reduce a community's emergency management costs because the area affected by a disaster is not decreased, and the total population affected by disaster is not decreased or not decreased significantly.

For commercial businesses, the appropriate measure of business income losses is net business income not gross business income because loss of function of a commercial building (i.e., functional downtime) generally reduces costs as well as receipts.

Loss of wage income generally applies only to hourly employees, since most salaried employees are likely to continue to be paid during relatively short post-disaster business interruptions. Estimates of lost wages should include wages and benefits. If local data are not available, the national average value of $21.16 for hourly wages and benefits may be used for benefit-cost analysis.

Only in rare circumstances are FEMA hazard mitigation projects likely to include an entire neighborhood of commercial structures. If, however, a flood infrastructure improvement project or flood acquisition project does affect an entire neighborhood of commercial structures (or a mix of residential and commercial structures), then the additional benefits discussed above for groups of residential structures also apply to groups of commercial structures. These possible additional benefits, which include avoided infrastructure damages and avoided emergency management costs, are subject to the same caveats and the same calculation methods as for residential structures.

3.4 Public Buildings

Most of the categories of benefits to be counted for public buildings are the same as for commercial buildings discussed above. Two exceptions are that business income losses and wage income losses are generally not applicable to public buildings. For public buildings, the measure of the economic impact of loss of function of a building is the loss of public services.

For ordinary public buildings that do not provide critical services for disaster response and recovery, the measure of the value of loss of service is the cost of providing the public service. To value public services, FEMA makes the very simple and direct assumption that public services are worth what it costs to provide the services to the public. For example, if a public service costs $1,000 per day to provide, then the value is assumed to be $1,000 per day. If the service is lost because of damage to the building, the loss is assumed to be $1,000 per day. If the loss of service is avoided because of a hazard mitigation project, then the benefit is assumed to be $1,000 per day. This method for valuing the loss of public services applies to all public services.

The daily cost of services is estimated from the annual operating budget for the agencies occupying a building. The annual operating budget includes all of the direct costs necessary to provide the public services, including salaries and benefits, materials, supplies, utilities, equipment costs, and rent or the annual cost of owning the building. The only exclusion is for transfer payments. For example, if a public office distributes pension checks, the value of the service is not the value of the checks distributed, but rather the cost of providing the service.

The equivalent of wage income losses is already explicitly included in estimates of functional downtime and loss of public services, because wages and benefits are a large portion of the costs of providing public services. Thus, to count wage income losses separately for public structures would be double counting.

For ordinary public buildings, a continuity premium is <u>not</u> added to the normal cost of service. A continuity premium is added <u>only</u> for services such as police, fire and medical, that is critical to emergency response and recovery. However, if some fraction of the staff of an ordinary public building does provide emergency services, an appropriate continuity premium could be added to that proportionate fraction of the cost of services.

For mitigation projects for public buildings, the suggested benefit-cost analysis strategy is to count first the most easily identifiable and quantifiable benefits. For this type of project, these benefits include building damages, contents damages, displacement costs, and loss of public services. In addition, casualties should always be counted for seismic projects. If the project is cost-effective, it may not be necessary to count additional benefits. If the project is not cost-effective, the category of other physical damages may add the most significant additional benefits to count. The other benefit categories generally contribute only minor benefits or aren't applicable.

The categories of benefits to be counted for mitigation projects for public buildings are summarized below in Table 3.5.

Table 3.5
Categories of Benefits to be Counted for Public Buildings

Types of Benefits to Consider	When to Count
1. Physical Damages	
Building damages	Always counted
Contents damages	Always counted
Other physical damages[1] - landscaping - outbuildings - vehicles, equipment - site contamination	Applicable to acquisition or flood control infrastructure projects only[2]. Consider counting if significant, especially for projects that are close to being cost-effective without counting these categories
2. Loss-of-Function Impacts	
Displacement costs	Always counted
Loss of public services	Always counted No continuity premium for ordinary services
3. Casualties	Always counted for seismic projects, rarely applicable to other projects[3]
4. Emergency Management Costs	Not applicable to single public structures[4]

Notes:

[1] Other physical damages can be counted by adding appropriate damage percentages to the damage function for building or contents. These damages may be significant and thus counting them may add significantly to the total benefits. This type of mitigation project does not reduce damages to off-site utilities or transportation systems and no benefits should be counted for such other physical damages.

[2] Other physical damages are applicable only to acquisition or flood control infrastructure projects because mitigation projects to elevate or retrofit the primary structure have no impact on these other categories of damages - thus, there are no additional benefits.

[3] Casualties may be important for seismic hazard mitigation projects. Counting the benefits of avoided casualties may be a substantial fraction of total benefits and thus they should always be counted. For most other mitigation projects, benefits of casualties avoided are non-existent or negligible and thus should be counted only in special circumstances.

[4] Acquisition, elevation or retrofit of single public structures, does not significantly reduce a community's emergency management costs because the area affected by a disaster is not decreased, and the total population affected by disaster is not decreased or not decreased significantly.

3.5 Summary

Benefit-cost analysis of ordinary residential, commercial, or public buildings is straightforward. Many of the same benefits are counted, regardless of the function of the building. For ordinary buildings, the following benefits are always counted and are usually the largest categories of benefits: 1) building damages, 2) contents damages, and 3) displacement costs. In addition, for public buildings, the value of lost public services should always be counted. For seismic hazard mitigation projects, the benefits of avoided casualties are often very important, sometimes the largest single category of benefits, and should always be counted. The most important benefits to count are summarized in Table 3.6 below.

Table 3.6
The Most Important Benefits for Hazard Mitigation Projects for Ordinary Buildings

Types of Benefits to Consider	When to Count
▪ Building damages	Always counted
▪ Contents damages	Always counted
▪ Displacement costs	Always counted
▪ Loss of public services	Always counted for public buildings
▪ Casualties	Always counted for seismic projects

In addition, there are several other categories of benefits that apply in more limited cases or are generally significantly smaller than those identified in Table 3.6. Possible additional benefits to count are summarized below in Table 3.7.

Table 3.7
Possible Additional Benefits to Count
(if project is not cost-effective after counting benefits in Table 3.6)

Types of Benefits to Consider	When to Count
▪ Other physical damages	Applicable for all building types, but only for acquisition or flood control infrastructure mitigation projects; may add significantly to total benefits.
▪ Rental income losses	Applicable to all building types, but not necessary to count; instead, it is easier to include in displacement costs.
▪ Business income losses	Applicable to commercial buildings and to home businesses; this category of benefits is generally small.
▪ Wage income losses	Applicable only to commercial buildings; may add significantly to total benefits.
▪ Disruption costs	Applicable to residential buildings; may add significantly to total benefits.

Types of Benefits to Consider	When to Count
▪ Emergency management costs	Applicable only to flood control infrastructure projects or acquisition projects that protect entire neighborhoods; this category of benefits is generally small.

This section provides guidance and examples of how to count benefits for mitigation projects for buildings providing police, fire, and medical services. Such buildings are considered critical facilities because the services they provide are critical to disaster response and recovery.

Benefit-cost analysis for critical facilities is generally similar to that for ordinary public buildings. The same categories of benefits are typically counted, as summarized below in Table 4.1

Table 4.1
Categories of Benefits to be Counted for
Critical Facilities: Police, Fire and Medical Buildings

Types of Benefits to Consider	When to Count
1. Physical Damages	
▪ Building damages	▪ Always counted ▪ Building replacement values may differ from those for ordinary buildings ▪ Specialized damage functions may be needed
▪ Contents damages	▪ Always counted ▪ Contents replacement values may differ from those for ordinary buildings ▪ Specialized damage functions may be needed
▪ Other physical damages1 - landscaping - outbuildings - vehicles, equipment - site contamination	Applicable to acquisition or flood control infrastructure projects only[2]. Consider counting if significant, especially for projects that are close to being cost-effective without counting these categories
2. Loss-of-Function Impacts	
▪ Displacement costs	▪ Generally counted ▪ May not be applicable for some facilities
▪ Loss of public services	▪ Always counted ▪ A continuity premium must be added to the normal cost of providing service ▪ In many cases, the continuity premium has a large impact on the benefit-cost analysis
3. Casualties	Always counted for seismic projects, rarely applicable to other projects[3]
4. Emergency Management Costs	Not applicable to single public structures[4]

Notes:

[1] Other physical damages can be counted by adding appropriate damage percentages to the damage function for building or contents. These damages may be significant and thus counting them may add significantly to the total benefits. This type of mitigation project does not reduce damages to off-site utilities or transportation systems and no benefits should be counted for such other physical damages.

[2] Other physical damages are applicable only to acquisition or flood control infrastructure projects because mitigation projects to elevate or retrofit the primary structure have no impact on these other categories of damages - thus, there are no additional benefits.

[3] Casualties may be important for seismic hazard mitigation projects. Counting the benefits of avoided casualties may be a substantial fraction of total benefits and thus they should always be counted. For most other mitigation projects, benefits of casualties avoided are non-existent or negligible and thus should be counted only in special circumstances.

[4] Acquisition, elevation or retrofit of single public structures, does not significantly reduce a community's emergency management costs because the area affected by a disaster is not decreased, and the total population affected by disaster is not decreased or not decreased significantly.

There are, however, important differences in benefit-cost analysis of mitigation projects for critical facilities as compared to analysis for ordinary buildings.

4.1 Physical Damage Estimates for Police, Fire and Medical Buildings

Physical damage patterns for these types of buildings are generally similar to those for ordinary buildings. However, in some cases critical facilities are designed to higher codes and standards than ordinary buildings and thus may be somewhat less vulnerable to damages. Building replacement values may also differ because of the specialized nature of these buildings. For example, building replacement values for hospitals can be has high as $300 per square foot. On the other hand, building replacement values for fire stations can be quite low, because of the simple nature of most fire stations, with much of the space being garage space for fire apparatus. Building replacement values for police, fire, or medical facilities are generally available from the agencies providing such services, from local building officials, or from local building engineers.

Contents damage patterns for these types of buildings are generally similar to those for ordinary buildings. In some cases, professional judgment is necessary to adjust typical or default contents damage functions to reflect the specialized communications or medical equipment in these types of facilities. For hospitals and other medical facilities, the contents replacement value may be very high, in some cases similar to or exceeding the building replacement value. Appropriate contents replacement values for police, fire, or medical facilities are generally available from the agencies providing such services, from local building officials, or from local building engineers.

