San Luis Obispo County
Local Hazard Mitigation Plan

July 2011

Revision 2

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I. ADOPTION RESOLUTIONS

A. San Luis Obispo County Board of Supervisors 2005 adoption resolution

Adoption by Local Governing Body: §201.6(c)(5)

November 1, 2005

To the Citizens, Visitors, Employees, and Officials of San Luis Obispo County:

As the costs of damage from natural disasters continue to increase, the County of San Luis Obispo realizes the importance of identifying effective ways to reduce vulnerability to disasters. Natural hazard mitigation plans assist communities in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities.

As a result the County of San Luis Obispo has developed this Local Hazard Mitigation Plan (LHMP) which provides guidance on how to reduce risk from natural hazards. This LHMP works in conjunction with other County plans, including the General Plan, and hazard mitigation plans developed for specific programs such as flood control and fire prevention.

This letter promulgates the San Luis Obispo County Local Hazard Mitigation Plan and constitutes the adoption of the Plan. This Local Hazard Mitigation Plan becomes effective on approval by the San Luis Obispo County Board of Supervisors on the date indicated below.

Original signed by Shirley Bianchi

Chairperson, Board of Supervisors November 1, 2005
County of San Luis Obispo

B. San Luis Obispo County Board of Supervisors 2011 adoption resolution

II. EXECUTIVE SUMMARY

A. General Plan Description

The mounting cost of disaster recovery in our nation over the past decade has engendered a renewed interest in uncovering effective ways to minimize our country's hazard vulnerability. The County of San Luis Obispo has joined a nationwide effort to develop a jurisdiction specific hazard mitigation plan. The goal of this jurisdictional plan is to arrive at practical, meaningful, attainable and cost-effective mitigation solutions to minimize each jurisdiction's vulnerability to the identified hazards and ultimately reduce both human and financial losses subsequent to a disaster.

Development of this mitigation plan entailed assessing the planning capabilities, securing political support and soliciting input and approval from each of the involved communities.

Risk assessments were then performed which identified and evaluated each natural and man-made hazard that could impact these areas. Historical hazard events are described. The future probability of these identified hazards and their impact on each of these communities is described.

Vulnerability assessments were performed which summarized the identified hazards' impact to each community's critical structures and infrastructure and future development. An estimate of the potential dollar losses to vulnerable structures was determined.

The risk and vulnerability assessments were used to determine mitigation goals and objectives to minimize long-term vulnerabilities to the identified hazards. These goals and objectives were the foundation behind the development of a comprehensive range of specific attainable mitigation actions created for each jurisdiction.

An action plan was developed in 2005 and updated in 2011 which entails adopting, implementing, assigning responsibility, monitoring, and reviewing this hazard mitigation plan over time, to ensure the goals and objectives are being achieved and the plan remains a relevant document.

B. Plan Purpose and Authority

The Disaster Mitigation Act (DMA) of 2000, also commonly known as "The 2000 Stafford Act Amendments" (the Act), constitutes an effort by the Federal government to reduce the rising cost of disasters. The Act stresses the importance of mitigation planning and disaster preparedness prior to an event.

Mitigation Planning Section 322 of the Act requires local governments to develop and submit mitigation plans in order to qualify for the Hazard Mitigation Grant Program (HMGP) project funds. It also increases the amount of HMGP funds available to states meeting the enhanced planning criteria, and enables these funds to be used for planning activities.

For disasters declared after November 1, 2004, San Luis Obispo County must have an LHMP approved pursuant to §201.6 in order to receive FEMA Pre-Disaster Mitigation (PDM) project grants or to receive post-disaster Hazard Mitigation Grant Program (HMGP) project funding. The LHMP is written to meet the statutory requirements of DMA 2000 (P.L. 106-390), enacted October 30, 2000 and 44 CFR Part 201 – Mitigation Planning, Interim Final Rule, published February 26, 2002.

To facilitate implementation of the DMA 2000, the Federal Emergency Management Agency (FEMA) created an Interim Final Rule (the Rule), published in the Federal Register in February of 2002 at section 201 of 44 CFR. The Rule spells out the mitigation planning criteria for States and local communities. Specific requirements for local mitigation planning efforts are outlined in section §201.6 of the Rule. Local jurisdictions must demonstrate that proposed mitigation actions are based upon a sound planning process that accounts for the inherent risk and capabilities of the individual communities as stated in section §201.5 of the Rule.

In developing this comprehensive Hazard Mitigation Plan, FEMA's Multi-Hazard Mitigation Planning Guidance (March 2004) was strictly adhered to for the purpose of ensuring thoroughness, diligence, and compliance with the new DMA 2000 planning requirements.

III. PLANNING PROCESS

A. DMA 2000 Requirements

DMA Requirements §201.6(b) and §201.6(c)(1):	An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and 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. [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.

B. Plan Development and Public Input Process

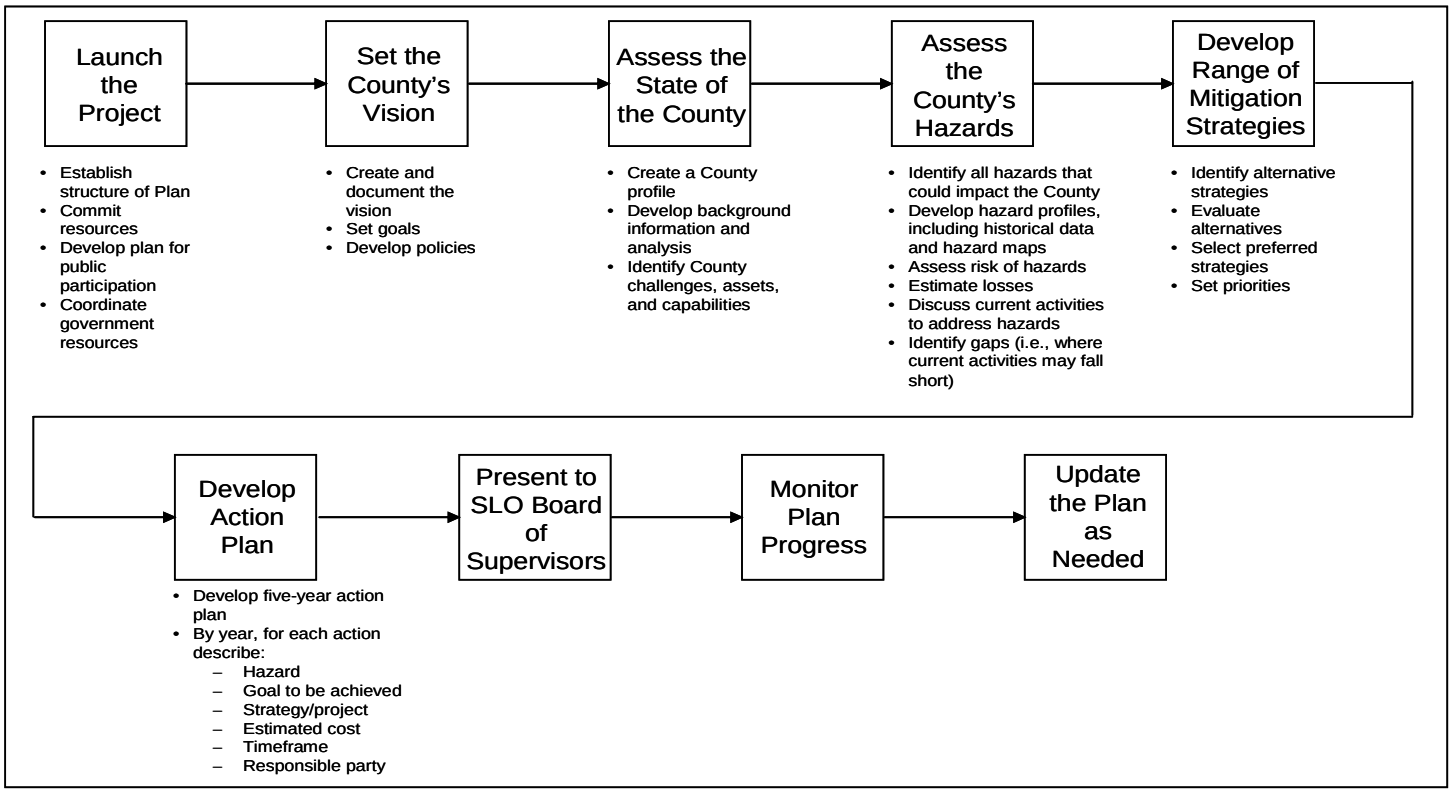
The County of San Luis Obispo Office of Emergency Services (OES) was responsible for the development of the LHMP. In 2005, they hired a consultant, Bluecrane Inc., to assist in the preparation of the original plan. The Office of Emergency Services formed a Planning Team with representatives from:

- County Office of Emergency Services
- Department of Planning and Building
- Department of Planning and Building – Geographic Technology and Design
- County Public Works Department
- CDF / County of San Luis Obispo Fire Department - Division Chief, Operations
- CDF / County of San Luis Obispo Fire Department – Battalion Chief, Fire Marshal
- County Department of Agriculture and Weights and Measures

The Planning Team participated actively in the LHMP's development, meeting every two to three weeks throughout the process to review draft documents and assess progress.

In addition to the steps shown in the diagram below, an effort was made to solicit public input during the planning process by allowing the completed plan to be viewed for 10 days per the Brown Act by the public prior to going in front of the County Board of Supervisors for review and adoption.

The Hazard Mitigation Planning Process Utilized by the County of San Luis Obispo



In 2011, the County of San Luis Obispo hired ***Category Five Professional Consultants, Inc.*** to rewrite and update the original Plan. A second Local Hazard Mitigation Planning Group was developed consisting of past and new members including:

Name	Agency
Ron Alsop	County Office of Emergency Services
Warren Hoag	County Department of Planning and Building
Chuck Stevenson	County Department of Planning and Building
John Kelly	County Department of Planning-Geographic Technology and Design
Alan Peters	CAL FIRE
Dan Turner	Office of Emergency Services
Dare Flynn	County Public Works Department
Michael Isensee	County Department of Agriculture and Weights and Measures
Robert Neumann	Category Five Professional Consultants
Sheri Eibschutz	Category Five Professional Consultants

At the first planning group meeting, a thorough description of the LHMP planning and approval process was provided by the contractor. Additionally, the planning group reviewed progress made to the 2005 mitigation actions and discussed new hazard concerns. Individual meetings occurred between *Category Five* and planning group members to ascertain new mitigation actions needed.

Upon completion of the administrative draft and acquiescence from the local hazard mitigation planning group members, a public hearing was conducted at the SLO County Board Chamber on July 15, 2011. The public was notified of the hearings via a news release to local news media outlets utilizing print, TV, and radio. Additionally, the hearing was posted on the County Office of Emergency Services' website and on the Office of Emergency Services Facebook page. In addition to the above listed notifications, the public meeting of the Board of Supervisors' for their adoption of the revised LHMP was posted on the Board of Supervisor's agenda in advance of the hearing.

Changes to the plan were implemented based upon feedback received at the public hearing. On August 16, 2011 the final plan was presented to the County Board of Supervisors and was formally adopted.

C. Incorporation of Existing Plans and Other Information

At the onset of and throughout the hazard mitigation planning process, all applicable local emergency operations plans and geotechnical reports were reviewed and incorporated into this mitigation plan. The following sources were used:

- County of San Luis Obispo General Plan including
    - Land Use Element
    - Open Space Element
    - Safety Element
- CAL FIRE/San Luis Obispo County Fire Management Plan
- California State Hazard Mitigation Plan
- Local and State land use regulations
- Flood ordinances
- Past disaster declarations
- Flood Insurance Rate Maps (FIRM's)

IV. SAN LUIS OBISPO COUNTY PROFILE

A. County History

San Luis Obispo County, the 16th largest County in California, is one of the original 27 California counties created by Act of the State Legislature on February 18, 1850. The county's name comes from the Mission San Luis Obispo de Tolosa, which was established by Padre Junipero Serra in 1772.

Located along California's Central Coast, San Luis Obispo County is midway (190 miles/306 kilometers) between Los Angeles and San Francisco, and is accessible north-to-south by U.S. Highway 101 and scenic Highway 1. Routes from the east include State Highways 41, 46, 58 and 166. San Luis Obispo County is bordered by Santa Barbara County to the south, Monterey County to the north and Kern County to the east.

B. Geography

16th largest County in California
3,316 square miles
2,114,750 acres
80 miles of coastline
Highest point: Caliente Mountain (5,104 feet)
Lowest point: Sea level

A series of ancient volcanic peaks, referred to as the "nine sisters", lie between Morro Bay and San Luis Obispo. Most notable of the peaks is Morro Rock, often called the sentinel of the Pacific Ocean.

C. Cities and Communities

The cities within San Luis Obispo County include:

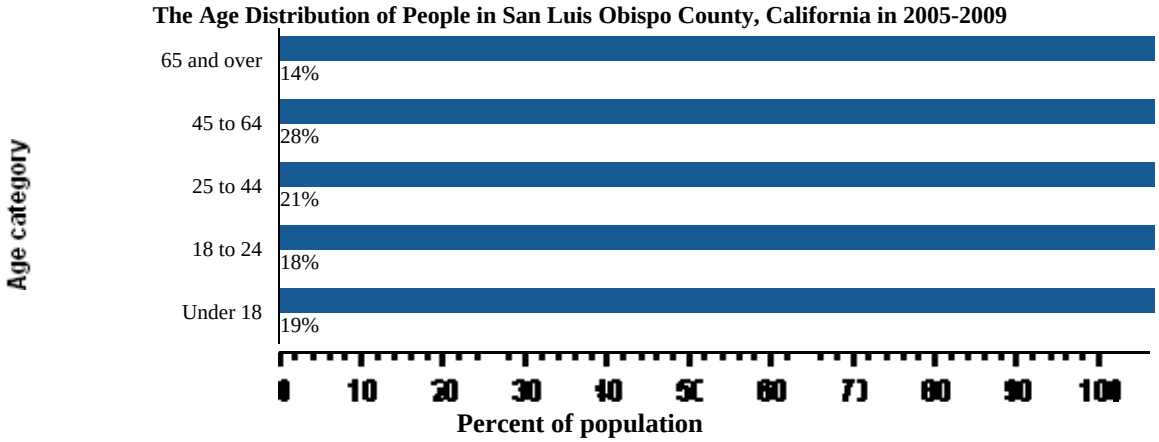
- Arroyo Grande
- Atascadero
- Grover Beach
- Morro Bay
- Paso Robles
- Pismo Beach
- San Luis Obispo

Unincorporated Communities and Census Designated Places (CDP) include:

- Avila Beach
- California Valley
- Cambria
- Cayucos
- Cholame
- Halcyon
- Harmony
- Lake Nacimiento
- Los Osos-Baywood Park
- Nipomo
- Oceano
- Pozo
- San Miguel
- San Simeon
- Santa Margarita
- Shandon
- Templeton

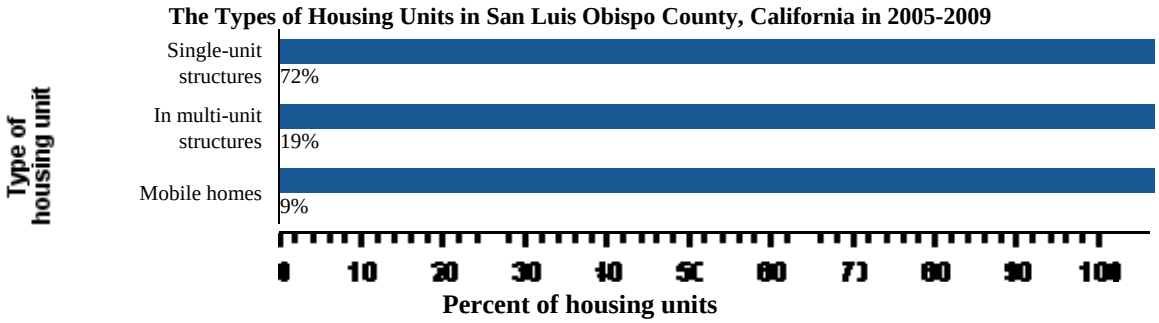
D. Population and Housing Profile

Population: In 2005-2009, San Luis Obispo County had a total population of 262,000; 128,000 (49 percent) females and 135,000 (51 percent) males. The median age was 38.8 years. Nineteen percent of the population was under 18 years and 14 percent was 65 years and older.



Source: American Community Survey, 2005-2009

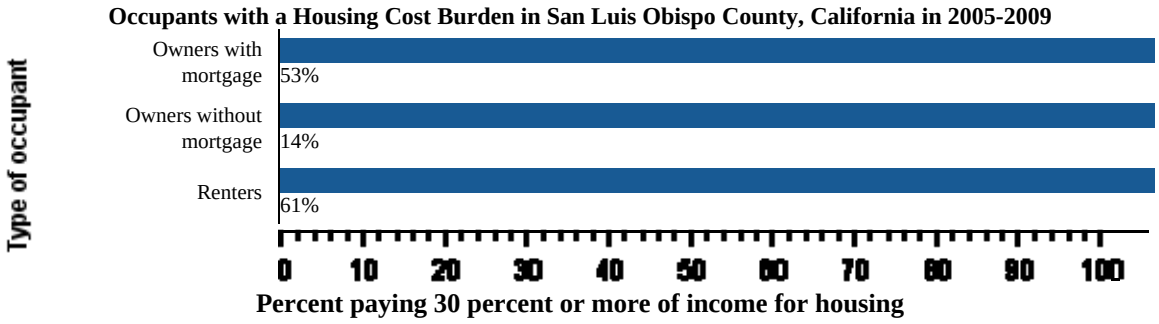
Housing Characteristics: In 2005-2009, San Luis Obispo County had a total of 115,000 housing units, 11 percent of which were vacant. Of the total housing units, 72 percent was in single-unit structures, 19 percent was in multi-unit structures, and 9 percent was mobile homes. Twenty-six percent of the housing units were built since 1990.



Source: American Community Survey, 2005-2009

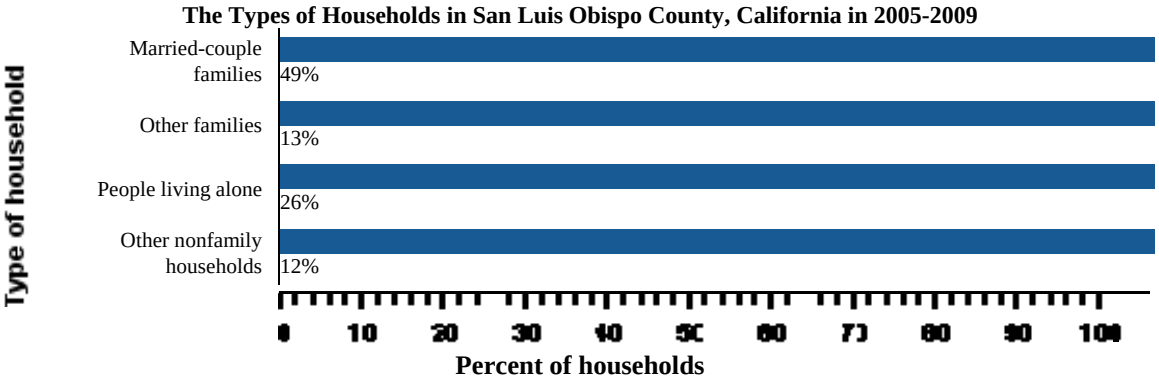
Occupied Housing Unit Characteristics: In 2005-2009, San Luis Obispo County had 103,000 occupied housing units - 63,000 (61 percent) owner occupied and 40,000 (39 percent) renter occupied. Three percent of the households did not have telephone service and 4 percent of the households did not have access to a car, truck, or van for private use. Multi Vehicle households were not rare. Forty percent had two vehicles and another 27 percent had three or more.

Housing Costs: The median monthly housing costs for mortgaged owners was $2,190, non-mortgaged owners $444, and renters $1,097. Fifty-three percent of owners with mortgages, 14 percent of owners without mortgages, and 61 percent of renters in San Luis Obispo County spent 30 percent or more of household income on housing.



Source: American Community Survey, 2005-2009

Households and Families: In 2005-2009 there were 103,000 households in San Luis Obispo County. The average household size was 2.4 people.

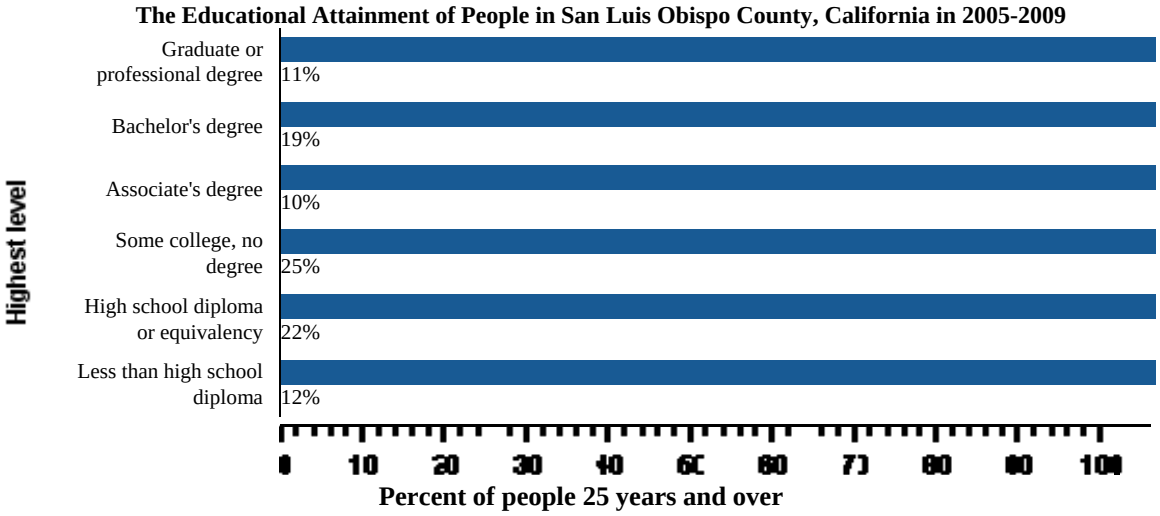


Source: American Community Survey, 2005-2009

Language: Among people at least five years old living in San Luis Obispo County in 2005-2009, 16 percent spoke a language other than English at home. Of those speaking a language other than English at home, 77 percent spoke Spanish and 23 percent spoke some other language; 41 percent reported that they did not speak English "very well."

Education: In 2005-2009, 88 percent of people 25 years and over had at least graduated from high school and 30 percent had a bachelor's degree or higher. Twelve percent were dropouts; they were not enrolled in school and had not graduated from high school.

The total school enrollment in San Luis Obispo County was 78,000 in 2005-2009. Nursery school and kindergarten enrollment was 6,600 and elementary or high school enrollment was 35,000 children. College or graduate school enrollment was 36,000.



Source: American Community Survey, 2005-2009

E. Economy

Historically, the economy in San Luis Obispo has been oriented to agriculture, services (including government), and tourism. After 1940, a diversified economy resulted from substantial increases in the services and trade sectors, coupled with the establishment and expansion of three large state institutions: California Polytechnic State University, Atascadero State Hospital, and the California Men's Colony (a California Department of Corrections prison). Public utilities also employ a substantial number of residents.

Tourism

Tourism is a $903.9 million industry in San Luis Obispo County, creates jobs for 16,270 residents and generates $60.5 million in local and state taxes.

Agriculture

In terms of dollar value, agriculture is the largest industry in San Luis Obispo County, providing employment for a significant portion of the County's population. Agriculture faces continual pressure from urbanization, foreign competition, and rising production costs. Despite these pressures, those areas which remain in agricultural production represent a significant open space and economic resource for the County.

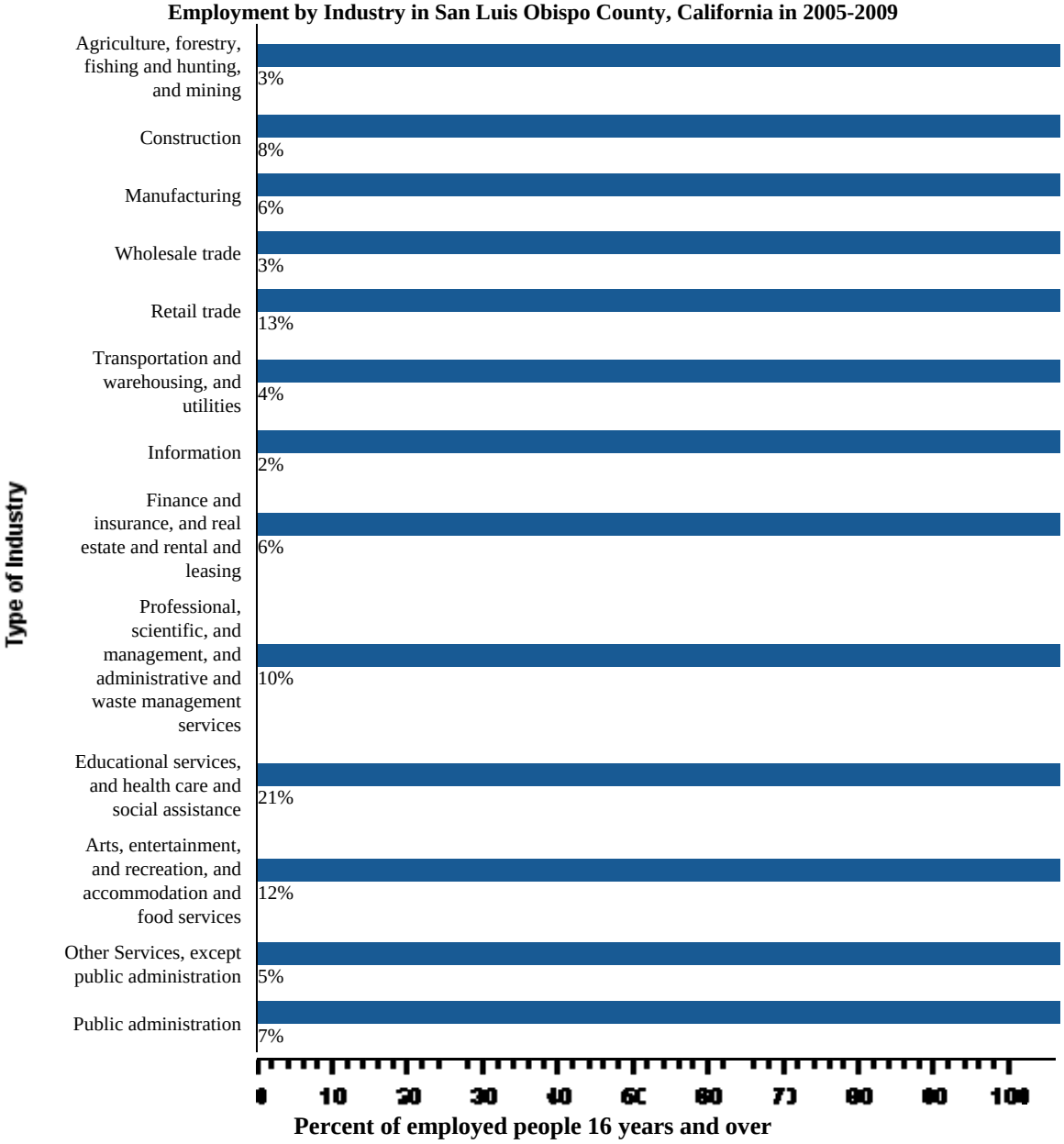
The San Luis Obispo County General Plan defines productive agricultural lands as those which are "involved in long-term, substantial investment to agricultural use, and which has a long-term economic viability for agricultural use." Some of the factors affecting the economic viability of these areas include weather, water prices, crop selection, management techniques, commodity prices, new technology, and proximity to developed lands. Because of the importance of agriculture to San Luis Obispo County, effects on agriculture are assessed for most of the hazard types identified in this LHMP.

2010 Top Twenty Value Crops

Wine Grapes all	$173,558,000
Strawberries	$123,542,000
Broccoli	$55,830,000
Cattle and Calves	$53,374,000
Avocados	$35,862,000
Vegetable Transplants	$33,460,000
Cut Flowers	$23,313,000
Indoor Decoratives	$23,289,000
Head lettuce	$18,454,000
Napa Cabbage	$14,064,000
Cauliflower	$9,271,000
Rangeland grazed	$9,225,000
Celery	$8,526,000
Lemons	$8,153,000
Outdoor Ornamentals	$8,152,000
Leaf Lettuce	$5,564,000
Bell peppers	$4,645,000
Cabbage	$4,021,000
Bedding Plants, Sod & Ground Cover	$3,827,000
Bok Choy	$3,620,000

Employment by Industry: In 2005-2009, for the employed population 16 years and older, the leading industries in San Luis Obispo County were educational services, and health care, and social assistance, 21 percent, and retail trade, 13 percent.

Employment by Industry in San Luis Obispo County, California in 2005-2009



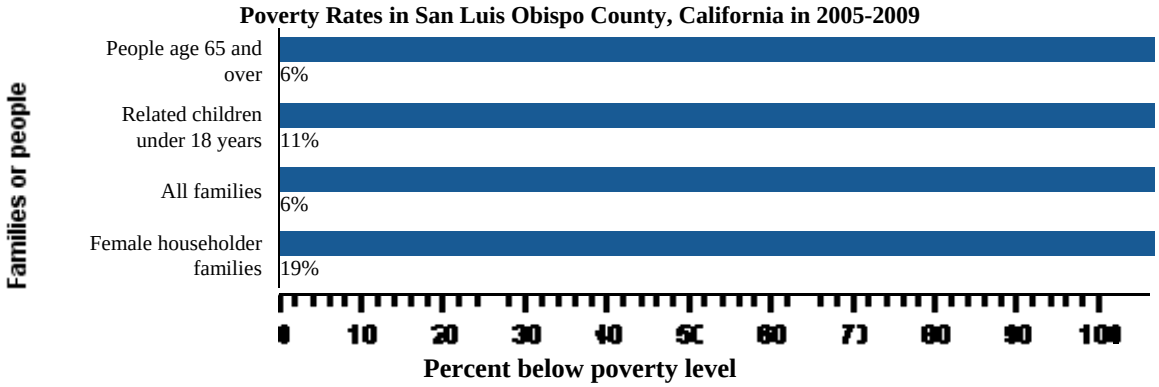
Source: American Community Survey, 2005-2009

2011-Top 20 San Luis Obispo County Employers

	Company/Organization	Location	Industry	Number of Employees
1	Cal Poly San Luis Obispo	San Luis Obispo	Public Education	1,000 –4,999
2	Arroyo Grande Community Hospital	Arroyo Grande	Health Care & Social Assistance	1,000 --4,999
3	Atascadero State Hospital	Atascadero	Public Administration	1,000 – 4,999
4	Pacific Gas & Electric	Countywide	Utilities	1,000 – 4,999
5	Cuesta College	San Luis Obispo	Public Education	500 – 999
6	Division of Juvenile Justice	Paso Robles	Correctional Institution	500 – 999
7	Sierra Vista Regional Medical Center	San Luis Obispo	Health Care & Social Assistance	500 – 999
8	Child Abuse & Neglect	San Luis Obispo	Social Service Welfare Organization	250 – 499
9	County Office of Education	San Luis Obispo	Public Education	250 -- 499
10	French Hospital Medical Center	San Luis Obispo	Health Care & Social Assistance	250 – 499
11	Madonna Inn	San Luis Obispo	Hotels & Motels	250 -- 499
12	San Luis Obispo County Social Services	San Luis Obispo	Government Offices	250 – 499
13	San Luis Obispo Sheriff's Department	County Wide	Sheriff	250 -- 499
14	Twin Cities Community Hospital	Templeton	Health Care & Social Assistance	250 – 499
15	Walmart	County Wide	Department Stores Public	250 -- 499
16	County of San Luis Obispo	San Luis Obispo	Administration Public	Not Available
17	California Men's Colony	San Luis Obispo	Administration	Not Available
18	Tenet Healthcare	Countywide	Health Care & Social Assistance	Not Available
19	San Luis Coastal Unified	San Luis Obispo	Public Education	Not Available
20	Paso Robles Public Schools	Paso Robles	Public Education	Not Available
21	Atascadero Unified School District	Atascadero	Public Education	Not Available
22	City of San Luis Obispo	San Luis Obispo	Public Administration	Not Available
23	Rabobank	Countywide	Finance/Insurance	Not Available
24	Community Action Partnership	San Luis Obispo	Other Services	Not Available

Income: The median income of households in San Luis Obispo County was $55,555. Seventy-nine percent of the households received earnings and 21 percent received retirement income other than Social Security. Twenty-nine percent of the households received Social Security. The average income from Social Security was $15,266. These income sources are not mutually exclusive; that is, some households received income from more than one source.

Poverty and Participation in Government Programs: In 2005-2009, 14 percent of people were in poverty. Eleven percent of related children under 18 were below the poverty level, compared with 6 percent of people 65 years old and over. Six percent of all families and 19 percent of families with a female householder and no husband present had incomes below the poverty level.



Source: American Community Survey, 2005-2009

F. Climate

The climate and air quality of San Luis Obispo County are directly related to its physical characteristics. The coastal lowlands and plains are bounded on the east by the Santa Lucia Mountains and experience a maritime climate. That climate is somewhat modified locally by elevation and distance from the ocean, as well as the mountains. The north and northeastern portions of the County include the upper end of the Salinas Valley, where the maritime climate is substantially modified by the intervening mountains. The Carrizo Plain in the east and southeastern portion of the County is climatically high desert. Because the County is located along the California coast, the weather is normally under the influence of a high pressure system located to the west. As a result, a common weather pattern includes afternoon and evening onshore winds.

San Luis Obispo County has a pleasant, Mediterranean climate year-round, averaging 315 days of sunshine per year.

Winter: 64°F / 31°F - Cool and Sunny
Spring: 75°F / 44°F - Breezy and Cool
Summer: 94°F / 54°F - Warm Coastal Mornings/Sunny Days
Fall: 77°F / 43°F - Warm Days and Cool Nights

G. Transportation Systems

The County contains major transportation arteries including U.S. Highway 101, California State Highways 1, 41, 46, 58, and 166, and the Union Pacific Railroad. The County has a regional airport near the southern portion of the City of San Luis Obispo which offers service to larger commercial airports to the north and south (Los Angeles and San Francisco, as well as flights to Phoenix and Arizona). In addition to air transportation, the County is also served with scheduled rail service by Amtrak, and motor bus service by companies such as Greyhound and Orange Belt Stages, as well as a number of tour coach operators, and local transit systems.

H. Governing Body

The Board of Supervisors serves as the Legislative body of San Luis Obispo County for the planning and provision of services related to public needs and the requirements of State and Federal laws. California law provides for five Supervisors to be elected by district. Each Supervisor is elected for a four-year term. Two of the Supervisors' terms are staggered so that all Supervisors are not standing for election at the same time. As the elected representative of the people of San Luis Obispo County, the Board of Supervisors establishes overall County priorities and sets policy.

I. Land Use

Existing land use within San Luis Obispo County is varied with respect to types of uses, ownership, character, and intensity. Land uses include:

- Rural residential
- Single family detached
- Single family attached
- High-density residential (apartments)
- Mobile homes
- Recreational open space
- Other open space
- Heavy industrial
- Warehouse
- Vacant
- Agriculture
- Water
- Utilities
- Public facilities
- Schools
- Retail / Office
- Tourist / Commercial recreation
- Light industrial / Business park
- Mineral extraction

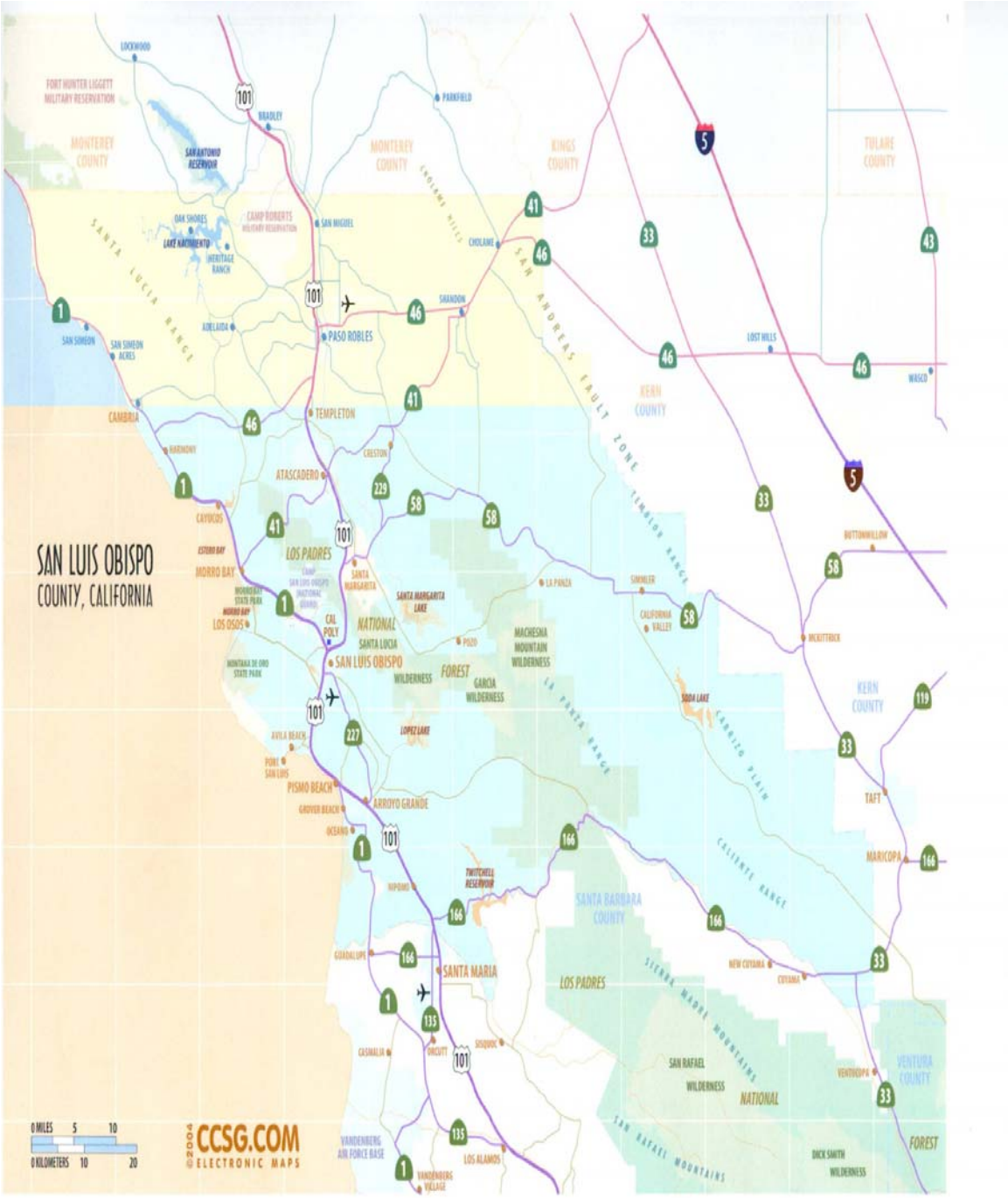
J. Development Trends

While the population of San Luis Obispo County is expected to continue growing, there are Land Use policies and elements within the County General Plan to help assure orderly development.