For acquisition or flood control infrastructure mitigation projects, one of the benefits may be reductions in other physical damages. As for ordinary buildings discussed in Section 3, other physical damages for critical service buildings include damages to landscaping, outbuildings, vehicles, and equipment and possible site contamination. Such damages can be estimated, but are generally small compared to the other categories of benefits for critical service facilities. Thus, such benefits can generally be ignored except for projects that are very close to being cost-effective without counting this category. For mitigation projects other than acquisition or flood control infrastructure, there are no benefits in this category because elevation, retrofit or strengthening of a building itself does not reduce this category of damages.

4.2 Displacement Costs

When facilities housing police and fire services are damaged to an extent such that the buildings cannot be occupied during repairs, the services are moved to temporary quarters. The displacement costs for such temporary quarters are part of the damages and losses attributed to a disaster and these displacement costs become part of the benefits to the extent that they are avoided or reduced by a mitigation project.

Displacement costs for police and fire facilities are counted in the same manner as for ordinary buildings. Displacement costs include:

Monthly costs of rent for temporary space

Other monthly costs such as furniture rental

One-time costs such as round-trip moving costs, utility connection fees and other such costs

For police and fire facilities, the one-time costs may be higher than for ordinary buildings because of the critical communications equipment that would have to be moved and reinstalled. Other monthly costs could also include extra transportation time and costs if the temporary facility is not as well located as the permanent facility.

For police facilities that include jails, the concept of displacement costs is somewhat more complicated. For security reasons, inmates probably cannot be housed in ordinary temporary quarters. Rather, displacement of jail inmates probably requires moving inmates to another correctional facility. In such cases, displacement costs would include the transportation or moving costs, any extra daily transportation time and costs, plus the monthly cost of housing inmates in the alternative facility.

For hospitals, the concept of displacement to temporary quarters is also somewhat more complicated. Some hospital facilities such as office space, storage space, residential quarter for staff and other ordinary functions can be relocated to temporary quarters. For such space, displacement costs are calculated as summarized above for police and fire services.

Some hospital services, including most patient care facilities cannot readily be located to temporary quarters. For such services, displacement probably requires moving patients and services to another medical facility. In this case, displacement costs would include the transportation or moving costs, any extra daily transportation time and costs, plus the extra monthly cost of housing patients in the alternative facility.

The typical values for displacement time assume that building damages of less than 10% of the building replacement value can be repaired without requiring displacement of occupants. For damages above 10%, a minimum displacement of 30 days is assumed, with the displacement time increasing linearly with damage percentage up to a cap of 365 days (one year) for displacement time. That is, regardless of the level of damages, it is assumed that public services will be back in the original (repaired) building or in a new permanent building within one year of the disaster. Professional judgment, experience, and many years of use confirm that these estimates appear reasonable in most cases, especially for small- to medium-sized facilities.

For major, complex or specialized facilities that suffer major damage or that require replacement with new facilities, or for large, monumental historical buildings, longer displacement times of up to two or three years are sometimes experienced. While such long displacement times are uncommon, they do occur and in such cases it is important to make realistic estimates of displacement time. Displacement time estimates for major complex projects can be based on construction duration estimates, construction bids, or on the professional judgment of the design and construction details of the repairs or of the replacement facility. Longer displacement time estimates are appropriate if and only if there is sound documentation of longer repair or replacement times for a specific facility under evaluation.

4.3 Loss of Public Services

For critical facilities, the first step in evaluating the benefits of reducing the loss of public service is exactly the same as that for ordinary buildings, as discussed in Section 3.4. The base value of public services, including police, fire and medical services, is estimated from the annual operating budget of the facility providing the service. The annual operating budget includes all of the direct costs necessary to provide the public services, including salaries and benefits, materials, supplies, utilities, equipment costs, and rent or the annual cost of owning the building. The only exclusion is for transfer payments. For example, if a public office distributes pension checks, the value of the service is not the value of the checks distributed, but rather the cost of providing the service.

The equivalent of wage income losses is already explicitly included in estimates of functional downtime and loss of public services, because wages and benefits are a large portion of the costs of providing public services. Thus, to count wage income losses separately for public structures would be double-counting.

4.3.1 Continuity Premiums for Police, Fire and Medical Services

A continuity premium is a measure of the extra importance that some public services have during disasters. In simple terms, a continuity premium is a measure of how much extra a community would be willing to pay to continue to have critical services during a disaster.

In benefit-cost analysis, the effect of a continuity premium is to count more highly those services that are essential for disaster response and recovery, compared to ordinary services that are not more important to a community during disasters. A high continuity premium increases the benefits of a mitigation project by increasing the benefits of avoiding loss of public services.

In assigning continuity premiums for police, fire and hospital services, the following question must be answered:

> **In a disaster, how much more important are police, fire and hospital services compared to their value to the community in non-disaster circumstances?**

Answering the above question and thereby determining an appropriate continuity premium for these services profoundly affects the determination of which hazard mitigation projects are or are not cost-effective.

For police and fire services, the maximum possible continuity premium is limited by the capacity of police and fire departments to respond to emergency calls. For example, police and fire departments cannot respond to 1,000 times more calls than normal during a disaster because of limited staff and apparatus. A more detailed analysis of continuity premiums for police and fire services is given in Chapter 1 of the Supporting Documentation (Technical Appendix: Guidance for Benefit-Cost Analysis of Mitigation Projects for Police, Fire, and Medical Service Facilities). In general, a continuity premium of ten times the normal cost of service is appropriate for police and fire services.

For medical services, similar concepts apply as discussed above for police and fire services, although appropriate continuity premiums for medical services vary with the disaster type as follows:

For earthquakes, the potential for mass casualties means that an appropriate continuity premium will be governed by the capacity to provide emergency medical services. A continuity premium of 10 times the normal cost of service is suggested for medical facilities providing direct patient care.

For floods, there is very little likelihood of significantly more than normal demand for emergency medical services and therefore no continuity premium should be applied.

For hurricanes, the typical number of casualties is low because of the widespread evacuations that are commonly ordered in advance of a hurricane. Thus, there is very little likelihood of significantly more than normal demand for emergency medical services and no continuity premium should be applied.

For tornadoes and fires, some casualties are likely. However, such events typically impact only very small segments of a hospital service area and thus, there is very little likelihood of significantly more than normal demand for emergency medical services and no continuity premium should be applied

Thus, for hospitals and other patient care medical facilities, a continuity premium is suggested only for seismic hazard mitigation projects. For seismic hazard mitigation projects for hospitals, a continuity premium of 10 is suggested only for facilities providing direct patient care. For a hospital complex as a whole, many facilities are support facilities not directly related to immediate patient care; therefore for hospital complexes as a whole, a continuity premium of 5 is suggested. For non-patient care buildings within a hospital complex, continuity premiums from none to perhaps 5 are suggested, depending on the strength of the linkage between the building's services and patient care. A more detailed analysis of continuity premiums for hospitals and other medical care services is given in Chapter 1 of the Supporting Documentation (Technical Appendix: Guidance for Benefit-Cost Analysis of Mitigation Projects for Police, Fire, and Medical Service Facilities).

Suggested continuity premiums for police, fire and medical services are summarized below in Table 4.2.

Table 4.2
Continuity Premiums
Police, Fire, and Medical Services

Type of Facility	Continuity Premium
Police Services	10
Fire Services	10
Medical Services	▪ 0 for non-seismic mitigation projects ▪ 10 for seismic mitigation projects for patient care facilities ▪ 5 for seismic mitigation projects for whole hospital complex ▪ 0 to 5 for seismic mitigation projects for non-patient care buildings, depending on linkage between services provided and patient care

4.3.2 Functional Downtime Estimates for Police, Fire and Medical Services

Functional downtime is the number of days that a public service is not available because of disaster damage. Functional downtime days may be fractional. For example, one day of functional downtime may be one day with 100% loss of service or two days with 50% loss of service or 10 days with 10% loss of service.

Functional downtime is not the same as displacement time. For example, a building providing a public service is damaged in a flood and occupants are displaced to temporary quarters for 3 months while repairs are made. The public service, however, is restored in two weeks from the temporary quarters. In this simple example, the functional downtime is two weeks, while the displacement time is three months.

Estimates of functional downtime are substantially different for critical services than for ordinary services. For example, if a library suffers damage in a flood or an earthquake, the library may close for several weeks or several months. Loss of library service may be tolerable to a community for an extended period of time. However, if a police or fire station suffers a similar level of damage, the police or fire services cannot be closed down for an extended period of time because these services are simply too important to the community. Thus, in the case of damage to a police or fire station, the essential police or fire services are generally reestablished quickly in temporary quarters. Essential services will be reestablished much more quickly than would less important services.

> **A general rule of thumb is that the more important a public service is to a community, the shorter the functional downtime will be.**

Police and fire services are in large part provided away from the facility housing the staff and apparatus. This aspect of such services is very important because it means that, to a considerable degree, service can be continued even when the facility housing the service has considerable damage. In an emergency, many operations can be run from a parking lot with manual dispatch or cell phone dispatch in the event that a station is heavily damaged in a disaster.

For the reasons cited above, loss of police and fire services is almost always partial. It would be very rare for a police or fire department to provide no service for any significant period of time. Rather, damage to facilities or disruption of communication links commonly result in delays or disruption of normal service. For any given disaster event, days of loss of service are not likely to be complete days with 100% loss of service. More likely there might be, for example, one day with 50% service, several days with 80% service and several days with 90% service. When historical data on service disruption are available, the functional downtime can be calculated by summing up the fractional days of lost service over the service restoration time period after the disaster.

The concepts discussed above and the analysis of functional downtime for police and fire services suggests that functional downtimes for these services are expected to be significantly shorter than for ordinary (non-critical) public services. A common sense rule of thumb, based on professional judgment and experience, is that functional downtimes might average a factor of three less than for ordinary public services.

Functional downtime estimates for hospitals are, in some regards, similar to those for police and fire services. Because hospital services, like police and fire services, are obviously important to a community in a disaster situation, functional downtimes are likely to be shorter for hospitals than for ordinary facilities. That is, repair and restoration of damaged hospital facilities almost always has a very high priority.

However, the shorter functional downtimes expected for hospitals because of their importance to the community is counterbalanced by the fact that many critical hospital services require special, sterile medical conditions and complex modern medical equipment. Thus, while police and fire staff and apparatus can be dispatched from a parking lot, if necessary, few major medical, surgical, or diagnostic procedures requiring specialized equipment and/or sterile conditions can be performed in a parking lot.

Similarly, a few inches of water or even a foot or two of water in a police or fire station will disrupt service, but will not result in complete loss of service. However, a few inches of water in an operating room, a diagnostic room with specialized medical equipment, or a patient care room, would almost certainly result in complete loss of service.

Combining the importance of hospital services to a community and the medical requirements for sterile conditions and other operating constraints for medical facilities suggests that functional downtimes for hospitals are likely to be shorter than those for ordinary buildings but longer than those for police and fire services. A common sense rule of thumb, based on professional judgment and experience, is that functional downtimes for hospitals might average a factor of two less than for ordinary public services.

4.4 Casualties

In some disaster events, occupants of facilities housing police and fire services and hospitals and other medical facilities are at risk of injury or death. Casualty estimates for such facilities are made in exactly the same manner as for ordinary buildings. Casualties are estimated from the average occupancy (24 hours per day, 365 days per year) of a facility and the estimated casualty rate as a function of severity of disaster.

For these critical facilities, casualty estimates are most important for earthquakes. Major earthquakes may pose a significant life safety risk for occupants of buildings with seismic vulnerabilities. For seismic hazard mitigation projects, the benefits of reduced or avoided casualties may be a major component of total benefits for any of these critical facilities, which usually have 24-hour occupancy. However, the benefits of avoided casualties are particularly important for hospitals because of their typically very high occupancy levels (patients, staff, and visitors). In some cases, especially for hospitals, the benefits of reduced casualties may be the largest single benefit of a mitigation project. For seismic mitigation projects, the benefits of reduced casualties are important and these benefits should always be counted.

For floods and hurricanes, casualties are generally low and many casualties that do occur are a result of individuals ignoring evacuation warnings (in the case of hurricanes) or ignoring road or bridge closures (in the case of floods). For most flood and hurricane hazard mitigation projects the benefits of reduced casualties are generally not significant and are not considered in the benefit-cost analysis. However, critical facilities such as those for police and fire services and hospitals are probably less likely to be evacuated in hurricanes than are ordinary facilities. Especially for mitigation projects that are designed to harden such facilities to withstand hurricane winds or tornadoes, the benefits of reduced casualties may be significant and should be considered in the analysis. In these circumstances, casualty rate estimates should always be made in close consultation with an engineer knowledgeable about the wind design characteristics of the existing building and the capacity of the post-mitigation building.

For benefit-cost analyses where reductions in casualties are included, the benefits of casualties avoided are often a large component of total benefits and thus estimates of casualty rates before and after mitigation become a very important determinant of the overall benefit-cost analysis and results. Making realistic estimates of casualty rates is difficult and requires a substantial understanding of the failure modes of buildings and the likely casualty rates that would result. Estimates of casualty rates should always be made by an engineer or analyst very knowledgeable about such issues, with a considerable amount of experience.

For seismic mitigation projects, the casualty rate estimates in the FEMA-sponsored HAZUS program (HAZUS, Earthquake Loss Estimation Methodology, National Institute of Building Science and Federal Emergency Management Agency, 1997) provide the best available consensus estimates of casualty rates for different structural types of buildings designed to varying seismic design levels. However, using these estimates is possible if and only if a building's seismic vulnerability is expressed as a fragility curve. A fragility curve is a mathematical representation that states the probability that a building will sustain a given level of damage as a function of the level of ground motion. Fragility curve-based estimates of casualty rates are the best available, but the necessary calculations are mathematically complicated and should not be attempted by analysts not thoroughly familiar with this mathematics.

Damage to critical facilities may also result in a loss of function that may pose a life safety threat to the community served by the facility. This potential casualty risk is separate from casualty risk faced by the occupants of the building. Police, fire and medical services are directly related to life safety in the community as a whole. The high operating budgets of such facilities reflect, in large part, the life safety aspects of these services. However, the life safety impacts of losing service from such facilities are already included in the value of public services calculation discussed above in Section 4.3. The high normal daily cost of service and the high continuity premiums for these critical services include the importance of these facilities in preserving life safety in the community. Thus, separate casualty estimates for the community as a whole should not be done for benefit-cost analysis and to do so would be to incorrectly double-count life safety benefits.

4.5 Summary Guidance

The major categories of benefits to be counted for mitigation projects for public buildings providing police, fire, and medical services are summarized below in Table 4.3.

Table 4.3
Summary Guidance
Benefit-Cost Analysis of Mitigation Projects for Police, Fire, and Medical Facilities

Damages/Benefits Categories	Data Sources and Guidance
1. Physical Damages	
▪ Building replacement value and contents value	Values from local officials.
▪ Building and contents damage functions	Historical data and professional judgment, as necessary.
▪ Other physical damages	For acquisition and flood control infrastructure projects only, generally of minor importance, estimates based on historical data and professional judgment.
2a. Economic Impact of Loss of Function (i.e., Displacement Costs)	
▪ Displacement time	Historical data and professional judgment, as necessary.
▪ Displacement costs	Estimates of monthly rent, other costs, and one-time costs from local officials. Costs may differ for critical service facilities.
2b. Economic Impact of Loss of Function (i.e., Loss of Public Services)	
▪ Normal cost of service	Annual operating budgets from local officials
▪ Functional downtime	▪ Police services: 1/3 of typical values ▪ Fire services: 1/3 of typical values ▪ Medical services: 1/2 of typical values
▪ Continuity Premiums - police and fire services	10x cost of normal service
▪ Continuity Premiums - medical services, seismic projects	▪ Patient care facilities: 10x cost of normal services ▪ Whole medical complex: 5x cost of normal services ▪ Non-patient care bldgs: 0 to 5x cost of normal services
▪ Continuity Premiums - medical services, other projects	None, demand for services is typically not significantly greater than normal

Damages/Benefits Categories	Data Sources and Guidance
3. Casualties	
▪ Average Facility occupancy	Local officials or applicant
▪ Casualty rates	HAZUS casualty rates for earthquakes, professional judgement for other hazards
▪ Statistical values of deaths, injuries, and illnesses	FEMA values, updated to 2001 values, see Section 2.3 - deaths: $2,710,000 - major injuries/illnesses: $15,600 - minor injuries/illnesses: $1,560

Mitigation projects for critical facilities are, by definition, important projects to communities. The guidance for benefit-cost analysis presented above makes it more likely that mitigation projects are cost-effective, compared to similar mitigation projects for ordinary facilities. Most importantly, the continuity premium places a greater value on avoiding loss of service, thus substantially increasing benefits. Furthermore, especially for hospitals, the greater building values, contents values, and high occupancy all result in higher benefits when mitigation projects will reduce damages and casualties. Benefit-cost analysis properly and fully recognizes and counts the importance of these critical facilities to a community.

However, regardless of how important these facilities may be to a community, not every mitigation project for a critical facility will be cost-effective. For example, consider a mitigation project for a seismic upgrade or replacement of a fire station built below the current building codes. If the building is located in a high seismic hazard area and is constructed of unreinforced masonry, subject to collapse during an earthquake with resulting casualties and substantial loss of the important services, then the benefits of retrofit or replacement will be very high. In many such cases, even a complete replacement of the building with a new building may be cost-effective. On the other hand, if the existing fire station has only minor seismic deficiencies, with little potential for casualties, and only limited potential for loss of service, then a very expensive seismic retrofit (e.g., $100 or $150 per square foot) to bring the entire building up to current code requirements will almost certainly not be cost-effective. In these circumstances a more modest seismic retrofit to address the specific deficiencies has a higher likelihood of being cost-effective.

Mitigation projects for critical facilities, which are reasonable in cost and address specific deficiencies in high hazard areas, have a high likelihood of being cost-effective. On the other hand, expensive mitigation projects that correct only minor deficiencies or located in areas with only minor exposure to hazards are unlikely to be cost-effective, even for critical facilities. It is important to understand that a benefit-cost analysis indicating that a mitigation project for a critical facility is not cost-effective does not mean that the benefit-cost analysis is flawed but may instead indicate that the mitigation project is poorly conceived and, indeed, not worth doing.

In many regards, benefit-cost analysis of mitigation projects for emergency operations centers (EOCs) and emergency shelters is similar to that for other critical facilities. For EOCs and emergency shelters, however, there are two very important differences: 1) such facilities often occupy only part of a building, and 2) such facilities are in function only immediately before, during or immediately after disaster events. Both of these differences affect benefit-cost analysis of mitigation projects for EOCs and emergency shelters.

Many mitigation projects for EOCs and emergency shelters address only the portion of a building used for the EOC or shelter. In this case, the benefit-cost analysis should consider only the portion of the building used for the EOC or shelter, because such a mitigation project has no effect on the remainder of the building. Estimates of building damages, contents damages, displacement costs, casualties, loss of public services and any other categories of benefits should consider only the portion of the building used as an EOC or shelter.

If a mitigation project affects the entire building housing an EOC or shelter and other non-critical public functions, then the easiest way to approach the benefit-cost analysis is to consider separately the parts of the building providing ordinary services and critical services and then add the benefits together. For benefit-cost analysis, the part of the building providing ordinary services is evaluated in exactly the same manner as "ordinary" public buildings, with guidance as outlined in Section 3.

> **For benefit-cost analysis, the portion of a building providing EOC or shelter services is treated conceptually as a separate building.**

The guidance in this section focuses only on portions of a facility providing EOC or shelter services, or the whole building if the whole building provides EOC or shelter services.

Benefit-cost analysis for these buildings or parts of buildings providing EOC or emergency shelter services is generally similar to that for ordinary public buildings. The same categories of benefits are typically counted, as summarized below in Table 5.1

Table 5.1
Categories of Benefits to be Counted
Critical Facilities: EOCs and Emergency Shelters

Types of Benefits to Consider	When to Count
1. Physical Damages	
▪ Building damages	▪ Always counted ▪ Building replacement values may differ from those for ordinary buildings ▪ Specialized damage functions may be needed
▪ Contents damages	▪ Always counted ▪ Contents replacement values may differ from those for ordinary buildings ▪ Specialized damage functions may be needed
▪ Other physical damages[1] - landscaping - outbuildings - vehicles, equipment - site contamination	▪ Applicable to acquisition or flood control infrastructure projects only2 ▪ Consider counting if significant, especially for projects that are close to being cost-effective without counting these categories
2. Loss-of-Function Impacts	
▪ Displacement costs	▪ May be applicable for some facilities, ▪ Displacement time estimates are different than for ordinary buildings: limited to normal duration of use during disasters
▪ Loss of public services	▪ Always counted ▪ A continuity premium must be added to the normal cost of providing service ▪ In many cases, the continuity premium has a large impact on the benefit-cost analysis ▪ Functional downtime estimates are different than for ordinary buildings: limited to normal duration of use during disasters
3. Casualties	Always counted for seismic projects, may be applicable for hurricane and tornado projects as well[3]
4. Emergency Management Costs	Not applicable to single public structures[4]

Notes:

[1] Other physical damages can be counted by adding appropriate damage percentages to the damage function for building or contents. These damages may be significant and thus counting them may add significantly to the total benefits. This type of mitigation project does not reduce damages to off-site utilities or transportation systems and no benefits should be counted for such other physical damages.