In addition, the Local Agency Formation Commission (LAFCO) of San Luis Obispo County is tasked with the mission to provide an orderly pattern of growth that reconciles the varied needs of the County. One of the fundamental principles of LAFCO is to ensure the establishment of an appropriate and logical municipal government structure for the distribution of efficient ad appropriate public services.
LAFCO Land Use Objectives include:

- the discouragement of urban sprawl;
- the preservation of the physical and economic integrity of agricultural lands;
- the preservation of open space within urban development patterns;
- the orderly formation and development of agencies by shaping local agency boundaries;
- the minimization of agencies providing services to a given area; and
- the utilization of Spheres of Influence to guide future development of agency boundaries.

The following maps provide a perspective of the size and layout of the County:


SAN LUIS OBISPO
COUNTY, CALIFORNIA
LOCKWOOD
FORT HUNTER LIGGETT MILITARY RESERVATION
MONTEREY COUNTY
SAN ANTONIO RESERVOIR
BRADLEY
PARKFIELD
KINGS COUNTY
TULARE COUNTY
OAK SHORES
LAKE NACIMIENTO
CAMP ROBERTS
SAN MIGUEL
CHOLAME
SANDON
SANTA LUCIA RANGE
SAN ANDREAS FAULT ZONE
ADELAIDA
PASO ROBLES
SAN SIMEON
SAN SIMEON ACRES
LOST HILLS
WASCO
KERN COUNTY
CAMBRIA
TEMPLETON
CRESTON
ATASCADERO
CAYUCOS
ESTERO BAY
MORRO BAY
LOS PADRES
SANTA MARGARITA
SANTA MARGARITA LAKE
LA PANZA
SIMMLER
CALIFORNIA VALLEY
BUTTONWILLOW
MCKITTRICK
LOS OSOS
CAL POLY
NATIONAL
SANTA LUCIA
SAN LUIS OBISPO
WILDERNESS
FOREST
GARCIA WILDERNESS
MACHESNA MOUNTAIN WILDERNESS
POZO
LA PANZA RANGE
SODA LAKE
CARRIZO PLAIN
LOPEZ LAKE
AVILA BEACH
PORT SAN LUIS
PISMO BEACH
GROVER BEACH
ARROYO GRANDE
OCEANO
TAFT
MARICOPA
CALIENTE RANGE
TWITCHELL RESERVOIR
NIPOMO
SANTA BARBARA COUNTY
GUADALUPE
SANTA MARIA
LOS PADRES
SIERRA MADRE MOUNTAINS
NEW CUYAMA
CUYAMA
CASMALIA
ORCUTT
JOSHUA
SAN RAFAEL WILDERNESS
NATIONAL
VENTURA COUNTY
VENTUCOPA
SAN RAFAEL MOUNTAINS
FOREST
DICK SMITH WILDERNESS
VANDENBERG AIR FORCE BASE
LOS ALAMOS
VANDENBERG VILLAGE
0 MILES 5 10
0 KILOMETERS 10 20
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ELECTRONIC MAPS

SAN LUIS OBISPO
COUNTY, CALIFORNIA
LOCKWOOD
FORT HUNTER LIGGETT MILITARY RESERVATION
MONTEREY COUNTY
SAN ANTONIO RESERVOIR
BRADLEY
PARKFIELD
KINGS COUNTY
TULARE COUNTY
OAK SHORES
LAKE NACIMIENTO
HERITAGE RANCH
CAMP ROBERTS MILITARY RESERVATION
SAN MIGUEL
CHOLAME HILLS
CHOLAME
SHANDON
SAN ANDREAS FAULT ZONE
SANTA LUCIA RANGE
ADELAIDA
PASO ROBLES
SAN SIMEON
SAN SIMEON ACRES
CAMBRIA
HARMONY
TEMPLETON
CRESTON
ATASCADERO
CAYUCOS
ESTERO BAY
MORRO BAY
MORRO BAY STATE PARK
LOS OSOS
LOS PADRES
CAMP SAN LUIS OBISPO (NATIONAL GUARD)
SANTA MARGARITA
SANTA MARGARITA LAKE
CAL POLY
NATIONAL
SANTA LUCIA
SAN LUIS OBISPO
WILDERNESS
FOREST
MONTAÑA DE ORO STATE PARK
AVILA BEACH
POBE SAN LUIS
PISMO BEACH
GROVER BEACH
OCEANO
ARROYO GRANDE
LOPEZ LAKE
POZO
LA PANZA
MACHESNA MOUNTAIN WILDERNESS
GARCIA WILDERNESS
LA PANZA RANGE
SIMMLER
CALIFORNIA VALLEY
SODA LAKE
CARRIZO PLAIN
CALIENTE RANGE
LOST HILLS
WASCO
KERN COUNTY
BUTTONWILLOW
MCKITTRICK
TAFT
MARICOPA
NIPOMO
TWITCHELL RESERVOIR
SANTA BARBARA COUNTY
GUADALUPE
SANTA MARIA
LOS PADRES
NEW CUYAMA
CUYAMA
SIERRA MADRE MOUNTAINS
CASMALIA
ORCUTT
SISQUOC
SAN RAFAEL WILDERNESS
NATIONAL
VENTOCOPA
VENTURA COUNTY
SAN RAFAEL MOUNTAINS
DICK SMITH WILDERNESS
FOREST
VANDENBERG AIR FORCE BASE
VANDENBERG VILLAGE
LOS ALAMOS
0 MILES 5 10
0 KILOMETERS 10 20
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V. RISK ASSESSMENT

A. DMA 2000 Requirements

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

B. Hazard Identification

Central California is susceptible to a number of both natural hazards. The State of California identifies the following types of major disasters and emergencies that California has encountered since 1950.

This HMP profiles the most significant of these hazards. Historical data, catastrophic potential, relevance to the jurisdiction, and the probability and potential magnitude of future occurrences were all used to reduce and prioritize the list of hazards to those most relevant to San Luis Obispo County.

The LHMP for San Luis Obispo County will be addressing natural hazards, which include:

- Earthquakes/Liquefaction
- Floods
- Landslides
- Tsunami and Seiche
- Wildfire
- Extreme Weather
- Coastal Storm / Coastal Erosion
- Biological Agents
- Pest Infestation and Disease

C. Hazard Profiles

1. Hazard: Earthquakes, Faults, and Liquefaction

Severity: Medium - High	Probability: Medium - High

Hazard Definition

An earthquake is a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the earth's surface or along fault lines. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet, commonly called faults; however, some earthquakes occur in the middle of plates.

A fault is a fracture in the earth's crust along which movement has occurred either suddenly during earthquakes or slowly during a process called creep. Cumulative displacement may be tens or even hundreds of miles if movement occurs over geologic time. However, individual episodes are generally small, usually less than several feet, and are commonly separated by tens, hundreds, or thousands of years. Damage associated with fault-related ground rupture is normally confined to a fairly narrow band along the trend of the fault. Structures are often not able to withstand fault rupture and utilities crossing faults are at risk of damage. Fault displacement involves forces so great that it is generally not feasible (structurally or economically) to design and build structures to accommodate this rapid displacement.

Fault displacement can also occur in the form of barely perceptible movement called "fault creep." Damage by fault creep is usually expressed by the rupture or bending of buildings, fences, railroads, streets, pipelines, curbs, and other linear features. Excellent examples of fault creep can be seen in the Carrizo Plain area of eastern San Luis Obispo County where gradual creep on the San Andreas fault has offset stream beds, roadways, and fence lines. In addition, there is also the potential for co-seismic creep, where movement on a fault is triggered by an earthquake on another nearby fault.

Liquefaction occurs when ground shaking causes the mechanical properties of some fine grained, saturated soils to *liquefy* and act as a fluid (liquefaction). It is the result of a sudden loss of soil strength due to a rapid increase in soil pore water pressures caused by ground shaking. In order for liquefaction to occur, three general geotechnical

characteristics should be present: 1) ground water should be present within the potentially liquefiable zone, 2) the potentially liquefiable zone should be granular and meet a specific range in grain-size distribution, and 3) the potentially liquefiable zone should be of low relative density. If those criteria are present and strong ground motion occurs, then those soils could liquefy, depending upon the intensity and duration of the strong ground motion. Liquefaction that produces surface effects generally occurs in the upper 40 to 50 feet of the soil column, although the phenomenon can occur deeper than 100 feet. The duration of ground shaking is also an important factor in causing liquefaction to occur. The larger the earthquake magnitude, and the longer the duration of strong ground shaking, the greater the potential there is for liquefaction to occur.

History

Where earthquakes have struck before, they will strike again. The central California coast has a history of damaging earthquakes, primarily associated with the San Andreas fault. However, there have been a number of magnitude 5.0 to 6.5 earthquakes on other faults which have affected large portions of the Central Coast. Recent events include the December 2003 - 6.5 magnitude San Simeon Earthquake and the September 2004 - 6.0 magnitude Parkfield Earthquake.

Historically active faults are generally thought to present the greatest risk for future movement and, therefore, have the greatest potential to result in fault rupture hazards. Active and potentially active faults in San Luis Obispo County are shown on map found on page 41 (Map 2 from the San Luis Obispo County Safety Element).

The areas of San Luis Obispo County most susceptible to the effects of liquefaction are those areas underlain by young, poorly consolidated, saturated granular alluvial sediments. These soil conditions are most frequently found in areas underlain by recent river and flood plain deposits. The map found on page 43 indicates areas of low to high liquefaction potential based on the geologic units (Map 3 from the San Luis Obispo County Safety Element).

Following are historic earthquakes that had an effect on San Luis Obispo County:

1830 San Luis Obispo Earthquake. The 1830 earthquake is noted in the annual report from the Mission, and had an estimated magnitude of 5. The location of the event is poorly constrained and cannot be attributed to a specific fault source, but the earthquake reportedly occurred somewhere near San Luis Obispo.

1906 San Francisco Earthquake. This earthquake has been studied in detail and the effects in San Luis Obispo County have been documented. Modified Mercalli intensity ratings ranged from III-IV in the inland and north coast portions of the County, and IV-V in the south coast areas. The higher intensities were felt in areas underlain by alluvial soil, while the lower intensities occurred in areas underlain by bedrock formations.

1916 Avila Beach Earthquake. This magnitude 5.1 event occurred offshore of Avila Beach in San Luis Bay. The earthquake reportedly resulted in tumbling smokestacks of the Union Oil Refinery at Port San Luis, and a landslide that blocked the railroad tracks. The maximum intensity appears to be approximately VI, but the available descriptions of the shaking are somewhat limited.

1952 Arvin-Tehachapi Earthquake. This 7.7 magnitude earthquake occurred on the White Wolf fault, located south and west of Bakersfield. Throughout most of the San Luis Obispo County, ground shaking intensities of VI were felt. Intensities of IV-V were experienced in the northwest portion of the County, and magnitude VIII intensities were felt in the Cuyama area, in the southeast portion of the County. The higher intensities were likely due to closer proximity to the earthquake epicenter.

1952 Bryson Earthquake. This magnitude 6.2 earthquake likely occurred on the Nacimiento fault, and resulted in intensity ratings of VI throughout most of the western portion of the County. Intensities of IV-V were experienced in the eastern portion of the County. Higher intensities were generally felt in the coastal valley areas that are underlain by alluvial soils.

1934, 1966 and 2004 Parkfield Earthquakes. These earthquakes had magnitudes of 6.0 and 5.5, respectively, and occurred on the San Andreas fault in or near the northeast corner of the County. Earthquake intensities generally conformed to anticipated characteristics for events of this size, with intense shaking (VII-VIII) being limited to a relatively small area near the epicenters of the quakes. Moderate shaking was experienced in most of the central and western parts of the County. A variation from the expected intensity characteristics was experienced in the La Panza area during the 1934 earthquake. La Panza is approximately 40 miles south of the fault rupture area, but experienced earthquake intensities of VII.

2003 San Simeon Earthquake. The San Simeon Earthquake struck at 11:15 a.m. on December 22, 2003. The magnitude 6.5 earthquake is attributed to having occurred near the San Simeon/Oceanic/Hosgri Fault system. The epicenter was approximately six miles from the community of San Simeon. In addition to significant property and other damages, two fatalities resulted from damages caused by the earthquake.

Earthquakes which have occurred outside yet felt in the County during the last century include events such as the 7.0 Lompoc earthquake in 1927, and the 7.7 Arvin-Tehachapi earthquake of 1952. Other more recent earthquakes, such as the 1983 - 6.7 Coalinga earthquake, 1989 - 7.1 Loma Prieta earthquake, 1992 - 7.5 Landers earthquake and the 1994 - 6.6 Northridge earthquake were felt in San Luis Obispo County, however, there was no damage to structures.

Hazard Potential
Like other areas of California, there are a number of active or potentially active fault systems throughout the San Luis Obispo County. Small earthquakes, in the range of magnitude 2.0 - 2.7 and smaller, occur quite often. There are a number of faults throughout the County believed to possibly be capable of larger, damaging earthquakes.

The intensity of ground shaking at a particular site or structure is a function of many factors including: 1) earthquake magnitude, 2) distance from the epicenter, 3) duration of strong ground motion, 4) local geologic conditions (soil type and topography), and 5) the fundamental period of the structure.

A brief description of those factors is presented below:

Earthquake Magnitude: Earthquake magnitude, as generally measured by either the Richter or Moment Magnitude scale, is a measurement of energy released by the movement of a fault. As the amount of energy released by an earthquake increases, the potential for ground shaking impacts also increases.

Distance from Epicenter: Earthquake energy generally dissipates (or attenuates) with distance from a fault. Over long distances, this loss of energy can be significant, resulting in a significant decrease in ground shaking with increased distance from the epicenter.

Duration of Strong Shaking**:** The duration of the strong ground shaking constitutes a major role in determining the amount of structural damage and the potential for ground failure that can result from an earthquake. Larger magnitude earthquakes have longer durations than smaller earthquakes.

Local Geologic Conditions**:** The geologic and soil conditions at a particular site have the potential to substantially increase the effects of ground shaking. The thickness, density, and consistency of the soil, as well as shallow ground water levels, have the potential to amplify the effects of ground shaking depending on the characteristics of the earthquake. In general, the presence of unconsolidated soils above the bedrock surface can amplify the ground shaking caused by an earthquake.

Fundamental Periods: Every structure has its own fundamental period or natural vibration. If the vibration of ground shaking coincides with the natural vibration period of a structure, damage to the structure can be greatly increased. The extent of damage suffered during an earthquake can also depend on non-geologic factors. The type of building and its structural integrity will influence the severity of the damage suffered. Generally, small, well constructed, one- and two-story wood and steel frame buildings have performed well in earthquakes because of their light weight and flexibility. Reinforced concrete structures will also usually perform well. Buildings constructed

from non-flexible materials, such as unreinforced brick and concrete, hollow concrete block, clay tile, or adobe, are more vulnerable to earthquake damage.

Effects of Ground Shaking: The primary effect of ground shaking is the damage or destruction of buildings, infrastructure, and possible injury or loss of life. Building damage can range from minor cracking of plaster to total collapse. Disruption of infrastructure facilities can include damage to utilities, pipelines, roads, and bridges. Ruptured gas and water lines can result in fire and scour/inundation damage, respectively, to structures. Secondary effects can include geologic impacts such as co-seismic fault movement along nearby faults, seismically induced slope instability, liquefaction, lateral spreading, and other forms of ground failure and seismic response. These secondary effects were demonstrated in Oceano by the San Simeon 2003 earthquake.

Major Faults in San Luis Obispo County

The California Geological Survey (CGS) is charged with recording and mapping faults throughout California. The Alquist-Priolo Earthquake Fault Zoning (AP) Act was passed into law following the destructive February 9, 1971 6.6 San Fernando earthquake. The AP Act provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the AP Act is to insure public safety by prohibiting the sitting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. Fault zoning is continually updated and reviewed by CSG and it is likely that other faults in addition to those currently listed by CSG will be added to the list in the future.

Table 4-9 list major faults that have been mapped by the CSG in San Luis Obispo County. The potential for fault rupture hazards along other faults listed in the Table as inactive faults is generally considered to be low. However, this hazard should be considered when placing a structure near or over any suspected fault location.

The primary active faults identified by the AP Act include the San Andreas, San Simeon-Hosgri, and Los Osos faults. Two recent studies by CSG have estimated potential ground acceleration that could be experienced in California. Studies have estimated the maximum credible ground acceleration that could be generated by active and potentially active faults. Deterministic peak horizontal ground accelerations from these studies range from a low of 0.4 g in the central portion of the County to a high of about 0.7 g along the San Andreas, Rinconada, Oceanic-West Huasna, and coastal fault zones.

The western portion of San Luis Obispo County has a high probability of experiencing ground accelerations in the range of 0.3 g to 0.4 g in the next 50 years. The eastern portion of the County adjacent to the San Andreas Fault has a high percent probability of experiencing a peak ground acceleration of 0.5 g to 0.7 g in the next 50 years. The statistical variance in estimated ground acceleration could easily be plus or minus 50 percent of the estimated ground motion. Major areas within San Luis Obispo County that

are underlain by recent alluvial sediments are depicted on the following map (Map 1 from the San Luis Obispo County Safety Element).

In 2008, the Shoreline Fault was discovered off the coast in the area of the Diablo Canyon Power Plant which is owned and operated by Pacific Gas and Electric Company (PG&E). The initial study of the fault, using conservative assumptions about the total length of the fault zone, indicates that a potential magnitude 6.5 strike-slip earthquake is possible. Follow up investigations were performed by PG&E in 2009 and 2010 and more detailed studies are planned in order to refine the size and potential of the fault. (Report on the Analysis of the Shoreline Fault Zone, Central Coastal California, Report to the U.S. Nuclear Regulatory Commission, January 2011, PG&E)

Active and potentially active faults in San Luis Obispo County are shown on map found on page 41 (Map 2 from the San Luis Obispo County Safety Element).

Table 1-1: Major Faults in San Luis Obispo County

Fault Name	Maximum Moment Magnitude	Activity	Earthquake Hazard Zone
Cambria	6.25	Potentially Active	Yes
Casmalia	6.5	Potentially Active	No
East Huasna	unknown	Potentially active	No
San Simeon-Hosgri	7.3	Active	Yes
La Panza Fault	7.5	Potentially Active	No
Los Osos	6.8	Active	Yes
Nacimiento	unknown	Active	No
Rinconada	7.3	Potentially Active	No
San Andreas (1857 rupture)	7.8	Active	Yes
San Andreas (1906)	7.9	Active	Yes
San Andreas-Carrizo	7.2	Active	Yes
San Andreas-Cholame	6.9	Active	Yes
San Andreas–Parkfield Segment	6.7	Active	Yes
San Juan	7.0	Potentially Active	No
San Luis Range	7.0	Potentially Active	No
Shoreline	6.5	Under Study	Under Study

The following paragraphs describe in detail the major faults listed above:

Cambria Fault
The northwesterly trending Cambria fault is approximately 64 kilometers long, including an 8 kilometer projection across Estero Bay. The fault is shown to coming back onshore near Morro Bay, and converging with the Oceanic and West Huasna fault near San Luis Obispo. The Cambria fault is considered potentially active. The Safety Element of the San Luis Obispo County General Plan lists the maximum moment magnitude as 6.25 for the Cambria.

East Huasna Fault
The East Husana fault zone trends north-northwest for a distance of about 70 kilometers from near Sisquoc in Santa Barbara County northward until it intersects with the South Cuyuma fault about 20 kilometers east of the city of San Luis Obispo. The fault is considered potentially active.

La Panza Fault
The northwest trending La Panza fault has been mapped for 71 kilometers along the western base of the La Panza Range. The La Panza fault has been identified as a thrust or reverse fault. The La Panza fault is considered potentially active. The Safety Element of the San Luis Obispo County General Plan lists the maximum moment magnitude as 5.0 - 7.5 for the La Panza.

Los Osos and Edna Fault Zones
The Los Osos fault zone has been mapped generally in an east/west orientation, along the northern flank of the Irish Hills. The western end of the onshore fault zone is located near the community of Los Osos, and the eastern end located near U.S. Highway 101. To the east of U.S. Highway 101, the fault may continue along the northeast flank of the Irish Hills as the Edna fault zone. Assuming an overall length of 35 miles, the Los Osos fault has the potential to generate and earthquake with about a magnitude 6.75.

Nacimiento Fault Zone
The Nacimiento fault zone has been mapped as a regional fault by many investigators, however it is not included as part of the data base of California faults by the California Geological Survey (CSG). While the fault is considered the Bryson earthquake of 1952 is sometimes assigned to the Nacimiento fault zone, and would make the fault seismically active. The Bryson earthquake, which occurred in a rural area of northern San Luis Obispo County, is poorly understood and may be attributed to movement on other faults such as the active San Simeon or potentially active Riconada fault zones. The faults that make up the Nacimiento fault zone enter the County in the vicinity of Nacimiento Lake. Faults, or portions of the faults, related to this system trend southwest near the city of Paso Robles, parallel Highway 101, pass through or near Templeton, through or near the city of Atascadero, through the area in and near Santa Margarita, and continues south.

Given the fault's proximity to major population centers, structures, dams, transportation and pipeline routes, it could pose a serious threat to the County.

Rinconada Fault Zone

The Rinconada fault zone has been mapped as a regional fault zone about 189 kilometers long located along the western margin of the La Panza Range. The Rinconada fault is inferred to be part of a zone of faults including the Jolon, San Marcos, Espinosa, and Reliz faults that extends from Monterey Bay southward to its juncture with the Nacimiento fault. The California Geologic Survey considers the Rinconada fault to be potentially active. The Safety Element lists the maximum moment magnitude as 7.3 for the Rinconada.

San Andreas Fault

The San Andreas is a historically active fault thought to be capable of an earthquake up to and above the 8.0 magnitude range and generally runs along the eastern county border. It enters the County near the Cholame area, passes through the Carrizo Plain, and exits the county near Maricopa. As it passes through the County, three relatively distinct portions of the fault have separate potentials for causing a damaging earthquake. The portion of the fault that runs from Monterey County into San Luis Obispo County to an area near Cholame has commonly been known as the Parkfield segment of the San Andreas fault system. That portion of the fault system is the one that has an approximate 5.6 – 6.0 magnitude earthquake from time to time. A segment of the system that runs from approximately the Cholame area to about the northern edge of the Carrizo Plain area has been commonly known as the Cholame segment. The portion running from the northern Carrizo Plain area and out of the County into Kern County has been commonly know as the Carrizo segment.

It is believed that in 1857 a large (possible 7.8 or larger) earthquake occurred on the San Andreas fault that possibly originated in the Parkfield area and stretched along the fault to the area near San Bernardino. This is perhaps an illustration of the potential for the San Andreas to cause a very powerful earthquake and the need to be prepared.

A major earthquake along any section of the San Andreas Fault could result in serious damage within San Luis Obispo County. An earthquake of 8.0 or greater magnitude would result in severe ground motion, and could cause damage throughout the County. Small earthquakes do occur in the area of the San Andreas within the County from time to time, perhaps most frequently in the Parkfield and nearby areas. Generally, they are so small or in such isolated areas that they are not felt, or are felt only very close by.

San Simeon - Hosgri Fault Zone

The San Simeon-Hosgri fault system generally consists of two fault zones: the Hosgri fault zone represented by a series of faults that are mapped off the San Luis Obispo County coast; and the San Simeon fault zone, which appears to be associated with the Hosgri, and comes onshore near the pier at San Simeon point. The San Simeon fault is

considered to be active. The Hosgri fault zone has been interpreted to extend from the northern termination west of the southern San Simeon fault in the Cambria/Point Estero area to its southern termination offshore of Point Perdernales, which is south of the Santa Maria River, off of Santa Barbara County. The Safety Element of the San Luis Obispo County General Plan lists the maximum moment magnitude as 7.3 for the Hosgri-San Simeon.

Fault Rupture Hazard Potential by Area

The following paragraphs briefly discuss the fault rupture hazard potential for the cities and several of the highly populated unincorporated areas of the County including: Cambria, Cayucos, Nipomo, Oceano, the South Bay area, San Miguel, Santa Margarita, and Templeton.

Arroyo Grande

Mapped faults in the City of Arroyo Grande are the potentially active Wilmar Avenue fault and the inactive Pismo fault. The Wilmar Avenue fault is exposed in the seacliff near Pismo Beach and the buried trace of the fault is inferred to strike northwest-southeast parallel and adjacent to U.S. Highway 101 beneath portions of Arroyo Grande. The potentially active fault presents a moderate potential fault rupture hazard to the City. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

Atascadero

Mapped faults in the vicinity of Atascadero are the potentially active Rinconada fault and the Nacimiento fault zones. The Rinconada fault and its western associated fault, the Jolon, is mapped trending northwest along the eastern City limits. The fault mostly lies East of the Salinas River and outside the City limits. Although there is evidence that indicates movement along the Rinconada fault, the fault lacks any geomorphic features to suggest the fault is active. Because the Rinconada fault is potentially active, it presents a moderate fault rupture hazard to the City of Atascadero. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

The Nacimiento fault zone consists of a nearly 10-kilometer wide northwest trending, complex fault zone located in the Santa Lucia Range of southwest Atascadero. The Nacimiento fault zone is classified as inactive by CSG, but is believed to be coincident with the location of the epicenter for historic earthquakes that suggest the fault is seismically active. Given the uncertainty of the Nacimiento fault's activity, further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

Grover Beach
The only mapped fault near Grover Beach is the potentially active Wilmar Avenue fault. The Wilmar Avenue fault is exposed in the seacliff near Pismo Beach and the buried trace of the fault is inferred to strike northwest-southeast generally along the alignment of U.S. Highway 101 past Grover Beach. The mapped location of the fault runs along a portion of the northern city limits for Grover Beach. The Wilmar Avenue fault is considered potentially active and presents a moderate fault rupture hazard to the City. Further studies to evaluate the activity of the fault are warranted, prior to placing structures near the mapped fault traces.

Morro Bay
The only known mapped faults in the City of Morro Bay are the potentially active Cambria fault and possible splays of the active Los Osos fault system. The Cambria fault is mapped within the eastern limits of the City. The Cambria fault consists of a complex system of thrust faults located primarily in the hills northeast of Morro Bay. The potentially active fault presents a moderate fault rupture hazard to City developments in that area. The Los Osos fault is active, but presents essentially no fault rupture hazard to the City as it is only mapped in undeveloped areas. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

Paso Robles
The only known mapped fault within the City of Paso Robles is the Rinconada fault. The potentially active Rinconada fault is mapped through southwestern Paso Robles and crosses Highway 101 just south of Spring Street. A trace of the fault is also identified as running up Spring Street, which corresponds to a line of hot springs that once existed in this area but have since been capped and buried. As a potentially active fault, the Rinconada presents a moderate fault rupture hazard to the City. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

The northern end of the potentially active La Panza fault is located about 20 kilometers southeast of Paso Robles, near the town of Creston. The northwest striking La Panza fault is about 75 kilometers long. The Huerhuero fault is a possible extension of the La Panza and is mapped trending northwest along Huerhuero Creek south of Highway 46, but is not within the current City limits.

Pismo Beach
As indicated on Map 2 p.41, the data reviewed does not indicate that there are mapped active or potentially active faults in Pismo Beach. The inactive Pismo fault presents a very low potential fault rupture hazard. As noted above, the nearby cities of Arroyo Grande and Grover Beach are transected by the Wilmar Avenue fault which is considered potentially active. Significant ground shaking could occur in Pismo Beach.

City of San Luis Obispo

CSG has mapped the active Los Osos fault through a portion of the City, which strikes northwest-southeast along the southwestern margin of the Los Osos Valley. Field evaluations for the main strand of the Los Osos fault, found evidence of movement in the last 11,000 years. This evidence of recent activity resulted in the establishment of an Earthquake Fault Zone by CSG in 1989 under the Alquist-Priolo Fault Zoning Act. It should not be interpreted that the active portion of the main trace of the Los Osos Fault is limited only to the designated Earthquake Fault Zone. Rather, the limits of the established zone correspond to the limits of the available information provided in site specific studies that show evidence of recent fault activity in that area. The Los Osos fault presents a high to very high fault rupture hazard to City developments near and southwest of the Los Osos Valley Road area.

Other faults that are near the borders of San Luis Obispo are the West Huasna, Oceanic, and Edna faults. These faults are considered to be potentially active and present a moderate fault rupture hazard to developments in their vicinity.

Unincorporated Areas in San Luis Obispo County

Cambria

Mapped faults in the vicinity of Cambria include the Cambria and Oceanic faults, and the offshore Hosgri fault. Although the offshore Hosgri fault is considered to be active and a likely source for future seismic events, it does not itself provide a fault rupture hazard to onshore facilities. The potentially active Cambria fault consists of a complex web of thrust faults that trend northwest along Highway 1 into the town of Cambria. In the vicinity of Cambria, the fault zone extends from the eastern portion of the town eastward for about two kilometers.

The potentially active Oceanic fault zone consists of a zone of northwest trending faults located about 8 kilometers northeast of Cambria. Because the faults are considered to be potentially active, they present a moderate fault rupture hazard to the town of Cambria. Further studies to evaluate the activity of the faults are warranted prior to placing structures near the mapped fault traces.

Cayucos

Faults in the vicinity of Cayucos include the Cayucos, Cambria, and Oceanic fault zones. Geologic mapping recorded the buried trace of the northwest striking Cayucos fault beneath the town of Cayucos. The fault is considered to be inactive and therefore results in a low potential to serve as a fault rupture hazard. Although the CSG considers the Cayucos fault to be inactive, it is often undesirable to site structures over any fault as a result of non-uniform foundation support conditions and the potential for co-seismic movement that could result from earthquakes on other nearby faults.

The northwest striking Oceanic fault zone is located about two kilometers northeast of Cayucos. The Cambria fault zone is mapped as going offshore north of Cayucos, and returning to shore as a broad zone of faults passing through Cayucos. These faults are considered to be potentially active and therefore present a moderate fault rupture hazard. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

Nipomo

The faults in the Nipomo area include the Santa Maria River, Wilmar Avenue, Oceano and West Huasna faults. The buried trace of the Santa Maria River/Wilmar Avenue fault is inferred to parallel U.S. Highway 101 in the vicinity of Nipomo. The Oceano fault generally is trending northwest across the Nipomo Mesa and into the town of Oceano. The West Huasna fault is mapped along the eastern side of the valley. These faults generally have a subdued topographic expression and are considered to be potentially active by CSG. Review of the Oceano fault suggests that the fault is inactive. On the basis of that information, potentially active faults present moderate fault rupture hazard in the Nipomo area. The inactive Oceano fault presents a very low potential as a fault rupture hazard. Although the Oceano fault is inactive, it is often undesirable to site structures over any fault as a result of non-uniform foundation support conditions and the potential for co-seismic movement that could result from earthquakes on other nearby faults. Further studies to evaluate the activity of the Wilmar Avenue and West Huasna faults are warranted, prior to placing structures near the mapped fault traces.

Oceano

The only known mapped fault in the vicinity of Oceano is the Oceano fault. The buried trace of the potentially active Oceano fault is interpreted to strike northwest along the southwestern side of the Cienega Valley about 1,000 meters southwest of Oceano, and goes offshore near the mouth of Arroyo Grande Creek. Although the fault is classified as potentially active by CSG, review of the Oceano fault suggests that the fault is inactive. The Oceano fault presents a very low fault rupture hazard to Oceano. Although the Oceano fault is likely inactive, it is often undesirable to site structures over any fault as a result of non-uniform foundation support conditions and the potential for co-seismic movement that could result from earthquakes on other nearby faults.

South Bay

The South Bay area includes the communities of Los Osos, Cuesta by-the-Sea, Baywood Park, and the south Morro Bay area. Mapped faults in the South Bay area include the active Los Osos fault. As mapped the Los Osos fault consists of a several hundred meter wide zone of west-northwest striking lineaments and scarps located along the southern side of the Los Osos Valley. Portions of the Los Osos fault have been zoned active by CSG. The activity of this fault segment is unknown, but is inferred to be at least potentially active or possibly active. The Los Osos fault and related branches present a moderate to very high fault rupture hazard to the area. Further studies to evaluate the

location and activity of the fault are warranted, prior to placing structures near the mapped fault traces.

San Miguel

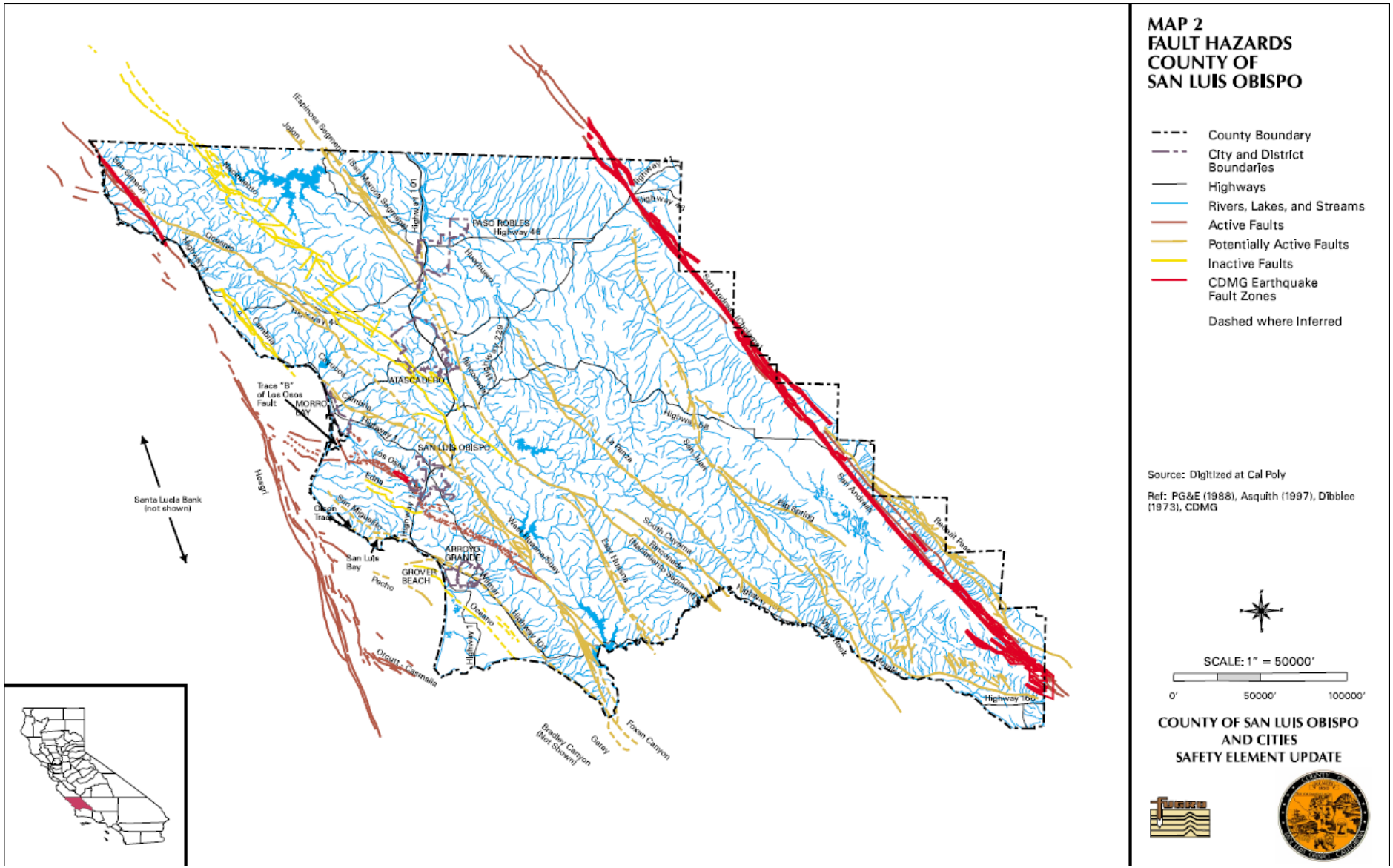
As indicated on Map 2, the data reviewed does not indicate that there are mapped active or potentially active faults in San Miguel.