[2] Other physical damages are applicable only to acquisition or flood control infrastructure projects because mitigation projects to elevate or retrofit the primary structure have no impact on these other categories of damages - thus, there are no additional benefits.

[3] Casualties may be important for seismic hazard mitigation projects. Counting the benefits of avoided casualties may be a substantial fraction of total benefits and thus they should always be counted. Benefits of avoided casualties may also be important for hurricane and tornado mitigation projects because EOCs and emergency shelters are intended to be occupied during disaster events.

[4] Acquisition, elevation or retrofit of single public structures, does not significantly reduce a community's emergency management costs because the area affected by a disaster is not decreased, and the total population affected by disaster is not decreased or not decreased significantly.

5.1 Physical Damage Estimates for EOC and Emergency Shelter Buildings

Physical damage estimates for EOCs and emergency shelters are generally similar to those for ordinary buildings. If the EOC or shelter is designed to higher than normal building code standards, then professional judgement must be used to make appropriate estimates of damages, before and after mitigation.

Contents damage estimates for EOCs and emergency shelters are also generally similar to those for ordinary buildings. For EOCs, the extra value of communications and other EOC equipment must be considered in the analysis.

Acquisition projects are uncommon for EOC or shelters. However, if a mitigation project is acquisition or is a flood control infrastructure project that provides better flood protection for an EOC or shelter, other physical damages (landscaping, outbuildings, etc.) can also be counted. However, for typical mitigation projects for EOCs and shelters, that involve hardening of the building itself, there are no additional benefits in this category and they should not be counted.

5.2 Displacement Costs

In principle, the public services provided by EOCs and emergency shelters are subject to being displaced to temporary quarters due to disaster damages, just like any other public service. In practice, however, the operation of EOCs or emergency shelters is typically only for short periods of time immediately before, during, or after disaster events. Furthermore, because of the specialized, temporary function of EOCs and shelters, displacement to temporary quarters may not be physical possible, during the brief periods that EOCs and shelters would normally operate in a single disaster event. Typically, there is ample time between disasters to allow for repairs between uses of EOCs or shelters.

Because of the operating characteristics of EOCs and emergency shelters, the possible benefits of reduced displacement time are likely to be substantially less than for ordinary buildings. For ordinary buildings, the benefits of reduced displacement time generally constitute only a small fraction of total benefits. Thus, for EOC or emergency shelter mitigation projects the benefits of reduced displacement time are likely to be very minor. Except for mitigation projects that are very close to being cost-effective without counting the benefits of reduced displacement time, it may not be necessary to count displacement benefits for most mitigation projects for EOCs and emergency shelters.

5.3 Loss of Public Services for EOCs

In principle, the benefits of avoiding loss of public services provided by EOCs and emergency shelters are calculated from the daily cost of public services, just like any other public service. In addition, since EOCs and emergency shelters are critical facilities, an appropriate continuity premium must be added to reflect properly the greater importance of EOCs and emergency shelters during disasters.

5.3.1 Functional Downtime Estimates for EOCs and Shelters

Functional downtime estimates for EOCs and shelters are different from those for ordinary buildings because EOCs and shelters are typically used only for short periods of time before, during and/or after disaster events. Functional downtimes for EOCs and shelters cannot be longer than the typical duration of use.

5.3.2 Value of Services

As with any public building, the base value of the service provided by an EOC or shelter is estimated from the daily cost of providing the service. However, unlike other public services, EOCs and shelters are used only for brief periods of time before, during or after disaster events. For ordinary public buildings, the daily cost of service is estimated by dividing the annual operating budget of a facility by 365 days per year.

> **For EOCs the daily cost of service is estimated by dividing the annual operating budget by the typical or average number of days of use per year.**

For example, if an EOC has an annual operating cost of $36,500 per year and operates an average of only 2 days per year, based on historical data, then the average daily cost of service is $17,500 per day (when used). In this case, the average value of the EOC services is estimated at $17,500 per day. As with any public services, the annual operating budget for an EOC includes annual costs for equipment, supplies, utilities, administrative and training costs and other operating costs, as well as the salary and benefit-costs of personnel when the EOC is activated.

Rather than trying to estimate an annual operating budget for emergency shelters, a different approach is suggested for estimating the base value of emergency shelter. For Federal travel, the GSA establishes standard rates for lodging and meals. For the continental U.S., the base CONUS daily rates are $55 or lodging and $30 for meals and incidentals. Higher rates are published for counties with higher than these typical values (i.e., many medium- to large- urban areas). The simplest measure of the value of temporary lodging and meals provided by an emergency shelter would be $85 per day (the base CONUS rate). A more accurate measure could be obtained by using the GSA rate appropriate for the county in which the emergency shelter is located. Current GSA lodging and meals rates are available at several websites, including a DOD site (*www.dtic.mil/perdiem*).

> **For emergency shelters, the base daily value of the public service is estimated by multiplying the average number of people given shelter by the $85 per day CONUS value (or the appropriate local value of lodging and meals from the GSA data).**

5.3.4 Continuity Premiums for EOCs and Shelters

Determining an appropriate continuity premium for an EOC is difficult. In many ways, evaluating a mitigation project for an EOC is similar to evaluating a mitigation planning project. An EOC does not, by itself, directly reduce damages, losses, or casualties in a disaster. Rather, by coordinating response efforts, an EOC makes a community’s disaster response more efficient and thus is beneficial to the community. Indirectly, an EOC may reduce damages by targeting and implementing preventative measures more efficiently or reduce casualties by focusing search and rescue operations more efficiently.

Clearly, an EOC is important to a community during disasters. However, because of the indirect connection between and EOC and reductions in damages, losses, and casualties, it is difficult to estimate a suitable continuity premium. For consistency, we suggest assuming that a functioning EOC has the same continuity premium, relative to the cost of service, as police and fire services. This assumption then assigns a common continuity factor of 10 times the daily cost of services to each of the primary emergency response functions: police, fire and EOCs.

In a disaster, there are several reasons why emergency shelter is clearly worth more to residents and to the community than during ordinary times. First, hotels and motels are likely to be filled to capacity, or unavailable due to closures and/or damage. Second, emergency shelter is more important than discretionary temporary shelter. Discretionary travel and shelter can be postponed, but the need for emergency shelter is immediate and cannot be postponed. Third, there is a life safety impact of emergency shelter. Availability of safe emergency shelters in tornadoes and hurricanes reduces casualties because people move from less safe structures to safer emergency shelters. In hurricanes, the availability of shelters undoubtedly reduces the number of people who are at risk because they ignore evacuation warnings. That is, the availability of emergency shelter makes it more likely that people will evacuate when so ordered by local officials.

Estimating the value of emergency shelter to a community and determining an appropriate continuity premium depends primarily on common sense and professional judgement. Clearly, people displaced from their homes or evacuated would be willing to pay more than the normal cost of shelter and food - perhaps twice normal costs, or several times normal costs or even ten times normal costs, but not 100 or 1000 times normal costs. At 100 or 1000 times normal costs, the value per day of temporary shelter would be $8,500 or $85,000 per person per day, respectively, and clearly such numbers exceed the bounds of common sense for the typical or average value of emergency shelter in disasters.

For emergency shelters, a continuity premium similar to, but not larger than, those assigned to police and fire services and EOCs appears reasonable. Thus, a continuity premium of 10 times the normal cost of service for emergency shelters should be used.

5.4 Casualties

In some disaster events, occupants of EOCs and shelters may be at risk of injury or death. In estimating casualties, the occupancy characteristics of EOCs and shelters must be carefully considered. Methods for estimating casualties depend on whether or not the facility has alternative uses during non-disaster times and whether or not the expected types of disasters occur with or without warnings.

For seismic hazard mitigation projects for EOCs and shelters, the appropriate occupancy value is the typical year-round occupancy for the normal function of the facility. In other words, casualty estimates are made in exactly the same manner as for any other building. For seismic mitigation projects, the best available casualty rate estimates are those in the FEMA-sponsored HAZUS program (HAZUS, Earthquake Loss Estimation Methodology, National Institute of Building Sciences and FEMA, 1997). HAZUS has consensus estimates of casualty rates for different structural types of buildings designed to several seismic design levels. However, using these estimates is possible if and only if a building's seismic vulnerability is expressed as a fragility curve. A fragility curve is a mathematical representation of a damage function expressed as the probabilities that a building will sustain a given level of damage as a function of the level of ground motion. Fragility curve-based estimates of casualty rates are the best available, but the necessary calculations are mathematically complex and should not be attempted by analysts not thoroughly familiar with this specialized mathematics and methodology.

For hurricane or tornado mitigation projects for EOCs and shelters, the appropriate occupancy value would be the occupancy during hurricane or tornado warnings, which may differ significantly from the normal occupancy of the facility. For hurricane winds and tornadoes, there are no currently available resources such as the earthquake HAZUS model to assist in casualty rate estimates. Rather, casualty rate estimates must be made for each building, based on the capacity of the specific building to withstand wind forces. In these circumstances, casualty rate estimates should always be made only in close consultation with an engineer very knowledgeable about the wind design characteristics of the existing building and the ability of the post-mitigation building to withstand wind forces.

For flood hazard mitigation projects for EOCs and shelters, life safety is generally not an issue and thus it is not necessary to make casualty estimates.

5.5 Summary Guidance

The major categories of benefits to be counted for mitigation projects for EOCs and emergency shelters are the same as those addressed for ordinary public buildings (Section 3) and for police, fire and medical facilities (Section 4). However, because of the function and occupancy characteristics of EOCs and shelters, there are several significant differences in benefit-cost analysis. These special considerations for EOC and shelter mitigation projects are highlighted in the summary Table 5.2 below.

Table 5.2
Special Considerations for Benefit-Cost Analysis of Mitigation Projects for EOCs and Emergency Shelters

Types of Benefits to Consider	Data Sources and Guidance
1. Economic Impact of Loss of Function (i.e., Displacement Costs)	May not be applicable for EOCs and shelters, because of short period of use of these services.
▪ Displacement time	Maximum possible displacement times are limited by the typical duration of use of EOCs or shelters.
▪ Displacement costs	If appropriate, the extra costs of providing service from temporary locations.
2. Economic Impact of Loss of Function (i.e., Loss of Public Services)	
▪ Normal cost of service	▪ EOCs: daily base cost of service is annual operating budget divided by average number of days of use, plus daily costs during operation. ▪ Shelters: $85 per day CONUS cost of temporary lodging and meals or local GSA values.
▪ Functional downtime	Maximum possible displacement times are limited by the typical duration of use of EOCs or shelters
▪ Continuity Premiums	10 x cost of normal service, calculated as above, differently than for other public services
3. Casualties	
▪ Facility occupancy	▪ Earthquakes: normal occupancy for all functions ▪ Hurricanes and tornadoes: occupancy during warnings ▪ Floods: not necessary to estimate, minimal life safety benefits
▪ Casualty rates	HAZUS casualty rates for earthquakes, professional judgement for other hazards
▪ Statistical values of deaths, injuries, and illnesses	FEMA values, updated to 2001 values, see Section 2.3 - deaths: $2,710,000 - major injuries/illnesses: $15,600 - minor injuries/illnesses: $1,560

6.1 Overview

In the context of emergency planning, disaster response, and disaster recovery, utilities are often characterized as lifelines. This characterization reflects the great importance that such systems have on the functioning of modern society. For example, loss of electric power greatly reduces economic activity in a community, as well as having a direct and major impact on affected residents. Similarly, loss of function of water or wastewater systems generally has direct economic impacts on a community that are far larger than the cost of repairs of the physical damages alone

Electric power, potable water and wastewater systems are subject to physical damages from natural disasters such as earthquakes, hurricanes and floods. More importantly, however, such systems are subject to loss of function; that is, loss of utility service. Such loss-of-function disruptions often have major negative impacts on affected communities.

Hazard mitigation projects for utility systems may eliminate or reduce physical damages in future disasters. However, in many cases, an important motivation or even the primary motivation in undertaking hazard mitigation projects for utility systems is not to reduce the physical damages alone, but rather to reduce the tremendous impacts that the loss of function of such systems may have on the affected communities.

The basic concepts of benefit-cost analysis of mitigation projects for utilities are the same as those for buildings. The general principles and categories of benefits outlined in Section 2 apply to utilities as well as to ordinary buildings (Section 3) and critical facilities (Sections 4 and 5).

Mitigation projects for utility administration buildings are evaluated in the same manner as for an ordinary commercial or public building, as discussed in Section 3. Mitigation projects for utility control or command centers are evaluated in the same manner, except that a continuity premium should be added to reflect the importance of such centers in providing utility services. By analogy to the continuity premiums assigned to EOCs, a continuity premium of 10 times the normal cost of operations appears reasonable for utility control or command centers.

, Most mitigation projects for utilities, however, deal with the complex infrastructure of the utility systems and not with buildings.

> **The guidance in this section focuses specifically on mitigation projects for utility infrastructure (not on mitigation projects for utility buildings).**

Some of the details of benefit-cost analysis differ between mitigation projects for electric power systems, potable water systems, and wastewater systems. These details are discussed below. Benefit-cost analysis for all three of these utilities considers four primary categories of possible benefits, as summarized below in Table 6.1. These are the same primary categories of benefits that were defined and discussed in Section 2.

Table 6.1
Primary Categories of Benefits
Mitigation Projects for Utilities.

Types of Benefits to Consider	Notes for Utility Mitigation Projects
1. Physical damages	Damage estimates made using professional judgement in consultation with those knowledgeable about utility system components and their vulnerability.
2a. Loss-of-Function Impacts (i.e., Displacement costs)	Not applicable to utility infrastructure mitigation projects; utility system components cannot be displaced to temporary quarters.
2b. Loss-of-Function Impacts (i.e., Economic impacts of loss of service)	▪ Economic impacts of loss of service are generally the largest category of benefits. ▪ See detailed guidance for each of the three utility systems evaluated.
3. Casualties	▪ May be significant for some types of projects, for some utility systems, for some hazards. ▪ See detailed guidance for each of the three utility systems evaluated.
4. Emergency Management Costs	▪ Not generally considered. ▪ Most utility mitigation projects have a negligible impact on a community's overall emergency management costs.

6.2 Physical Damage Estimates

Utility systems contain a wide range of highly specialized components. Electric power systems have generating plants, transmission and distribution lines, high voltage substations and a host of specialized ancillary equipment. Potable water systems have storage reservoirs, storage tanks, wells, treatment plants, aqueducts and transmission pipes, distribution pipes, pumping plants, valves and a host of specialized ancillary equipment. Wastewater systems have treatment plants, systems of collection pipes, pumping plants (lift stations) and a host of specialized ancillary equipment.

Because of the complex, technical, and specialized nature of the components of utility infrastructure systems, damage estimates should always be made in close consultation with qualified individuals familiar with the specific systems under evaluation.

6.3 Functional Downtime Estimates

Functional downtime estimates for utility systems differ fundamentally from functional downtime estimates for buildings because of the network characteristics of utility systems. In order for an electric power or potable water or wastewater system to deliver service and to function as intended, a myriad of interconnected components has to work together as designed. Utility system networks are generally described in terms of links and nodes. Links are the lines or pipes that connect the other elements of the system, defined as nodes. Nodes include generating plants, treatment plants, substations, pumping plants and other facilities that are necessary to provide utility service.

In complex, networked utility systems, some components may be redundant; that is, there is an alternative, functionally equivalent component that can serve the same function if the first component fails. Other components are unique; that is, alternative components are not available if the first component fails. Therefore, the extent of loss of utility service that results from specific levels of damage depends on the detailed network operating characteristics of each specific utility system. For example, damage to one substation or pumping plant might result in little or no loss of function if the component is redundant. However, the same level of damage to another substation or pumping plant might result in loss of service to an entire neighborhood or city.

Because of the networked nature of utility systems, estimating functional downtime requires a thorough understanding of the network operating characteristics of the specific utility system under evaluation. Functional downtime estimates for utility systems should always be made in conjunction with qualified individuals knowledgeable about the specific utility system under evaluation and in close cooperation with local utility staff.

For utility systems, functional downtimes are best expressed as “system days” of lost service. A “system day” of lost service is defined as one day in which the entire system is without service. However, system days are usually fractional. For example, one system day may be one day of complete loss of service, or two days with 50% loss of service, or 10 days with 10% loss of service, and so on. Loss of service is generally defined as the percentage of customers without service. For example, if 20% of a utility’s customers have no service for 2 days, with 5% having no service for a third day, then the functional downtime is 0.45 system days. In this example the system days are calculated as 20% (0.20) times two days plus 5% (0.05) times one day or 0.45 days.

6.4 Economic Impact of Loss of Utility Services

The economic impact of loss of utility services is analogous to estimating the impact on a community of loss of public services provided from a building. The estimated economic impacts of loss of utility services differ for electric power systems, potable water systems, and wastewater systems. Thus, guidance for each of these types of utility systems is presented separately.

6.4.1 Economic Impacts of Loss of Electric Power

The base economic value of electric power is the cost of service. Recent data from the U.S. Department of Energy show a national average price of electricity of 6.74 cents per kilowatt-hour. However, electric power is extremely important for the functioning of a modern community. The economic impacts of loss of electric power are far greater than the simple cost of electric power. The primary motivation for most mitigation projects for electric power is to minimize the loss of electric power service to the community. Reductions in damage to the electric power system are an important objective, but generally secondary to preserving the delivery of electric power to the community.

The direct economic impact of loss of electric power is estimated from nationwide data on economic activity by sector of the economy (1997 Economic Census, North American Industry Classification System, and NAICS). These data were combined with electric power importance factors for each major economic sector. These importance factors reflect the reality that different sectors of the economy have varying degrees of dependence on electric power. Importance factors were taken from the FEMA-sponsored publication ATC-25 (Applied Technology Council, Seismic Vulnerability and Impact of Disruption of Lifelines in the Conterminous United States, 1991). These estimated economic impacts include both wage and business income losses.

For purposes of benefit-cost analysis, the economic impacts calculated as described in the previous paragraph were updated to 2000 values and then adjusted downwards. The downwards adjustments were made because: 1) some facilities have on-site generation or back-up power sources, 2) some lost economic production can and will be made up after restoration of electric power, and 3) there is a high potential for double-counting of reasons for the loss of economic production. With these corrections, the direct economic impact of loss of electric power is estimated to be $87 per capita per day. Following this approach, the direct regional economic impact of one system day of complete loss of electric service for a community of 100,000 people would be estimated at $8,700,000 (100,000 times $87).

In addition to these regional economic impacts, loss of electric power service also has direct economic impacts on residents, separate from the regional economic impacts estimated above. Examples of these impacts include food spoilage during prolonged outages, extra costs for meals or temporary lodging for some people, water damages due to frozen pipes and so on. Rough, common sense estimates outlined in the Supporting Documentation Volume Chapter 3 (to be available in late 2001) suggest that these impacts may total about $30 to $35 per capita per day, on average.

In addition, there is an economic value to the major disruption of normal activities that result from loss of electric power. The key point is that people's time has economic value, whether such time is devoted to remunerative work or to personal leisure and recreation.

The estimated economic value per person per hour of disruption from loss of electric power is estimated using an approach similar to that used by the U.S. Department of Transportation (DOT) for highway planning purposes. Technical details of this approach are given in the DOT memo: The Value of Travel Time: Departmental Guidance for Conducting Economic Evaluations (U.S. Department of Transportation, memo from Frank E. Kruesi, Assistant Secretary for Transportation Policy, April 9, 1997).

The simplest assumption consistent with economic theory is that each hour of people's time is worth the same amount, whether such time is personal or business time. In other words, the last hour of work time and the first hour of leisure or recreation time are assumed to have equal value. This is the assumption that should be used when valuing the direct economic impact of the disruption time for residents subjected to electric power outages.