Santa Margarita

The only mapped fault in the Santa Margarita area is the potentially active Rinconada fault. The fault trends northwest through the Santa Margarita area near Pozo Road, Trout Creek, and the Salinas River. Although there is evidence that indicates movement along the Rinconada fault, the fault lacks any geomorphic features to suggest the fault is active. Because the Rinconada fault is potentially active, it poses a moderate fault rupture hazard to this area. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.

Templeton

The only mapped fault in the Templeton area is the western trace of the potentially active Rinconada fault system referred to as the Jolon fault. The fault trends northwest through the community just south of the junction of Highways 46 and 101. Although there is evidence that indicates movement along the Rinconada fault, the fault lacks any geomorphic features to suggest the fault is active. Because the Rinconada fault is potentially active, it poses a moderate fault rupture hazard to this area. Further studies to evaluate the activity of the faults are warranted, prior to placing structures near the mapped fault traces.


MAP 2
FAULT HAZARDS
COUNTY OF
SAN LUIS OBISPO
County Boundary
City and District Boundaries
Highways
Rivers, Lakes, and Streams
Active Faults
Potentially Active Faults
Inactive Faults
CDMG Earthquake Fault Zones
Dashed where Inferred
Source: Digitized at Cal Poly
Ref: PG&E (1988), Asquith (1997), Dibblee (1973), CDMG
SCALE: 1" = 50000'
0'
50000'
100000'
COUNTY OF SAN LUIS OBISPO
AND CITIES
SAFETY ELEMENT UPDATE
PASO ROBLES
Highway 46
ATASCADERO
MORRO BAY
SAN LUIS OBISPO
ARROYO GRANDE
GROVER BEACH
San Luis Bay
Trace "B" of Los Osos Fault
Santa Lucia Bank (not shown)
Hosgri
Los Osos
Edna
Oceano
Nacimiento
Highway 101
Highway 1
Highway 166
Highway 58
Highway 41
Highway 46
Highway 227
Highway 229
Highway 227
Highway 229
Highway 41
Highway 46
Highway 1
Highway 101
Highway 166
Highway 58

Areas Susceptible to Effects of Liquefaction

County of San Luis Obispo
Portions of coastal San Luis Obispo County are under laid by sediments that may be vulnerable to liquefaction. Developed areas having a higher potential for liquefaction are the coastal communities of Oceano, Avila, South Bay, Cayucos, and Cambria. Site-specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials and if they require mitigation for development.

Arroyo Grande
The areas of Arroyo Grande that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by younger alluvium. The younger alluvium underlies most of the low-lying downtown areas south of Branch Street and along Grand Avenue. Site-specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.

Atascadero
The areas of Atascadero that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by younger alluvium. Portions of the City in the low lying areas adjacent to Atascadero Creek, Graves Creek, and the Salinas River are mapped as being underlain by younger alluvium. Site-specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.

Grover Beach
The areas of Grover Beach that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by beach sand and young alluvium. High ground water levels can be expected near the Pacific Ocean and adjacent to Meadow Creek. Site specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.

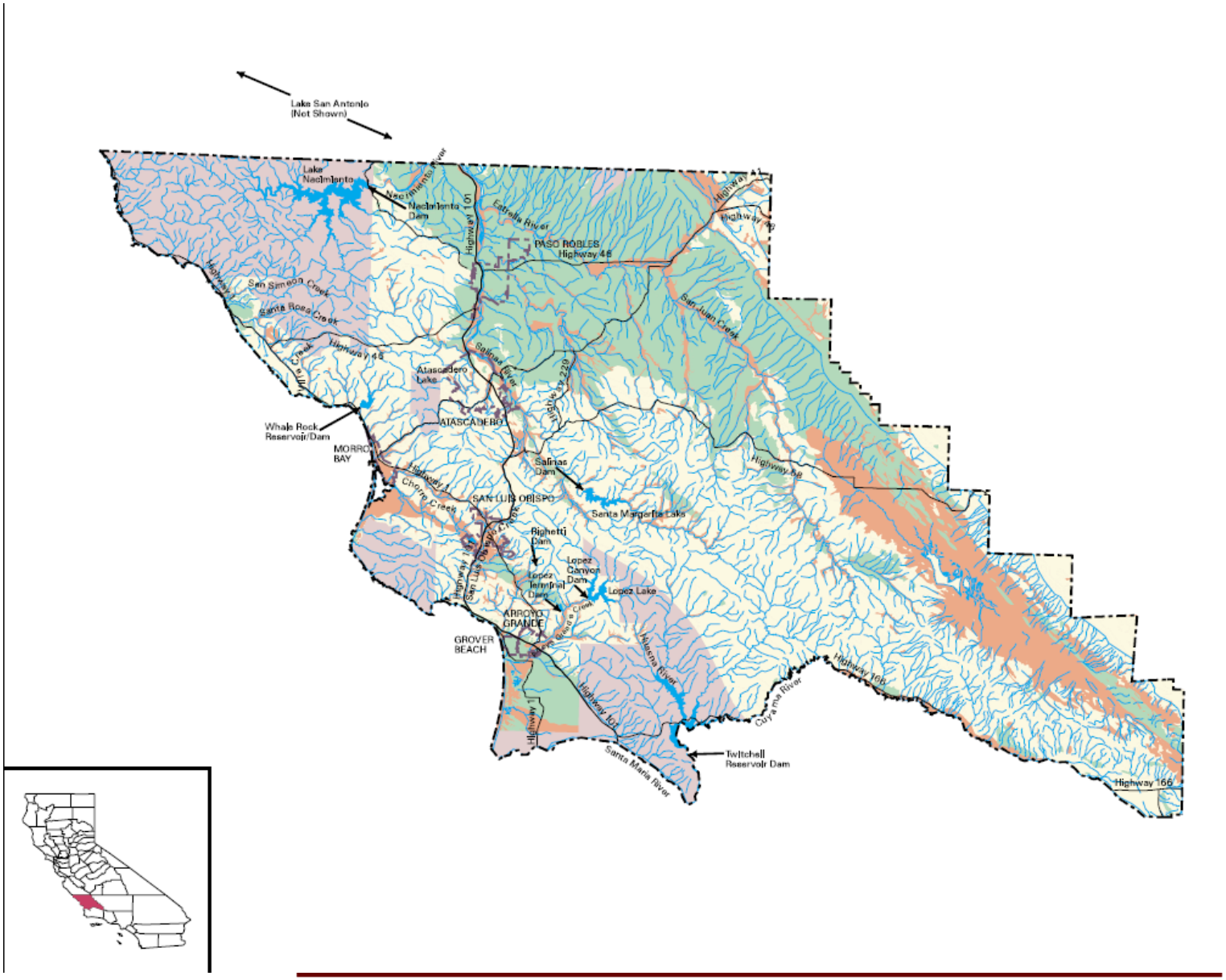
Morro Bay
The areas of Morro Bay that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by beach and sand dune deposits and younger alluvium. A majority of the City is underlain by these alluvial, estuarine, beach and sand dune deposits. High ground water levels can be expected in the Embarcadero area and other beach front areas. Flood plain areas along Chorro, Little Morro and Morro Creeks are also underlain by younger alluvium. Site-specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.

Paso Robles
The areas of Paso Robles that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by younger alluvium. Portions of the City

that are located on recent alluvium in the low lying areas adjacent to the Salinas River (or its tributaries) appear to have the highest potential for liquefaction. Site specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.

City of San Luis Obispo

The areas of the City of San Luis Obispo that have a high potential to be underlain by potentially liquefiable sediments are those areas underlain by younger alluvium. Most of the City of San Luis Obispo is underlain by alluvium. Site specific studies are needed to evaluate if a geologic unit actually contains potentially liquefiable materials, and if they require mitigation for development.



MAP 3
LIQUEFACTION HAZARDS COUNTY OF SAN LUIS OBISPO

County Boundary
City and District Boundaries
Highways
Rivers, Lakes, and Streams

LIQUEFACTION HAZARDS

High Potential
Moderate Potential
Low Potential
No Data

Note: This map is for preliminary planning purposes only. Liquefaction potential is dependent on such factors as soil type, depth to ground water, degree of seismic shaking, and the relative density of the soil. Site-specific studies to evaluate subsurface conditions and estimate ground motion parameters are needed before reliable estimates of liquefaction potential can be estimated.

Source: Digitized at Cal Poly

Ref: Dibblee (1973, 1974), Hall (1973, 1973b), McClean (1994, 1995), Hall and Others (1975), Hall and Prior (1975)

SCALE: 1" = 50000'

0' 50000' 100000'

COUNTY OF SAN LUIS OBISPO AND CITIES SAFETY ELEMENT UPDATE

Damage Potential

Structural Hazards

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking. Much of the damage in earthquakes is predictable and preventable.

When liquefaction of the soil does occur, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement. Liquefaction may also result in the development of cracks in the ground surface followed by the emergence of a sand/water mixture, typically referred to as a sand-boil. In areas underlain by thick deposits of saturated, loose granular sediment (such as alluvial valleys or beaches), subsidence as much as several feet may result.

Unreinforced Masonry Buildings

Unreinforced masonry building type structures consist of buildings made of unreinforced concrete and brick, hollow concrete blocks, clay tiles, and adobe. Buildings constructed of these materials are heavy and brittle, and typically provide little earthquake resistance. In small earthquakes, unreinforced buildings can crack, and in strong earthquakes, they have a tendency to collapse. These types of structures pose the greatest structural risk to life and safety of all general building types.

Non-structural items and building components can also influence the amount of damage that buildings suffer during an earthquake. Unreinforced parapets, chimneys, facades, signs, and building appendages can all be shaken loose, creating a serious risk to life and property.

As described above, unreinforced masonry buildings generally perform poorly in strong earthquakes, and have a high potential to suffer extensive damage. Due to the public safety risks that are posed by unreinforced masonry buildings, the California legislature passed Senate Bill 547 (Government Code section 8875 et seq.). This legislation went into effect January 1, 1987, and required all cities and counties located in Seismic Zone 4, which includes San Luis Obispo County, to conduct an inventory of potentially hazardous structures, including unreinforced masonry buildings.

To comply with the requirements of SB 547, the County of San Luis Obispo adopted the Uniform Code for Building Conservation as part of Title 19 (Building and Construction Ordinance) of the County Code. Surveys that were conducted to identify potentially unsafe unreinforced masonry buildings identified about 80 structures that required modifications to meet specified earthquake resistance structural standards. Identified

structures that require seismic retrofit are generally located in various areas, mostly urban. The County's ordinance implementing SB 547 requires the owners of identified unreinforced buildings to demolish the structures or complete modifications, depending upon the building's use and number of occupants. As of July 2011, only six structures remain on the URM registry. These buildings are vacant and have been posted.

Diablo Canyon Power Plant.
Located just north of Avila Beach this nuclear power plant was designed in the late 60's and the first unit was put in service in 1985. Equipped with extensive seismic monitoring and safety systems, the plant is designed to shut down promptly in the event of significant ground motion.

Diablo Canyon was originally designed to withstand a 6.75 magnitude earthquake. However, before its completion it was upgraded to withstand a 7.5 magnitude quake. This action was required based on the discovery of the Hosgri Fault located just off shore of the plants location.

As noted earlier in this section, the Shoreline fault was recently discovered offshore near Diablo Canyon in 2008, by PG&E working in conjunction with the U.S. Geological Survey.

To address public concerns regarding the seismicity of the area surrounding Diablo Canyon, PG&E is now planning to expedite the regulatory permitting process so it can begin additional fault studies as soon as possible. PG&E also plans to conduct significant research along the Los Osos Valley and in the Irish Hills. The company will share the results with local jurisdictions in order to enhance their knowledge of the seismic characteristics of the region for their emergency planning and building standards requirements. PG&E is planning high-energy offshore 3-D studies of the shoreline fault's deeper regions as soon as it obtains regulatory permits from the State Lands Commission, California Coastal Commission and County of San Luis Obispo.

Risk Assessment
Located within San Luis Obispo County are several known active and potentially active earthquake faults, including the San Andreas, San Simeon and Los Osos faults. Research centers devoted to the detection and logging of earthquake events post a continuous string of activity in San Luis Obispo County faults.

In the event of an earthquake, the location of the epicenter as well as the time of day and season of the year would have a profound effect on the number of deaths and casualties, as well as property damage. The hazard of earthquakes varies from place to place, dependent upon the regional and local geology. Ground shaking may occur in areas 65 miles or more from the epicenter (the point on the ground surface above the focus).

A moderate earthquake occurring in or near San Luis Obispo County could result in deaths, casualties, property damage, agricultural and environmental damage, and disruption of normal government and community services and activities. The effects could be aggravated by collateral emergencies such as fires, flooding, hazardous material spills, utility disruptions, landslides, and transportation emergencies.

Relationship to Other Hazards – Cascading Effects

Earthquakes can cause many cascading effects such as fires, flooding, hazardous materials spills, utility disruptions, landslides, and transportation emergencies. Ground shaking may cause seiche, the rhythmic sloshing of water in lakes or bays.

- **Effects on people and housing.** In any earthquake, the primary consideration is saving lives. Time and effort must also be dedicated to providing for mental health by reuniting families, providing shelter to displaced persons, and restoring basic needs and services. Major efforts will be required to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and temporary housing for affected citizens.

  A survey of local, State, and Federal government emergency plans indicate that although there is a general capacity to respond to small and intermediate-sized earthquakes, it is unlikely that any of these governmental units will be able to cope with the *immediate* impact of a great quake, such as an M 8.3 event on the south-central San Andreas fault. The general public must realize that the assistance that they have been used to expecting simply will not be immediately available. In fact, in the event of an earthquake of such magnitude, citizens must be prepared to wait for up to 72 hours or more for any type of organized response.

- **Effects on commercial and industrial structures:** After any earthquake, individuals are likely to lose wages due to the inability of businesses to function because of damaged goods and/or facilities. With business losses, the County of San Luis Obispo will lose revenue. Economic recovery from even a minor earthquake will be critical to the communities involved.

- **Effects on infrastructure:** The damage caused can lead to the paralysis of the local infrastructure: police, fire, medical and governmental services.

- **Effects on agriculture:** Earthquakes can cause loss of human life, loss of animal life, and property damage to structures and land dedicated to agricultural uses. The most significant long-term impacts on agriculture from earthquakes are those that arise from the cascading effects of fire and flood.

Risk Assessment Conclusion

San Luis Obispo County is located in a geologically complex and seismically active region. There are numerous active and potentially active faults in the County. The County has a history of damaging earthquakes, including those associated with the San Andreas fault, but there have also been a number of magnitude 5.0 to 6.2 earthquakes which have affected large portions of the County. While it is impossible to accurately predict the next earthquake event, the probability for future damaging earthquakes in San Luis Obispo County is rated as Medium to High.

HAZUS Analysis

The following pages contain summarized HAZUS Analysis results for three scenarios: 1) a magnitude 7.9 earthquake on the San Andreas Fault with an epicenter at Fort Tejon, 2) a magnitude 6.8 earthquake on the Los Osos Fault with the epicenter approximately five miles west of U.S. Highway 101, and 3) a magnitude 7.2 earthquake on the Hosgri Fault.

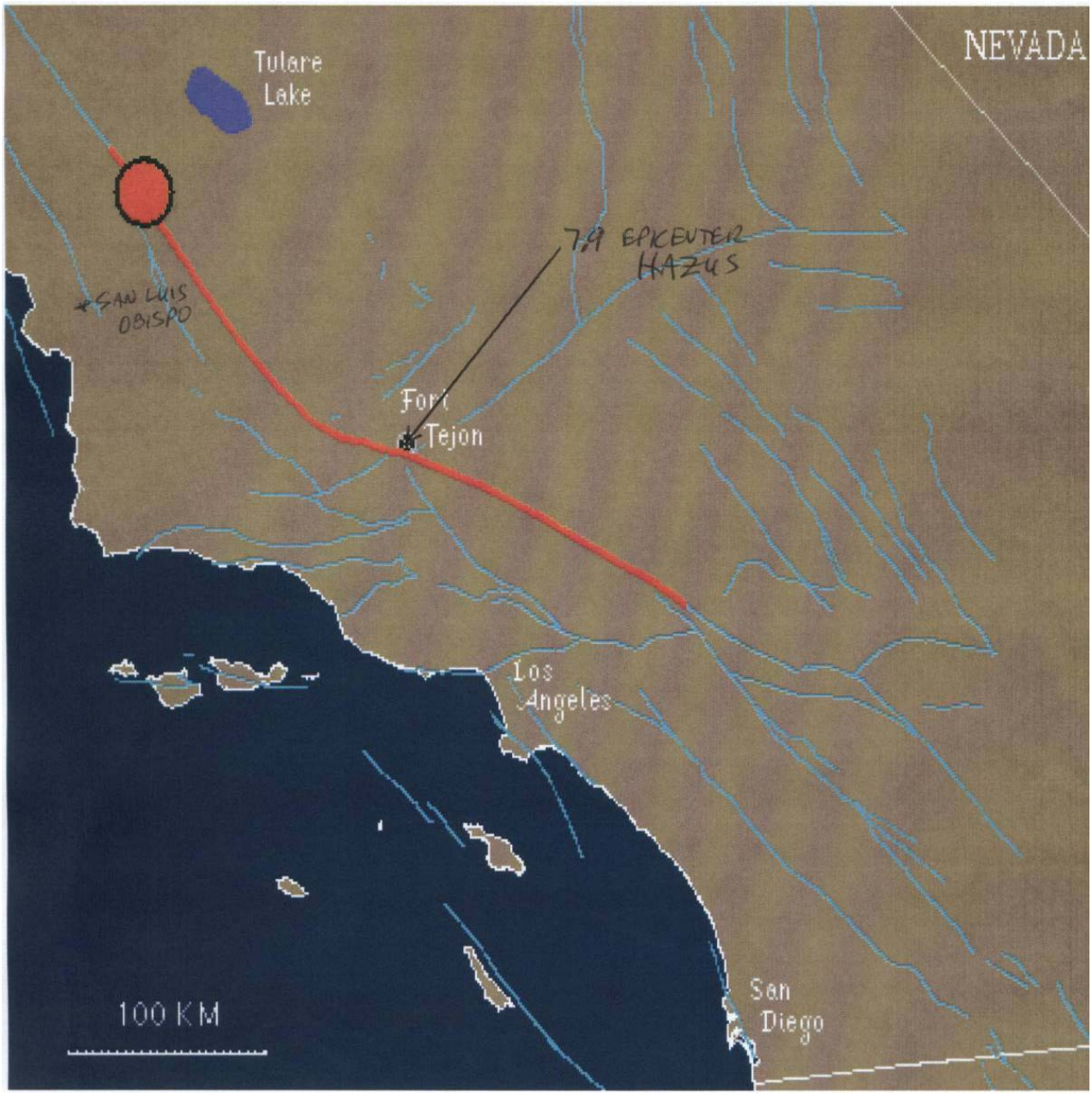
Scenario earthquake damage assessments implemented for this study utilized the Federal Emergency Management Agency's HAZUS® natural hazard loss estimation software. HAZUS® (HAZards U.S.), developed for FEMA by the National Institute of Building Sciences (NIBS), is geographic information system (GIS) based, standardized, nationally applicable multihazard loss estimation methodology and software. Local, state and federal government officials use HAZUS® for preparedness, emergency response, and mitigation planning.

HAZUS Analysis 1: San Andreas Fault

In this scenario, a magnitude 7.9 earthquake on the San Andreas Fault was simulated with an epicenter at Fort Tejon (approximately 45 miles south of Bakersfield and 65 miles north of Los Angeles) – replicating the historical 1857 earthquake. The following Map indicates the Fort Tejon 1857 epicenter.

The results produced by HAZUS are reported by census tract. The summarized results for San Luis Obispo County are presented on the pages immediately following.

HAZUS Analysis – Number 1



SUMMARIZED HAZUS RESULTS
HAZUS Analysis – Number 1
Jurisdiction: San Luis Obispo County

Scenario: San Andreas Fault Earthquake 7.9	
Direct Economic Loss Estimates (thousands of dollars)	
Structural Damage	$78
Non-Structural Damage	$312
Building Damage	$390
Contents Damage	$47
Inventory Loss	$1
Relocation Cost	$3
Income Loss	$10
Rental Income Loss	$16
Wage Loss	$12
Total Loss	$478

Commercial Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Commuting Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Educational Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Hotels Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Industrial Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Other Residential Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

Single Family Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

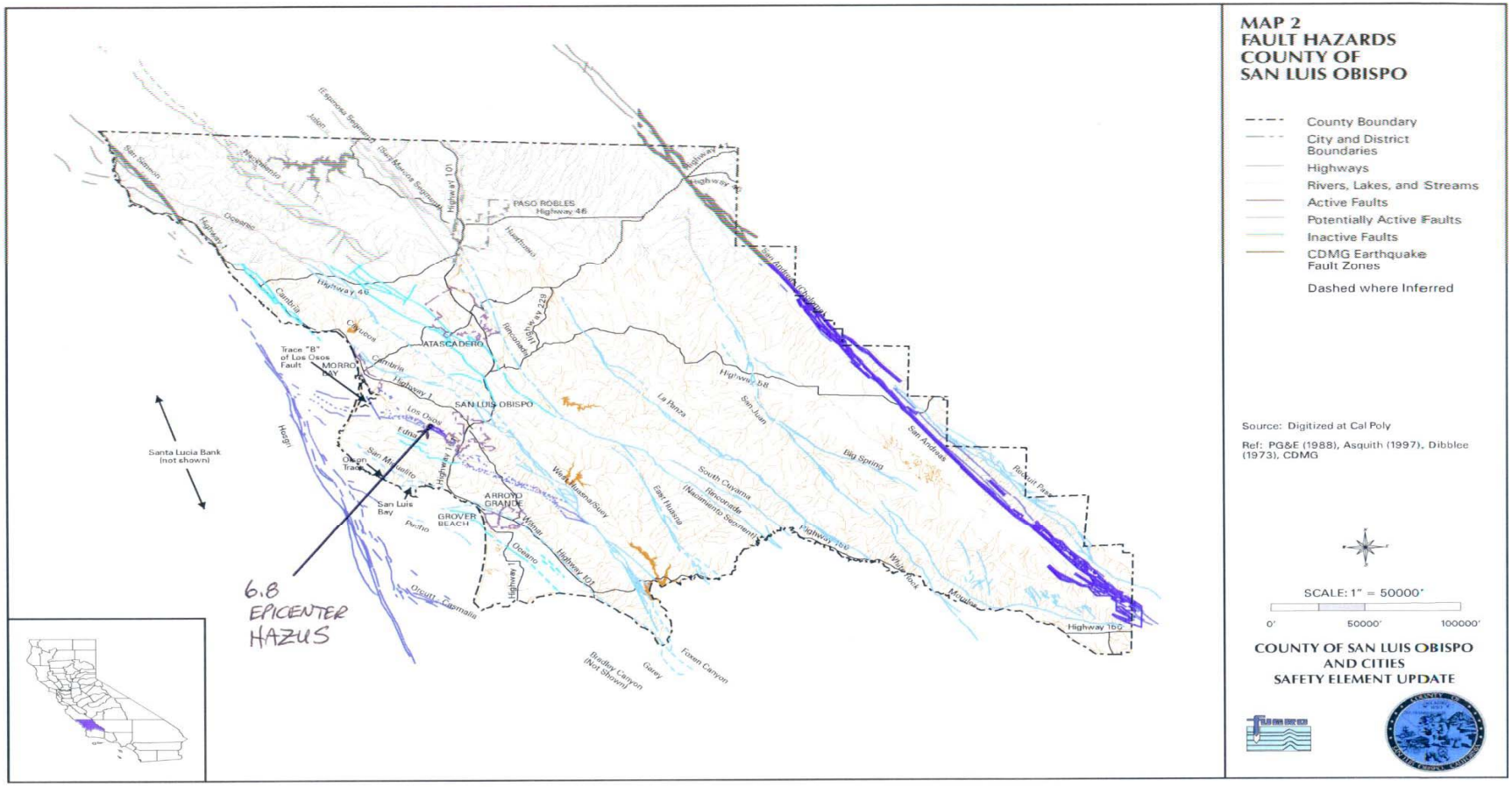
Total Casualties for Daytime Event	
Medical Aid	0
Hospital Treatment	0
Life-Threatening Severity	0
Death	0

HAZUS Analysis 2: Los Osos Fault

This scenario contains a magnitude 6.8 earthquake on the Los Osos Fault with an epicenter approximately 5 miles west of US Highway 101. The following Map indicates the simulated epicenter.

The results produced by HAZUS are reported by census tract. The summarized results for San Luis Obispo County are presented on the pages immediately following.

HAZUS Analysis – Number 2



SUMMARIZED HAZUS RESULTS
HAZUS Analysis – Number 2
Jurisdiction: San Luis Obispo County

Scenario: Los Osos Fault Earthquake 6.8	
Direct Economic Loss Estimates (thousands of dollars)	
Structural Damage	$143,533
Non-Structural Damage	$613,496
Building Damage	$757,028
Contents Damage	$199,614
Inventory Loss	$3,858
Relocation Cost	$3,625
Income Loss	$39,187
Rental Income Loss	$50,729
Wage Loss	$48,619
Total Loss	$1,102,661

Commercial Casualties for Daytime Event	
Medical Aid	369
Hospital Treatment	96
Life-Threatening Severity	15
Death	29

Commuting Casualties for Daytime Event	
Medical Aid	1
Hospital Treatment	1

Life-Threatening Severity	1
Death	0
Educational Casualties for Daytime Event	
Medical Aid	69
Hospital Treatment	17
Life-Threatening Severity	3
Death	5

Hotels Casualties for Daytime Event	
Medical Aid	2
Hospital Treatment	1
Life-Threatening Severity	0
Death	0

Industrial Casualties for Daytime Event	
Medical Aid	38
Hospital Treatment	10
Life-Threatening Severity	1
Death	3

Other Residential Casualties for Daytime Event	
Medical Aid	34
Hospital Treatment	7
Life-Threatening Severity	1
Death	1

Single Family Casualties for Daytime Event	
Medical Aid	24
Hospital Treatment	3
Life-Threatening Severity	0
Death	0

Total Casualties for Daytime Event	
Medical Aid	537
Hospital Treatment	135
Life-Threatening Severity	21
Death	38

HAZUS Analysis 3: Hosgri Fault

This HAZUS scenario involving a 7.2 Hosgri Fault earthquake, was done as part of a project performed by MMI Engineering to provide HAZUS® analysis services in support of the Diablo Canyon Power Plant (DCPP) Earthquake Emergency Evacuation Study (in process as of June 2011) for Pacific Gas and Electric Company. The objective of the project was to provide estimates of potential bridge and roadway damage within DCPP's Emergency Planning Zone (EPZ) resulting from a Moment Magnitude (Mw) 7.2 scenario on the Hosgri Fault, with the resulting information to be used in the subsequent evacuation planning efforts.

This study also leveraged earlier work conducted on behalf of the California Emergency Management Agency (previously the California Office of Emergency Services) to test methodologies for improving the underlying building inventory databases for HAZUS®. Improved building inventory databases developed from San Luis Obispo County Assessor's data (ABS Consulting and ImageCat, Inc., 2006a), updated to reflect HAZUS®' current valuation model (in 2006 dollars), were incorporated into this Hosgri scenario analyses.

HAZUS® Global Summary Report for the Magnitude 7.2 Hosgri Fault Scenario Earthquake with Liquefaction and Landslide Under Dry Conditions. *(This study was also performed under wet conditions- results are available in the San Luis Obispo County Office of Emergency Services).*

General Description of the Region

The geographical size of the region is 3,318.79 square miles and contains 44 census tracts. There are over 92 thousand households in the region and a total population of 262,000 people.

Building Inventory

There are an estimated 79 thousand buildings in the region with a total building replacement value (excluding contents) of 15,373 (millions of dollars). Approximately 94% of the buildings (and 90% of the building value) are associated with residential housing. In terms of building construction types found in the region, wood frame construction makes up 86% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two 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 7 hospitals in the region with a total bed capacity of 1,484 beds. There are 105 schools, 19 fire stations, 14 police stations and 1 emergency operation facilities. With respect to HPL facilities, there are 14 dams identified within the region. Of these, 6 of the dams are classified as 'high hazard'. The inventory also includes 28 hazardous material sites, 0 military installations and 1 nuclear power plant.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications.
The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 1,661.00 (millions of dollars). This

inventory includes over 2,474 kilometers of highways, 359 bridges, 23,226 kilometers of pipes.

The replacement value of the transportation and utility lifeline systems is estimated to be 730 and 931 millions of dollars respectively.

Table 1: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	359	429.80
	Segments	10,991	0.00
	Tunnels	0	0.00
		Subtotal	**429.80**
Railways	Bridges	8	0.90
	Facilities	3	8.00
	Segments	15	104.30
	Tunnels	0	0.00
		Subtotal	**113.20**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	11	14.10
		Subtotal	**14.10**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	2	21.30
	Runways	4	151.90
		Subtotal	**173.20**
		Total	**730.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	232.30
	Facilities	1	39.30
	Pipelines	0	0.00
		Subtotal	**271.60**
Waste Water	Distribution Lines	NA	139.40
	Facilities	8	628.70
	Pipelines	0	0.00
		Subtotal	**768.10**
Natural Gas	Distribution Lines	NA	92.90
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**92.90**
Oil Systems	Facilities	2	0.20
	Pipelines	0	0.00
		Subtotal	**0.20**
Electrical Power	Facilities	2	259.60
		Subtotal	**259.60**
Communication	Facilities	34	4.00
		Subtotal	**4.00**
		Total	**1,396.40**

Building Damage

HAZUS estimates that about 9,281 buildings will be at least moderately damaged. This is over 12% of the total number of buildings in the region. There are an estimated 392 buildings that will be damaged beyond repair. Table 3 below summaries the expected damage by general occupancy for the buildings in the region. Table 4 summaries the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	483	1.00	76	0.34	25	0.38	4	0.17	0	0.03
Commercial	1,959	4.07	1,058	4.69	301	4.53	48	2.13	9	2.18
Education	117	0.24	39	0.17	7	0.10	3	0.13	1	0.16
Government	71	0.15	36	0.16	14	0.21	4	0.17	1	0.20
Industrial	42	0.09	10	0.04	3	0.05	1	0.03	0	0.01
Other	5,064	10.52	4,035	17.90	3,963	59.74	1,142	50.64	122	31.07
Religion	270	0.56	107	0.47	14	0.21	6	0.25	1	0.35
Single Family	40,127	83.37	17,176	76.21	2,307	34.78	1,049	46.49	259	66.00
Total	**48,133**		**22,537**		**6,634**		**2,256**		**392**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	44,874	93.23	19481	86.44	2,616	39.44	1,136	50.34	281	71.81
Steel	19	0.04	7	0.03	5	0.07	2	0.07	0	0.08
Concrete	6	0.01	2	0.01	1	0.01	1	0.02	0	0.04
Precast	2	0.01	1	0.00	0	0.01	0	0.01	0	0.02
RM	745	1.55	185	0.82	119	1.79	40	1.76	5	1.37
URM	51	0.11	34	0.15	21	0.31	6	0.25	1	0.34
MH	2,435	5.06	2827	12.54	3,872	58.37	1,073	47.55	103	26.35
Total	**48,133**		**22,537**		**6,634**		**2,256**		**392**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 1,484 hospital beds available for use. On the day of the earthquake, the model estimates that only 1,296 hospital beds (87%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 99% of the beds will be back in service. By 30 days, 100% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	7	0	0	7
Schools	105	0	0	88
EOCs	1	0	0	1
PoliceStations	14	0	0	12
FireStations	19	0	0	12

Transportation and Utility Lifeline Damage

Table 6: 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	10,991	0	0	10,991	10,991
	Bridges	359	2	0	356	358
	Tunnels	0	0	0	0	0
Railways	Segments	15	0	0	15	15
	Bridges	8	0	0	8	8
	Tunnels	0	0	0	0	0
	Facilities	3	0	0	3	3
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	11	2	0	11	11
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
	Facilities	2	0	0	2	2
	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.

Table 7: 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	1	1	0	0	1
Waste Water	8	4	0	0	6
Natural Gas	0	0	0	0	0
Oil Systems	2	2	0	0	2
Electrical Power	2	2	0	0	2
Communication	34	3	0	33	34

Table 8: Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	11,613	475	234
Waste Water	6,968	376	185
Natural Gas	4,645	402	197
Oil	0	0	0

Table 9: 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	92,739	2,021	898	30	0	0
Electric Power		10,169	5,900	2,225	404	15

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 10,400 ignitions that will burn about 0.59 square miles- 0.02 % of the region's total area. The model also estimates that the fires will displace about 1,185 people and burn about 68 millions of dollars of building value.

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 828 households to be displaced due to the earthquake. Of these, 533 people (out of a total population of 262,000) 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 at its maximum. The 2:00 PM estimate considers that the educational, commercial and industrial sector loads are at their maximum. The 5:00 PM represents peak commute time.

Table 10: 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	4	1	0	0
	Industrial	0	0	0	0
	Other-Residential	69	10	0	1
	Single Family	118	17	1	1
	Total	**192**	**28**	**1**	**2**
2 PM	Commercial	64	11	1	2
	Commuting	1	1	1	0
	Educational	21	4	0	1
	Hotels	1	0	0	0
	Industrial	1	0	0	0
	Other-Residential	13	2	0	0
	Single Family	22	3	0	0
	Total	**122**	**20**	**3**	**3**
5 PM	Commercial	52	9	1	2
	Commuting	10	13	22	4
	Educational	7	1	0	0
	Hotels	1	0	0	0
	Industrial	1	0	0	0
	Other-Residential	25	4	0	0
	Single Family	46	7	0	1
	Total	**142**	**34**	**24**	**7**

Economic Loss

The total economic loss estimated for the earthquake is 973.13 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 692.62 millions of dollars; 10 % 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 84 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates (millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.43	6.49	0.00	1.29	8.21
	Capital-Related	0.00	0.19	3.72	0.00	0.18	4.09
	Rental	7.42	4.10	2.23	0.00	0.43	14.18
	Relocation	24.88	10.18	5.65	0.02	2.43	43.17
	Subtotal	**32.30**	**14.90**	**18.08**	**0.03**	**4.34**	**69.65**
Capital Stock Loses							
	Structural	58.64	12.40	5.56	0.05	2.77	79.42
	Non-Structural	277.75	64.99	30.45	0.42	16.55	390.16
	Content	104.32	16.85	20.52	0.33	11.12	153.14
	Inventory	0.00	0.00	0.16	0.05	0.05	0.25
	Subtotal	**440.70**	**94.24**	**56.69**	**0.85**	**30.50**	**622.97**
	Total	**473.00**	**109.14**	**74.77**	**0.87**	**34.83**	**692.62**

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 12 & 13 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 12: Transportation System Economic Losses (Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	0.00	$0.00	0.00
	Bridges	429.79	$8.45	1.97
	Tunnels	0.00	$0.00	0.00
	Subtotal	**429.80**	**8.50**	
Railways	Segments	104.32	$0.04	0.04
	Bridges	0.85	$0.01	0.72
	Tunnels	0.00	$0.00	0.00
	Facilities	7.99	$1.62	20.27
	Subtotal	**113.20**	**1.70**	
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	14.15	$3.52	24.91
	Subtotal	**14.10**	**3.50**	
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	21.30	$3.35	15.74
	Runways	151.86	$0.00	0.00
	Subtotal	**173.20**	**3.40**	
	Total	**730.30**	**17.00**	

Table 13: 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	39.30	$18.91	48.13
	Distribution Lines	232.30	$3.29	1.41
	Subtotal	**271.56**	**$22.20**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	628.70	$143.89	22.89
	Distribution Lines	139.40	$2.60	1.87
	Subtotal	**768.07**	**$146.49**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	92.90	$2.78	2.99
	Subtotal	**92.91**	**$2.78**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.20	$0.05	20.59
	Subtotal	**0.24**	**$0.05**	
Electrical Power	Facilities	259.60	$91.42	35.21
	Subtotal	**259.60**	**$91.42**	
Communication	Facilities	4.00	$0.58	14.54
	Subtotal	**4.01**	**$0.58**	
	Total	**1,396.39**	**$263.51**	

2. Hazard: Flooding

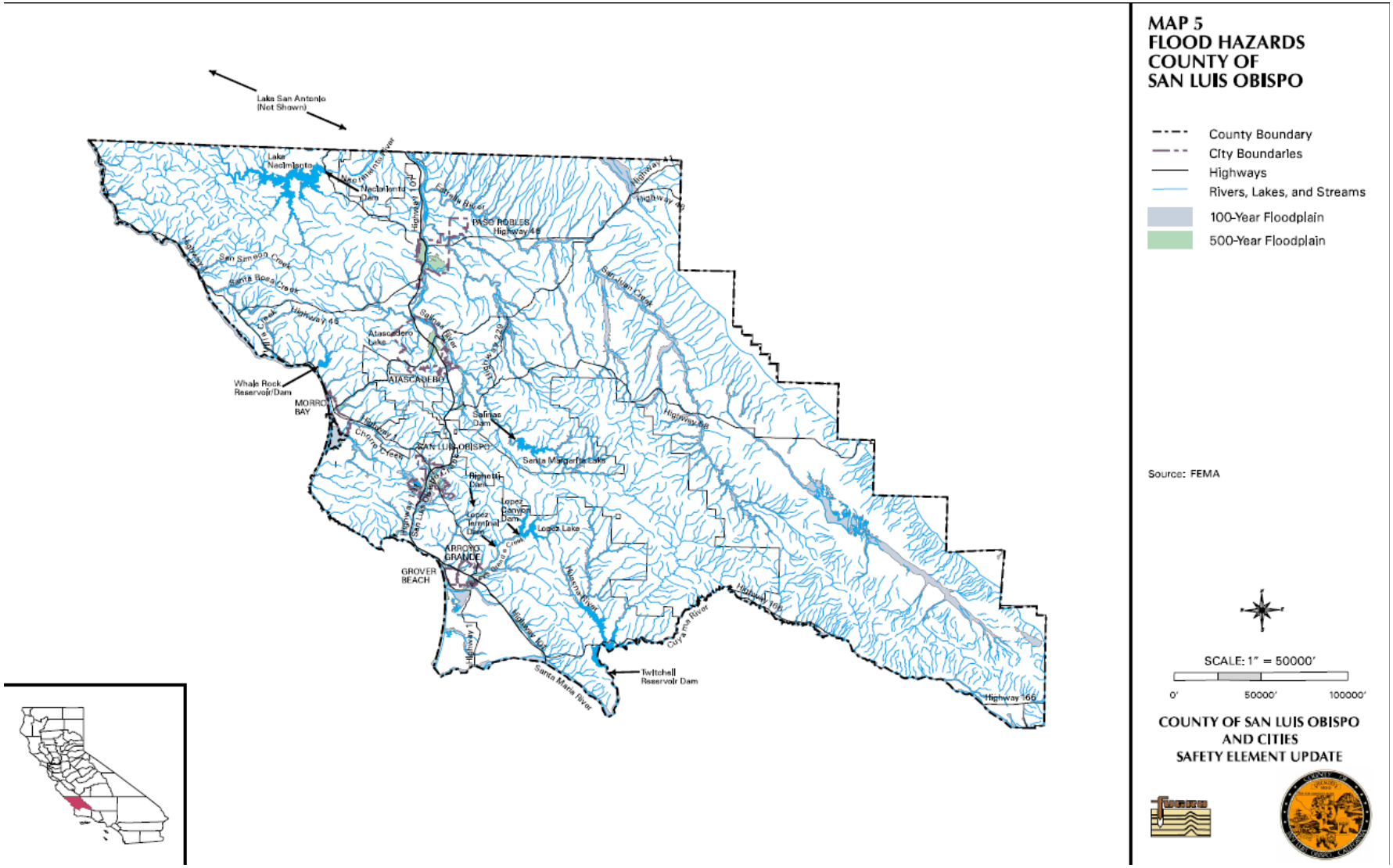
Severity: Medium	Probability: Medium

Hazard Definition
A flood is defined as an overflowing of water onto an area of land that is normally dry. Floods generally occur from natural weather related causes, such as a sudden snows melt, often in conjunction with a wet or rainy spring or with sudden and very heavy rain fall. Floods can also result from human causes such as a dam impoundment bursting.