Following the DOT approach, the average hourly compensation rate (wages and benefits) is the best available measure of the economic value of people's time. The latest available data, for March 2000, of average employer cost for employee compensation for civilian workers (private industry and state and local government) is $21.16 per hour (U.S. Department of Labor, Bureau of Labor Statistics News, USDL: 00-186, June 29, 2000). A value of $21.16 per person per hour should be used as the value for the economic impact of disruption time for customers subject to loss of electric power service.

Loss of electric power has a major disruptive impact on residential customers. The impacts include loss of lighting and in many cases loss of cooking capability, hot water and heating. Almost all normal daily activities, including preparing food, cleaning, reading, watching television, listening to music, and using computers, are disrupted. As a conservative estimate, such disruptions total at least 3 to 4 hours per person per system day of electric power outage. At slightly more than $21 per hour, such disruption of normal activities would add $63 to $85 per capita per day to the estimated direct economic impacts of $30 to $35 for residential customers estimated above. The resulting total estimated economic impacts for residential customers are approximately $93 to $110 per capita per day. The midpoint of this range of estimates is $101 per day per person.

Combining the estimated impact of losing electric power on regional economic activity and the estimated impact on residential customers yields a total estimated impact of $187 per person per day of lost service. These estimates are summarized below in Table 6.2.

Table 6.2
Economic Impacts of Loss of Electric Power
Per Capita Per Day

Category	Estimated Economic Impact
Reduced regional economic activity[1]	$87
Impacts on Residential Customers	
▪ Direct economic losses	$30 to $35
▪ Disruption economic impact	$63 to 85
▪ Total Best estimate	$101
Total economic impacts	**$188**

[1] This value of reduced regional economic activity is based on national economic data. If desired, more detailed estimates could be made for specific metropolitan areas using NAICS data in the economic census referenced above.

As an example, consider a community of 40,000 people that suffers a partial loss of electric power due to flood damage at one substation. If 50% of the customers have no power for 1 day, 15% have no power for an additional day, and 5% have no power for two additional days, then the number of system days of loss of power is calculated as 0.50 times 1 plus 0.15 times 1 plus 0.05 times 2 or 0.75 system days. With 0.75 system days of lost service, total economic impacts of $188 per person per day and 40,000 customers, the total economic impacts are calculated as 0.75 times 40,000 times $188 or $5,640,000.

6.4.2 Economic Impacts of Loss of Potable Water

The economic impacts of loss of potable water service are estimated in the same manner as for electric power service above. For potable water systems, two levels of loss of service are evaluated: 1) complete loss of water service, and 2) water unsafe for drinking.

The impact of loss of water service on regional economic activity is estimated using nationwide economic data by economic sector and water importance factors from the same sources as referenced in Section 6.4.1. The economic impact of loss of water service is large, but smaller than that for electric power. For complete loss of water service, and water unsafe for drinking, the regional economic impacts are estimated at $35 and $8.75 per person per day, respectively.

In addition to these regional economic impacts, loss of potable water service also has direct economic impacts on residents, separate from the regional economic impacts estimated above. Examples of these impacts include costs of bottled water for drinking, cleaning and sanitation purposes, increased meal costs for restaurant meals, temporary lodging for some people, increased transportation costs to obtain water, meals, and sanitation facilities and so on. Prolonged outages could also cause landscaping damage in climates where irrigation is necessary. Rough, common sense estimates outlined in the Supporting Documentation Volume (Chapter 4) (to be available in late 2001) suggest that these impacts may total about $15 per capita per day, on average.

In addition, there is an economic value to the major disruption of normal activities that result from loss of potable water service. As described in Section 6.4.1, people's time has economic value, whether such time is devoted to remunerative work or to personal leisure and recreation. As a conservative (lower bound) estimate, we suggest that such disruptions would total about 2 to 3 hours per person per system day of complete loss of water service. At about $21 per hour (the average hourly wage, as described in Section 6.4.1), the economic impact of such disruption would add $42 to $63 per day to the estimated direct economic impacts of $15 per day. The resulting total estimated economic impacts of complete loss of water service for residential customers are approximately $57 to $78 per day. The midpoint of this range is about $68 per person per day.

For loss of water quality, such that water is unsafe for drinking, the estimated economic impacts on residential customers are about 50% of the estimates for complete loss of service, or about $34 per person per day.

The above estimates of the economic impact of loss of potable water service apply to all types of natural hazard events. For earthquakes, there are additional potential losses arising from fire following the earthquake event. Earthquakes commonly cause fire ignitions, due to building damage, downed power lines, and gas line breaks. For earthquake-induced fires, loss of water service reduces fire suppression capability and leads to a statistical expectation of higher fire losses. The extent of fire following earthquake losses arising from loss of water service is possible to model mathematically, with inputs on building stock, building density, climate and wind conditions, and fire suppression capability. As a first level estimate, fires following earthquake losses due to loss of water service are estimated at $35, $17.50, and $8.75 per person for dry, moderate and wet climates, respectively.

Fire following earthquakes occurs predominantly during the first few hours or first day after a major earthquake, although some ignitions may occur later. For example, reconnecting gas lines may lead to fires if leaks are present in the distribution lines.

Loss of water service also reduces fire suppression capability for normal fires, but such fires are relatively infrequent. Thus, the effective number of days of functional downtime to be considered for fire following earthquake should logically be capped at a smaller number than the total system restoration time.

> **For purposes of benefit-cost analysis, a maximum of one system day should be used for estimating fire following earthquake losses.**

Table 6.3
Economic Impacts of Loss of Potable Water Service
Per Capita Per Day

Category	Complete Loss of Water Service	Water Unsafe for Drinking
Reduced regional economic activity[1]	$35	$8.75
Impacts on Residential Customers		
▪ Direct economic losses	$15	$7.50
▪ Disruption economic impact	$42 to 63	$21 to 42
▪ Total Best estimate	$68	$34
Total economic impacts (all hazards)	$103	$43
Fire following earthquake losses		
▪ Dry climates	$35	None
▪ Moderate climates	$17.50	None
▪ Wet climates	$8.75	None
[1] This value of reduced regional economic activity is based on national economic data. If desired, more detailed estimates could be made for specific metropolitan areas using NAICS data in the economic census referenced above.		

The estimated economic impacts of loss of water service, as summarized above in Table 6.3 are large, but somewhat lower than those for loss of electric power.

As an example, consider a community of 500,000 people that has a partial loss of potable water service in an earthquake. The loss of service is primarily because of pipe breaks in the distribution system, coupled with minor damage at pumping plants. If 20% of the customers have no power for 1 day and 5% have no power for an average of three additional days, then the number of system days of loss of potable water service is calculated as 0.20 times 1 plus 0.05 times 3 or 0.35 system days. With 0.35 system days of lost service, total economic impacts of $103 per person per day and 50,000 people affected, the total economic impacts are calculated as 0.35 times 500,000 times $103 or $18,025,000.

In this example, there are also earthquake-induced fires resulting from the loss of water service. The community is a moderate climate. The fire losses only occur on the first day (0.20 system day of lost service); therefore the estimated fire losses are 0.20 times 500,000 times $17.50 or $1,750,000. In this example, fire losses are slightly less than 10% of the total estimated economic impacts of loss of water service.

6.4.3 Economic Impacts of Loss of Wastewater Service

The economic impacts of loss of wastewater service are estimated in the same manner as for electric power and potable water service above. A detailed examination of the economic impacts of loss of wastewater service is given in the Supporting Documentation Volume (Chapter 5) (to be available in late 2001). A brief summary is presented below.

The impact of loss of wastewater service on regional economic activity is estimated using nationwide economic data by economic sector and water importance factors from the same sources as referenced sections 6.4.1 and 6.4.2. The economic impact of loss of wastewater service is large, similar to that for potable water, but smaller than that for electric power. The regional economic impacts of loss of wastewater service are estimated at $33.50 and $8.50 per person per day for complete loss of treatment and partial loss of treatment, respectively.

As discussed above in Sections 6.4.1 and 6.4.2, loss of electric power and potable water services has direct impacts on residential customers, separate from the impacts on regional economic activity. For wastewater services, however, impacts on residential customers are generally non-existent or negligible. Temporary loss of wastewater treatment capability (complete or partial loss of treatment) does not generally interrupt residential customer’s ability to dispose of sewage or other wastewater.

The above estimates of the economic impact of loss of potable water service apply to all types of natural hazard events. These estimates are summarized below in Table 6.4

Table 6.4
Economic Impacts of Loss of Wastewater Service
Per Capita Per Day

Category	Complete Loss of Treatment	Partial Loss of Treatment
Reduced regional economic activity[1]	$33.50	$8.50
Impacts on Residential Customers ▪ Direct economic losses ▪ Disruption economic impact ▪ Total Best estimate	 None None None	 None None None
Total economic impacts (all hazards)	**$33.50**	**$8.50**

[1] This value of reduced regional economic activity is based on national economic data. If desired, more detailed estimates could be made for specific metropolitan areas using NAICS data in the economic census referenced above.

The estimated total economic impacts of loss of wastewater service, as summarized above in Table 6.4are large, but significantly smaller than those for loss of potable water or electric power service.

As an example, consider a community of 27,000 people with flood damage to a wastewater treatment plant. There is complete loss of service for 2.5 days and then partial loss of treatment capability for an additional 5 days. These losses of service affect the entire community. The estimated economic impact of complete loss of service for 2.5 days is 2.5 times 27,000 times $33.50 or $2,261,250. The estimated economic impact of partial loss of service for 5 additional days is 5.0 times 27,000 times $8.50 or $1,147,500. The total estimated economic impact of loss of wastewater services is $3,408,750.

The above analysis does not explicitly consider environmental impacts of loss of wastewater treatment services. Discharge of untreated or partially treated wastewater has potential negative environmental impacts. Flooding of wastewater treatment plants is the most common reason for loss of wastewater treatment services. Discharges of untreated or partially treated wastewater most commonly occur during periods of high water flows, when dilution of wastes is maximized and potential environmental impacts (are minimized.

The scope of the present guidance does not include evaluating environmental damages or the benefits of reducing or avoiding such damages. However, in effect, such environmental impacts are partially considered in the present analysis of the economic impacts of loss of function of wastewater treatment facilities, as described below.

The analysis of the regional economic impacts of loss of wastewater services implicitly assumes that business activity will be curtailed during periods of loss of wastewater service. When wastewater services are lost, communities sometimes impose operating restrictions on industrial and large commercial facilities to reduce the inflow of waste. More commonly, however, communities simply discharge partially treated or completely untreated waste.