For floodplain management purposes, the Federal Emergency Management Agency (FEMA) will often use the term “100-year flood” or “500-year flood” to describe the size or magnitude. These terms are misleading. It is not a flood that occurs once every 100 or 500 years. Rather, it is the flood elevation that has a 1 percent chance of being equaled or exceeded each year. Thus, a 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 and to determine the need for flood insurance. A structure located within a special flood hazard area shown on a map has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage.

The following map (Map 5 from the San Luis Obispo County Safety Element) depicts the 100-year and 500-year floodplain.


MAP 5
FLOOD HAZARDS
COUNTY OF
SAN LUIS OBISPO
County Boundary
City Boundaries
Highways
Rivers, Lakes, and Streams
100-Year Floodplain
500-Year Floodplain
Source: FEMA
SCALE: 1" = 50000'
0'
50000'
100000'
COUNTY OF SAN LUIS OBISPO
AND CITIES
SAFETY ELEMENT UPDATE
Lake San Antonio
(Not Shown)
Lake Nacimiento
Nacimiento Dam
Nacimiento River
Highway 101
Estrella River
PASO ROBLES
Highway 46
Highway 41
Highway 58
San Simeon Creek
Santa Rosa Creek
Highway 46
Atascadero Lake
Salinas River
Highway 229
ATASCADERO
Whale Rock
Reservoir/Dam
MORRO
BAY
Highway 1
Chorro Creek
Salinas
Dam
SAN LUIS OBISPO
Santa Margarita Lake
Highway 227
Highway 58
Highway 166
Righetti
Dam
Lopez
Canyon
Dam
Lopez
Terminal
Dam
Lopez Lake
San Luis Obispo Creek
ARROYO
GRANDE
Arroyo Grande Creek
GROVER
BEACH
Nacimiento River
Highway 101
Highway 1
Highway 166
Cuyama River
Santa Maria River
Twitchell
Reservoir Dam
Highway 166

History

San Luis Obispo County has experienced severe flooding events that have resulted in extensive property damage. Flooding hazards are most likely to exist along major river and stream courses including the Salinas River, San Luis Obispo Creek, Santa Rosa Creek, Arroyo Grande Creek, Morro Creek and Huerhuero Creek. Areas that have been recently affected by flooding impacts are the areas most to be likely to be affected by future events. Therefore, a historical perspective of the effects of recent flood events can provide useful insight in land use planning and reduction of future flood hazard risks.

The following table contains a list of previous flooding events throughout the County over the past fifty years.

Table 4-4: Major Floods in San Luis Obispo County

Incident Date	Location	Intensity	Incident Description
January-February 1969	San Luis Obispo County including Paso Robles, Avila, Pismo Beach, and San Luis Obispo	12 to 21 inches of rain	January 1969: a series of storms delivered 12-21 inches of rainfall over an 8 day period. In February, another storm brought over 5 inches of rain. The most severe damage to urban property occurred in the City of SLO, where San Luis Obispo Creek channel filled with debris and flow over-topped the channel banks and onto the city streets. Severe damages were sustained by streets, highways, and utilities through-out the County. In Cambria, the water-supply system was damaged. The sewage-treatment plants at Morro Bay, Avila Beach, and Pismo Beach were inundated by both floods.
January, 1973	City of San Luis Obispo		Unusually heavy rainfall occurred over a 10 hour period. San Luis Obispo Creek, and its tributary, Stenner Creek, overtopped their banks and inundated a wide area of downtown San Luis Obispo.
February 22, 1993	Cambria	2.5 inches of rain	This flash flood occurred in a 2 hour period causing $500,000 damage to 4 businesses and several residences.
January and March, 1995	City of San Luis Obispo, Cambria		Serious flooding occurred in all coastal and many inland streams. Extensive damaged occurred in the City of San Luis Obispo and the San Luis Obispo Golf Course. Cambria had up to 6 feet of water in areas.
May 5, 1998	Southern San Luis Obispo		Heavy rain produced flash flooding and mudslides across Southern SLO County and

			closed portions of Highway 166.
January 11. 2001	Coastal Flooding		An extremely large swell, combined with high astronomical tides produced heavy surf and flooding of coastal areas along Central and Southern California.
March 5, 2001	San Luis Obispo County including Nipomo, Arroyo Grande, Oceano and Pismo Beach	2 to 13 inches of rain	A powerful and slow-moving storm brought heavy rain, strong winds and snow to Central and Southern California and extensive flooding to the County. In Oceano, the Arroyo Grande Creek overflowed, destroying numerous crops and damaging 1 home. The Pacific Dunes RV Park flooded. In Arroyo Grande, flooding along Corbett Creek damage 4 homes and 5 classrooms at AG High School. In Pismo Beach, Pismo Creek flooding damaged homes in Pismo Court Village. In Nipomo, 20 to 30 homes were damaged. In Creston, there was widespread urban flooding.
December 27, 2004	San Luis Obispo County	1 to 6 inches	A powerful Pacific storm brought heavy rain, snow and flooding to Central and Southern California. Flash flooding closed Highway 101 at Gaviota and killed a Paso Robles man.
Late December of 2005 and early January 2006	Cambria and Oceano	4 to 6 inches	In late December of 2005 and early January 2006 a series of storms battered the County. Most of the damage occurred New Years Eve and day. High winds and saturated soils resulted in significant tree falls particularly in the Cambria area where heavy damage was reported to a number of homes and businesses. There was one fatally which was a result of a tree falling on a pick-up truck while it was traveling on U.S. 101 in the Paso Robles area. Damage estimates for both private property loss and the loss and cost to local governments totaled approximately $3,000,000.
December 19, 2010	San Luis Obispo County, Oceano	5 to 8 inches	A series of and slow-moving storms brought heavy rain, strong winds and light snow to the area. The most severe damages began on December 19, with primarily affected areas in the South County, particularly in the Oceano area. Damages reported to Cal EMA were just over $2,000,000 in private property losses and an estimated cost and loss total to local governments of just over $1,100,000 for a total storm damage cost estimate of approximately $3,135,000.

Flood Hazard Potential

San Luis Obispo County

A Flood Insurance Study conducted by FEMA for San Luis Obispo County noted that runoff in the streams of the County is small, with appreciable flows occurring only during and immediately after precipitation. However, during large storms, stream flow increases rapidly, and flood waters can contain high amounts of debris, causing major flood damage. For many of the water courses that are located in the County, areas that may be inundated in response to 100-year storm events are located adjacent to or near the stream or river channel. Since many of the County's watercourses are located in mountainous or remote areas with little or no development, flooding events along these rivers and streams generally result in minimal impacts. Other watercourses that are located in the County, however, have floodplains that extend well beyond the defined stream or river channel. When a flood occurs along one of these watercourses, and it is located in or near an area that is urbanized, damage to property and infrastructure can be widespread.

In the southern portion of San Luis Obispo County, Arroyo Grande Creek, San Luis Obispo Creek, and their respective tributaries, flow through urbanized areas and that have caused major floods. The north coast area of the County also contains a number of short, steep-gradient creeks that can experience rapid increases in water flows in response to storm events in Cambria. Santa Rosa Creek is a watercourse that has caused significant flooding events. The largest water course in the inland portion of the County is the Salinas River, which is located adjacent to numerous incorporated and unincorporated communities. Although the floodplain of the Salinas River can be extensive, it is generally contained within the river channel. Other major inland water courses include the Estrella River and San Juan Creek. Due to the generally remote locations of these watercourses, flooding impacts are generally not significant.

Communities within San Luis Obispo County

Communities of San Luis Obispo County that have been mapped by FEMA as being located within the 100-year floodplain are described below:

Arroyo Grande

Areas of potential flooding in response to a 100-year storm are located adjacent to Canyon/Meadow Creek on the west side of the City, adjacent to Corbett Canyon and Arroyo Grande Creeks in the eastern portion of the City, and a limited area along Los Berros Creek, in the southeastern portion of the City. Areas that would be inundated in response to a 100-year flood along these creeks are generally located along stream channels; however, in isolated areas, adjacent properties could be adversely affected. Near the confluence of Corbett Canyon and Arroyo Grande Creek, the 100-year floodplain widens, resulting in impacts to properties. The floodplain along Arroyo Grande Creek also widens slightly on the north and south sides of U.S. 101. Although areas subject to flooding from a 100-year flood are limited, floodwater could cause

roadways to become impassable, thereby hindering travel and response efforts. Map 5 depicts areas subject to inundation from a 100-year storm, and does not necessarily depict areas that may be affected by local drainage problems. The City has worked to alleviate drainage problems in these areas.

Atascadero

The Salinas River is located in the northeastern and eastern areas of the City. The floodplain of the river is generally removed from the developed areas, however, properties on the east side could be affected by flooding during a 100-year storm. The crossing of Halcon Road over the Salinas River is frequently washed-out in storm events and would be washed-out during a 100-year storm event.

Atascadero Creek extends through the central portion of the City, but has a limited potential for flooding impacts as the 100-year floodplain is generally confined to the channel and adjacent properties. Where Atascadero Creek crosses U.S. 101 and State Route 41, a 100-year flood could cause inundation of the portions of the highways. This would have the potential to result in significant local and regional transportation impacts. Although the 500-year floodplain is not generally used for planning purposes, it should be noted that the area designated as being located within the 500-year floodplain of the Salinas River and Atascadero Creek encompasses approximately 1.5 square miles of the central portion of Atascadero.

In the southeastern portion of Atascadero, flooding hazards could result from 100-year flows in several branches of Paloma Creek. Identified inundation areas are primarily located adjacent to the creek channels, although some more extensive areas could also be affected. In the western portion of the City, flooding along Graves Creek would primarily be restricted to the stream channel.

Map 5 from the San Luis Obispo County Safety Element depicts areas subject to inundation from a 100-year storm, and does not necessarily depict areas that may be affected by local drainage problems. Atascadero has historically experienced drainage and related flooding problems in an area known as the Amapoa/Tecorida Basin, which is located to the east of Atascadero Creek and Morro Road, and south of U.S. Highway 101. This area has been subject to building moratoriums and fee programs to pay for drainage improvements. In recognition of this drainage problem, the lower portion of the basin has a Flood Hazard overlay zoning designation.

The Amapoa/Tecorida drainage basin has been prone to flooding for a variety of reasons. The primary cause of flooding in this area is the result of storm events which cause water flows in Atascadero Creek, greater that the 17-year design storm, to overtop the Atascadero Lake spillway channel banks and flow into the Amapoa/Tecorida basin.

Other factors that have contributed to inadequate drainage in this area include flat topography and low water velocities increasing run-off volumes due to urban

development, undersized drainage culverts and channels, particularly at Highway 101, and the lack of a formal method to maintain existing drainage facilities on private property.

A variety of control strategies for correcting the drainage deficiencies of the Amapoa/ Tecorida area has been proposed. These measures include improvements to the Atascadero Lake spillway, construction of a new storm drain along Highway 41, requiring drainage analysis for projects located within the basin that increase building density, and provision of a mechanism to facilitate the maintenance of drainage facilities on private property. Construction of the storm drain along Highway 41 has already begun.

Grover Beach

Isolated areas of potential flooding in response to a 100-year storm are located in the northern and western portions of the City that are adjacent to Meadow Creek. Flood hazard areas in the northern portion of the City are restricted to an area south of U.S. 101 and north of Nacimiento Avenue. A mobile home subdivision is located in this area.

In the western part of the City, flooding could affect areas located west of the Union Pacific Railroad tracks. Map 5 depicts areas subject to inundation from a 100-year storm, and does not necessarily depict areas that may be affected by local drainage problems. Local flooding conditions currently exist in two isolated areas within the City where properties are located below street level. One parcel is subject to flooding from a 50-year storm event if sandbags are not used or if cars are parked on the street. For the second parcel a 75-100 year storm event will flood this property, however, an asphalt berm has been constructed which alleviates flooding under storms of lesser magnitude.

Morro Bay

Flooding in the City of Morro Bay could occur as a result of flows in Morro Creek, Little Morro Creek, Chorro Creek, and the several smaller creeks located in the northern portion of the City. Flooding from these creeks could potentially render State Highway 1 bridges over these waterways unusable during a major storm.

During the rains of 1995 Highway 1 was closed through Morro Bay due to flooding. Flooding from Chorro Creek would affect the eastern portion of the City. In 1995, flooding from Chorro Creek inundated Twin Bridges (now Chorro Creek Bridge) for several days, forcing travelers from Los Osos to detour through San Luis Obispo in order to reach Morro Bay. The new Chorro Creek Bridge, completed in 1996, was constructed at a higher elevation than Twin Bridges to avoid future closures due to flooding.

The creeks located in the northern portion of the City traverse areas that have been extensively developed with residential uses. In 1995, houses located along Alva Paul Creek, and other houses in north Morro Bay, were flooded. Also, the area between Highway 41 and Radcliffe Street flooded in 1995 causing much property damage to both

residences and businesses. In the isolated areas where the creek floodplains extend beyond the stream channels, flooding impacts could also be significant.

Paso Robles

Several watercourses are located within Paso Robles that have the potential to cause flooding impacts. The Salinas River is the major watercourse located in Paso Robles, and runs through the center of the City. Flows in the Salinas River that could result from a 100-year storm are primarily contained in the river channel. On the west side of the City, flooding from Mountain Springs Creek could affect isolated residential areas.

The area located adjacent to and west of U.S. 101 could also be inundated by runoff from a 100-year storm. 100-year flooding events could result in the inundation of areas in the southwestern portion of the City. In the eastern portion of the City, several unnamed creeks have 100-year floodplains that would primarily affect the creek channel and adjacent properties. In the northern portion of the City, Huerhuero Creek could cause isolated areas of flooding along the road that leads to the Paso Robles Municipal Airport.

Pismo Beach

The City has two areas with potential flood hazards: the Pismo Creek/Price Canyon and Meadow Creek/Pismo Marsh drainage ways. Since major flooding in 1971, the city, with the aid of the Army Corp of Engineers, has made alterations to Pismo Creek channel to reduce flood hazard. Existing flood plain maps prepared prior to the creek improvements show that substantially developed areas in the city's commercial core and Pismo Creek Planning Areas could be subject to flooding from a 100 year storm.

The majority of the Meadow Creek floodplain within the city limits is contained within the State Department of Fish and Game controlled Pismo Lake Ecological Preserve (Pismo Marsh). The preserve is bounded on all sides by slopes which rise over the 100 year level of flood, thus containing flooding within the preserve boundary. Meadow Creek leaves the preserve at State Highway1 which crosses the creek via a low lying bridge. The creek flows into the North Beach Campground where it divides into two channels one flowing into the ocean and the other flowing southward into the Grover Beach area. The creek channel floods state Highway 1, the commercial property to the north of the creek at State Highway 1, and the North Beach Campground during periods of heavy storm flows. The level of flooding is affected by tidal conditions.

City of San Luis Obispo

The City of San Luis Obispo is traversed by several creeks, including San Luis Obispo Creek and its major tributaries, Stenner Creek, Brizziolari Creek and Prefumo Creek.

The 100-year floodplains for these creeks encompass extensive areas of the City on the east and west sides of U.S. 101, including the downtown area. Historic flooding on San Luis Obispo Creek, such as the floods of 1969, 1973, and 1995, have resulted in

substantial property damage and loss of life. Several areas in the downtown of San Luis Obispo are subject to localized flooding.

Unincorporated Communities of San Luis Obispo County

Major unincorporated communities of San Luis Obispo County that have been mapped by FEMA as being located within the 100-year floodplain are described below.

South Bay
The South Bay area of the County (including the communities of Baywood Park, Los Osos, and Cuesta-by-the Sea) has not been identified as being located within a 100-year storm floodplain by the most recent Flood Insurance Rate Maps. Flooding in response to a 100-year storm is generally confined to shoreline areas surrounding Morro Bay. There are locations in this area, however, that are subject to chronic localized flooding. After a significant rain, localized flooding occurs throughout the Los Osos area. Numerous intersections within the community experience flooding during storm events.

Cambria
Santa Rosa Creek has a history of flooding which has caused severe erosion of the creek banks as well as damage to phone and gas lines, water wells, and bridges. Major bank erosion in the past has caused complete interruption of the town's water supply. The 100-year floodplain for Santa Rosa Creek is generally confined to the creek channel and surrounding areas south of Main Street. However, the West Village business area along Main Street has been subjected to severe flooding as a result of recent flood levels that overtopped the banks of Santa Rosa Creek. A creek bypass and West Village Storm Drain system constructed in 2009 has significantly reduced, but not eliminated, this potential flood scenario.

Cayucos
100-year flood areas near the community of Cayucos are predominately confined to areas adjacent to Cayucos Creek, Little Cayucos Creek, and Willow Creek. Several limited areas of the community along these areas have been designated as being in a 100-year floodplain.

Nipomo
Flooding in the community of Nipomo occurs primarily along Nipomo Creek and its tributaries, such as Deleissiques Creek and Haystack Creek. The 100-year floodplain along these creeks encompasses areas adjacent to the watercourses, along with extensive areas located east and west of U.S. Highway 101.

Oceano
Flooding in Oceano is a result of heavy flows in Arroyo Grande Creek and Meadow Creek.The most significant inundation area is near the creeks' confluences with the

ocean. Areas subject to flooding as a result of a 100-year storm generally extend south of Highway 1 and west of Halcyon Road. The Arroyo Grande Creek channel has limited storm capacity and has potential of overtopping levees through town. An emergency response plan has been adopted to deal with potential breach of levees and the wide spreading flooding that may result. Flooding within the town generally occurs at the Oceano County Airport and the Sanitation District Wastewater Plant, along with the residential neighborhoods in low-lying areas around these facilities in particular. This area was subject to the greatest extent of damage in the December 2010 storm.

San Margarita

Yerba Buena Creek, which drains a significant watershed, runs through the community and continues north toward before joining Santa Margarita Creek which empties into the Salinas River. The shadowing effect of Santa Lucia range to the south of the community tends to limit the amount of rainfall. Localized flooding occurs due to potential creek flows and the flat terrain inhibiting runoff to the creeks.

Templeton

Watercourses located in and near the community of Templeton include the Salinas River and Toad Creek. The 100-year floodplain of the Salinas River as it passes to the east of the community is confined to the river channel and does not significantly affect the town. The floodplain for Toad Creek is not extensive. The 100-year flood along this watercourse would have the potential to affect adjacent properties most notably along Salinas and Eddy Streets and an area between Route 101 and Main Street at the north edge of town.

San Miguel

The community of San Miguel is located west of the Salinas River, and north of the confluence of the Estrella River with the Salinas River. The 100-year floodplain of the Salinas River near San Miguel is confined to the river channel and does not significantly affect populated areas of the community. Localized flooding has occurred along Mission Street and the railroad tracks due to the flat terrain in town. Systems to drain area to river have been partially constructed.

Creston

The community of Creston is located between the west and middle branches of Huerhuero Creek. The 100-year floodplains of these creeks are located adjacent to the western and eastern edges of the community and could have the potential to affect adjacent developed properties.

Shandon

The community of Shandon is located southwest of the confluence of San Juan Creek with the Estrella River. The 100-year floodplains of these watercourses are not located within the town of Shandon, but are located adjacent to developed areas. These water courses also cross State Routes 41 and 46 near the town. Flooding along these

watercourses could have the potential to adversely affect access to and from the community.

Rural Areas
Many areas are isolated or forced into excessively long detours during and after floods due to flood impacts on roads. These access impacts are a significant "flood hazard." In 1997 after the Logan fire, severe rains took out California Highway 166 and two CHP officers and two civilians died, in addition to property loss.

Ordinances and Regulations

Arroyo Grande
Ordinance Number 366 C.S. of *The Arroyo Grande Municipal Code* establishes the "Flood Hazard" (F-H) zoning district. The purpose of the ordinance is to promote the public health, safety, and general welfare, and to minimize public and private loses due to flood conditions.

The City of Atascadero's Zoning Ordinance, 9-3.600, FH (Flood Hazard) Overlay Zone, identifies areas where terrain would present new developments and their users with potential flood hazards. In addition, Ordinance No. 193, *An Ordinance Adding Chapter 5 to Article 7 of the City of Atascadero Municipal Code Relating to Flood Damage Prevention*, provides further guidance to reduce flood damage. It is the purpose of this ordinance to promote the public health, safety, and general welfare and to minimize public and private loses due to flood conditions. Also, Ordinance No. 304 amended Title 6, Chapter 13 of the Atascadero Municipal Code to provide a mechanism to allow the Fire Chief to order the removal of weeds, rubbish, and similar material that has the potential to become a flooding hazard.

Grover Beach
Sections 7300-7361, *Chapter 3 - Flood Damage Prevention Regulations*, of the Grover Beach Municipal Code addresses flood hazards relative to public health, safety and general welfare. The purpose of these regulations is to minimize public and private loses due to flood conditions.

Morro Bay
Local flood regulations for the City of Morro Bay are provided in sections 14.72.010-14.72.060 of *Chapter 14.72- Flood Damage Prevention* contained in the Morro Bay Municipal Code. The intent of these regulations is to reduce public and private loses due to flood damage.

Paso Robles
The City of Paso Robles Municipal Code, *Chapter 21.14 Flood Damage Prevention Regulations* specify methods of reducing flood losses. A variety of standards relative to

construction, utilities, and manufactured homes are provided to minimize public and private losses due to flood conditions.

Sections 17.84.010-17.84.170 within *Chapter 17.84, Flood Damage Prevention Regulations* of the San Luis Obispo Municipal Code set forth means to reduce losses from floods. These standards focus on areas located within or near the 100-year floodplain. Section 8.12.010-8.12.010 of the Municipal Code provides a mechanism for the City to require the removal of dangerous obstructions in streambeds that have the potential to obstruct water flow.

Pismo Beach

Local flood regulations for the City of Pismo Beach are provided in Chapters 15.44 *Flood Hazard Area Use Control* and Chapter 17.075 *Flood Plain Overlay Zone*. contained in the Pismo Beach Municipal Code. The intent of these regulations is to reduce public and private loses due to flood damage.

San Luis Obispo

The *San Luis Obispo County Land Use Ordinance and Coastal Zone Land Use Ordinance* (Titles 22 and 23 of the County Code), provides standards for the preparation and submittal of drainage plans for new development. These regulations specify when drainage plans are required, the contents of an adequate drainage plan, drainage standards, and the plan review and approval process. The Land Use Ordinances also contain the County's Floodplain Ordinance, which specifies development standards for areas that have a Flood Hazard (FH) combining land use designation. The development standards contained in the Floodplain Ordinance pertain to land use permit processing and construction standards for new development located in areas that have the potential to be inundated by a 100-year flood.

Relationship to Other Hazards – Cascading Effects

While there are some benefits associated with flooding, such as the replenishment of beach sand, and nutrients to agricultural lands, it is generally considered a hazard to development in floodplains. Floods can cause many cascading effects. Fire can break out as a result of dysfunctional electrical equipment. Hazardous materials can also get into floodways, causing health concerns and polluted water supplies. In many instances during a flood, the drinking water supply will be contaminated.

- **Effects on people and housing.** Direct impacts of flooding can include injuries and loss of life, damage to property and health hazards from ruptured sewage lines and damaged septic systems. Secondary impacts include the cost and commitment of resources for flood fighting services, clean-up operations, and the repair or replacement of damaged structures.

- **Effects on commercial and industrial structures.** Flooding can cause damage to commercial and industrial structures, damage to vegetation, crops and livestock. Beach erosion results in the loss of sand from coastal areas. This hazard can accelerate the rate of erosion of coastal bluffs, and can also contribute to increased wave-related damage to coastal structures.

- **Effects on infrastructure.** Flooding can cause damage to roads, communication facilities and other infrastructure.

- **Effects on agriculture.** Effects on agriculture can be devastating. Flooding can damage crops, livestock and dairy stock. In addition to the obvious impacts on crops and animals, flooding can have deleterious effects on soil and the ability to reinvigorate the agricultural activities impacted once the flood waters recede. Damage to water resources such as underground irrigation systems, water storage reservoirs, springs and other natural water bodies could have a serious effect upon agriculture operations.

Plans and Programs

In San Luis Obispo County, the County Flood Control and Water Conservation District, through the County Public Works Department, is responsible for developing potential projects which could protect life and property from flood hazards through community involvement and establishing funding mechanisms. The District has the authority to maintain and construct flood control improvements on major drainage facilities located throughout the County when specific flood control zones are established.

The County is taking action to:

- Strictly enforce flood hazard regulations both current and revised. FEMA regulations and other requirements for the placement of structures in flood plains shall be followed.

- Maintain standards for development in flood-prone and poorly drained areas. Establish mitigation for new development impacts on flooding.

- Identify areas known to be prone to flooding, such as Los Osos, Avila Valley, Santa Margarita, Cambria, Oceano and Templeton by developing community drainage studies. Seek stakeholder involvement in developing funding mechanisms and in acquiring grants to implement listed flood control improvements.

- Fire, Public Works, and law enforcement agencies will maintain and improve their ability to respond to water hazard emergencies throughout the County.

- Outline the needs for mapping of high-risk areas of the County.
- Participate in the flood insurance program.
- Develop Flood Control Zones and assessment districts to finance capital projects and provide for on-going maintenance of facilities and waterways.

Risk Assessment Conclusion

In San Luis Obispo County, runoff in the streams of the County is varies over the seasons, with appreciable flows occurring only during and immediately after precipitation. However, during large storms, stream flow increases rapidly, and flood waters can contain high amounts of debris, causing major flood damage. For many of the water courses that are located in the County, areas that may be inundated in response to 100-year storm events are located adjacent to or near the stream or river channel. Since many of the County's watercourses are located in mountainous or remote areas with little or no development, flooding events along these rivers and streams generally result in minimal impacts. Other watercourses that are located in the County, however, have floodplains that extend well beyond the defined stream or river channel. When a flood occurs along one of these watercourses, and it is located in or near an area that is urbanized, damage to property and infrastructure can be widespread. This threat is rated as Medium.

3. Hazard: Landslides/Rockslides

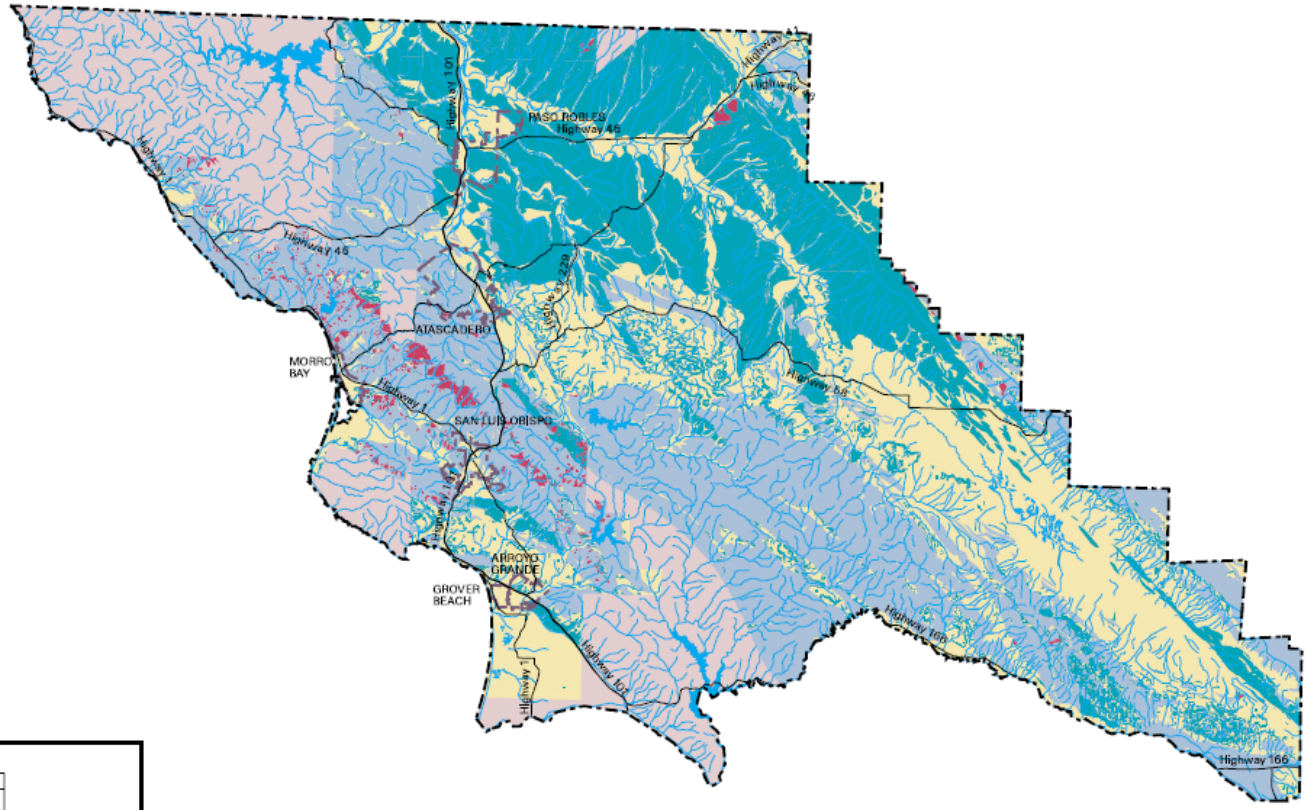
Severity: Low	Probability: Low

Hazard Definition
A landslide is a geologic hazard where the force of gravity combines with other factors to cause earth material to move or slide down an incline. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Slopes with the greatest potential for sliding are between 34 degrees and 37 degrees. Although steep slopes are commonly present where landslides occur, it is not necessary for the slopes to be long.

Landslides, rockslides, and debris flows occur continuously on all slopes; some processes act very slowly, while others occur very suddenly, often with disastrous results. As human populations expand over more of the land surface, these processes become an increasing concern.

There are predictable relationships between local geology and landslides, rockslides, and debris flows. The down-slope movement of earth material, either as a landslide, debris flow, mudslide, or rockslide, is part of the continuous, natural process of erosion. This process, however, can be influenced by a variety of causes that change the stability of the slope. Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, or by ground shaking caused by an earthquake. Slopes can also be modified artificially by grading, or by the addition of water or structures to a slope. Development that occurs on a slope can substantially increase the frequency and extent of potential slope stability hazards. Knowledge of these relationships can improve planning and reduce vulnerability. Slope stability is dependent on many factors and their interrelationships, including rock type, moisture content, slope steepness, and natural or man-made undercutting.

History
In San Luis Obispo County, there are several geologic formations commonly associated with slope stability problems. The data presented on the following map (Map 4 from the San Luis Obispo County Safety Element) presents a limited summary of landslides hazards related to slope gradient and topography that were identified.



MAP 4
LANDSLIDE HAZARDS COUNTY OF SAN LUIS OBISPO

County Boundary
City Boundaries
Highways
Rivers, Lakes, and Streams

LANDSLIDE POTENTIAL

Very High
Existing Mapped Landslide (Qls, Qlsa)

High Potential
Franciscan and Other Potentially Unstable Rocks (KJfme, KJfmv, KJt, KJfg, Tm, s, Tf, KJs, K) and/or Slope Gradient > 50%

Moderate Potential
Formations Known to Have Localized Areas of Instability (QTp, Ka, K) and/or Slope Gradient > 20%

Low Potential
Slope Gradient < 20%

No Landslide Data

Source: Digitized at Cal Poly

Ref: Dibblee (1973, 1974), Hall (1973, 1973b), McClean (1994, 1995), Hall and Others (1975), Hall and Prior (1975)

SCALE: 1" = 50000'

0' 50000' 100000'

COUNTY OF SAN LUIS OBISPO AND CITIES SAFETY ELEMENT UPDATE

The geologic formations commonly associated with slope stability problems in San Luis Obispo County, include the Franciscan, Rincon, Toro, and Monterey formations. Of these, the Franciscan is the most well known formation known for slope instability. Numerous landslides within the Franciscan complex are observable along the Highway 1 corridor from San Luis Obispo to San Simeon. Numerous landslides have also been mapped in the Franciscan and Toro formations along Highway 101 on the Cuesta Grade. Landslides in the Franciscan formation have impacted residences, roadway facilities, pipelines, and other infrastructure in the County. The Rincon and Toro formations have a similar geologic history of land sliding, but are generally not as widespread as the Franciscan. An active landslide has also been identified in the vicinity of Harbor Terrace near Port San Luis Harbor west of Avila Beach.

Geologic formations located in San Luis Obispo County that present a moderate slope stability hazard potential include the Quaternary bedrock units such as the Paso Robles Formation and formations of equivalent age and composition. The susceptibility of areas underlain by these formations to slope stability impacts will vary based on a variety of site specific factors, such as slope, the orientation of bedding planes, rainfall, characteristics of the overlying soil, and the type and extent of proposed slope modifications. In some areas, slopes may be stable in a natural condition, but alterations to the hillsides to accommodate urban development may cause unstable conditions that could adversely affect future development. Prior to the initiation of new development that could be adversely affected by slope movement, site specific evaluations are necessary to determine the hazard potential and to identify engineering design methods to minimize the risk of landslide-related damage.

Landslide Hazard Potential by Area

San Luis Obispo County

Numerous large landslides are also mapped in the steep mountainous terrain of the Santa Lucia, La Panza and Caliente Mountain ranges and many canyons. Landslides of this type have been mapped in nearly all of the formations and are generally related to steep slopes, adverse geologic structure, weak or weathered formations, faulting, and wet slopes. To date, only limited geologic mapping has been performed to evaluate the presence of landslides in the hillside areas of the County. Most of the geologic studies to date have focused on large scale geologic structure, faulting, or other geologic issues and did not specifically evaluate land sliding. A significant amount of additional studies need to be performed to identify and evaluate landslides to help reduce the potential for long term damage related to slope instability.

Sections 22/23.05.020 of the San Luis Obispo County Land Use Ordinance and Coastal Zone Land Use Ordinance, Titles 22 and 23 of the County Code, contain the

County's grading ordinance. This ordinance outlines specific requirements for grading permits, procedures for reviewing and approving grading permits, inspection requirements for completed grading projects, and erosion and drainage requirements. Section 22/ 23.07.080 defines general requirements for identifying Geologic Study Areas (GSA) that would require a geology report to address landslide hazards.

Arroyo Grande

A majority of the existing development in Arroyo Grande is located on gently inclined alluvial valley sediments and the hilly terrain north of Branch Street. The potential for slope stability hazards in valley areas is low to very low. The potential slope instability is greatest in the hilly areas of the City. The potential for slope instability in the sloping terrain can mostly be mitigated by applying building code requirements that provide minimum requirements for building construction and grading on sloping ground as those areas are not known to be underlain by large landslide features or unstable formations. However, there are relatively steep hillsides and canyons near the City, and as development moves into those areas, there could be greater potential for slope stability related concerns. A thorough geologic/geotechnical study should be prepared prior to development for projects planned in those areas.

Title 7, Chapter 1, of the Arroyo Grande Municipal Code provides development standards adopted by the City pertaining to excavation, grading, erosion, and sediment control. This chapter specifies performance standards and other requirements intended to protect public health and safety and minimize hazards from excavation and filling activities.

Atascadero

Development in Atascadero generally has occurred in two areas: along the alluvial valley of the Salinas River and Highway 101, and in the relatively steeply sloping terrain of the Santa Lucia Mountains west of Highway 101. The primary bedrock geologic units exposed in the area include the Tertiary-age Santa Margarita, Vaqueros, and Monterey formations, and Cretaceous-age unnamed, Franciscan, Toro, and Atascadero formations. The potential for slope instability in the alluvial valleys is low to moderate because of fairly gentle slopes. Developments in steeper hillside areas have a known history of slope instability, and a moderate to very high hazard potential for slope instability problems.

Localized undercutting by streams or development could cause instability. Appropriate geologic studies should be performed prior to development to evaluate this increased level of risk.

The Franciscan and upper Cretaceous formations are exposed along the eastern flank of the Santa Lucia Mountains. These formations are the predominant geologic unit in the hilly southwestern portion of the City. In this area, 50 separate landslides have been mapped, encompassing 268 acres. The City has recently made repairs in this area to roadways damaged from land sliding. Although some of the mapped landslides may now

be relatively stable, the concentration of old and recent landslides are indicative of relatively unstable slope conditions. This area is considered to have a high to very high potential for slope instability. Thorough geologic/geotechnical study should be prepared prior to development for projects planned in those areas.

Sections 9-4.138 through 9-4.146 of the Atascadero Zoning Ordinance provide development standards adopted by the City pertaining to excavation, grading, erosion, and sediment control. These sections specify performance standards and other requirements intended to protect public health and safety and minimize hazards from excavation and filling activities. In Atascadero, any grading on slopes at or exceeding ten percent must undergo environmental review pursuant to the California Environmental Quality Act (CEQA).

Grover Beach

Grover Beach is characterized by fairly gently inclined slopes with gradients of less than 50 percent on slopes consisting of older alluvium and late Pleistocene dune sands. The potential for slope stability concerns is low. Locally, there may be a potential for shallow slope failures in loose dune sands on areas of steep terrain. The potential for slope instability in the sloping terrain can mostly be mitigated by applying building code requirements that provide minimum requirements for building construction and grading on sloping ground as these areas are not known to be underlain by large landslide features or notoriously unstable formations.

Sections 8400 through 8423 of the Grover Beach Municipal Code provides for the development standards adopted by the City pertaining to excavation, grading, erosion, and sediment control. These sections specify performance standards and other requirements intended to protect public health and safety and minimize hazards from excavation and filling activities.

Morro Bay

Numerous studies have documented unstable, landslide prone slopes in the Morro Bay area east of Highway 1 and north of Highway 41. Many of the landslides mapped in the area are associated with the Franciscan mélange. The landslide hazards that have impacted residential development and lifeline facilities are most prevalent on west-facing slopes. Although some of the mapped landslides may now be relatively stable, the concentration of old and recent landslides are indicative of relatively unstable slope conditions. This area is considered to have a high to very high potential for slope instability. Thorough geologic/geotechnical study should be prepared prior to development for projects planned in those areas.

General Plan Policies S-6.1 and S-7.1 and Coastal Plan Policies 9.04 and 9.07 require that geology and soils reports be prepared to identify and evaluate potential adverse conditions from grading activities in specific areas of the City.

Paso Robles
A majority of the existing development in Paso Robles is located in areas of gently rolling hills with slope inclinations between 50 percent to 20 percent or less. The primary bedrock geologic unit in the area is the Paso Robles Formation. However, the Paso Robles Formation contains localized areas of relatively weak clay units, which are susceptible to small- to large-sized landslides. These landslides are not well mapped regionally, but are often identified by site-specific studies.

The Salinas River flood plain is also an area of extensive development in the Paso Robles area. Because of the fairly gentle slopes, the potential for slope stability concerns in this area is generally low. The layered bedrock is folded and faulted and is subject to localized undercutting by streams or development. If the bedding becomes laterally unsupported, there is an increased potential for instability. Appropriate geologic studies should be performed prior to development to evaluate this increased level of risk.

Title 20 of the Paso Robles Municipal Code provides development standards that have been adopted by the City pertaining to excavation, grading, erosion, and sediment control. These sections specify performance standards and other requirements intended to protect public health and safety and minimize hazards from excavation and filling activities.

Pismo Beach
The potential for landslides is present on the hill sides to the north of highway 101 and along the Price Canyon corridor. The potential slope instability is greatest on the west facing slopes directly adjacent to the freeway and Price Canyon Road. The potential for slope instability in the sloping terrain can mostly be mitigated by applying building code requirements that provide minimum requirements for building construction and grading on sloping ground, as these areas are not known to be underlain by large landslide features or notoriously unstable formations. The City of Pismo Beach's Safety Element provides information on their policies related to land areas subject to hazards associated with steep slopes.

City of San Luis Obispo
The majority of the development in San Luis Obispo is in the valley area with a low to very low potential for slope instability. However, the hillside areas to the east, north and west of the City, as well as along the flanks of the Morros, are underlain by the Franciscan mélange, which is a source of significant slope instability. Areas of the City with steep topography and geologic formations prone to slope stability problems are depicted on Map 4. Because of the past slope stability related problems, a thorough geologic/ geotechnical study should be prepared prior to development for projects planned in those areas.

Ordinances and Regulations
The California Building Code, which has been adopted by all seven cities and the County of San Luis Obispo, requires that site specific investigations be performed for development located in hillside areas. Investigations and practices typically required for hillside development include the following:

- Conduct thorough geologic/geotechnical studies by qualified geotechnical engineers and engineering geologists.
- Require both engineering geologists and geotechnical engineers during construction to confirm preliminary findings reported during initial studies.
- Require certification of the proposed building site stability in relation to the adverse effects of rain and earthquakes prior to the issuance of building permits.
- Mandate coordination between the civil engineer and the project engineering geologist and geotechnical engineer during construction grading.
- Require mitigation of on-site hazards caused by grading that may affect adjoining properties, including erosion and slope instability.

Plans and Programs
The County acknowledges that areas of known landslide activity are generally not suitable for residential development. The County will avoid development in areas of known slope instability or high landslide risk when possible, and continue to encourage that development on sloping ground use design and construction techniques appropriate for those areas. More stringent slope stability criteria, or dynamic stability analysis, may apply to improvement design under the jurisdiction of some agencies.

Risk Assessment
The risk of landslides and rockslides in San Luis Obispo County is Low, however, these events are recurring in nature and could disrupt access to critical elements of the County's infrastructure.

Relationship to Other Hazards – Cascading Effects

Landslides are usually a cascading effect of severe weather.

- **Effects on people and housing:** People and housing are at risk from landslides and rockslides in San Luis Obispo County. For the most part, past incidents have not resulted in significant injuries or loss of life. Property loss is rare, but is usually significant when it occurs.

- **Effects on commercial and industrial structures:** Landslides can result in damage to property and cause buildings to become unsafe either due to distress or collapse during sudden or gradual slope movement. Structures constructed in steep terrain, possibly on stable ground, may also experience landslide hazards if they are sited in the path of potential mud flows or rockslide hazards.

- **Effects on infrastructure:** Landslides and rockslides can result in the destruction of infrastructure such as water and sewer lines, electrical and telecommunications utilities and drainage. Disrupted transportation routes occur occasionally, usually during heavy rain storms, and cause considerable inconvenience.

Risk Assessment Conclusion:

In San Luis Obispo County, there are several geologic formations commonly associated with slope stability problems. The geologic formations commonly associated with slope stability problems in San Luis Obispo County, include the Franciscan, Rincon, Toro, and Monterey formations. Of these, the Franciscan is the most well known formation known for slope instability. Numerous landslides within the Franciscan complex are observable along the Highway 1 corridor from San Luis Obispo to San Simeon. An active landslide has also been identified in the vicinity of Harbor Terrace near Port San Luis Harbor west of Avila Beach. The probability for future damaging landslides in San Luis Obispo County is rated as Low.

4. Hazard: Tsunami and Seiche

Severity: Low –High	Probability: High

Hazard Definition
A tsunami is a wave, or a series of waves, caused by a displacement of the ocean floor, usually by movement along a fault. In deep ocean water, tsunamis may travel as fast as 600 miles per hour. As they approach the shore, waves may increase in size and can cause extensive damage to coastal structures.

Withdrawal of the sea may be a precursor to the arrival of the first wave. After the first wave appears, waves may continue to arrive at internals for several hours. Intervals between successive waves may be similar. If the second wave appears 20 minutes after the first, it is likely that a third wave (if there is one) would arrive 20 minutes after the second. The first wave may not be the biggest. Yet the largest wave usually occurs within the first ten waves. The height the sea level rises above mean high tide line is referred to as runup.

San Luis Obispo County could be affected by a tsunami caused by fault-related ground displacement on a local offshore fault, or on a more distant fault.

Seiche (pronounced seish) is defined as oscillations of enclosed and semi-enclosed bodies of water, such as bays, lakes, or reservoirs, due to strong ground motion from seismic events, wind stress, volcanic eruptions, and local basin reflections of tsunami. Seiches can result in the creation of long-period waves which can cause water to overtop containment features or cause seiche runup on adjacent land masses, similar to tsunami runup.

Although faults are located near several of the reservoirs in San Luis Obispo County, seiche is not considered a significant risk. Seiches could occur in any reservoir located in the County, and in Morro and San Luis Bays. However, significant waves in these water-bodies are not anticipated because they are simply not large enough.

History
Tsunamis have done great damage to communities located on the California Coast. A tsunami in 1964, following an earthquake in Alaska, killed 12 people in Crescent City and damaged piers and boats in Morro Bay as the bay emptied and filled every 15 minutes for over an hour.

On March 11, 2011, a great quake (9.0) struck northern Japan. Nearly 12 hours later, approximately $500,000 in damage was recorded to piers and docks in Morro Bay as a result of a tsunami from this earthquake. At the Center of Coastal Marine Science in Morro Bay (near the back of the bay), an oceanographer recorded a 6ft. surge, while fisherman

and Coast Guard personnel estimated an 8-9ft. surge at the Coast Guard pier near the entrance to the harbor.

Table 4-1: Historical Tsunamis in San Luis Obispo County

Location	Date of Incident	Intensity	Description
Morro Bay	1868	Unknown	Unknown
Cayucos	4/16/1877	Height: 3.6 meters	California
Morro Bay	1878 Reportedly overtopped sand spit between the bay and the ocean	Unknown	Unknown
Pismo Beach	1927	Height: 1.8 meters	California
Avila & Morro Bay	4/1/1946	Height: 1.3 meters Source Magnitude: (Ms) 7.3	Source location: Alaska Source Event: E. Aleutian Islands Travel time: 5 hours
Avila Beach	11/4/1952	Height: 1.4 meters Source Mag.: (Ms) 8.2 (Mw) 9	Source location: Russia Source event: Kamchatka Travel time: 8 hours
Pismo Beach	5/22/1960	Height: 1.4 meters Source Mag.: (Ms)9.5	Source location: Chile Source event: Central Chile
Avila & Morro Bay	3/28/1964	Height: 1.6 meters Source Mag.: (Ms)9.2	Source location: Alaska Source Event: Gulf of Alaska Travel time: 5 hours
Morro Bay	3/12/2011	Height: 1.5 meters Source Mag.: (Ms)9.0	Source location: Japan Source Event: Pacific Ocean near Honshu Travel time: 12 hours

Tsunami Hazard Potential

As noted in the above table, the historic record shows that significant tsunamis typically have been generated from distant earthquake sources. It has been estimated that the 100- and 500-year tsunami runups in the study area are based on far-field source generation locations (such as the Aleutian or Chile-Peru Trenches). Estimated tsunami runup along the Cayucos/Morro Bay coastline is approximately 9.5 feet to 24.2 feet for the 100-year and 500-year events, respectively. Those runups were calculated using astronomical high tides, and compare well with recorded tsunamis that have occurred in other locations along the California Coast. However, the worst case scenario would occur if a tsunami occurred during a meteorological high tide (storm surge), which would add an estimated 14.5 feet (4.5 meters) to the runup values calculated. Thus, with a worst case scenario, the estimated tsunami runup for the 100-year and 500-year would be approximately elevation 24 and 39 feet above mean sea level, respectively.

The Tsunami Response Plan for San Luis Obispo County uses as its planning basis all those coastal communities, recreation and developed areas with an elevation of 50 feet above mean sea level. In general, much of the coast of the County is protected by wide beaches, coastal dune, or sea cliffs that provide protection for coastal developments. Areas most vulnerable to the tsunami hazard are developments or infra-structure near the mouths of streams that drain into the Pacific Ocean. They include;

- San Simeon Creek in San Simeon
- Santa Rosa Creek in Cambria
- Cayucos Creek, Little Cayucos Creek, Old Creek and Willow Creek in Cayucos,
- Morro and Avila Paul Creeks in Morro Bay, Chorro Creek in Morro Bay/ South Bay area
- San Luis Obispo Creek in Avila
- Pismo Creek in Pismo Beach, and
- Meadow Creek and Arroyo Grande Creek in Oceano

Plans and Programs

Plans are in place to increase the understanding and response to tsunamis. Programs include: Working with Federal and State agencies to better understand and prepare for the hazard of tsunamis and to improve the ability to respond to tsunami warnings provided by NOAA's West Coast and Alaska Tsunami Warning Center.

Risk Assessment
A considerable portion of the coast of San Luis Obispo County is protected by wide beaches, coastal dunes, or sea cliffs that provide protection for low-lying coastal developments. Port San Luis and the Morro Bay harbor along with coastal developments at the stream mouths of creeks draining into the Pacific Ocean are at risk of potential tsunami damage. The worst case scenario would occur if a tsunami occurred during a meteorological high tide combined with a storm surge which could add 14.5 feet to the wave height.

This threat severity can range from low to high. The probability is high.

Relationship to Other Hazards – Cascading Effects
The threat of tsunami-related damage is primarily confined to low-lying coastal areas. If the gradient is shallow, tsunami waves can travel upstream into river channels and creek beds causing flooding. The primary effects of a tsunami can be widespread destruction and damage to coastal structures.

- **Effects on people and housing:** There is a low probability that a tsunami event constituting significant property damage or loss of life will occur in San Luis Obispo County as most developed areas are well above the estimated run up elevation and a sophisticated warning system is in place.

- **Effects on commercial and industrial structures:** A tsunami event occurring along the coast of the County could have devastating effects in terms of property damage to piers, docks, floats, and to moored boats. The Diablo Canyon Power Plant is not considered to be at risk as it is located on a marine terrace 85 feet above the sea level. The cooling intakes and release structures for the plant, which are located at sea level, are protected by natural barriers and a concrete jetty.

- **Effects on infrastructure:** A tsunami event can cause damage to roads, communication facilities, and other infrastructure.

- **Effects on agriculture:** Effects on agriculture can be devastating if flooding occurs as a result of a tsunami.

5. Hazard: Wildfires

Severity: High - Very High	Probability: High - Very High

Hazard Definition
A wildfire is an uncontrolled fire spreading through vegetative fuels, posing danger and destruction to property. Wildfires can occur in undeveloped areas and spread to urban areas where structures and other human development are more concentrated.

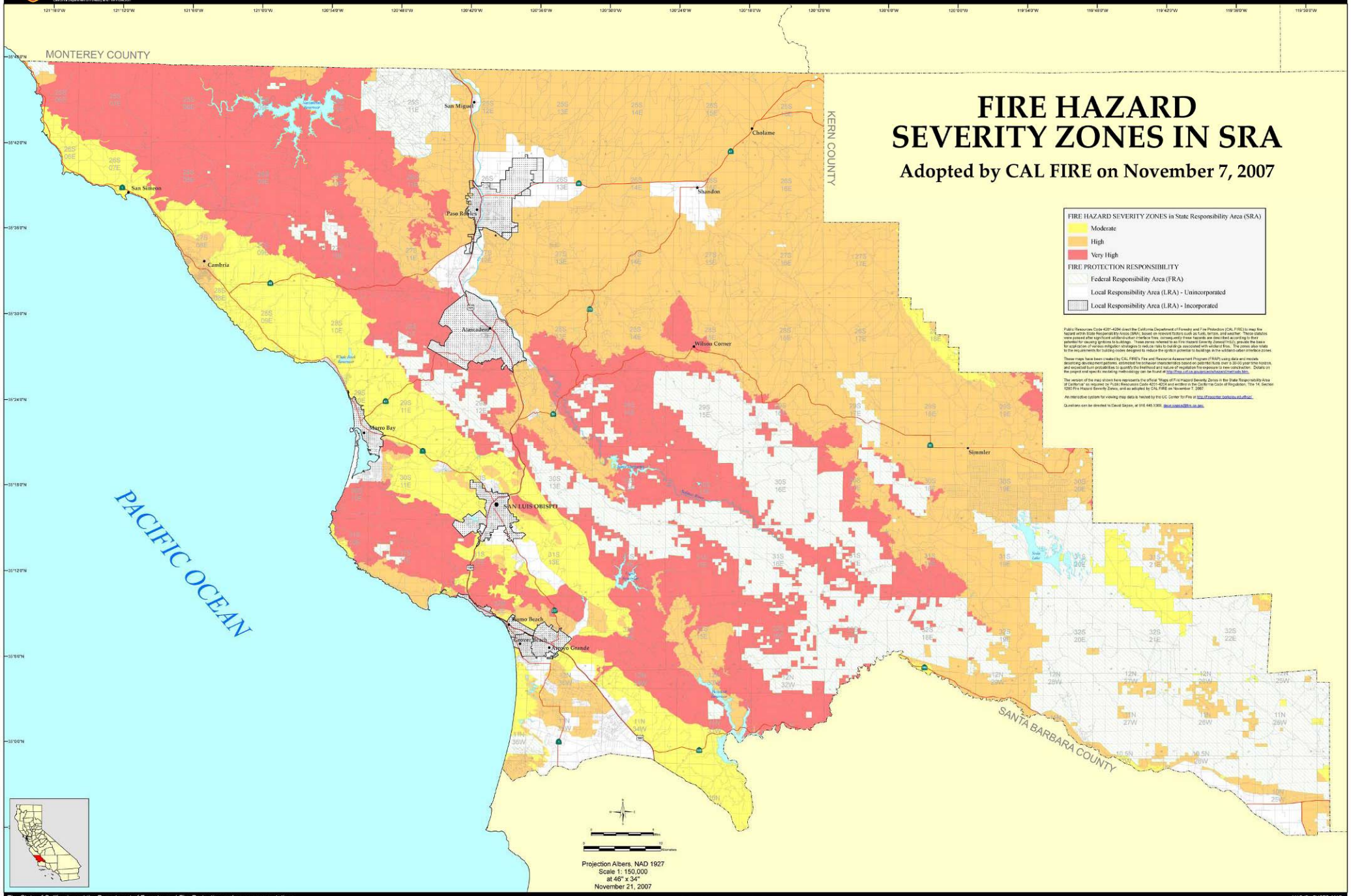
While some wildfires start by natural causes, humans are responsible for four out of every five and are usually the result of debris burns, arson or carelessness. As a natural hazard, a wildfire is often the direct result of a lightning strike that may destroy personal property and public land areas, especially on state and national forest lands. The predominant dangers from wildfires are:

- The destruction of vegetation, property, wildlife; and
- Injury or loss of life to people living in the affected area or using the area for recreational facilities.

History
The climate in San Luis Obispo County is generally referred to as "Mediterranean" with warm dry summers and relatively cool, moderately wet winters. Rainfall throughout the County occurs primarily between November and April, and ranges between 20-25 inches per year in the coastal areas, to less than 10 inches per year in inland areas. Climatic conditions throughout the County range from the cool, damp coastal areas, to hot and dry inland areas. Because summers are generally warm and dry, the risk of wildfires is highest in late summer and early fall. Fog and cool weather that are common in the coastal regions help to maintain moisture levels in vegetation along the coast, which helps to minimize fire risk. The hot and dry conditions of the Santa Lucia Mountains and the inland plains and valleys of the County, however, can quickly desiccate vegetation resulting in an increased fire risk.

San Luis Obispo County Fire Hazard Severity Zones and Fire History by Decade are shown on the following maps:

SAN LUIS OBISPO COUNTY



Public Resources Code 4201-4204 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map fire hazard within State Responsibility Areas (SRA), based on relevant factors such as fuels, terrain, and weather. These statutes were passed after significant wildland-urban interface fires, correspondingly these hazards are described according to their potential for causing ignitions to buildings. These zones referred to as Fire Hazard Severity Zones (FHSZ), provide the basis for application of various mitigation strategies to reduce risks to buildings associated with wildland fires. The zones also relate to the requirements for building codes designed to reduce the ignition potential to buildings in the wildland-urban interface zones.

These maps have been created by CAL FIRE's Fire and Resource Assessment Program (FRAP) using data and models describing development patterns, estimated fire behavior characteristics based on potential fuels over a 30-60 year time horizon, and expected burn probabilities to quantify the likelihood and nature of vegetation fire exposure to new construction. Details on the project and specific modeling methodology can be found at http://frap.cdf.ca.gov/projects/hazard/methods.html.

The version of the map shown here represents the official "Maps of Fire Hazard Severity Zones in the State Responsibility Area of California" as required by Public Resources Code 4201-4204 and entitled in the California Code of Regulation, Title 14, Section 1280 Fire Hazard Severity Zones, and as adopted by CAL FIRE on November 7, 2007.

An interactive system for viewing map data is hosted by the UC Center for Fire at http://firecenter.berkeley.edu/frap/.

Questions can be directed to David Sayers, at 916.445.1369, david.sayers@fire.ca.gov.

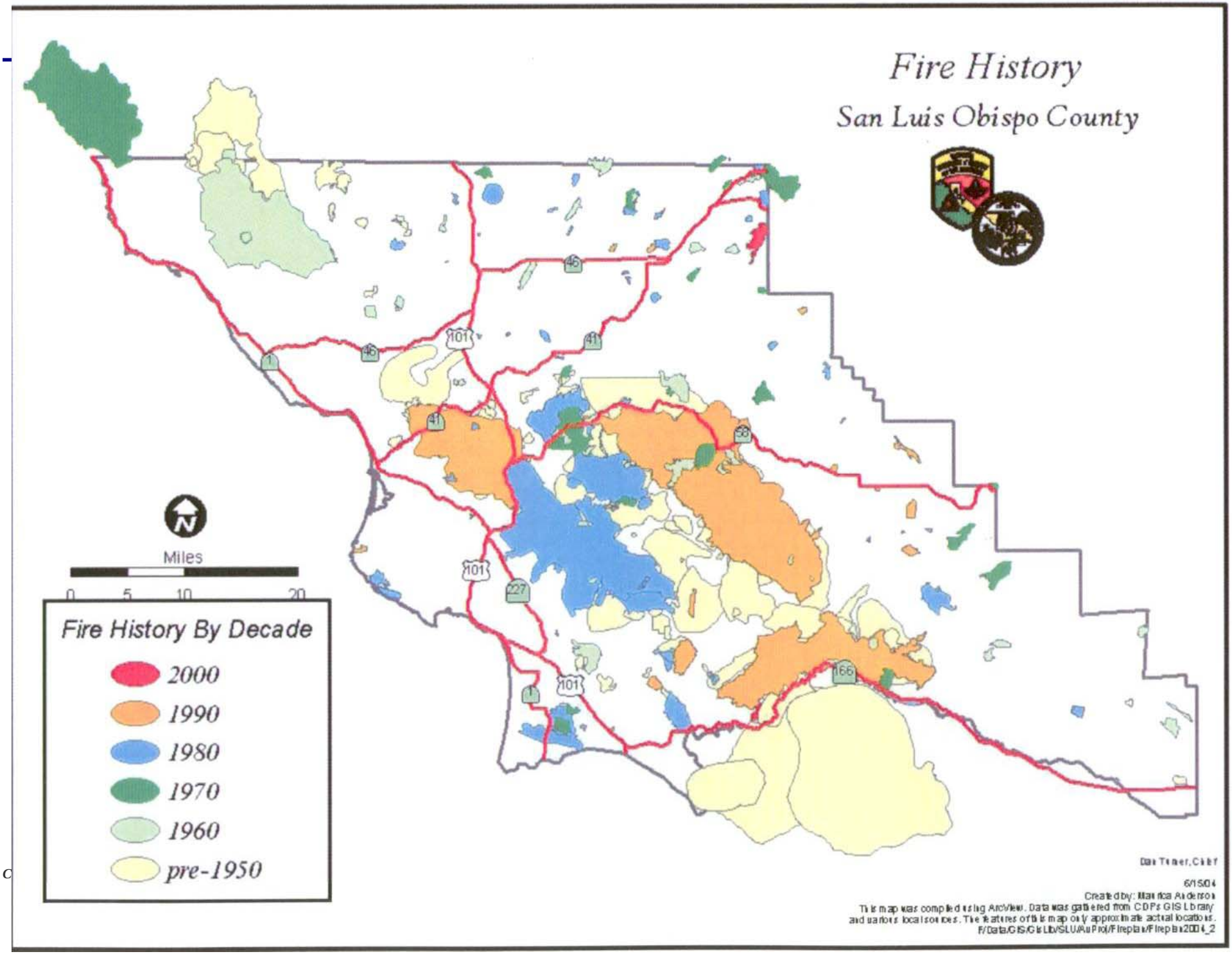
The State of California and the Department of Forestry and Fire Protection make no representations or warranties regarding the accuracy of data or maps. Neither the State nor the Department shall be liable under any circumstances for any direct, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of data or maps.

Obtain FRAP maps, data, metadata and publications on the Internet at http://frap.cdf.ca.gov
For more information, contact CAL FIRE-FRAP, PO Box 944246, Sacramento, CA 94244-2460, (916) 327-3939.

Arnold Schwarzenegger, Governor,
State of California
Mike Chrisman, Secretary for Resources,
The Resources Agency
Ruben Grijalva, Director,
Department of Forestry and Fire Protection

MAP ID: FHSZS_MAP

DATA SOURCES
CAL FIRE Fire Hazard Severity Zones (FHSZS06_3)
CAL FIRE State Responsibility Areas (SRA05_5)
CAL FIRE Incorporated Cities (Incorp07_3)
PLSS (1:100,000 USGS, Land Grants with CAL FIRE grid)


Fire History
San Luis Obispo County
Miles
0 5 10 20
Fire History By Decade
2000
1990
1980
1970
1960
pre-1950
1
46
101
41
58
227
166
Dan Turner, Cal F
6/15/04
Created by: Maurica Anderson
This map was compiled using ArcView. Data was gathered from CDF's GIS Library and various local sources. The features of this map only approximate actual locations.
F:/Data/GIS/GisLib/SLU/AuProj/Fireplans/Fireplan2004_2

Historic Wildfires

San Luis Obispo County has one of the worst fire environments in the State of California for large damaging wildfires. The Las Pilitas, Chispa, Highway 41, Highway 58 and the Logan, were all large damaging fires that combined, consumed approximately 300,000 acres, scores of homes and cost millions of dollars to suppress.

Most recently, the Logan fire that occurred in 1997, burned 50,000 acres and cost $6 million to extinguish. No structures were lost in the Logan fire. Also, the Highway 41 and Highway 58 fires that occurred in 1994 and 1996 caused widespread and substantial damage. The Highway 41 fire resulted in the destruction of 42 homes, 61 other structures, and 91 vehicles. It also cause massive power outages, shut down two major highways for over 24 hours and destroyed public radio and television transmissions. A total of 48,531 acres were burned and an estimated $10,000,000 in property loss damages occurred. The Highway 58 fire burned 106,668 acres and resulted in the loss of homes and 14 other structures.

A summary of major wildfires that have occurred in San Luis Obispo County is provided on Table 5-1. This table, however, does not list the numerous smaller fires that have occurred throughout the County. Several areas of the County have been subject to numerous smaller fires 50-500 acres in size including the Santa Margarita and areas west of Nipomo. Still another location with a high occurrence of wildfires is near the Nacimiento Reservoir, located in the northwest portion of the County.

Table 5-1: Recent Major Wildfires in San Luis Obispo

Las Pilitas	July 1985	75,000 acres $1.2M loss	12 homes, & numerous mountain top repeaters and antennas	The Las Pilitas fire started in the central portion of the county and burned into coastal mountains behind the City of Arroyo Grande.
Chispa	July 1989	10,000 acres $250K loss	12 homes, numerous out-structures	Originating near the Chalk Mtn. Golf Course in Atascadero, the fire spread to the east towards Santa Margarita and Parkhill.
Highway 41	August 1994	49,000 acres $10M loss	42 homes, 61 other structures, 91 vehicles	Fire started in the coastal mountains behind the City of Morro Bay. The fire burned into the City of Atascadero and threatened the City of San Luis Obispo
Highway 58	Sept. 1996	106,000 acres $1.0M loss	13 homes, Numerous out structures and vehicles	Point of origin was near Hwy 58 and Shell Creek Rd. the fire spread quickly to the south and east and advanced into the Los Padres National Forest. Fire stopped just east of Pozo.
Logan Fire	August 1997	50,000 acres $6M loss	Remote unpopulated area	The Logan Fire burned in the coastal mountains in the south-east portions of the county near Hwy. 166

Weather

Weather can have complex and important effects on wildfire intensity and behavior. Wind is of prime importance because as wind velocity increases, the rate of fire spread also increases. Gusty and erratic wind conditions can cause a fire to spread irregularly, making it difficult to predict its path and effectively deploy fire suppression forces. Relative humidity is also an important fire-related weather factor. As humidity levels drop, the dry air causes vegetation moisture levels to decrease, thereby increasing the likelihood that plant material will ignite and burn.

Fuels and Topography

A large portion of the County is covered by natural vegetation. This vegetation can be grouped into approximately 14 regimes, each of which contributes varying degrees to fire hazard severity. Table 5-2 depicts general vegetation communities that are found throughout the County, and their likely relative fire hazard severity rated by fuel conditions only. The likely fire hazard severity depicted in the table can be influenced by many factors, including the age of vegetation, accumulation of dead plant material, vegetation management programs that may have been

implemented, period of time since a stand of vegetation was last burned, historic climate, and topography of the region. Chaparral plant communities present the most significant fire hazard severity, as this type of vegetation burns with intense heat and the amount of fuel available to burn can be very high if the area is not properly managed or has not been recently burned. Controlled burning is one method that can greatly reduce the fire hazard severity for a given area. A significant increase in dead material as the result of insect or disease infestations can lead to a much higher fire hazard. The pitch canker infestation in Cambria is an example of this problem.

Fuel loading in developed areas susceptible to wildfire becomes even more complex. The introduction of some ornamental plantings as landscaping and groundcover can dramatically increase the fire loading of a neighborhood. Gazebos, fencing, patios, decks and even the structures themselves add even more fuel. Once structures become involved in fire, the problem compounds as embers cast out thousands of feet onto combustible roofs well removed from the wildland area.

Steep terrain also plays a key role in the rate at which wildfires spread, as fires will normally burn much faster uphill. Generally, when the gradient of a slope doubles, the rate of spread of a fire will also double. Steep topography also channels air flow, thereby creating erratic wind patterns. Fire suppression in steep areas is also complicated by limited accessibility, and the effectiveness of firefighters and equipment are hampered by lack of access roads.

Table 5-2: Likely Fire Hazard Severity Rated by Fuel Conditions Only

Very High	High	Moderate
Chaparral	North Coast Scrub	Riparian Woodland
	Foothill Woodland	North Coast Grassland
	Juniper Oak Woodland	Evergreen Forest
		Interior Herbaceous
		Desert Scrub
		Beach-Dune
		Coastal Sand-Plains
		Saline Plains
		Coastal Salt Marsh
		Freshwater Marsh

Ordinances and Regulations
Several local ordinances direct fire prevention activities within San Luis Obispo County. These include Chapter 19.20, Construction Standards of Title 19, of the County Code; as well as Section 22/23.05.050 of the Land Use Ordinance and Coastal Zone Land Use Ordinance. These sections of Titles 22 and 23 contain standards pertaining to the preparation and review of fire safety plans, fire safety standards, site access, and driveway requirements. In addition, the California Fire Code has been adopted by San Luis Obispo County with amendments as part of County Ordinance Title 16.

California Fire Code
This code may be adopted by local jurisdictions, with amendments, and provides minimum standards for many aspects of fire prevention and suppression activities. These standards include provisions for access, water supply, fire protection systems, and the use of fire resistant building materials.

California Health and Safety Code and the California Building Code
The Health and Safety Code provides regulation pertaining to the abatement of fire related hazards. It also requires that local jurisdictions enforce the California Building Code, which provides standards for fire resistive building and roofing materials, and other fire-related construction methods.

Title 19 of the California Code of Regulations
These regulations pertain to fire prevention and engineering measures for State Fire Marshal regulated occupancy.

Public Resources Code and Title 14 of the California Code of Regulations
These regulations provided statewide fire prevention and suppression standards in the wildland fire areas.

Assembly Bill 337 (Bates Bill)
In response to the Oakland Hills fire of 1991, this bill was passed in 1992 and requires brush clearance and fire resistant roof material (Class A or B) to be used on all new construction that is located in areas designated as being a “Very High Fire Hazard Severity Zone”. Atascadero is the only city in the County that has an area designated as a Very High Fire Hazard Severity Zone.

Plans and Programs

The California Department of Forestry and Fire Protection (CAL FIRE), U.S. Forest Service (USFS), and the Bureau of Land Management (BLM) have entered into mutual aid agreements for the purpose of wildfire protection in San Luis Obispo County. Mutual aid agreements are reciprocal arrangements in which fire protection agencies share personnel and equipment during emergency situations. Cities and fire protection districts are also participants in various mutual aid and auto aid agreements, including the State Master Mutual Aid Agreement.

The Public Resources Codes (PRC) 4290 and 4291 are State laws that have a significant impact on the prevention of large losses of life and property in the wildland/urban intermix areas from a destructive wildfire. The intent of these codes is to require new development in wildfire prone areas to be built with adequate road access, water for firefighting, addressing, fire resistive construction, and vegetation clearance. The code also requires the owners to maintain an adequate defensible space around their buildings from an approaching fire. These laws are an important component in the land use approval process in the County as well as in enforcement by the fire department.

A number of steps have been taken by San Luis Obispo County to reduce the potential for wildfires. Although these measures cannot eliminate the risk of wildfire related damages, they will help to substantially reduce the associated risk. Wildfire hazard reduction measures generally include implementation by the County of the following precautions:

- **Use fire resistant building materials and construction methods**: Standards have been adopted to reduce the use of combustible building materials in high fire hazard areas. Standards for fire resistive building materials and construction methods are provided by the California Building Code (Chapter 7A), The California Fire Code (Chapter 47) and the Public Resources Code.

- **Provide defensible space around structures**: This broad measure as implemented in the County includes a number of specific actions that are taken to minimize wildfire risks. Providing a defensible space area around a structure serves a dual function of limiting fuel for the fire to approach the structure, as well as providing a position from which fire fighters can combat the blaze. Wildfire risk reduction and management practices enforced in the County include the removal or thinning of highly combustible vegetation, the use and maintenance of fire resistant plantings, providing clearings around structures and other combustible materials, and the implementation of a variety of other fuel reduction and fire prevention/ suppression measures.

- **Provide adequate water supply**: Water that is used for fire suppression purposes, and the pressure under which it is delivered, is referred to as “fire flow.” The fire flow that would be required for a specific development is dependent upon a variety of factors,

including the type of construction, the use or occupancy of the structure, and the location of surrounding structures. For residential development, the County determines adequate fire flow ranges to be a minimum of 1,000 gallons per minute at 20 psi, for a minimum of two hours.

- **Provide adequate access**: Adequate access to structures includes providing roadways that are passable by large fire-fighting equipment. This requires roadways to have adequate widths, as well as gradients, bridges, and turn-around areas that accommodate fire trucks.

Existing Fire Protection Services

San Luis Obispo County
Services to San Luis Obispo County are provided by the California Department of Forestry and Fire Protection (CAL FIRE) under contract to provide full service fire protection. CAL FIRE is responsible for the administration of the fire stations that serve the unincorporated areas of the County not within fire protection or other special districts, and provides equipment and training for volunteer stations located throughout the county.

Other Jurisdictions
Fire suppression and fire prevention services are provided within the following communities by the designated entities:

- Los Osos: Los Osos Community Services District: CAL FIRE/County Fire Department through contract services
- Arroyo Grande: Five Cities Fire Authority
- Atascadero: City of Atascadero Fire Department
- Grover Beach: Five Cities Fire Authority
- Morro Bay: Morro Bay Fire Department
- Paso Robles: Department of Emergency Services
- Pismo Beach: CAL FIRE/County Fire Department, through contract services
- San Luis Obispo: City of San Luis Obispo Fire Department
- Avila Beach: CAL FIRE/County Fire Department, through contract services

Fire Prevention and Response
Fire prevention is a primary objective and the major activity of fire departments both in urban and rural areas of the County. After a fire starts, it is the objective of the fire department to minimize the damage to life and property.

San Luis Obispo County Community Fire Safe Council

In addition to the measures outlined above to prevent and best respond to fires, the County has undertaken a variety of mitigation activities including an aggressive inspection program, a Countywide Community Fire Safe Council, a vegetation management program, completing the removal of fuel through a chipping program, creation of community separators and pre-planning major wildfire scenarios in the high and very high fire danger areas (includes evacuation plans and pre-plans).