In making a public policy decision to discharge partially treated or completely untreated waste, rather than to impose drastic restrictions to curb waste inflows, communities are implicitly deciding that possible environmental impacts are less than the economic losses that would arise from imposing more drastic reductions to curb waste inflows. To the extent that communities choose to release completely untreated or partially treated waste instead of curbing economic activity to reduce waste inflow, the estimated regional economic impacts of loss of wastewater service, as outlined above, will be over-estimated.

Following the above analysis, the estimated regional economic impacts of loss of wastewater treatment services probably overestimate the actual economic impacts. However, the estimated regional economic impacts implicitly are deemed equal to or greater than possible environmental damages. In effect, possible environmental impacts are counted indirectly (at least roughly) in the proposed methodology for estimating regional economic impacts.

6.5 Casualties

Loss of function of utilities - electric power, potable water and wastewater - has potential life safety impacts on affected communities. In some cases there may be deaths, injuries or illnesses arising from loss of utility services.

Loss of electric power may result in casualties. However, facilities for which electric power is a critical life safety issue (such as acute care in hospitals) always have redundant backup power supplies (e.g., battery back-ups and emergency generators). An upper bound analysis of potential casualties due to loss of electric power in Chapter 3 of the Supporting Documentation Volume (to be available in late 2001), suggests that the economic value of casualties is likely to be well below $2.50 per person per day of lost service. This upper bound value is very low compared to the estimated economic impacts of loss of electric power, $188 per person per day, and thus may be ignored as negligible for benefit-cost analysis. Actual casualties are likely to be less than these upper bound estimates.

Loss of potable water service may also result in casualties, most commonly illness from drinking contaminated water. Deaths from contaminated water are possible, but extremely rare. A rather extreme upper bound analysis of potential casualties due to loss of potable water service in Chapter 4 of the Supporting Documentation Volume (to be available in late 2001), suggests that the economic value of deaths is likely to be well below $2.50 per person per day of lost service, with the economic value of illnesses likely to be well below $1.50 per person per day. These upper bound values is low compared to the estimated economic impacts of loss of potable water service, $103 per person per day, and thus can probably be ignored as negligible for benefit-cost analysis. Actual casualties are likely to be less than these upper bound estimates.

Loss of wastewater service also has the potential for casualties, most commonly illness from drinking or exposure to contaminated water. However, any such illnesses are likely to be much less than those estimated above for potable water systems, since few people are likely to drink raw untreated water. Casualties arising from loss of function of wastewater treatment plants appear to be negligible for purposes of benefit-cost analysis.

6.6 Summary Guidance

The basic concepts of benefit-cost analysis of mitigation projects for utilities are the same as those for buildings (as discussed in previous sections). Significant differences are as follows:

> Physical damage estimates for utility systems must be estimated by qualified individuals thoroughly familiar with the specific utility systems under evaluation, based on historical damage data, professional judgement and engineering calculations.
>
> Displacement costs are not applicable to utility systems, since utility system components cannot be displaced to temporary quarters. Displacement costs should not be counted in benefit-cost analysis of mitigation projects for utility systems.
>
> Loss of function of utility services has a great economic impact on regional economic activity in general and residential customers in particular. In addition, for loss of potable water service in earthquakes, there are additional losses due to fires following earthquakes. These economic impacts are summarized in Table 6.5 below.

Table 6.5
Economic Impacts of Loss of Utility Services
per Person Per Day of Lost Service

Loss of Electric Power	**Cost of Complete Loss of Service**	
Reduced Regional Economic Activity[1]	$87	
Impacts on Residential Customers	$101	
Total Economic Impact	**$188**	
Loss of Potable Water Service	**Cost of Complete Loss of Service**	**Cost of Water Unsafe for Drinking**
Reduced Regional Economic Activity[1]	$35	$8.75
Impacts on Residential Customers	$68	$34
Total economic impact (all hazards)	**$103**	**$43**
Fire Following Earthquake Losses	**Cost of Fire Damage**	
- Dry Climates	$35	
- Moderate Climates	$17.50	
- Wet Climates	$8.75	
Loss of Wastewater Service	**Cost of Complete Loss of Service**	**Cost of Partial Treatment Only**
Reduced Regional Economic Activity[1]	$33.50	$8.50
Impacts on Residential Customers	None	None
Total Economic Impact	**$33.50**	**$8.50**

[1] This value of reduced regional economic activity is based on national economic data. If desired, more detailed estimates could be made for specific metropolitan areas using NAICS data in the economic census referenced above.

7.1 Overview

In the context of emergency planning, disaster response, and disaster recovery, roads and bridges are often characterized as lifelines. This characterization reflects the importance that roads and bridges have on the functioning of modern society. Especially in a disaster, roads and bridges are often critical for disaster response and evacuation.

Roads and bridges are subject to physical damages from natural disasters such as earthquakes, hurricanes and floods. More importantly, however, roads and bridges are subject to loss of function; that is, closure to traffic. Such closures often have significant negative impacts on affected communities.

Hazard mitigation projects for roads and bridges may reduce physical damages in future disasters. However, in many cases, an important motivation or even the primary motivation in undertaking hazard mitigation projects for roads and bridges is not to reduce the physical damages alone, but rather to reduce the negative impacts that the closures of roads and bridges may have on the affected communities. That is, mitigation projects for roads and bridges are often focused primarily on keeping the roads and bridges open during disaster events.

The basic concepts of benefit-cost analysis of mitigation projects for roads and bridges are the same as those for buildings and are summarized in Table 7.1. The general principles and categories of benefits outlined in Section2 apply to roads and bridges as well as to ordinary buildings (Section3), critical facilities (Sections4 and 5), and utilities (Section6).

Table 7.1
Primary Categories of Benefits
Mitigation Projects for Roads and Bridges

Primary Categories of Damages/Benefits	Notes for Utility Mitigation Projects
1. Physical Damages	Damage estimates must be made by engineers knowledgeable about roads and bridges and their vulnerability to each type of hazard.
2a. Loss-of-Function Impacts (i.e., Displacement costs)	Not applicable to road and bridge mitigation projects; roads and bridges cannot be displaced to temporary quarters.
2b. Loss-of-Function Impacts (i.e., Economic impacts of loss of service)	Economic impacts of road or bridge closures are the generally the largest category of benefits; see detailed guidance in this section.
3. Casualties	Not generally significant, except for seismic mitigation projects for bridges.
4. Emergency Management Costs	Not generally considered; most road and bridge mitigation projects have a negligible impact on a communities overall emergency management costs

7.2 Physical Damage Estimates

Roads and bridges vary in their materials and designs. The vulnerability of roads and bridges to flood, wind, or seismic damage varies drastically depending on the type of components, their age, their design and condition. As such, it is necessary to make facility-specific estimates based on historical damage data and professional judgement. Because of the somewhat specialized nature of road and bridge engineering, damage estimates should always be made in close consultation with qualified individuals thoroughly familiar with the specific components under evaluation.

7.3 Functional Downtime Estimates

Functional downtime estimates for roads and bridges are somewhat different than for buildings or utilities. For roads and bridges there are two aspects of functional downtime. The first aspect is the closure time or the time period during which the road or bridge is closed to normal traffic while repairs are made. Closure times may range from a few hours to several days to several weeks in unusual cases. The second aspect is the delay or detour time. Delay or detour time is the average amount of extra time that motorists spend taking alternative routes because of road or bridge closures. Delay or detour time may be only a few minutes if an alternative route is only a block or two away. Typically delay or detour times are fractions of an hour. In rare cases, delay or detour times may be an hour or more if, for example, a bridge is closed and the nearest alternative bridge is a long distance away.

For road and bridge closures, functional downtime is expressed in two steps:

1. Estimate the number of days for the damaged road or bridge to be repaired and reopened to normal traffic flow
2. Estimate the average delay or detour time for motorists while the bridge is closed.

For example, assume that a culvert fails in a flood and a road is washed out. A county highway department estimates that the repair time is one week and that the average delay or detour time caused by the closure is about 20 minutes. When a disaster event causes numerous road or bridge closures, repairs are almost always made first to the most important roads or bridges. Thus, secondary or rural roads and bridges are generally expected to have longer closure times than primary roads.

Estimates of repair times and delay or detour times are made based on historical data and experience. Local highway department staff is generally very experienced with closures and is the best source of repair time estimates and delay or detour times.

7.4 Economic Impact of Road and Bridge Closures

The economic impact of road and bridge closures is analogous to estimating the impact on a community of loss of public services provided from a building. Closure of a road or bridge represents loss of a public service - the availability of a transportation route.

The economic impact of road and bridge closures is estimated from the number of vehicles per day using the route, the average delay or detour time, and the average value of people's time. The primary economic impact of road and bridge closures is loss of time.

There are four steps in estimating the direct economic impacts of road or bridge closures:

1. Estimate the functional downtime; that is, the repair time to restore normal traffic flow on the road or bridge

2. Determine the average daily traffic count for the closed road or bridge
3. Estimate the average delay or detour time arising because of the closure
4. Place a typical or average dollar value per person hour or per vehicle hour of delay or detour

Each of these steps is discussed in detail below.

7.4.1 Functional Downtime (Repair Time) for Roads and Bridges

For roads and bridges, functional downtime is the time period for which the road or bridge is closed to normal traffic flow. For a given road or bridge that is damaged in a disaster event, the repair time depends on the severity of damage, on the number of other damaged roads or bridges, and, very importantly, on the priority placed on repair and reopening by the local highway department. When there are multiple outages, local highway departments almost always prioritize repairs so that the most important roads or bridges are reopened first. Small residential or rural roads are likely to be repaired much later than major arteries with high traffic flows.

Repair times can range from a few hours if there are only a few outages, to several days to several weeks, depending on the number of damaged roads or bridges. Repair times are very rarely longer than two or three weeks, except for major bridge structures, which might take many months or even a year or two to replace if destroyed.

Estimating repair times requires somewhat specialized knowledge of the local highway transportation system, of the availability of local resources, and of local priorities, and is thus best made in close cooperation with local traffic officials.

7.4.2 Average Daily Traffic Counts

Average daily traffic counts for most roads or bridges are available from local highway officials. Traffic counts are used for road/bridge design purposes and for traffic control, planning and management purposes. Local highway officials generally can provide actual traffic counts for specific segments of roads or bridges, or at least reasonable estimates based on traffic counts for similar nearby roads and bridges.