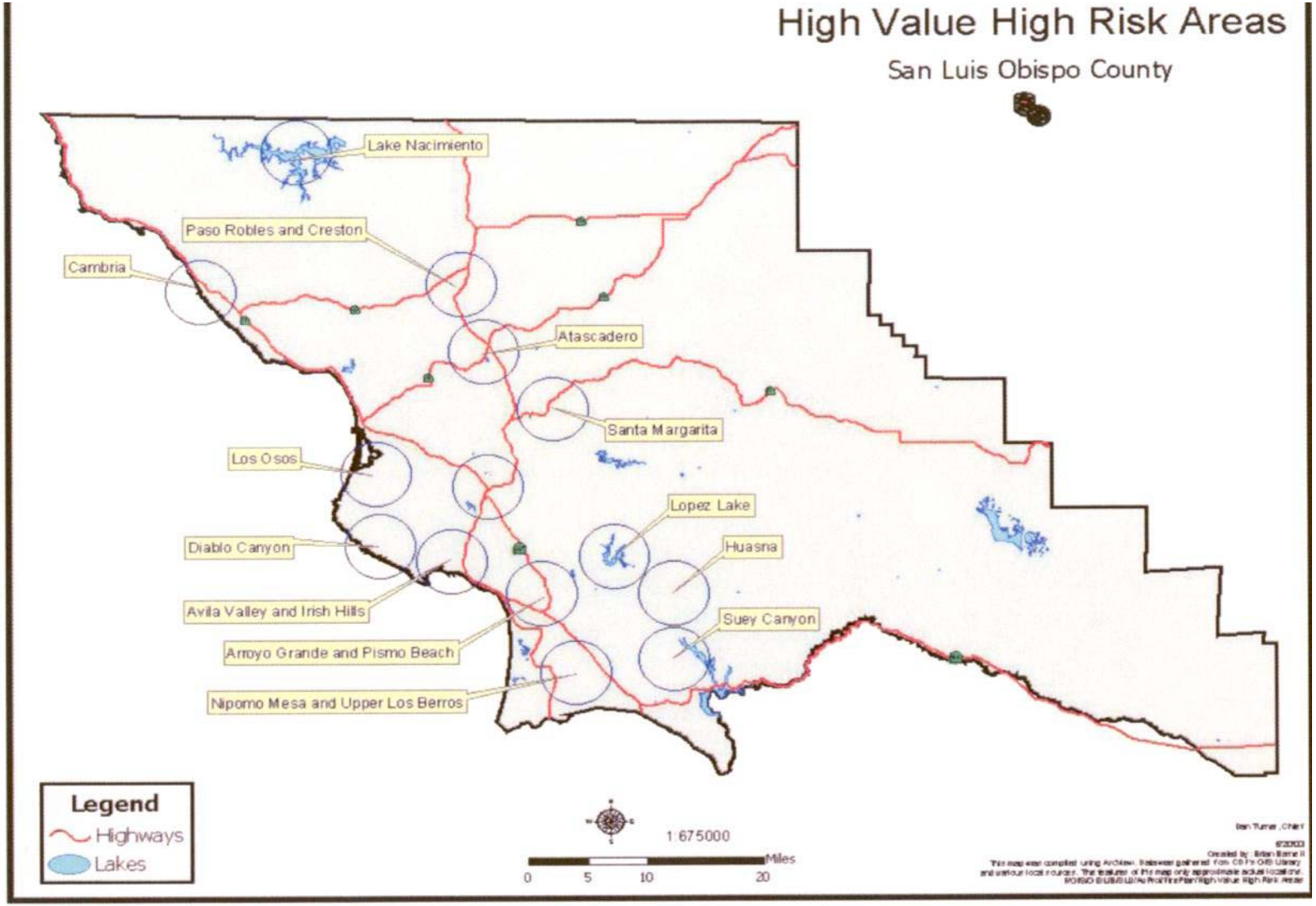
Fires impact an array of agencies, organizations and citizens known as stakeholders. These stakeholders are represented on the San Luis Obispo County Community Fire Safe Council. The purpose of the Council is to bring these representatives to the table to discuss solutions for the prevention and reduction of losses from fire. The primary objective and purpose of the San Luis Obispo County Community Fire Safe Council is to provide education, exchange information and foster fire prevention and fire safety within the County of San Luis Obispo. The San Luis Obispo County Community Fire Safe Council plays a vital role in the development and implementation, and reviews all elements of the Fire Management Plan. This practice ensures buy-in from the stakeholders.

Risk Assessment

San Luis Obispo County is exposed to a variety of wildfire hazard conditions ranging from very low levels of risk along the coastal portions of the County, to extreme hazards in the inland and chaparral covered hillsides of the Santa Lucia Mountains. CAL FIRE has undertaken a state wide program to map areas of potential wildfire risk, and to describe the potential for wildfires to occur in a given area; several risk classifications have been used.

Fire hazard severity is a function of fuel conditions, historic climate, and topography. Population density and the presence of structures located in a particular region is not currently used to determine the fire hazard severity for a particular region, however they do have an impact. Fire Hazard Severity Zones throughout the County have been designated as “Very High,” “High,” or “Moderate.” In San Luis Obispo County, most of the area that has been designated as a “Very High Fire Hazard Severity Zone” is located in the Santa Lucia Mountains, which extends from Monterey County to the north, to Santa Barbara County to the south. These areas exhibit the combination of vegetative fuel, topography, and human proximity that contribute to an extreme fire hazard potential. The fact that an area is in a Moderate Hazard designation does not mean it cannot experience a damaging fire. It only means that the probability is reduced, generally because the number of days a year that the area has “fire weather” is less.

A wildfire high-value high-risk area map for this county is depicted on the following map.


High Value High Risk Areas
San Luis Obispo County
Lake Nacimiento
Paso Robles and Creston
Cambria
Atascadero
Santa Margarita
Los Osos
Lopez Lake
Diablo Canyon
Huasna
Avila Valley and Irish Hills
Suey Canyon
Arroyo Grande and Pismo Beach
Nipomo Mesa and Upper Los Berros
Legend
Highways
Lakes
1:675000
Miles
0
5
10
20

Wildland/Urban Interface Areas

Unincorporated communities within the County that are subject to increased wildfire risks are generally those communities like Cambria and Atascadero where development has resulted in the creation of a wildland/urban interface (WUI). Table 4-3 on the following page identifies communities that are located in or near wildland areas and that have an increased risk of wildfire-related hazards. These areas are identified in the high-value high-risk area map. When residential development occurs within or adjacent to an area that has a high wildfire hazard severity, the ability of fire fighting forces to combat a fire may also be impaired.

When residences are located in the vicinity of wildfire, typiCAL FIREfighting techniques, such as the use of backfires, may not be feasible. Additionally, firefighting equipment and personnel may be used for structure protection, instead of being used to fight the fire. This results in the need for additional equipment to effectively minimize structural losses and to control the fire. Some unincorporated communities located within the County are not confronted with a high wildfire risk. These communities include much of Cayucos, and Oceano. This low wildfire risk results primarily from the type of vegetation that is dominant throughout these areas. The low-growing native grasses and shrubs found in these communities present a minimal vegetative fuel source and a corresponding low wildfire risk. Additionally, in the coastal communities, cool marine influenced temperatures and relatively high humidity levels help to minimize potential wildfire risks.

Table 5-3: Wildland/Urban Interface Areas of San Luis Obispo County

Location	Description
Cambria	This area contains extensive stands of oaks, laurel, madrone and Monterey Pine. The location of residences intermixed within this vegetation increases the potential wildfire hazard.
Los Osos	Residential development that has occurred in the foothill areas around Los Osos and Montana De Oro State Park are intermixed with native vegetation.
Avila Valley and Irish Hills Areas	Development in the areas around Indian Knob, Squire Canyon, See Canyon, and Perfumo Canyon are intermixed with extensive stands of native vegetation.
Arroyo Grande and Pismo Beach Areas	Development to the north and east of the City of Arroyo Grande is intermixed with dense vegetation and many areas have limited access. The Pismo Heights area has residences build above vegetated steep slopes.
Nipomo Mesa and Upper Los Berros Areas	Residential development in the Nipomo Mesa areas are subject to wildfire risks from extensive stands of eucalyptus trees. As development occurs, however, the removal of eucalyptus trees reduces potential fire risks. The Upper Los Berros area has limited access, is isolated and has dense vegetation and an increasing number of residences.
Suey Canyon	This area is located in the southern portion of the County, north of Highway 166. Development in this area is fairly isolated and removed from fire suppression services.
Huasna	Development in this area is relatively isolated and removed from fire suppression services.
Lopez Lake	Development around the lake is intermixed with native vegetation and often has access difficult for fire suppression vehicles.
Santa Margarita Areas	Development areas near Santa Margarita, Pozo, La Panza, and Huerhuero, are intermixed with native vegetation and often have steep slopes and difficult access conditions.
Atascadero Area	Development in and around the City of Atascadero is intermixed with large stands of native vegetation.
Paso Robles and Creston Areas	Development west of Paso Robles includes residences that are intermixed with native vegetation.
Lake Nacimiento Areas	Developments in the Heritage Ranch, Oak Shores, Bee Rock, York Mountain, Santa Rita, Adelaide, and Running Dear Ranch include residences that are intermixed with native vegetation.
Diablo Canyon	A nuclear power plant and its critical power grid sit in a densely vegetated canyon with a long response for wildland fire suppression.
San Luis Obispo Areas	The San Luis Obispo City and the surrounding area intermix with the wild lands on all sides.

Local Area Wildfire Hazard Potential

Arroyo Grande

The majority of Arroyo Grande is located in a generally flat valley that has been developed with urban and agricultural uses. The northern and eastern portions of the City, however, are hilly and contain parcels that are within or contiguous to grassland and forested areas. Fire protection for the residences located within these wildland/urban interface zones may be constrained by heavy fuel loads, steep slopes, limited access, and in some areas, limited water supplies.

Atascadero

Wildfire and urban fire hazards are closely related in Atascadero as a result of extensive residential development that has occurred in the hilly portions of the City where flammable grassland, chaparral and oak woodland habitat is located. Much of the City can be described as being wildland/urban interface area. Several areas in Atascadero qualify as Bates-rated areas, indicating a very high hazard potential for wildfire at the urban edge. Factors that contribute to an elevated fire risk in these areas are described below.

Microclimate- Localized afternoon winds from the northwest are common in the western portion of the City. These winds are associated with inland valley heating and cooler air currents flowing from the ocean. These gusty winds can cause a grass fire to spread and shift direction in a rapid and unpredictable manner.

Topography- Much of the residential development within the City has occurred in areas with moderate to steep topography. Areas that exceed 30 percent slope are subject to rapid flame spread, and often have poor access for fire suppression equipment.

Vegetation- Areas of the City with dense stands of chaparral vegetation face an elevated risk of wildfire. In areas where chaparral vegetation has not been burned in more than 20 years, fuel loading (the amount of vegetation that is available to be burned) averages from 7 to 10 tons per acre. Drainages with oak woodlands have fuel loading that can exceed 15 tons per acre. Chaparral vegetation contains a variety of compounds, such as waxes, turpentine, and resins that cause this type of vegetation to burn intensely and at extremely high temperatures. Air temperatures in chaparral fires can exceed 1,500 degrees. The intensity of the fire that results from chaparral vegetation makes it difficult to extinguish.

Cayucos, Cambria, Nipomo, and Oceano

Each of these communities is developed with primarily low-density residential uses with supporting commercial uses. With the general absence of dense or hazardous land uses, basic fire protection and response needs are met by providing a minimum level of

structural fire protection. However, Cambria and Nipomo's fire needs are greater because their intermixed wooded areas are wildland/urban representing a higher level of risk than the other coastal communities. Fire protection services could be improved in these communities by providing additional firefighting equipment, increasing water supplies, and continuing to add full-time professional fire fighting personnel to augment existing volunteer forces. As density increases and fuel conditions become more hazardous in areas like Nipomo and Cambria, these areas may require additional mitigation measures and fire protection.

Grover Beach

Grover Beach is not confronted with a significant wildfire hazard because of its location on the coast away from vegetated hillsides. High humidity levels and cool ocean-influenced temperatures also limit the potential for wildfires to occur. Open areas containing annual grasses are present in areas throughout the City, but do not represent a major wildfire risk.

Morro Bay

Morro Bay is not confronted with a significant wildfire risk, primarily due to the type of vegetation that is found throughout the City. Vegetation in the area is mostly limited to low-growing grasses and scattered shrubs, characteristic of disturbed north coastal grasslands habitat. High humidity levels and cool ocean influenced temperatures also limit the potential for wildfires to occur. Areas of the City near Morro Bay State Park contain some native vegetation that present a moderate wildland/urban intermix fire hazard. However, because these areas are not contiguous to other high fire hazard areas, they do not present a significant wildfire risk.

Paso Robles

Paso Robles is located in the Salinas River Valley, adjacent to the foothills of the Santa Lucia Mountains. Extensive oak woodlands, grasslands, and chaparral communities occur in the vicinity of Paso Robles, and present a high wildfire risk. The risk of wildfire within the City of Paso Robles, however, is moderate because most development has occurred in the flatter portions of the City, away from the flammable foothill vegetation. Developed areas that are adjacent to significant stands of native vegetation and that may be subject to wildfire hazards are located in incorporated areas west of the City. A fire that begins in this area could migrate towards the City posing potential wildfire risks. Future residential development within the City is most likely to occur in the eastern portion of the City. While not as mountainous as the areas further to the east, this portion of the City is also adjacent to areas containing significant amounts of native vegetation. Therefore, there is the potential for a wildfire to affect this part of the City.

City of Pismo Beach

Much like Grover Beach and Morro Bay, Pismo Beach is not confronted with a significant wildfire hazard because of its location on the coast. However, on the inland side of the City, large expanses of steep, undeveloped terrain with moderate to high wild-

land fuel loading do exist. Wildfire in these areas, in conjunction with coastal winds, Santa Ana winds, and similar dry, midsummer conditions could threaten the City with burning embers traveling thousands of feet igniting combustible roofs.

City of San Luis Obispo

The City of San Luis Obispo is confronted with one of the more hazardous wildfire risks in the County because of its location near the foothills of the Santa Lucia Mountains and the Irish Hills. For planning purposes, the entire perimeter of the City should be considered as a wildland/urban interface area. Specific areas with an increased wildfire hazard include the foothills northeast and southwest of the City and on Cerro San Luis Obispo, Bishop Peak, Chumash Peak, and Islay Hill. Although the Las Pilitas and Highway 41 fires that occurred in 1985 and 1994 did not result in property losses within the City limits, structures in the City were threatened by these fires. The Fire Prevention Code that has been adopted by the City considers all areas within the jurisdictional limits of the City to be subject to regulations pertaining to hazardous fire areas, such as requiring the installation of fire resistive roofing materials.

Relationship to Other Hazards – Cascading Effects

Major wildfires can completely destroy ground cover. If heavy rains follow a major fire, flash floods, heavy erosion, landslides and mudflows can occur. After a wildfire passes through an area, the land is laid bare of its protective vegetation cover and is susceptible to excessive run-off and erosion from winter storms. The intense heat from the fire can also cause a chemical reaction in the soil that makes it less porous, and the fire can destroy the root systems of shrubs and grasses that aid in stabilizing slope material. These cascading effects can have ruinous impacts on people, structures, infrastructure, and agriculture.

- **Effects on people and housing:** In addition to damage to natural environments, wildfires result in a high risk for personal injury, loss of life to inhabitants of the fire area and firefighters, and losses of structures and personal property.

- **Effects on commercial and industrial structures:** As mentioned in the historic wildfires, the effects on commercial and industrial structures can be significant. Many of the fires resulted in damaged or destroyed structures.

- **Effects on infrastructure:** Public utilities are often strained by the impacts of wildfire, including depletion of water reserves, downed power lines, disrupted telephone service and blocked roads. Furthermore, flood control facilities may be inadequate to handle an increase in storm runoff, sediment, and debris that is likely to be generated from barren, burned over hillsides.

- **Effects of agriculture:** Effects on agriculture can be devastating. In addition to the obvious impacts on crops and animals, wildfire can have deleterious effects on soil and water that will impact agriculture for an extended period of time.

Risk Assessment Conclusion

In summary, the risk of wildfire fire in San Luis Obispo County is High to Very High. The fuels, topography and weather conditions of the County present natural circumstances for wildland fires. This risk is increased when development is located in wildland/urban intermix areas, such as hillside and canyon areas. The additional fire risk associated with residential development in urban fringe areas results from the proximity of structures to flammable vegetation, the increased distance from fire protection services, limited access, and potential for low fire flows for combating fires.

6. Hazard: Extreme Weather

Severity: Low	Probability: Low

Hazard Definition
Extreme weather could include drought, freeze, hail, high wind, tornados, and thunderstorm.

Drought
A drought, or an extreme dry period, is an extended timeframe where water availability falls below the statistical requirements for a region. Droughts are not a purely physical phenomenon, but rather interplay between the 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 three 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** occurs 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.

When the word "drought" is used by the general public, the most often intended definition is meteorological drought. However, when the word is used by urban planners, it is more frequently in the sense of hydrologic drought.

Wind Storms
Resulting from air movement from areas of high pressure to those of low air pressure, wind storms can occur at any time of the year and can vary in strength and duration.

Thunderstorm
A thunderstorm, also known as an electrical storm, a lightning storm, thundershower or simply a storm is a form of weather characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere known as thunder. Thunderstorms are usually accompanied by strong winds, heavy rain and sometimes snow, sleet, hail, or no precipitation at all. Those which cause hail to fall are known as hailstorms.

Tornado
A tornado often referred to as a twister, is a violent, dangerous, rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud. Tornadoes come in many shapes and sizes, but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust. Most tornadoes have wind speeds less than 110 miles per hour, are approximately 250 feet across, and travel a few miles before dissipating. The most extreme can attain wind speeds of more than 300 mph, stretch more than two miles across, and stay on the ground for dozens of miles.

Hail Storms
Hail is precipitation in the form of balls or irregular lumps, always produced by convective clouds, nearly always cumulonimbus. They can vary from pea size all the way up to that of a grapefruit in rare circumstances. Hailstones generally form in thunderstorms between currents of rising air called the updrafts and the current of air descending toward the ground, called the downdraft. Large hailstones indicate strong updrafts in the thunderstorm. The larger the hail, the stronger the updraft needed to hold it aloft in the storm.

Freeze
In this mild Mediterranean climate area, a freeze refers to a particularly cold spell of weather where the temperature drops below 32 degrees, most typically in the early morning hours. Usually these cold spells will last only two or three days when the ocean influence will overcome the cold front returning and the early morning temperatures will return to the normal 45 to 55 degree range. Rain fall during these periods may result in snow fall in the higher elevations of the county.

History
A sample of the variety of extreme weather events that have occurred in and San Luis County are found on the next page.

Table 6-1: Historical Extreme Weather in San Luis Obispo County

Location	Date of Event	Damage Reported	Incident Description
City of San Luis Obispo	5/5/1988	4 homes damaged	Tornado-A small tornado developed over the City of San Luis Obispo. The tornado knocked out power to several hundred homes. Four homes were damaged, including a home struck by a falling cypress tree.
Countywide	12/21/1998 through 12/24/1998	$5.4 million in crop damage	Freeze. An unseasonable cold air mass produced a three-night period of sub-freezing temperatures across Central and Southern California. Agricultural interests suffered heavy crop losses.
San Luis Obispo County	12/17/2000 through 12/18/2000		High Wind. Gusty offshore winds buffeted the Coastal section of San Luis Obispo County. In the City of San Luis Obispo, the winds blew out the windows in an unoccupied mobile home and destroyed part of a car port. In Nipomo, a weather spotter reported sustained winds of 35 mph with gusts to 55 mph. The strong winds produced widespread power outages.
San Luis Obispo County	3/04/2001 through 3/06/2001		High Wind. A powerful and slow-moving storm brought heavy rain, strong winds and snow to Central and Southern California. Across San Luis Obispo County, rainfall totals ranged from 2 to 6 inches over coastal and valley areas and ranged from 6 to 13 inches in the mountains. In San Luis Obispo County, the heavy rain produced extensive flooding.
Oceano	2/02/2004		Tornado. A waterspout, which developed offshore of Oceano Dunes came onshore as a weak tornado. The tornado hit, but did not injure a park ranger in his truck. The truck sustained no reportable damage.
San Luis Obispo County	1990 to present (events number more than 25)		Heavy Surf. Each winter, large surf produced by Pacific storms, batters the coastal areas of Central and Southern California. Along the coast of San Luis Obispo, waves as high as 25 feet have been reported. Shoreline erosion is common, especially at high tide. Damage has occurred to the breakwater and jetties at the entrance to Port San Luis and Morro Bay Harbor.
Mountains of	1990 to		Very cold Pacific storms brought snow fall to the higher

San Luis Obispo County	present (events number more than 5)		elevations of the county. On rare occasions, it caused damage to the naturally occurring vegetation. This resulted in an increased fire season threat as the damaged vegetation dried out and augmented the normal fuel loading. The snow caused rare transportation impacts on Hwy. 101 at Cuesta Grade and Hwy.s 41 and 46 at higher elevations.
North San Luis Obispo County	April, 2011		In mid April, a bitter cold weather system sent temperatures plunging to the mid-20's, bringing hail and freezing rain for at least two nights and in some lower elevation areas, three or four. Thousands of acres of vineyards lost newly emerging grape buds, which experts say could amount to 50% of the area's 2011 crop. Loss estimates range from 70 to 80 million dollars.

Hazard Potential

Drought
Periods of drought can have significant environmental, agricultural, health, economic and social consequences. Drought can also reduce water quality, because lower water flows reduce dilution of pollutants and increase contamination of remaining water sources. Wildfires are typically larger and more severe in periods of drought due to the lower fuel moisture content.

Wind Storms, Thunderstorms, and Tornados
These wind related events can be quite destructive, especially in urban areas where falling trees and branches can result in considerable property damage. Occasionally, summer thunderstorms (lightning) will cause wildfire in the coastal mountain regions of the county.

Hail Storms
Significant amounts of damage to property notably to automobiles, skylights, and glass-roofed structures can occur from hail storms. The damage to crops can also be severe. Fortunately, hail very rarely kills anyone, however each year dozens of people are injured when they are not able to find adequate shelter.

Freeze
Freeze is rarely a threat to human life in this county. The major impact will be to agricultural operations where crop damage to high value products such as strawberries, citrus, grapes and row crops such as lettuce and celery can be extensive.

Plans and Programs
In San Luis Obispo County, the County Agriculture Department works with growers following inclement weather however at this time does not alert growers of impending severe weather such as freeze, high winds and heavy rains.

Risk Assessment
The proximity to the Pacific Ocean both moderates and exaggerates certain types of extreme weather. Winter storms impacting coastal portions of the study areas tend to be more extreme than in inland portions. The ocean's influence is also a significant factor in moderating extreme cold temperatures, hail storms and other cold weather events. These events are rare and short lived, causing little if any life threatening situations and only occasional significant damage to property or agricultural concerns.

Relationship to Other Hazards – Cascading Effects
Drought leads to the weakening and ultimately death of trees which constitute increased fire hazard. Heavy rainfall carries the risks of power and communications outages, floods and landslides/mudslides.

Effects on people, housing, commercial/industrial structures and infrastructure:

- **Drought/Freeze/Snow Fall-**Although drought and freeze in and of themselves are not a serious threat to property and life, the indirect effects can be monumental. The costs to the County for heavy freezes and snow fall, in particular, can endanger plants, have detrimental effects on oak forests and agriculture and can have an impact in the millions of dollars. On rare occasions, snow fall maybe heavy enough to cause damage to the naturally occurring vegetation. This may result in an increased fire season threat as the damaged vegetation dries out and increases the normal fuel loading. Snow may very rarely have transportation impacts on Hwy. 101 at Cuesta Grade and Hwy.s 41 and 46 at higher elevations.

- **Hailstorms/High Winds-**It is highly unlikely that a hailstorm or high wind event constituting significant property damage or loss of life will occur in the County.

Risk Assessment Conclusion
San Luis Obispo County is at some risk for drought. Extreme summer heat in the inland portions of the County is a hazard but is generally well-mitigated by air conditioning and avoidance of prolonged direct exposure. Hailstorms constitute a minimal risk. Other severe weather hazards are not relevant to San Luis Obispo County. This threat is rated as Low.

7. Hazard: Coastal Storm/Coastal Erosion

Severity: Low	Probability: Medium

Hazard Definition

Coastal Storm

Coastal storms may have hurricane-force winds and cause damage similar to that of a hurricane. However, they are not classified as such because they don't originate in the tropics. Coastal storms usually do most of their damage on the coast, in the form of beach erosion and flooding. The winds originate from low-pressure systems offshore and circulate counterclockwise around the low. When the low stops moving, its winds combine with those of the high pressure system to blow in one direction over a long period of time, which creates massive waves. The duration of such a storm, the number of high tides through which it persists, can be the most significant measure of its destructiveness.

Coastal Erosion

The process of coastal erosion is highly complex and depends on a number of factors such as geologic formation, groundwater seepage, and exposure to wave energy. The coastline along the County of San Luis Obispo is variable in terms of geologic composition and exposure to wave energy. Sections of the coast range from rocky coastline to sandy beaches backed by cliffs, to sandy beaches backed by sand dunes. Due to these variances along the shoreline, erosion characteristics also vary significantly.

Driven by a rising sea level, large storms, flooding, and powerful ocean waves, erosion wears away the beaches and bluffs along shorelines. The retreat of the bluffs undermines waterfront houses, businesses, and public facilities, eventually rendering them uninhabitable or unusable. By moving the shoreline inland, erosion also brings nearby structures ever closer to the water, often putting them at greater risk than either their owners or insurers recognize. An April 2000 study sponsored by FEMA predicts that over the next 60 years, erosion may claim one out of four houses within 500 feet of the U.S. shoreline.

Coastal erosion rates can be accelerated by a rise in the sea level. Future climate change, global warming, is expected to particularly affect sea levels as the glaciers, polar ice packs, and ice sheets retreat. The predicted sea level rise over the course of this century varies widely. Since 1992, a number of satellites have been recording the change in sea level. Given the variables involved, it is not yet possible to determine the actual rate of sea level increase.

History

Coastal erosion is a natural geological process caused by currents, storms, earthquakes, winds, waves, tides, and the gradual movement of tectonic plates. It may take place slowly over thousands of years, or it may occur dramatically, as with landslides or severe storms.

It is important to note that coastal erosion occurs primarily during periods of intense wave action that coincides with high tides. Rates of erosion are reported as a yearly average. Local annual erosion rates range from three inches a year to over one foot. However, this pattern is not indicative of future annual changes.

Hazard Potential

Coastal Storm

The entire San Luis Obispo County coastline has the potential to be significantly impacted by coastal storms.

Coastal Erosion by Area

The reported rates of erosion presented in the following sections must only be considered as approximations in characterizing coastal erosion rates and vulnerability due to difficulties in obtaining accurate erosion data.

Cambria

Cambria is primarily characterized by narrow beaches backed by low cliffs approximately 20 feet-high. This section of coastline is subject to moderate to heavy wave action mostly from northerly swells. The coast in the area is comprised of a rock unit called the Cambrian slab which is a local, colloquial name for the Cretaceous-age sandstones that form the resistant rock headlands in the area. Since sandstone is fairly resistant to erosion, cliff retreat rates in Cambia are relatively low when considering the wave energy imposed on this area. However, present developments along Windsor Avenue are considered to be in danger from wave action and are currently experiencing rates that average seacliffs retreat of two to three inches per year.

Cayucos

Shorelines in Cayucos are similar to those found in Cambria. However, there are several important differences that affect the erosion potential. Cayucos has wider beaches than those found in Cambria. In the winter month the sandy beaches virtually disappear and waves strike directly against the bluffs. The Cayucos shoreline faces south therefore its beaches are partially protected from northerly swells. Still, wave action in this area is significant. The seacliffs are comprised of Franciscan melanges, characterized by blocks of rocks often surrounded by small zones of sheared or crushed rock that tend to erode easily. Some zones contain more erosion resistant rock blocks that have been exposed as the weaker blocks have eroded away. During the intense storm waves of 1983, even

these seemingly resistant blocks were breached at some spots. As a result, the bluff receded as much as 20 feet.

Rates of erosion are highly variable along this coastline, and range from 6 to 10 inches per year. In response to the storm waves of 1983, emergency rip-rap and numerous seawalls were constructed. Even with this protection, rapid erosion rates can be expected to continue in the future.

Downtown Cayucos is another area of concern. Built upon the unconsolidated sediment deposited from the Cayucos creek, this area is susceptible to shoreline erosion. Up coast from the downtown area along Lucerne Avenue and extending north to the undeveloped bluffs, the shoreline is comprised of Franciscan melange containing erodable rocks with high silt contents. Also, unconsolidated clays form approximately the upper 10 feet of these bluffs and contribute to rates of cliff retreat through a landslide-type mechanism. During rainy months when the ground becomes wet, the low permeability of the clays tends to perch or elevate the ground water table. Consequently, the saturated soils cause increased erosion due to slope instability and slumping of the seacliff face.

Morro Bay

From Atascadero State Beach and continuing south through much of Montana de Oro State Park, the Morro Bay coast is fronted by large sand dunes that provide protection for developments located on terrace materials behind the sand dunes. Due to the construction of the Morro Bay Harbor Breakwater and the presence of Morro Rock, the littoral drift north of Morro Bay has been interrupted and the coast has extended, seaward. In about 50 years, the beach has widened about 250 feet near San Jacinto Avenue and almost 500 feet in front of Morro Bay High School. This sandbar, provides protection for developments in this region. South of Morro Rock, the bay is protected by the sandspit which provides a barrier to wave attack that would otherwise impact the developed areas along the Embarcadero.

Los Osos

From the Morro Rock extending into Montana de Oro State Park, large sand dunes protect the community of Los Osos from potential wave hazards. Coastal development in the area from Montana de Oro State Park through Port San Luis is unlikely due to the current allowable land uses. Erosion rates for shorelines of geology similar to this area range from approximately four to six inches per year.

Port San Luis

Port San Luis and the coastline surrounding San Luis Bay is well protected from the predominant northwesterly swells by the 2,300 foot long Port San Luis breakwater. However, little protection is offered from southerly swells. The Port San Luis area is backed by 100 foot-high cliffs which descend eastward into approximately 30 foot-high cliffs. Proceeding eastward from Port San Luis toward Avila Beach, protective rip-rap has been placed adjacent to Avila Beach Drive in to protect the roadway from storm

waves. Just east of the mouth of the San Luis Obispo Creek, and extending eastward to Fossil Point, the community of Avila Beach is fronted by a 300 foot-wide beach which provides little protection from storm waves.

Winter storm waves of 1983 damaged the concrete seawall which runs parallel to Front Street. Housing developments in this area experienced landslide activity as well as cracking of foundations and roads. The recreational pier at Avila Beach was also severely damaged.

Historic storms have shown that both Port San Luis and Avila Beach are susceptible to coastal damage resulting from storm waves, especially those generated from southerly swells. This region is classified with a "moderate risk" with respect to possible coastal damage incurred by storm waves.

Pirates Cove

From Fossil Point proceeding eastward to Shell Beach, the coastline is characterized by offshore rocks and sea stacks backed by high (30-100 feet) eroding cliffs. Rates of seacliff retreat range from four to seven inches per year for the Shell Beach coastline and catastrophic rock fall is an important agent of erosion in this area. Although many homes located very near the coastline of Shell Beach are protected by seawalls, bulkheads, sandbags, and rip rap, this stretch of coastline as a "high risk" with respect to possible coastal damage incurred by storm waves.

Grover Beach

Grover Beach is fronted by sandy beaches backed by low active dunes covered with dense vegetation, a golf course, and a mobile home park. The sandy beaches provide structures with moderate protection from storm waves. However, during the winter storms of 1983, timber beach access ramps were damaged. The Grover Beach shoreline is classified as a "moderate risk" with respect to possible coastal damage incurred by storm waves.

Oceano

Oceano is generally fronted by wide sandy beaches backed by low active dunes. These dunes provide protection for structures located nearby; however they are subject to erosion during storm surges at extreme high tides. Continuous vehicle traffic on the beach and dunes is hindering dune protection with respect to erosion. Although these sand dunes offer dwellings protection from storm waves, the winter storms of 1983 damaged structures and destroyed timber ramps which provided vehicular beach access. Therefore, this region is characterized with a "moderate risk" and a "high risk" region adjacent to the Arroyo Grande Creek mouth with respect to coastal erosion.

Pismo Beach
Approximately five miles of the northwest portion of the city shoreline consists of cliffs and bluffs ranging in height from ten to one hundred feet. The rapidly receding nature of this long cliff line has claimed and continues to threaten a broad range of public and private investments located near the edge. This bluff erosion has been caused by both natural events and human activities including development and intrusion up and down unprotected banks.

South County
From Oceano southward to the San Luis Obispo/Santa Barbara County line, the coastline is described as "sandy beaches backed by active dunes with sparse vegetative cover, high intermediate old dunes with vegetative cover, marshes, and lakes." Although the dune face is wave cut and experiences frequent slides, this region is classified with a "moderate risk" with respect to coastal erosion.

Plans and Programs
Development is not be permitted near the top of eroding coastal bluffs. San Luis Obispo County will require coastal bluff erosion studies to determine the rate or erosion and the resulting safe distance from the top of the bluff for development.

Risk Assessment
Coastal storms are a recurring hazard for San Luis Obispo County. Waves erode the coastline at varying rates depending upon the geology. Coastal bluffs on the marine terraces are the most likely to result in destruction as homes and other structures built near the edge are threatened by the retreat of the bluff.

Relationship to Other Hazards – Cascading Effects
Humans have the ability to alter the configuration of the shoreline by influencing long and short-term erosion rates. One of the major causes of beach erosion is the construction of dams and other structures along creeks and rivers that trap sediment and prevent it from reaching the ocean. This deprives the shoreline of the material that would replenish beach sand supplies. Coastal structures such as groins, jetties, seawalls, and breakwaters can also alter littoral drift. Beach groins and breakwaters, for example, can trap littoral sand and build beaches over a limited area but by doing so they reduce the amount of sand that flows to down-current beaches. This can result in a rapid loss of beach sand in down-current beaches. Seawalls are often used to protect seacliffs from eroding wave action. However, these structures can reflect wave energy to strip

protective beach sand at an accelerated rate. This may ultimately result in increased seacliff erosion rates, particularly at sections of coastline adjacent to the seawall.

- **Effects on people and housing:** Historically, there has been little or no loss of life or injury in San Luis Obispo County due to coastal storms. The primary impacts have been economic in nature.

- **Effects on commercial and industrial structures:** As beaches erode, the amount of recreational beach available to the public is greatly reduced. Also, changes in beach geometry can alter the wave characteristics of a particular site. Beach erosion results in the loss of sand from coastal areas. This hazard can accelerate the rate of erosion of coastal bluffs, and can also contribute to increased wave-related damage to coastal structures.

- **Effects on infrastructure:** Erosion of beach sand removes the natural barrier which protects landforms and structures from the potentially destructive wave action. The end result can be the direct destruction of roads, homes, and other structures by waves whose force is no longer dissipated by wide beaches.

Risk Assessment Conclusion

The coastline along the County of San Luis Obispo is variable in terms of geologic composition and exposure to wave energy. Sections of the coast range from rocky coastline to sandy beaches backed by cliffs, to sandy beaches backed by sand dunes. Due to these variances along the shoreline, erosion characteristics also vary significantly. It is important to note that coastal erosion occurs episodically, mainly during periods of intense wave action that coincides with high tides. Typically, annual rates of coastal erosion range from about three inches a year to more than one foot a year.

8. Hazard: Biological Agents

Severity: Varied	Probability: High

Hazard Definition
Public health associated hazards may be naturally occurring or the result of terrorism. The following diseases caused by naturally occurring biological agents possess epidemic potential for San Luis Obispo County.

Naturally Occurring Biological Agents

a. Influenza (Pandemic)
Influenza viruses have for centuries threatened the health of humans and animals worldwide by causing a contagious respiratory illness with mild to severe severity. Annual influenza epidemics create a significant public health burden with the highest risk of complications occurring in the elderly, children under the age of 2, and individuals with prior medical conditions. This virus' diversity and propensity for mutation has prevented the development of both a universal vaccine and highly effective antiviral drugs. Ongoing concern exists over the potential emergence of a new strain of influenza with the ability to infect and be passed between humans. Because humans won't have immunity to this novel virus, a worldwide epidemic (pandemic) could result as recently occurred.

Three human influenza pandemics have occurred in the 20th century each resulting in illness in approximately 30 percent of the world population and death in up to 2 percent of those infected. The 1918 Spanish Influenza (H1N1) pandemic occurred towards the end of World War I. More people died during the flu pandemic than were killed during the entire war. The influenza death toll was an estimated 50–100 million worldwide. In the United States, about 675,000 died. The 1957 Asian Influenza (H2N2) pandemic killed 1–2 million worldwide and caused approximately 70,000 deaths in the United States. The third pandemic, the Hong Kong Influenza (H3N2), occurred in 1968-69 and killed an estimated one million people worldwide.

More recently, a novel influenza virus emerged, the 2009 H1N1, which spread worldwide and caused the first flu pandemic in over 4 decades. In the U.S., the CDC believed H1N1 may have been responsible for up to 17,000 deaths as of May 2010.

Prevention
Preventing transmission of influenza virus and other infectious agents within healthcare settings requires a multi-faceted approach. Spread of influenza virus can occur among patients, healthcare personnel, and visitors. Additionally, healthcare personnel may acquire influenza from persons in their household or community.

Prevention strategies include:
- Administration of influenza vaccine
- Implementation of respiratory hygiene and cough etiquette
- Appropriate management of ill healthcare personnel
- Adherence to infection control precautions for all patient-care activities and aerosol-generating procedures
- Implementing environmental and engineering infection control measures.

General public prevention measures include:
- Educating the public on cough etiquette and basic personal hygiene
- Immunization with available influenza vaccine

Once an epidemic has been identified, the San Luis Obispo County Public Health Department will respond in the following manner:

1. Investigate the epidemic to determine its etiology, level of severity, mode of transmission, and persons affected and at risk.
2. Determine and institute control measures to prevent further spread.
3. Communicate control measures to the public and healthcare professionals.

b. Novel Infections (SARS et al)
Novel infections, particularly those of viral origin, pose a tremendous risk to public health because the general public has no immunity from prior infections or vaccination, and because a vaccine is not readily available. For influenza viruses, it takes at least six months to produce large quantities of vaccine. For other viral pathogens such as HIV, a vaccine that protects individuals against HIV infection has been the goal of many research programs for the past two decades, yet only in the past few years has a vaccine reached the clinical trial stage.

Vaccines, which are believed to work by activating the body's ability to produce antibodies, eliminated or curtailed smallpox, polio and other feared viral diseases.

One novel virus that took the world by surprise was the appearance of the Severe Acute Respiratory Syndrome (SARS) virus in China at the end of 2002. Within months, this

coronavirus spread internationally, with the help of air travel, resulting in 8,098 cases in 26 countries with 774 deaths occurring.

Prevention

Preventative measures consist of preparedness planning to enable the rapid detection, investigation and detainment of unexplained clusters of illness or death. Isolation of persons with unexplained potentially infectious disease may be indicated.

c. Food and Waterborne Illness

Food and waterborne illnesses are major global health problems resulting in over 2 million deaths per year. In the United States alone, an estimate 76 million cases of foodborne disease occurs annually resulting in 325,000 hospitalizations and 5,000 deaths.

The following biological agents have been historical threats to the food and water supply in this county.

- Staphylococcus aureus
- Salmonella
- E. coli 0157: H7
- Campylobacter
- Amebiasis
- Hepatitis A
- Shigella

Food-borne outbreaks are identified by the presence of illness shortly following a meal. Illness can occur within a few hours and up to several weeks. Symptoms range from mild to severe:

- Upset stomach
- Abdominal cramps
- Vomiting
- Diarrhea
- Fever
- Dehydration

Intrinsic problems in food or water production, processing, storage, distribution, or preparation can all result in contamination of the food supply. Because food production and distribution practices are constantly changing, new unforeseen problems will continue to emerge. The need for ongoing monitoring and control efforts is essential and is unlikely to diminish anytime soon.

Prevention
Preventative measures are based on the principles of: avoiding food contamination, destroying contaminants, and preventing further spread. Specifically, these include:

- Education of food handlers about sanitation, food and personal hygiene, kitchen cleanliness, temperature control, thorough cooking of animal related food products and hand washing before, during and after food preparation.
- Reducing food-handling time from initial preparation to service to be no more than 4 hours at ambient temperature.
- Teaching food handlers the importance of keeping wounds covered and not working with nasal or eye infections, boils, abscesses or other purulent skin lesions.
- Exclude individuals with diarrhea from food handling and from care of hospitalized patients, the elderly and children.
- Education of farmers on the importance of sanitary work practices and safe food preparation and transportation.

d. Antibiotic Resistant Microorganisms (e.g. MRSA, MDR and XDR-TB)

MRSA
Methicillin-resistant *Staphylococcus Aureus* (MRSA) is a bacterium that is resistant to certain antibiotics called beta-lactams. These antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin, and amoxicillin. In the community, most MRSA infections are skin infections. More severe or potentially life-threatening MRSA infections occur most frequently among patients in healthcare settings. While 25% to 30% of people are colonized in the nose with staphylococcus, less than 2% are colonized with MRSA.

MRSA Community Transmission
MRSA infections, as with all Staphylococcus, are usually spread by having contact with someone's skin infection or personal items they have used, like towels, bandages, or razors that touched their infected skin. These infections are most likely to be spread in places where people are in close contact with others—for instance, schools and locker rooms where athletes might share razors or towels.

Factors that have been associated with the spread of MRSA skin infections include: close skin-to-skin contact, openings in the skin such as cuts or abrasions, contaminated items and surfaces, crowded living conditions, and poor hygiene. People may be more at risk in

locations where these factors are common, including: athletic facilities, dormitories, military barracks, households, correctional facilities, and daycare centers.

Prevention
Preventative measures consist of good hygiene practices, using Standard Precautions in healthcare settings and patient education.

MDR and XDR Tuberculosis
Tuberculosis (TB) is a disease caused by the infectious bacterium Mycobacterium tuberculosis. It is responsible for 1.7 million deaths globally each year (230,000 are HIV associated cases). Person to person transmission of TB occurs when droplet nuclei are inhaled (typically occurs after sustained or recurrent exposure to an infected patient from coughing, sneezing, talking, singing or spitting). The aerosolized particles (bacilli) are inhaled into the lungs and subsequently ingested by alveolar macrophages initiating a new infection. The treatment regimen for infected patients involves multiple drug therapy for a minimum of 6 months. If not properly treated, TB can be fatal.

Outbreaks of multidrug-resistant TB (MDR-TB) defined as exhibiting resistance to at least isoniazid and rifampicin, have occurred primarily in settings where HIV-infected persons congregate such as hospitals, prisons, drug treatment clinics and HIV residences. These outbreaks have been associated with high fatality rates. Transmission of M. tuberculosis to healthcare workers and other patients also occurred.

Recently, extensively resistant TB (XDR-TB) has emerged. This is defined as MDR-TB plus resistance to any fluoroquinolone and any of the three injectable drugs (amikacin, capreomycin and kanamyin). Outbreaks have primarily occurred in situations where the use of second-line TB drugs has been used and poorly managed. A 2005-2006 outbreak in South Africa resulted in a 98% fatality rate and a median survival rate of 16 days from the date of XDR-TB diagnosis.

Prevention
Preventative measures include: 1) Promptly identifying and treating infectious patients, 2) Active case finding for secondary cases of TB amongst contacts with subsequent treatment, 2) Public education, 3) Reducing overcrowding, and 4) Providing outreach services for direct supervision of patient therapy.

Biological Agents of Terrorism
A bioterrorism attack is the deliberate release of viruses, bacteria, or other germs used to cause illness or death in people, animals, or plants. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment. Biological agents can be spread through the air, through water, or

in food. Terrorists may use biological agents because they can be extremely difficult to detect and do not cause illness for several hours to several days. Some bioterrorism agents, like the smallpox virus, can be spread from person to person and some, like anthrax, can not.

Category A Biological Agents

Local healthcare providers must be knowledgeable of and prepared to address various biological agents of terrorism, including pathogens that are rarely seen in the United States. High-priority disease/biological agents include:

- Anthrax (*Bacillus anthracis*)
- Botulism (*Clostridium botulinum* toxin)
- Plague **(***Yersinia pestis*)
- Smallpox (*Variola major)*
- Tularemia (*Francisella tularensis*)
- Viral Hemorrhagic Fever (*filoviruses and arenaviruses)*

These **Category A** microorganisms pose a risk to national security because they:

- Can in most cases be easily disseminated or transmitted from person to person
- Result in high mortality rates and have the potential for major public health impact
- Might cause public panic and social disruption, and
- Require special action for public health preparedness.

a. Anthrax

Anthrax is an acute disease caused by the bacterium Bacillus anthracis. Three forms of anthrax occur depending upon the route of exposure. These are cutaneous, pulmonary, and gastrointestinal.

Cutaneous: Approximately 95% of anthrax infections occur when the bacterium enters a cut or abrasion on the skin, such as when handling contaminated wool, hides, leather or hair products (especially goat hair) of infected animals. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a vesicle and then a painless ulcer, usually 1-3 cm in diameter, with a characteristic black necrotic (dying) area in the center. Lymph glands in the adjacent area may swell. About 20% of untreated cases of cutaneous anthrax will result in death. Deaths are rare with appropriate antimicrobial therapy.

***Inhalation*:** Initial symptoms may resemble a common cold – sore throat, mild fever, muscle aches and malaise. After several days, the symptoms may progress to severe breathing problems and shock. Inhalation anthrax is usually fatal.

Gastrointestinal: The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax results in death in 25% to 60% of cases.

Transmission

Anthrax is not known to spread from one person to another. *B. anthracis* spores can live in the soil for many years, and humans can become infected with anthrax by handling products from infected animals or by inhaling anthrax spores from contaminated animal products. Anthrax can also be spread by eating undercooked meat from infected animals. It is rare to find infected animals in the United States. Anthrax spores can be used as a bioterrorist weapon, as was the case in 2001, when *Bacillus anthracis* spores had been intentionally distributed through the postal system, causing 22 cases of anthrax, including 5 deaths.

Prevention

The primary preventative measures for naturally occurring anthrax are the vaccination of livestock in endemic regions and vaccination of humans in high-risk professions.

b. Botulism

Botulism is a serious paralytic illness caused by a nerve toxin that is produced by the bacterium Clostridium botulinum. There are three main kinds of botulism: food-borne, wound and infant. Food-borne botulism is caused by eating foods that contain the botulinum toxin. Wound botulism is caused by toxins produced from a wound infected with Clostridium botulinum. Infant botulism is caused by consuming the spores of the botulinum bacteria, which then grow in the intestines and release toxin. All forms of botulism can be fatal and are considered medical emergencies. Food borne botulism can be especially dangerous because many people can be poisoned by eating a contaminated food.

Prevention

Preventative measures for food borne botulism include:

- Hygienic practices in food preparation and preservation
- Inactivation of bacterial spores in canned or heat sterilized products and inhibition of growth in all other products.

c. Plague

Plague is a disease caused by Yersinia pestis, a bacterium found in rodents and their fleas in many areas around the world. Pneumonic plague is different from the bubonic form of plague. Both are caused by the same microorganism, but they are transmitted differently and their symptoms differ. Pneumonic plague can be transmitted from person to person; bubonic plague cannot. Pneumonic plague affects the lungs and is transmitted when a person breathes in Y. pestis particles in the air. Bubonic plague is transmitted through the bite of an infected flea or exposure to infected material through a break in the skin. Symptoms include swollen, tender lymph glands called buboes. Buboes are not present in pneumonic plague. If bubonic plague is not treated, however, the bacteria can spread through the bloodstream and infect the lungs, causing a secondary case of pneumonic plague. Patients usually have fever, weakness, and rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery sputum. Nausea, vomiting, and abdominal pain may also occur. Without early treatment, pneumonic plague usually leads to respiratory failure, shock, and rapid death.

d. Smallpox

Smallpox, caused by the Variola virus, was once a devastating disease occurring world wide. After an extensive eradication campaign, the World Health Organization (WHO) declared smallpox globally eradicated in 1979. Because of concerns about the use of clandestine supplies of Variola virus as a bioterrorism agent, it's important for healthcare workers to be familiar with the clinical and epidemiological features of smallpox and know how to distinguish it from chicken pox.

e. Tularemia

Tularemia is a potentially serious illness that occurs naturally in the U.S. It is caused by the bacterium Francisella tularensis found in animals (especially rodents, rabbits, and hares). Tularemia is a widespread disease in animals. About 200 human cases of tularemia are reported each year in the U.S. Most cases occur in the south-central and western states and are transmitted by a tick bite. Person to person transmission is not known to occur.

Prevention

Prevention is focused on educating the public to avoid bites of ticks, flies and mosquitos (by wearing long sleeves or using repellents) and to avoid contact with untreated water where infection prevails among wild animals.

f. Viral Hemorrhagic Fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo])
Hemorrhagic fever viruses cause severe acute illnesses with sudden onset of fever, headache, myalgia and malaise, followed by maculopapular rash, pharyngitis, vomiting and diarrhea. In severe and fatal forms of the disease, hepatic damage, renal failure, central nervous system involvement and terminal shock with multi-organ dysfunction can occur. Case fatality rates are between 50% to 90% for Ebola virus and 25% to 80% for Marburg virus. No specific treatment or vaccine is currently available for hemorrhagic fever viruses.

Prevention
Epidemic measures include rodent control, infection control and barrier nursing measures in hospitals and health facilities and contact tracing.

Future Probability
The potential exists within the study areas and in all regions of the U.S. for an outbreak of an infectious disease to occur that would dramatically affect the health and safety of the general public and the economy of the affected area, state and possibly nation. The San Luis Obispo County Public Health Department has been proactive in its infection control surveillance efforts and in its emergency preparedness planning activities.

One area of particular concern for the County of San Luis Obispo is the limited surveillance for vector borne diseases such as West Nile Virus. Surveillance efforts throughout California have been extensive, including human and horse case detection, and WNV testing of mosquitoes, sentinel chicken flocks, and dead birds. Because San Luis Obispo County is one of the few remaining counties in California without a Vector Control District, the risk of vector borne diseases increases.

The greatest ongoing concern national health agencies have is the potential emergence of a novel influenza virus as recently occurred with the 2009 H1N1 pandemic. For the past several years, federal, state and local governments have been actively engaged in pandemic influenza preparedness planning efforts. The San Luis Obispo Public Health Department has an up-to-date Pandemic Influenza Plan and Strategic National Stockpile Plan. While influenza is an unpredictable virus, these preparedness measures will facilitate prevention, early detection and treatment when the next pandemic does strike.

Plans and Programs

Public Health

The County Health Officer (CHO) is authorized under the California Health and Safety Code to take measures as may be necessary to prevent the spread of communicable disease. Generally, actions may include: 1) Obtaining information pertaining to the incident, 2) Assessing the health risk to the community, 3) Notifying appropriate agencies, and 4) Coordinating disease prevention and control with community, local, regional, state and federal agencies. Should it be necessary, the CHO may also initiate isolation and/or quarantine measures within the county.

Enhanced disease surveillance, including accurate, reliable and timely disease reporting and investigation are crucial to early detection of a naturally occurring infectious disease and also a bioterrorism induced event. The Public Health epidemiologist routinely investigates and records the causes and distribution of disease and disability within the County. Use of the existing centralized reporting system will help ensure coordinated and timely epidemiological investigation of disease occurrence.

Risk Assessment

The probability of an infectious disease epidemic occurring within San Luis Obispo County is high. Ongoing Public Health surveillance and emergency preparedness planning activities are geared towards minimizing the likelihood and reducing the severity of such an occurrence. Given the vast array of infectious diseases that could potentially impact the study area, it would be unrealistic to provide a single severity rating. Past and recent history dictates that the most likely microorganism to be involved in a local epidemic or global pandemic is the influenza virus. Due to an increasingly global marketplace for food products, occurrence of significant foodborne outbreaks is also on the rise.

The continued absence of a Vector Control District within San Luis Obispo County delays the detection of vector borne disease such as plague, tularemia and West Nile Virus.

9. Hazard: Agricultural Pests and Diseases

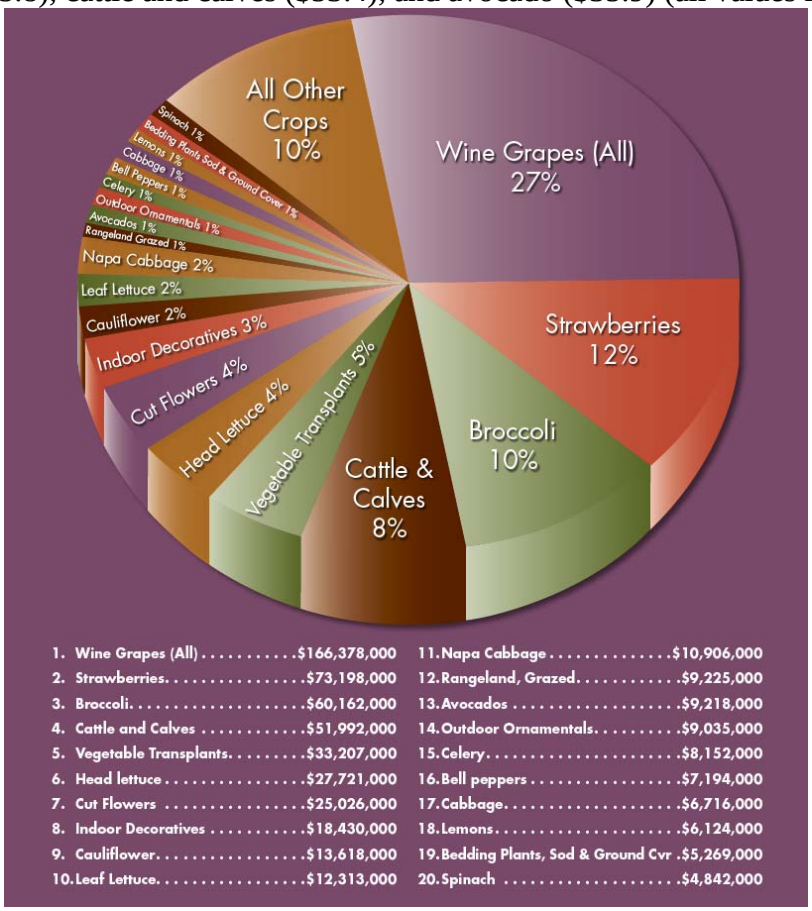
Severity: Low – Medium	Probability: Medium-High

Hazard Definition

Agricultural pests are organisms (insect, fungi or bacteria) that cause injury or destruction to crops or livestock. From exotic fruit flies to noxious weeds, California's agriculture is constantly under attack by a wide variety of invasive pests. These pests pose significant threats to the state's agricultural crops, economy, food supply and native habitat. The number of invasive pests and pathogens newly detected in California and the rest of the United States has increased at alarming rates in recent years, and that trend is projected to continue into the future.

History

San Luis Obispo County crop values for 2010 estimate a gross agricultural commodity of $712,808,000. The top five value crops are wine grapes ($173.6), strawberries ($123.5), broccoli ($55.8), cattle and calves ($53.4), and avocado ($35.9) (all values in millions).



Top 20 Cash Crops 2009

San Luis Obispo County has a demonstrated vulnerability to pest infestation including the Vine Mealybug, Glassed Winged Sharpshooter and Pine Pitch Canker.

Vine Mealybug

The Vine Mealybug (VMB), Planococcus ficus, is an exotic pest in California that was first found in San Luis Obispo County in 1991. It causes an enormous amount of damage, is very difficult and costly to treat, and can lead to total crop loss without the diligent use of insecticide treatment. Although it has only been found on grapes so far in California, alternate hosts include avocados, citrus and other crops. It is currently seen in most grape growing counties of California including vineyards in San Luis Obispo, Santa Barbara and Monterey counties.

The Vine Mealybug has 5 to 7 generations per year, enabling populations to grow very rapidly. Unlike other mealybugs, all life stages of the VMB can be present year-round on a vine. During winter months, eggs, crawlers, nymphs, and adults are found under bark, within developing buds, and on roots.

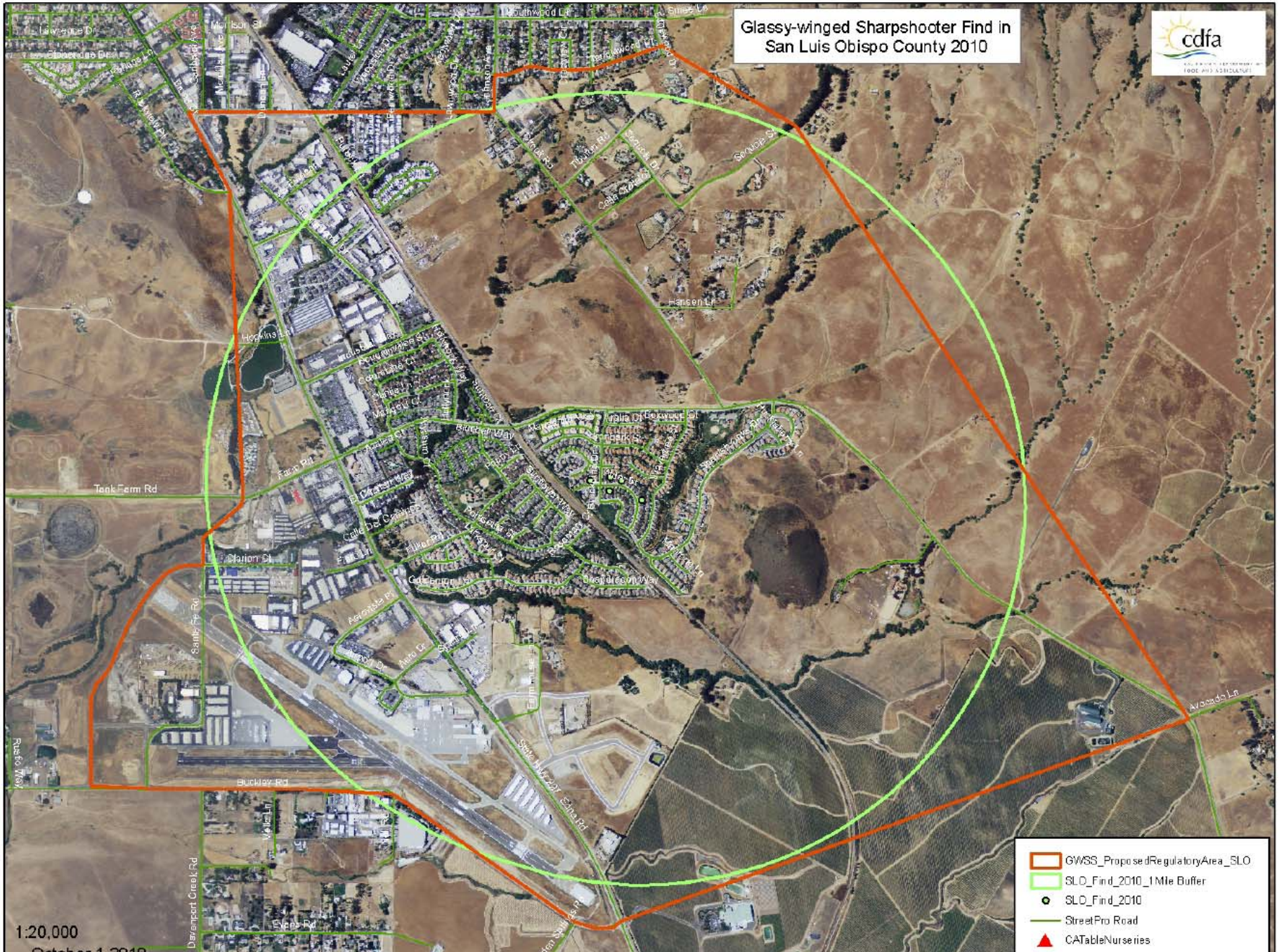
Prevention

The female VMB can easily spread on contaminated nursery stock, equipment, personnel as well as birds and other wildlife. Vineyard managers need to employ strict biosecurity and sanitation in the vineyard. Best Management Practices (BMP) in the vineyard and at the wineries that process the grapes can reduce the spread of VMB. Monitoring vineyards for the presence of VMB by detection trapping is essential to the early detection and successful treatment of the pest. It is unlikely that VMB will be eradicated from most vineyards. With early detection and vigilant treatment VMB populations can be kept in check.

Glassy Winged Sharpshooter

Glassy-winged sharpshooter (Homalodisca coagulata) is an insect that poses a significant hazard to California agriculture. When feeding, it can transmit Pierce's disease, caused by the bacterium Xylella fastidiosa, to grapevines, and other diseases to almond trees, alfalfa, citrus and oleanders. First detected in California in 1994, this insect has spread throughout Southern California and into the southern San Joaquin Valley. The first major infestation in California occurred in 1999 in Temecula, where more than 300 acres of vineyards were destroyed.

The glassy-winged sharpshooter is considered a serious threat to San Luis Obispo County's multimillion-dollar wine industry because it spreads bacteria that cause a lethal disease to grape plants. It is also a nuisance to homeowners because it deposits a sticky residue on plants.


Glassy-winged Sharpshooter Find in
San Luis Obispo County 2010
cdfa
Tank Farm Rd
Hockins Ln
Buckley Rd
Santa Fe Rd
Davenport Creek Rd
Ruiz Ln
Avocado Ln
Hansen Ln
Stenner Creek Rd
1:20,000
GWSS_ProposedRegulatoryArea_SLO
SLO_Find_2010_1 Mile Buffer
SLO_Find_2010
StreetPro Road
CATableNurseries

Prevention
The San Luis Obispo County Agricultural Commissioner's Office (SLOCACO) is in partnership with the California Department of Food and Agriculture (CDFA), the United States Department of Agriculture, the University of California, and other county Agricultural Commissioner's offices to form the Pierce's Disease Control Program (PDCP). The PDCP works to minimize the statewide impact of Pierce's Disease and the Glassy-Winged Sharpshooter GWSS. The strategy is to slow or stop the spread of the glassy-winged sharpshooter while both short and long-term solutions to Pierce's disease are developed.

This strategy relies on the following five elements:

- Containing the Spread
- Statewide Survey and Detection
- Rapid Response
- Outreach
- Research

The bulk of the SLOCACO's efforts have been in excluding GWSS from San Luis Obispo County and implementing a detection program most heavily weighted in nursery and urban settings. The exclusion efforts for the program consist mainly of inspecting incoming plant shipments from GWSS infested portions of the state bound for wholesale and retail nurseries throughout San Luis Obispo County.

The detection efforts for the program consist mainly of deploying insect traps in nursery and urban residential areas. Monitoring of the traps is performed every two weeks along with periodic relocation of the traps.

Pine Pitch Canker
A condition that is threatening the health of the Monterey pine trees in the Cambria area is the Pine Pitch Canker. This disease, native to Mexico and the southeastern United States, was first found in California in 1986. Since then, it has been found in 16 counties, and is spread by insects, the use of contaminated tools, and the transport of infected wood. The Pine Pitch Canker is considered to be a significant threat to the continued survival of the Monterey Pine ecosystem. Large native stands of the trees are now only found in the Ano Nuevo, Monterey, and Cambria areas. If a tree becomes infected with the Pine Pitch Canker, the disease can spread quickly, and can result in the rapid death of the tree. If an infected or dead tree is not properly removed, it not only becomes a threat to spread the disease, but can also result in a safety threat, as a large dead tree is a fire hazard as well as presenting the potential to become uprooted and to fall during a storm.

Prevention
Preventative measures consist of pest detection, exclusion and eradication.

Light Brown Apple Moth

The Light Brown Apple Moth is native to Australia and is found in New Zealand, the United Kingdom and Hawaii. The range of host plants is broad with more than two-thousand plant species known to be susceptible to attack by this pest, and more than 250 crops. It threatens California's environment—including cypress and oak trees—by destroying, stunting or deforming young seedlings and damaging new growth in the forest canopy. The moth also feeds on host plants and damages or spoils the appearance of ornamental plants, citrus, grapes, and deciduous fruit tree crops. Currently nine coastal California counties are under quarantine for the presence of this pest. State and federal agriculture officials are currently developing sterile insect technology to combat the infestation.

Light Brown Apple Moth

Prevention

Preventative measures consist of pest detection, exclusion and eradication.

Light Brown Apple Moth
July 2009
N
W
E
S
Light Brown Apple Moth
Crops
Nurseries
1.5 miles from Find
South Bay
Los Osos Valley Road
1.5 Miles
Find = 2 Male Moths July 23, 2009
Find = 1 Male Moth July 14, 2009
San Luis Obispo County
Agriculture Commissioner
July 29, 2009

Sudden Oak Death

A disease of oak trees and more than one hundred other plant species, *Phytophthora ramorum* (or Sudden Oak Death), has been found throughout much of coastal California but to date has not become established in San Luis Obispo County. This disease has killed over a million trees in Coastal California forests and has the potential for broad ecological changes to natural areas, including significantly increasing the risk of wildfire.

Bleeding ooze from a canker on an oak.

Symptoms and Impact: On oaks and tanoak, cankers are formed on the stems. Cankered trees may survive for one to several years, but once crown dieback begins, leaves often turn from green to pale yellow to brown within a few weeks.

Black or reddish ooze often bleeds from the cankers, staining the bark, as well as killing the mosses that grow on it. Bleeding ooze may be difficult to see if it has dried or has been washed off by rain.

Necrotic bark tissues surrounded by black zone lines are present under affected bark. Because these symptoms can also be caused by other Phytophthora species, laboratory tests must be done to confirm pathogen identity.

Infected coast live oaks sometimes gradually lose their leaves and fade out slowly. If bleeding oaks and leaf spots on bay laurel or other symptomatic hosts are adjacent to one another, the presence of Phytophthora ramorum is likely.

Prevention

Preventative measures consist of pest detection, exclusion and eradication.

Plans and Programs

San Luis Obispo County Pest Detection, Exclusion and Eradication Programs

Pest Detection Program
During 2009, county staff placed over 2000 insect traps throughout the county and made more than 26,000 total visits to these traps to determine if certain detrimental insects were present. The year was notable for the three insect pests captured in county-deployed traps for the first time: the Light Brown Apple Moth (Epiphyas postvittana), which prompted an eradication program by CDFA; the Apple Maggot Fruit Fly (Rhaguletis pomonella), which is under close surveillance through continued trapping; and the Spotted-Winged Drosophila (Drosophila suzukii), a pest the University of California is studying to develop control techniques. Other examples of pests being sought through trap monitoring include the Asian Citrus Psyllid, Red Imported Fire Ant, Glassy-winged Sharpshooter, Gypsy Moth, Japanese Beetle and a variety of exotic fruit flies. None of these pests were captured in traps in 2009. Efforts to detect detrimental pests through targeted trapping in 2009 helped to maintain the high quality of agricultural products grown in San Luis Obispo County.

Pest Exclusion Program
Throughout 2009, staff intercepted, inspected, quarantined, excluded and destroyed plant shipments infested with various types of pests arriving into San Luis Obispo County from across the United States and around the world. Out of a total of 18,423 shipments arriving into San Luis Obispo County, 6,609 shipments were visually inspected by staff. One hundred and three shipments were rejected for significant pest finds or otherwise not meeting California's high quarantine standards, thus protecting local agriculture and the environment from the introduction of pests that do not currently exist in San Luis Obispo County. In addition to the inspection of incoming plant material, staff certified 1,775 outgoing shipments of fresh produce and plants leaving local farms and nurseries for destinations throughout the United States and around the world. Staff also searched for the Glassy-winged Sharpshooter (Homaludisca coagulata) through inspection of 3,998 nursery plant shipments originating from outside the county. Eleven shipments were rejected due to the presence of live Sharpshooters and were either sent back to origin, reconditioned or destroyed. This strict and thorough inspection program has been successful in keeping the Glassy-winged Sharpshooter out of the county, protecting the grape, citrus, and plant nursery industries from the devastating effects of this insect and the plant diseases it can spread.

Pest Eradication
Pest eradication is designed to eliminate small populations of invasive pests that have become established in the county. Rapid response and long term consistent follow-up are critical to an effective pest eradication project. Depending on the pest type, location and the technology available, an eradication plan may include mechanical, cultural, chemical,

or biological means. Regardless of the technique, eradication efforts are generally long term commitments.

Education

The San Luis Obispo County Fire Safe Council has issued articles and brochures on Sudden Oak Death and Pine Pitch Canker, both diseases that increase the potential for catastrophic fires.

Risk Assessment

The climate in San Luis Obispo County makes it possible for some insects and other pests to reproduce with little natural hindrance to their proliferation. This mission of the San Luis Obispo Department of Agriculture/Weights and Measures is to protect agriculture and the community by managing infestations and the spread of detrimental pests through partnerships, education, and the promotion of integrated pest management strategies.

VI. VULNERABILITY ASSESSMENT

A. Overview

The vulnerability assessment is a summary of the hazard's impact to the community's vulnerable structures. Community assets and development trends will be identified and assessed with respect to the developed hazard profiles to ascertain the potential amount of damage that could ensue from each identified hazard. This section will include: 1) A description of the critical buildings and infrastructure within the study areas including future building and land use decisions. 2) A general description of the extent of each hazard's impact to these vulnerable structures, 3) An estimate of the potential dollar losses to vulnerable structures.

B. DMA 2000 Requirements

DMA Requirement §201.6(c)(2)(ii):	[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.
DMA Requirement §201.6(c)(2)(ii)(A):	The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas … .
DMA Requirement §201.6(c)(2)(ii)(B):	[The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate … .
DMA Requirement §201.6(c)(2)(ii)(C):	[The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land decisions.
DMA Requirement §201.6(c)(2)(iii):	For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

C. Critical Facilities and Infrastructure

Critical facilities and infrastructure are those systems within each community whose incapacity or destruction would have a debilitating effect on the community's ability to recover subsequent to a major disaster. The following critical facility and infrastructure are categorized as follows:

1. **Emergency Services** for the health and welfare of the whole population (e.g., hospitals, police, fire stations, emergency operations centers, evacuation shelters, schools).

2. **Lifeline Utility Systems** such as potable water, wastewater, oil, natural gas, electric power and communications systems.

3. **Transportation Systems** including railways, highways, waterways, airways and city streets to enable effective movement of services, goods and people.

4. **High Potential Loss Facilities** such as Nuclear power plants, dams and levies.

Non-Critical Facilities

For the purpose of this plan, properties such as recreational facilities, parks, libraries, religious facilities, and historical buildings will be classified as non-critical facilities. Although their relevance to the school district, cities, and their residents is undeniably significant, they are not classified as 'critical facilities' per the definition set in Executive Order 13010 (Critical Infrastructure Protection 1996).

Residential Facilities

Although personal residences are not by the above definition considered to be critical facilities, their relevance to these communities and its citizens is unquestionable. For that reason, they have been included in each jurisdiction's vulnerability assessment.