Traffic counts are usually presented as the number of vehicles per day or per hour. Traffic counts may be presented as total vehicles or separately for different classes of vehicles (e.g., cars, light trucks, heavy trucks). Traffic counts are usually presented as the number of single (one-way) trips, but are sometimes presented as the number of round trips. The difference between one-way and round-trip counts is important and the unit of measure (one-way or round-trip) must always be noted carefully.

7.4.3 Average Delay or Detour Times

When a given road or bridge is closed because of high water, unsafe conditions, or physical damage, the delay or detour varies markedly, depending on local conditions. Delay or detour times can range from five minutes or less to several hours (in rare cases).

Road and systems are networked systems of interconnected elements. In, networked systems, some elements may be redundant; that is, alternative paths may be available if such elements fail. Other elements may be nearly unique; that is, no practical alternative paths are available. The extent of loss of function that results from specific damage depends on the characteristics of each specific road and bridge system. For example, damage that closes one city street may have very little impact on traffic if the resulting detour is only one city block while repairs are made. However, closure of a rural road or a bridge may result in a substantial detour (duration and mileage) with a correspondingly significant economic impact.

The length of delay or detour that is likely to result from the closure of a particular road or bridge depends entirely on specific local conditions and so no generalizations can be drawn. The length of delay or detour depends on:

The traffic count for the closed road or bridge

The layout of the local road and bridge system (what alternative routes are available, how suitable the alternative routes are, how heavy the normal traffic is on these routes, and the distance between the closed road or bridge and the alternative route)

Local highway officials are the best source of delay or detour time estimates. Local highway officials have knowledge of past closures, of what detours or alternative routes are available, and knowledge of the local road and bridge system and local traffic patterns. Estimated delay or detour times will never be exact and will vary depending on the time of the day and on the day of the week. However, knowledgeable local highway officials should be able to make reasonable estimates: Will closure of this bridge result in a 5 minute detour, a 30 minute detour, or a several hour detour?

7.4.4 Economic Impact Per Person Per Hour of Delay or Detour Time

The economic impacts of road or bridge closures are estimated by combining the number of days of road or bridge closure, the average daily number of vehicles using the road, the average delay or detour time per vehicle, and the estimated economic value per person per hour of delay or detour.

The estimated economic value per person hour of delay or detour is estimated using an approach similar to that used by the U.S. Department of Transportation (DOT) for highway planning purposes (The Value of Travel Time: Departmental Guidance for Conducting Economic Evaluations, U.S. Department of Transportation, memo from Frank E. Kruesi, Assistant Secretary for Transportation Policy, April 9, 1997).

The DOT memo referenced above has a detailed analysis of economic theory and references to its approach. For the present purposes, a condensed summary of the analysis is presented. The key point is that time saved from travel has economic value, whether such time is devoted to remunerative work or personal leisure/recreation. Furthermore, if travel is associated with unpleasant conditions of crowding (or delays and detours), exposure to weather, risk, effort or boredom, cutting the time it requires will be beneficial. In simple terms, people would, on average, be willing to pay something to avoid such unpleasant travel conditions.

The simplest assumption consistent with economic theory is that each hour of time lost in travel delays or detours is worth the same amount, whether such time is personal or business time. In other words, the last hour of work time and the first hour of leisure/recreation time are assumed to have equal value. This is the assumption that should be used for valuing the direct economic impact of the time lost by closures of roads and bridges. For benefit-cost analyses of FEMA-funded hazard mitigation projects, 100% of the national average hourly wage (plus benefits) should be the value of travel time lost by road and bridge closures. As described in Section 6.4.1, the average employer cost for employee compensation is $21.16 per hour according to U.S. Department of Labor.

The U.S. DOT also has data on average vehicle occupancies. For 1996, the total highway passenger miles were 3.962 trillion. A passenger mile is one person traveling one mile by automobile, motorcycle, light truck, heavy truck, or bus. For 1996, the total highway vehicle miles were 2.482 trillion. The ratio of these two numbers, 1.596 is the average vehicle occupancy. Applying this occupancy value and the $21.16 per person per hour value derived above yields a value of $33.78 per vehicle hour of lost travel time.

The U.S. Census Bureau population estimate for November 2000 indicates that 74.47% of the population is 18 or over, with 25.53% under 18. If these ratios are applied to the average vehicle occupancy, assuming that drivers are 18 or over, then the average vehicle occupancy is 1.444 adults and 0.152 children under 18. This estimated proportion of adult and child passengers does not consider that some drivers are under 18 (about 3% of the total population is between 16 and 18) but this is offset by the fact that the proportion of children as passengers is likely lower than in the population as a whole, because there are few children as passengers for commuting or business travel. Combining these data, we estimate that the average vehicle occupancy is about 1.45 adults and 0.15 children.

If lost time for children were assumed to have no economic value (a somewhat extreme assumption), then the estimate of $33.78 per vehicle hour of lost travel time would be reduced by nearly 10% to $30.68. More reasonably, lost time for children has an economic value, but less than that for adults. Taking the midpoint of these two extremes (counting children's lost time the same as adults or counting children's lost time at zero) yields an estimate of $32.23, which appears to be a reasonable estimate. Thus, the average economic value of lost travel time as $32.23 per vehicle hour of delay or detour due to road and bridge closures.

The above analysis considers all traffic to be of equal economic value. However, there are two other possible economic impacts from closures of roads and bridges that need to be evaluated for possible inclusion in benefit-cost analysis, namely:

1. Economic impacts for commercial traffic
2. The impact of road and bridge closures on emergency vehicles

For commercial travel (including heavy trucks) the analysis presented above includes only the value of the driver's time. As discussed above, typical delay or detour times are short, on the order of a few minutes to perhaps an hour or two. For such short delays there are unlikely to be major economic impacts such spoilage of perishables goods or interruption of normal economic activity. Therefore, no adjustments for commercial traffic need be made.

For emergency vehicles, the delay or detour times may increase the response time and thus lower the quality of emergency response. However, the fraction of normal traffic that is emergency vehicles is extremely small, a very small fraction of 1% of total traffic. Furthermore, delays and detours may be shorter for emergency vehicles as such vehicles typically have expedited access to the transportation system and some emergency response vehicles have off-road capabilities or higher ground clearances and thus can travel on roads closed to normal traffic. Thus, the impact of road and bridge closures on emergency vehicle response is assumed to be minor.

For purposes of benefit-cost analysis, the economic impact of road or bridge closures is estimated as $32.23 per vehicle hour of delay.

7.5 Casualties

Failure of a road or bridge may occasionally result in deaths or injuries from vehicular accidents at the failure location. However, such incidents are extremely rare. Closure of a road or bridge, or even a major washout of a section of road or complete washout of a bridge very rarely results in casualties. Historical experience suggests that deaths from such accidents would be many times less than 1 person per 1,000,000 in a community affected by a typical road or bridge closure. Based on the statistical value of human life (deaths and injuries), such rare incidents are generally negligible compared to the economic impact of delay and detour times discussed above.

The statistical value of casualties avoided may be important for one type of hazard mitigation project: seismic retrofit of bridges subject to collapse in earthquakes. For example, if one of the approximately 300-foot long segments of the Bay Bridge between Oakland (CA) and Treasure Island were to fail completely in an earthquake, the expected death rate would be a very high percentage of the average "occupancy" of the bridge segment. For high traffic bridges that could be subject to complete failure in earthquakes, the value of casualties avoided should be evaluated individually for each mitigation project.

Estimating casualty rates from bridge failures from earthquakes requires professional judgement. Such estimates should be made in close consultation with seismic engineers thoroughly familiar with seismic bridge engineering.

7.6 Summary Guidance

The suggested approach for benefit-cost analysis of hazard mitigation projects for roads and bridges has five steps, each of which must be done for both the before and after mitigation states of the road or bridge, as a function of the severity of disaster:

1. Estimate the physical damages to road or bridges in dollar terms
2. Estimate the repair time to restore normal traffic flow,
3. Estimate the average delay or detour time
4. Obtain the average daily traffic count for the road or bridge
5. Calculate the economic impacts of loss of function of the road or bridge, using the above data and the per vehicle per hour value of lost travel time of $32.23

For floods, these estimates are made as a function of flood depth or flood frequency. For hurricanes or earthquakes, these estimates are made as a function of wind speed or peak ground acceleration

(PGA), respectively. Data sources and guidance for making these estimates calculations are summarized in Table 7.2 below. For earthquakes only, the additional category of casualties losses is also considered for bridge mitigation projects.

Table 7.2
Summary Guidance for Benefit-Cost Analysis
of Hazard Mitigation Projects for Roads and Bridges

Parameter	Data Sources
1. Physical damages to road or bridge	Historical data and professional judgement from individuals knowledgeable about roads and bridges
2. Repair time to restore normal traffic flow	Historical data and professional judgement or estimates from local traffic officials
3. Average delay or detour time	Historical data or estimates from local traffic officials
4. Average daily vehicle count	Historical data or estimates from local traffic officials
5. Economic impact of road or bridge closure	$32.23 per vehicle hour of delay or detour

As an example, consider a situation in which a culvert washout closes a road until repairs are made. For benefit-cost analysis, estimates are made of the physical damage costs and loss-of-function economic impacts for each flood depth or flood frequency, both before and after mitigation. As an example, we show a typical calculation of the damages and losses before mitigation for one flood frequency (a 25-year event).

Example

Physical damages, the actual cost t repair the road and culvert, are estimated from historical sources to be **$6,500**. Local traffic officials estimate the number of days of closure to be **3 days**, the average delay or detour time to be **30 minutes**, and the average daily vehicle count to be **1,200**.

To determine the economic impact of the road closure, we take the product of the repair time (3 days), average delay or detour time (0.5 hours), average daily vehicle count (1,200 vehicles per day), and the cost per vehicle hour of the delay or detour ($32.23) (see Table 7.2), or:

3 x 0.5 x 1,200 x $32.23 =	$58,014	for the economic impact of the road closure.
Add the physical damage cost:	+ 6,500	
for total damages and losses:	**$64,514**	

In this example, nearly 90% of the total damages and losses arise from the economic impact of the road closure. Only 10% of the total damages and losses are from the repair costs. For benefit-cost analysis of mitigation projects for roads and bridges, it is always extremely important to count the benefits of avoiding road closures. To not do so would be to grossly undercount the benefits of mitigation projects for roads and bridges.