D. Jurisdictional Assets at Risk to Applicable Hazards

Assets at risk include: Buildings, Critical Facilities, Infrastructure, Private Property and Areas (Residential, Environmental, Historical and Economic)

Critical Facilities and Infrastructure	Asset Location (Latitude and Longitude)	Total Value in Dollars (K for thousands or M for millions)	Wildfire	Flood	Extreme Weather	Tsunami	Earthquake	Fault Rupture/ Groundshaking / Liquefaction	Coastal Storm / Coastal Erosion	Landslides / Rockslides	Naturally-Occurring Biological Threats	Insect Infestation
HOSPITALS												
Twin Cities, Templeton	35.5546°N, 120.7186°W	$138.6M		X			X	X			X	
FIRE STATIONS												
#21 SLO Airport	35.2384°N, 120.6361°W	$3.5M					X	X			X	X
#62 Avila Valley	35.1905°N, 120.7191°W	$1M		X	X		X	X			X	X
#22 Nipomo Mesa	35.0473°N, 120.5839°W	$1M					X	X			X	X
#33 Heritage Ranch	35.7275°N, 120.8952°W	$2M			X		X	X				
#36 Meridian	35.6600°N, 120.5786°W	$2M		X			X	X			X	X

SHERIFF FACILITIES												
Sheriff HQ	35.3215°N, 120.7297°W	$6.1M			X		X	X		X	X	X
Sheriff Jail	35.3215°N, 120.7297°W	$13M			X		X	X		X	X	X
Women's Jail	35.3215°N, 120.7297°W	$13.1M			X		X	X		X	X	X
Sheriff's Honor Farm	35.3203°N, 120.7166°W	$2.67M			X		X	X			X	X
Sheriff Coast Station	35.3131°N, 120.8324°W	$482K		X	X		X	X				
Sheriff / AG North	35.5649°N, 120.7017°W	$3.6M					X	X				
BRIDGES												
Jack Creek, 1.3 miles SW of Vineyard Drive	35.5516°N, 120.7769°W	$530K		X	X		X	X				
San Simeon Creek Road, 3.7 miles E of State Route 1	35.5994°N, 121.1190°W	$899K		X	X		X	X				
Arroyo Grande, Huasna River, 2.55 mi E of Huasna	35.1291°N, 120.3843°W	$1.6M		X	X		X	X				
San Simeon Creek Road, 2.65 mi E of State Route 1	35.5991°N, 121.1212°W	$1.4M		X	X		X	X				
Huasna Townsite Road, Husana River, 3.1 mi SE of Huasna	35.1169°N, 120.3918°W	$1.5M		X	X		X	X				
Davenport Creek Road, Davenport Creek, .2 mi S of Buckley Road	35.2283°N, 120.6492°W	$722K		X	X		X	X				
Toro Creek Road, Toro Creek, 2.7 mi W of State Route 41	35.4117°N, 120.8360°W	$378K		X	X		X	X				
Branch Mill Road, Tar Springs Creek, .25 mi SW of Huasna Road	35.1322°N, 120.5433°W	$764K		X	X		X	X				
Main Street, Cambria 1.2 mi N of State Route 1	35.5630°N, 121.0923°W	$773K		X	X	X	X	X				
ROADS												
Santa Rosa Creek Road, Cambria	35.5719°N, 120.9748°W	$300K per site *		X			X					

Cypress Mountain Road, Cambria	35.5725°N, 120.9736°W	$300Kper site *					X			X		
Chimney Rock Road, Lake Nacimiento	35.6785°N, 120.9336°W	$200K per site *					X			X		
Nacimiento Lake Drive, West Paso Robles	35.7499°N, 120.8768°W	$300K per site *					X					
Peachy Canyon Road, West Paso Robles	35.6250°N, 120.7883°W	$200K per site *					X			X		
Vineyard Drive, Templeton	35.6312°N, 120.8535°W	$300K per site *					X					
Estrella Road, San Miguel	35.6543°N, 120.5105°W	$200K per site *		X			X					
River Road, San Miguel	35.6562°N, 120.6906°W	$250K per site *		X			X					
Geneseo, Creston	35.6436°N, 120.5609°W	$200K per site *					X					
Creston Road, Creston	35.5725°N, 120.5996°W	$200K per site *					X					
El Pomar Road, Templeton	35.5574°N, 120.6290°W	$200K per site *					X					
South Bay Boulevard, Los Osos	35.3332°N, 120.8235°W	$350K per site *		X			X					
Los Osos Valley Road, Los Osos	35.3107°N, 120.8279°W	$300K per site *					X					
Foothill Road, SLO	35.2865°N, 120.7006°W	$250K per site *					X					
Orcutt Road, SLO	35.2575°N, 120.6319°W	$200K per site *					X					
Price Canyon, Pismo Beach	35.1816°N, 120.6201°W	$250K per site *					X			X		
Lopez Drive, Arroyo Grande	35.1502°N, 120.5372°W	$300K per site *		X			X					
Huasna Road, Arroyo Grande	35.1390°N, 120.5190°W	$200K per site *		X			X					
Pomeroy Road, Nipomo	35.0719°N, 120.5408°W	$200K per site *					X	X				
Tefft Street, Nipomo	35.0390°N, 120.4817°W	$350K per site *					X	X				
Division Street, Nipomo	35.0234°N, 120.4875°W	$300K per site *					X	X				
Orchard Ave, Nipomo	35.0159°N, 120.4794°W	$250K per site *					X	X				

Commercial and Industrial Buildings and Areas	Asset Location (Latitude and Longitude)	Total Value in Dollars (K for thousands or M for millions)	Wildfire	Flood	Extreme Weather	Tsunami	Earthquake	Fault Rupture/ Groundshaking / Liquefaction	Coastal Storm / Coastal Erosion	Landslides / Rockslides	Naturally-Occurring Biological Threats	Insect Infestation
COMMERCIAL BUILDINGS												
Woodlands Development: streets, water, sewer, 1,320 residential units and 65 commercial acres	35.0190°N, 120.5157°W	Undetermined (high M)		X	X		X	X				
INDUSTRIAL PLANTS												
PG&E Electrical and related facilities, including Diablo Canyon Power Plant	Various locations; Diablo Canyon is at approximately 35.2122°N, 120.8574°W	$2.167B	X		X	X	X	X	X			
Conoco Phillips Refinery and Pipeline	Various locations; refinery is at approximately 35.0473°N, 120.5839°W	Unknown (high M)					X	X				
BUSINESSES												
Cypress Ride proposal; in addition to proposed additional residential, includes hotel/resort/ restaurant, conference rooms	35.0663°N, 120.5730°W	Proposed development (multi-M)		X	X		X	X				
Various small businesses in Cambria	35.5641°N, 121.0807°W	Unknown (high M)	X	X	X	X	X	X	X	X	X	

Various small businesses in Cayucos	35.4428°N, 120.8921°W	Unknown (high M)		X	X	X	X	X	X	X	X	
Various small businesses in Santa Margarita	35.3900°N, 120.6091°W	Unknown (high M)	X	X	X		X	X			X	X
Various small businesses in Oceano	35.0989°N, 120.6124°W	Unknown (high M)		X	X	X	X	X	X		X	X
Various small businesses in San Miguel	35.7525°N, 120.6963°W	Unknown (high M)		X	X		X	X			X	X
Various small businesses in San Simeon	35.6439°N, 121.1908°W	Unknown (high M)		X	X	X	X	X	X	X	X	
Various small businesses in Los Osos/Baywood Park	35.3111°N, 120.8324°W	Unknown (high M)	X	X	X	X	X	X	X		X	
Various small businesses in Creston	35.5189°N, 120.5238°W	Unknown (high M)	X	X	X		X	X			X	X
Various small businesses in Nipomo	35.0428°N, 120.4760°W	Unknown (high M)	X	X	X		X	X		X	X	X
Various small businesses in Shandon	35.6552°N, 120.3754°W	Unknown (high M)		X	X		X	X			X	X
Various small businesses in Templeton	35.5497°N, 120.7060°W	Unknown (high M)	X	X	X		X	X				
Various small businesses in other unincorporated areas	35.367°N, 120.533°W and surrounding areas all directions	Unknown (high M)	X	X	X	X	X	X	X	X	X	X
OTHER												
Health Clinic, SLO	35.4958°N, 120.6618°W	$1.7M		X			X	X			X	X
Health Clinic Morro Bay	35.4958°N, 120.6618°W	$441K		X	X		X	X			X	X
Health Clinic Paso Robles	35.3657°N, 120.8443°W	$763K		X	X		X	X			X	X
South County Regional Center	35.1246°N, 120.5910°W	$1.8M		X	X		X	X				
South County Library	35.1246°N, 120.5910°W	$1.8M		X	X		X	X				
Veteran's Building	35.1185°N, 120.5782°W	$327K		X	X		X	X				
Recreation Bldg. (Jocelyn)	35.5652°N, 121.0975°W	$925K		X	X	X	X	X				
Veteran's Bldg., Cayucos	35.4513°N, 120.9041°W	$721K		X	X		X	X				
Senior Center, Nipomo	35.0442°N, 120.4719°W	$335K		X	X		X	X				
Veteran's Bldg., SLO	35.2894°N, 120.6526°W	$2.7M		X	X		X	X				

Original Courthouse	35.2824°N, 120.6615°W	$15.2M		X	X		X	X				
Cambria Library	35.5656°N, 121.0979°W	$1M		X	X		X	X				
South Bay Library	35.3111°N, 120.8324°W	$1.8M		X	X		X	X				
Santa Margarita Lake Res. Facilities	35.3375°N, 120.5024°W	$1M	X	X	X		X	X		X	X	X
RV Park and Pool	35.1049°N, 120.6235°W	$853K		X	X		X	X			X	
San Miguel Library	35.7514°N, 120.6984°W	$327K		X	X		X	X				
Morro Bay Library	35.3670°N, 120.8463°W	$1.6M		X	X		X	X				
City-County Library, SLO	35.2825°N, 120.6620°W	$11.5M		X	X		X	X				
Atascadero Library	35.4815°N, 120.6662°W	$3.2M		X	X		X	X				
Nipomo Library	35.0302°N, 120.4955°W	$3.4M		X	X		X	X				
County Hospital Campus	35.2746°N, 120.6463°W	$15.9M		X	X		X	X				
County Hospital Annex	35.2747°N, 120.6464°W	$2.4M		X	X		X	X				
Mental Health Services	35.2746°N, 120.6463°W	$3.1M		X	X		X	X				
Lopez Lake Store and Marina	35.1875°N, 120.4581°W	$500K		X	X		X	X			X	X
Store/Marina	35.3375°N, 120.5024°W	$425K		X	X		X	X			X	X
JSC	35.3225°N, 120.7212°W	$2.5M		X	X		X	X				
Veteran's Bldg, SLO	35.2894°N, 120.6526°W	$2.7M		X	X		X	X				
Original Courthouse	35.2824°N, 120.6615°W	$15.2M		X	X		X	X				
Cambria Library	35.5656°N, 121.0979°W	$1M		X	X		X	X				
South Bay Library	35.3111°N, 120.8324°W	$1.8M		X	X		X	X				
Santa Margarita Lake Res. Facilities	35.3375°N, 120.5024°W	$1M	X	X	X		X	X		X	X	X
RV Park and Pool	35.1049°N, 120.6235°W	$853K		X	X		X	X			X	
San Miguel Library	35.7514°N, 120.6984°W	$327K		X	X		X	X				
Morro Bay Library	35.3670°N, 120.8463°W	$1.6M		X	X		X	X				
City-County Library, SLO	35.2825°N, 120.6620°W	$11.5M		X	X		X	X				
Atascadero Library	35.4815°N, 120.6662°W	$3.2M		X	X		X	X				
Nipomo Library	35.0302°N, 120.4955°W	$3.4M		X	X		X	X				
County Hospital Campus	35.2746°N, 120.6463°W	$15.9M		X	X		X	X				
County Hospital Annex	35.2747°N, 120.6464°W	$2.4M		X	X		X	X				
Mental Health Services	35.2746°N, 120.6463°W	$3.1M		X	X		X	X				
Lopez Lake Store and Marina	35.1875°N, 120.4581°W	$500K		X	X		X	X			X	X
Store/Marina	35.3375°N, 120.5024°W	$425K		X	X		X	X			X	X
JSC	35.3225°N, 120.7212°W	$2.5M		X	X		X	X				
DSS Building	35.2540°N, 120.6691°W	$10.4M		X	X		X	X				
DSS	35.1199°N, 120.5969°W	$541K		X	X		X	X				

Health Dept Facilities, Lab	35.2742°N, 120.6465°W	$1.9M		X	X		X	X			X	X
PH Facility	35.6285°N, 120.6728°W	$817K		X	X		X	X			X	X
Los Osos Sewer Project	35.3126°N, 120.8368°W	$150M		X	X		X	X			X	
AG Commissioner	35.2745°N, 120.6478°W	$2M		X	X		X	X			X	X
County Airport - Terminal Bldg.	35.2390°N, 120.6395°W	$2.55M		X	X		X	X				
Airport facilities	35.1027°N, 120.6240°W	$750K		X	X		X	X				
Animal Services Complex	35.3209°N, 120.7185°W	$933K	X	X	X		X	X			X	X
Clerk's Office	35.2832°N, 120.6593°W	$1.4M		X	X		X	X				
Court Facilities	35.1178°N, 120.6123°W	$403K		X	X		X	X				
Drug & Alcohol Services	35.4995°N, 120.6840°W	$691K		X	X		X	X				
American Legion Templeton	35.5476°N, 120.7068°W	$575K		X	X		X	X				
County Govt Center	35.2822°N, 120.6601°W	$32.3M		X	X		X	X				
County Govt Facility, Grover Beach	35.1192°N, 120.6126°W	$1.2M		X	X		X	X				
Community Center San Miguel	35.7514°N, 120.6984°W	$481K		X	X		X	X				
Community Center Santa Margarita	35.3894°N, 120.6083°W	$363K		X	X		X	X				
Courthouse Annex	35.2830°N, 120.6611°W	$11.3M		X	X		X	X				
1050 Govt Center	35.2824°N, 120.6607°W	$19.5M		X	X		X	X				
Simmler Community Bldg	35.3513°N, 119.9961°W	$313K		X	X		X	X				X
Nipomo Community Center	35.0442°N, 120.4719°W	$426K		X	X		X	X				
Gen Svs	35.2819°N, 120.6595°W	$1.3M		X	X		X	X				
Public Works Shops/Yard	35.3203°N, 120.7166°W	$1.3M		X	X		X	X				
Public Works Shops/Yard, Atascadero	35.4997°N, 120.6588°W	$546K		X	X		X	X				
Lopez Lake Water Treatment Plant	35.1725°N, 120.5302°W	$12M		X	X		X	X			X	X
Public Works Road Yard, Paso Robles	35.6280°N, 120.6851°W	$1M		X	X		X	X				
Salinas Dam	35.3375°N, 120.5024°W	$1.9M					X	X				
Oak Shores Sewer Treatment	35.7638°N, 120.9356°W	$3.7M		X	X		X	X			X	X
Road Yard	35.1250°N, 120.5922°W	$528K		X	X		X	X				
Section 3 Road Yard	35.3203°N, 120.7166°W	$426K		X	X		X	X				

Public Works Offices, SLO	35.2832°N, 120.6593°W	$453K		X	X		X	X				
Community Center (San Miguel)	35.7514°N, 120.6984°W	$481K		X	X		X	X				
Community Center (Santa Margarita)	35.3894°N, 120.6083°W	$363K		X	X		X	X				
Courthouse Annex	35.2830°N, 120.6611°W	$11.3M		X	X		X	X				
1050 Govt Center	35.2824°N, 120.6607°W	$19.5M		X	X		X	X				
Simmler Community Bldg	35.3513°N, 119.9961°W	$313K		X	X		X	X				X
Nipomo Community Center	35.0442°N, 120.4719°W	$426K		X	X		X	X				
GEN SVS	35.2819°N, 120.6595°W	$1.3M		X	X		X	X				
Public Works Shops/Yard	35.3203°N, 120.7166°W	$1.3M		X	X		X	X				
Public Works Shops/Yard, Atascadero	35.4997°N, 120.6588°W	$546K		X	X		X	X				
Lopez Lake Water Treatment Plant	35.1725°N, 120.5302°W	$12M		X	X		X	X			X	X
Public Works Road Yard, Paso Robles	35.6280°N, 120.6851°W	$1M		X	X		X	X				
Salinas Dam	35.3375°N, 120.5024°W	$1.9M					X	X				
Oak Shores Sewer Treatment	35.7638°N, 120.9356°W	$3.7M		X	X		X	X			X	X
Road Yard	35.1250°N, 120.5922°W	$528K		X	X		X	X				
Section 3 Road Yard	35.3203°N, 120.7166°W	$426K		X	X		X	X				
Public Works Offices, SLO	35.2832°N, 120.6593°W	$453K		X	X		X	X				
Water Operations Plant, Cayucos	35.4374°N, 120.8867°W	$4.5M		X	X		X	X	X	X	X	X
Water/Treatment Operations Facility, Graystone, rural SLO	35.2102°N, 120.6242°W	$3.4M		X	X		X	X			X	X
Outlet Control Building, Lopez Drive, AG	35.1872°N, 120.4582°W	$900K	X	X	X		X	X			X	X

Residential and Private Properties	Asset Location (Latitude and Longitude)	Total Value in Dollars (K for thousands or M for millions)	Wildfire	Flood	Extreme Weather	Tsunami	Earthquake	Fault Rupture/ Groundshaking/Liquefaction	Coastal Storm / Coastal Erosion	Landslides / Rockslides	Naturally-Occurring Biological Threats	Insect Infestation
Residential Developments												
Woodlands Development: Streets, water, sewer, 1,320 residential units and 65 commercial acres	35.0190°N, 120.5157°W	Undetermined (high M)	X	X	X		X	X				
San Miguel residential subdivision projects	35.7525°N, 120.6963°W	Undetermined (high M)	X	X	X		X	X			X	X
Templeton residential subdivision projects	35.5497°N, 120.7060°W	Undetermined (high M)	X	X	X		X	X			X	X
Nipomo residential subdivision projects	35.0428°N, 120.4760°W	Undetermined (high M)	X	X	X		X	X	X	X	X	X
Private Property (Land/Facilities)												
Various mixed use projects (residential and commercial)	Various areas of the county, including Avila Beach, Oceano, Templeton, and Nipomo; 35.367°N, 120.533°W and surrounding areas all directions	Undetermined (high M)	X	X	X	X	X	X	X	X	X	X

Environmental, Historical and Economic Areas	Asset Location (Latitude and Longitude)	Total Value in Dollars (K for thousands or M for millions)	Wildfire	Flood	Extreme Weather	Tsunami	Earthquake	Fault Rupture/ Groundshaking/Liquefaction	Coastal Storm / Coastal Erosion	Landslides / Rockslides	Naturally-Occurring Biological Threats	Insect Infestation
Historical Buildings/ Areas												
Rios Caledonia Adobe	35.7449°N, 120.6982°W	$416K		X	X		X	X				
San Miguel Adobe	35.7449°N, 120.6982°W	$314K		X	X		X	X				
Museum/Historical Bldg, SLO	35.2801°N, 120.6648°W	$113K		X	X		X	X				
Tourist/Economic Areas:												
Cayucos Pier	35.4489°N, 120.9064°W	$3.3M		X	X	X	X	X	X			X

Notes: * Road damage estimates are based on a per site cost figure, with each site covering an estimate road length of 2 to 300 feet. Each road may experience multiple damaged sites from one hazard event, or multiple roads may experience one event each. There is no way to make an accurate estimate of the potential limits one hazard may cause.

E. Methodology Used

To determine the number of critical structures and infrastructure at risk, a combination of field surveys, aerial photos, tsunami and GIS maps, and Google Earth software was used. The methodology used in preparing the Vulnerability Estimate consisted of determining the value of critical buildings and facilities from insurance property schedules. Critical infrastructure values were established by using actual replacement costs which were determined by recent comparable replacement projects.

F. Loss Estimations

Dollar losses to buildings and infrastructure vary depending upon the natural hazard occurring and the severity of the hazard. In general, earthquakes can extensively damage a wide area therefore critical structure and infrastructure losses should be estimated at a 100% value. Destruction from flooding takes place in specific areas and the damage is historically less severe than that of an earthquake. Thus, the estimated loss as a result of flooding should be calculated at the 50% level. Damage resulting from Wildfires should be calculated at 25% of structural value for those structures located within 300 feet of the wildfire areas. Tsunami losses are expected to be 100% yet are only applicable in the coastal tidal inundation zones. Extreme weather could impact any portion of the jurisdiction. Historical data indicates that these events are extremely localized and a 10% loss should be anticipated.

G. Development Trend Analysis

Land Use

Existing land use within San Luis Obispo County is a mosaic of varying types of uses, ownership, character, and intensity. Uses include:

- Rural residential
- Single family detached
- Single family attached
- High-density residential (apartments)
- Mobile homes
- Recreational open space
- Other open space
- Heavy industrial
- Warehouse
- Vacant
- Agriculture
- Water

- Utilities
- Public facilities
- Schools
- Retail / Office
- Tourist / Commercial recreation
- Light industrial / Business park
- Mineral extraction

Development Trends
While the population of San Luis Obispo County is expected to continue to change, there are Land Use policies and elements within the County General Plan to help assure orderly development.

In addition, the Local Agency Formation Commission (LAFCO) of San Luis Obispo County is tasked with the mission to provide an orderly pattern of growth that reconciles the varied needs of the County. One of the fundamental principles of LAFCO is to ensure the establishment of an appropriate and logical municipal government structure for the distribution of efficient ad appropriate public services. LAFCO Land Use Objectives include:

- the discouragement of urban sprawl;
- the preservation of the physical and economic integrity of agricultural lands;
- the preservation of open space within urban development patterns;
- the orderly formation and development of agencies by shaping local agency boundaries;
- the minimization of agencies providing services to a given area; and
- the utilization of Spheres of Influence to guide future development of agency boundaries.

VII. CAPABILITY ASSESSMENT

A. Overview
An important component of the Mitigation Strategy is an understanding of the resources available to the County in order to mitigate the effects of each of the identified hazards. The Capability Assessment begins with a review of legal and regulatory capabilities, including ordinances, codes, and plans needed to address hazard mitigation activities. This Assessment also describes the administrative and technical capability available to each jurisdiction. The third component of the Assessment is each jurisdiction's fiscal capability to ensure the availability of financial resources to implement proposed

mitigation strategies. The final part of the Capability Assessment is a review of the physical assets available to respond to the emergency needs of the community.

B. Legal and Regulatory

The cities applicable Building Codes, Zoning Ordinances, Subdivision Regulations, Capital Improvement Plan, and other regulatory development guides provide specific support to hazard mitigation activities within each of the communities. Additionally, the cities General Plans, Multi-hazard Emergency Response Plans, and Post-Disaster Recovery Plans provide additional authority. Further, participation in the County's Hazardous Waste Management Plan (HWMP) ensures compliance with hazardous materials regulations.

C. Administrative and Technical

The County of San Luis Obispo has experienced and competent administrative and technical staff in place to expedite the mitigation actions identified. They possess technical expertise in the areas of planning, engineering, floodplain management, Geographic Information Systems (GIS), and both emergency and general management authority. Additionally, technical and administrative resources are available to assist the staff in implementing the hazard mitigation goals.

D. Financial

In order to achieve the goals and objectives of the Mitigation Strategy, one or more of the following funding sources could be utilized: federal and state entitlements and grants, general fund, sales and property taxes, infrastructure user fees, impact fees, and new development impact fees.

All of the agencies studied have the necessary budgetary tools and practices in place to facilitate handling appropriate funds; however funding sources are very limited.

D. Physical Assets

Sheriff's Department	
Asset / Capability	**Inventory**
Rolling Stock	• 46 Patrol vehicles • 7 Custody vans • 6 Patrol SUVs • 48 Undercover vehicles • Various bomb task force, search and rescue, mobile command units, and related special needs vehicles
Personnel	• 159 Sworn Personnel • 119 Correctional Staff • 098 Civilian Personnel • 400 Volunteers • 1 Canine
Facilities	• County Jail • 911 / Communications Center • 3 Patrol Stations
Technical Assets	• 200 Computers • 376 Users • 12 Major Systems • Livescan; Picture Link and Cal-Photo; CAD; Megan's Law; TRAK; AFIS; CLETS; Records Management System (RMS); CivilServ

Fire Department	
Asset / Capability	**Inventory**
Rolling Stock	**State Fire Protection** • 14 Engines • 2 Bulldozer / Transport Units • 1 CDF Airbase w/Type 1 Air Tanker and Air Attack • 1 Mobile Field Kitchen **San Luis Obispo County Fire Department** • 21 Engines (Includes 2 ALS Engines) • 1 OES Engine • 4 Water Tenders • 2 Aircraft Crash / Rescue • 7 Rescues (plus one reserve) • 6 Boats • 1 Patrol • 1 Mobile Air Unit
Personnel (Approx. Numbers)	• 175 Permanent (3FC / 6FAE paramedics) • 60 Seasonal / Limited-Term • 240 Inmate and Ward Firefighters • 245 Paid-Call Firefighters (County) • 45 Volunteers in Prevention (CDF)
Facilities	• 20 Fire Stations • 3 Conservation Camps • 5 Field Battalions (1 local government-funded)

VIII. MITIGATION STRATEGY

A. DMA 2000 Requirements

DMA Requirement §201.6(c)(3)(i):	[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
DMA Requirement §201.6(c)(3)(ii):	[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

B. 2005 Mitigation Goals, Objectives, Strategies and Progress Made

HAZARD	Goals and Objectives	Strategies	Progress Made
Wildfire	**Goal:** Reduce risks of wildfires **Objective:** Minimize the amount of fuel in areas prone to wildfires	▪ Expand vegetation management program ▪ Vegetation mapping - acquire detailed vegetation mapping to identify level of fire hazard severity by fuel conditions. ▪ Expansion of the chipping program ▪ Develop a Countywide pre-plan handbook, including firefighter risks assessment matrix ▪ Topographic mapping – acquire high resolution DEM data for creation of well defined topographic/terrain maps (slope, aspect, and contour elevations)	▪ CAL FIRE/County Fire continues to track and map all fuel reduction efforts throughout the County. ▪ County GIS staff continues to gather data and improve mapping of all infrastructure such as roads, hydrants, structures, power lines, etc. ▪ Chipping program has been successful in several locations throughout the County. Continuance will be

			determined by level of interest and support of the communities and local agencies. ▪ Numerous pre-attack plans have been completed and several more are being prepared. ▪ High resolution aerial imagery was acquired for the entire County and for most of the larger communities
Flooding	**Goal:** Reduce risks of flooding **Objective:** Improve drainage	▪ Acquire funding for the "6 Communities Drainage Study" ▪ Topographic Mapping – acquire high resolution DEM data for creation of well defined topographic/terrain maps (slope, aspect, and contour elevations)	
Extreme Weather	**Goal:** Increase public awareness **Objective:** Better prepare communi-cations for the effects of Extreme Weather	▪ Public education – notifications enhancements	
Tsunami	**Goal: Increase public awareness** **Objective:** Better prepare communities	▪ Increase public education ▪ Evacuation route determination ▪ Topographic Mapping – acquire high resolution DEM data for creation of well	▪ Inundation maps have been developed and made available to the public; ▪ Evacuation routes have been determined in concurrence with all

	for effects of and reaction to Tsunamis	defined topographic/terrain maps (slopes, aspect, and contour elevations)	affected jurisdiction's ▪ Topographic maps have been updated and DEM data process/input is continuing.
Earthquake	**Goal:** Increase public awareness **Objective:** Better prepare communities for the effects of and reaction to Earthquakes	▪ Increase public education ▪ Develop scenarios – pre-planning program ▪ Geology Mapping – create comprehensive geological mapping of the County to identify earthquake faults, liquefaction and landslides; acquire high resolution DEM data for creation of well defined topographic/terrain maps (slopes, aspect, and contour elevations)	▪ Public education has increased through the County's participation in such programs as the annual Great California Shakeout, most recently in 2009 and 2010, with plans for continuing participation annually; ▪ The County has been provided with an updated HAZUS, as of 2011, with the scenario a 6.5 on the Hosgri fault, which helps with scenario and preplanning development; ▪ The County has been provided information on a newly discovered earthquake fault, the Shoreline fault, which is referenced earlier in this document; the County is continuing to follow updated studies of the fault to determine the impact, if any, to our mitigation or emergency response planning; ▪ The County obtained a high-resolution IFSAR Digital Elevation Model in

			2004 which was used in the development of a more accurate, comprehensive countywide GIS geology map, initially completed in 2006. Subsequently the new geology map and DTM have been combined in a GIS model to perform analysis of probable landslide risk and liquefaction risk areas as defined in the County's Safety Element. The geology map has been updated several times as new geology studies for our county are completed. The latest updates were incorporated into the geology mapping in February, 2011. The landslide risk and liquefaction model and output have as well been updated using the latest geology data set. The mapping of earthquake fault lines is in process and additional fault lines are being added to the data set as new information becomes available.
Fault Rupture/ Ground Shaking/ Liquifaction	**Goal:** Increase public awareness **Objective:** Better prepare communities for the effects of and reaction to Fault Rupture, Ground-shaking and	▪ Increase public education ▪ Develop scenarios – pre-planning program ▪ Geology Mapping – create comprehensive geological mapping of the County to identify earthquake faults, liquefaction and landslides; acquire high resolution DEM data for creation of well defined	

	Liquefaction	topographic/terrain maps (slopes, aspect, and contour elevations)	
Coastal Storm/Coastal Erosion	**Goal:** Limit development on or near bluffs **Objective:** Avoid the effects of and better prepare for Coastal Storms and Coastal Erosion	▪ Acquire updated digital aerial photography every three years ▪ Develop scenarios – pre-planning program ▪ Geology Mapping – create comprehensive geological mapping of the County coastline ▪ Geology Mapping – create comprehensive geological mapping of the County to identify coastal storm/erosion areas ▪ Topographic Mapping - acquire high resolution DEM data for creation of well defined topographic/terrain maps (slopes, aspect, and contour elevations)	
Landslides/ Rockslides	**Goal:** Identify areas prone to hazards **Objective:** Avoid the effects of and better prepare for Landslides and Rockslides	▪ Update the existing inventory and expand on aerial mapping ▪ Develop scenarios – pre-planning program ▪ Geology Mapping – create comprehensive geological mapping of the County landslide and rockslide prone areas	
Biological Threats	**Goal:** Prevent agents from entering the County	▪ Establish a comprehensive Vector Control District / mechanism ▪ Implement and manage a screening program	▪ In 2009, county staff placed over 2000 insect traps throughout the county and made more than 26,000 total visits to these traps to determine if certain

	Objective: Secure the County from intentional and unintentional introduction of naturally occurring biological agents	for pets, plants, and produce entering the County to protect the County's ecosystem and highly vulnerable agricultural industry ▪ Create a Sudden Oak Death outbreak and vulnerable area inventory ▪ Vegetation Mapping – acquire detailed vegetation mapping to identify areas of vulnerability	detrimental insects were present. ▪ Throughout 2009, staff intercepted, inspected, quarantined, excluded and destroyed plant shipments infested with various types of pests arriving into San Luis Obispo County from across the United States and around the world. ▪ The San Luis Obispo County Fire Safe Council has issued articles and brochures on Sudden Oak Death and Pine Pitch Canker, both diseases that increase the potential for catastrophic fires.
Insect Infestation	**Goal:** Prevent pests from entering the County **Objectives**: Secure the County from intentional and unintentional introduction of pests	▪ Establish a comprehensive countywide Vector Control District / mechanism ▪ Increase monitoring, and testing ▪ Provide assistance to private property owners with controlling pests on private land ▪ Expand public outreach ▪ Undertake more detection and exclusion efforts	

C. 2011 Goal, Objectives and Mitigation Actions

Goal 1	**Promote understanding and support for hazard mitigation by key stakeholders and the public within the County of San Luis Obispo.**
Objective 1.1	Educate key stakeholders and the public to increase awareness of hazards and opportunities for mitigating hazards.
Mitigation Action 1.A	Through newsletters, advertisements, speaking engagements and other public contacts, educate the general public and key stakeholders on the issues, responsibilities, and current efforts and successes in the area of disaster preparedness.

Goal 2	**Ensure that future development is protected from natural disasters.**
Objective 2.1	Limit new development in hazardous areas, and as permissible, build to standards that will prevent or reduce damage.
Mitigation Action 2.A	Educate the County's planning staff, administrative staff and elected officials on the importance of keeping current on trends and developments in disaster preparedness.
Mitigation Action 2.B	Encourage planning staff to attend seminars and lectures on natural occurring hazards so that they may better assist the appropriate governing bodies as they process future developments.

Goal 3	**Build and support local capacity and commitment to minimize the County of San Luis Obispo's vulnerability to potential hazards.**
Objective 3.1	Improve existing capabilities to manage emergency situations.
Objective 3.2	Enhance the safety of residents, students and staff within the community.

Mitigation Action 3.A	Continue to train all new employees and the Sheriff and CAL FIRE supervisors and officers on their roles and responsibilities at the EOC.
Mitigation Action 3.B	Develop an SOP or other procedure for guidance on external agency response coordination to winter storm type events.
Mitigation Action 3.C	Update the County Emergency Operations Plans and supporting plans including the Tsunami Emergency Response Plan and Earthquake Emergency Response Plan.
Mitigation Action 3.D	Support the development of the County Regional Community Emergency Response Team (CERT) in local areas.
Mitigation Action 3. E	Survey the applicable department heads as to their perceived disaster preparedness needs. Convene special meetings to prioritize these needs and develop funding strategies.
Goal 4	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to flooding.**
Objective 4.1	Enhance the ability of community assets, particularly critical facilities, located in the 100-year floodplain to handle existing and projected flood waters.
Mitigation Action4.A	Review and expand existing policies, procedures and regulations under the San Luis Obispo Flood Control ad Water Conservation District in order to reduce the exposure to flood hazards.
Mitigation Action 4.B	Identify flood prone areas within communities and define options under Community Drainage Studies. Engage stakeholders in defining, funding, and implementing community drainage facilities.

Mitigation Action 4.C Maintain compliance with the National Flood Insurance Program (NFIP) requirements.

Mitigation Action 4.D Continue to update and enhance Emergency Response Plan for Arroyo Grande Creek Levee System. Develop safeguards for levee protection. Implement Arroyo Grande Waterway Management Plan to maximize floodway capacity of the facility.

Mitigation Action 4.E Through Development Review process, restrict construction of essential service facilities in the 100-year flood plain.

Mitigation Action 4.F Continue to work cooperatively with the state and federal flood related agencies for funding improvements through grant and agency programs.

Goal 5 Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to wildland fires.

Objective 5.1 Develop a comprehensive approach to reducing the level of damage and losses due to wildland fires through vegetation management, code enforcement, GIS mapping, and planning processes.

Mitigation Action 5.A Prevent wildfires through aggressive code enforcement efforts by working with Engine Company Captains and Fire Prevention staff to increase the education and enforcement of PRC 4291, defensible space rules.

Mitigation Action 5.B In order to assist fire prevention efforts and to better manage large fires when they occur, continue to improve GIS mapping and tracking efforts by gathering and maintaining relevant GIS data layers and imagery and utilizing the best available mapping applications and software.

Mitigation Action 5.C Work with the San Luis Obispo County Fire Safe Council to initiate fuel thinning and chipping projects in high priority areas. Collaborate with property owners and regulatory agencies in order to utilize prescribed fire on private and state owned lands in the county.

Mitigation Action 5.D Create and maintain fuel breaks in strategic locations.

Mitigation Action 5.E Utilizing grant funding, develop a Community Wildfire Protection Plan for the County that will:

- Assess the fire hazard in the County
- Prioritize treatment areas
- Enhance collaboration among all fire agencies and stakeholders
- Streamline environmental review process

Goal 6 **Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to geological events (earthquakes, landslides, and liquefaction).**

Objective 6.1 In order to better protect life and property, develop a more accurate, comprehensive series of countywide GIS geology maps and data sets and continue response efforts.

Mitigation Action 6.A Capture most recent earthquake fault line map.

Mitigation Action 6.B Increase participation in earthquake preparedness activities such as the Great California Shake-Out Campaign.

Mitigation Action 6.C Monitor the progress of PG&E as they perform studies on the newly discovered Shoreline fault and updated plans and policies as necessary.

Goal 7 **Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to tsunami events.**

Objective 7.1 Develop a comprehensive approach to reducing the level of damage and losses due to tsunamis through improved policies, procedures, training, and evacuation planning.

Mitigation Action 7.A Provide the coastal cities assistance in updating their tsunami plans, maps, and evacuation processes.

Mitigation Action 7.B	Provide training on changes to tsunami emergency plans and pre-response plans and policies to appropriate agencies.
Mitigation Action 7.C	Maintain emergency responder pre-response plans for tsunami inundation areas.
Mitigation Action 7.D	Install tsunami area warning signs.

Goal 8	**Minimize human morbidity and mortality as a result of biological agent threats.**
Objective 8.1	Curtail the entry and spread of infectious diseases within San Luis Obispo County.
Mitigation Action 8.A	Continue communication and coordination efforts amongst Public Health, local hospitals, healthcare workers and first responders to provide information about the effects and transmission of diseases causing epidemics along with specific preventative measures.
Mitigation Action 8.B	Continue general public and patient education regarding basic hygiene, cough etiquette and other disease prevention methods.
Mitigation Action 8.C	Increase involvement of special populations (disabled, elderly) in education and disaster preparedness activities.
Mitigation Action 8.D	Support establishment of a Vector Control District in San Luis Obispo County.

Goal 9	**Minimize the extent of damage and destruction to crops, farm animals, humans, and existing and future critical facilities as a result of agricultural pests and disease.**
Objective 9.1	Curtail the entry of harmful agricultural pests into San Luis Obispo County.
Objective 9.2	Quickly detect and eradicate pathogenic pests within the

County. When eradication is not feasible, minimize pest spread.

Mitigation Action 9.A Continue Agriculture Department pest detection, exclusion and eradication efforts.

Mitigation Action 9.B Continue general public education regarding existing and potential threats from various pests, the necessity for pest exclusion, and the role the public and applicable businesses have in excluding unwanted pests from the County.

Mitigation Action 9.C Implement eradication and/or control strategies appropriate to the pest species when a pest infestation is detected. Continue to improve rapid response efforts and long-term follow up.

Mitigation Action 9.D Support establishment of a Vector Control District in San Luis Obispo County

D. How Mitigation Goals Address Existing and New Buildings and Infrastructure

The following tables demonstrate how the proposed mitigation actions take into account both existing and new buildings and infrastructure.

MITIGATION GOALS	EXISTING BUILDINGS AND INFRASTRUCTURE						
	Electrical and Power Infrastructure	**Dams and Water Management**	**Communication Facilities**	**Critical Road**	**Coastal Harbors, Bays and Fisheries**	**Agricultural Infrastructure**	**Public Structures**
Goal 1-General Mitigation: Promote understanding and support for hazard mitigation by key stakeholders and the public within the County of SLO.	X	X	X	X	X	X	X
Goal 2-General Mitigation: Ensure that future development is protected from natural disasters.	X	X	X	X	X	X	X
Goal 3-General Mitigation: Build and support local capacity and commitment to minimize the County of SLO's vulnerability to potential hazards.	X	X	X	X	X	X	X

Goal 4-Flood: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to flooding.				X	X	X	X
Goal 5-Wildfire: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to wildfire.	X		X				X
Goal 6-Earthquake: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to earthquake, landslide and liquefaction.	X	X	X	X		X	X
Goal 7-Tsunami: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to tsunami.	X			X	X		X

Goal 8-Biological Agents: Minimize human morbidity and mortality as a result of biological agent threats.							
Goal 9-Agricultural Pests: Minimize the extent of damage and destruction to crops, farm animals, humans, and critical facilities as a result of agricultural pests and disease.							

MITIGATION GOALS	NEW PROJECTS/BUILDINGS AND INFRASTRUCTURE					
	Residential Subdivisions	**Various mixed use projects (residential and commercial)**	**Ag Clusters (residential, open space, and Ag uses)**	**Los Osos Sewer Project**	**San Luis Obispo Airport Master Plan Development (new terminal, runway extension)**	**Commercial and Industrial Projects**
Goal 1-General Mitigation: Promote understanding and support for hazard mitigation by key stakeholders and the public within the County of SLO.	**X**	**X**	**X**	**X**	**X**	**X**
Goal 2-General Mitigation: Ensure that future development is protected from natural disasters.	**X**	**X**	**X**	**X**	**X**	**X**
Goal 3-General Mitigation: Build and support local capacity and commitment to minimize the County of SLO's vulnerability to	**X**	**X**	**X**	**X**	**X**	**X**

potential hazards.						
Goal 4-Flood: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to flooding.	**X**	**X**	**X**	**X**	**X**	**X**
Goal 5-Wildfire: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to wildfire.	**X**	**X**	**X**			**X**
Goal 6-Earthquake: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to earthquake, landslide and liquefaction.	**X**	**X**	**X**	**X**	**X**	**X**

Goal 7-Tsunami: Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to tsunami.		**X** *Coastal Areas Only*	**X** *Coastal Areas Only*			**X** *Coastal Areas Only*
Goal 8-Biological Agents: Minimize human morbidity and mortality as a result of biological agent threats						
Goal 9-Agricultural Pests: Minimize the extent of damage and destruction to crops, farm animals, humans, and critical facilities as a result of agricultural pests and disease.						

IX. IMPLEMENTATION AND MONITORING

A. DMA 2000 Requirements

DMA Requirement §201.6(c)(3)(iii):	[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
DMA Requirement §201.6(c)(3)(iv):	For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
DMA Requirement §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.
DMA Requirement §201.6(c)(4)(ii):	[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
DMA Requirement §201.6(c)(4)(iii):	[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

B. Prioritization of Mitigation Actions

The Mitigation actions were prioritized using a system which is outlined below. This system factored in the following components: 1) Probability of Occurrence 2) Effectiveness of Mitigation Actions, 3)Practicality of mitigation action for the jurisdiction based on the STAPLE+E criteria of Social, Technical, Administrative, Political, Legal, Economic and Environmental components. This gave rise to the development of an overall relative risk value that resulted in ratings of HIGH, MEDIUM and LOW for each of the mitigation actions. The resultant prioritization was presented to criteria key stakeholders and lengthy

discussions were held to ensure that the results were indeed applicable to the priorities and capabilities of the jurisdictions served.

Sample Mitigation Action Prioritization Worksheet

Mitigation Action	Probability of Associated Threat Occurrence Low=1 Med.=2 High=3	Effectiveness of Mitigation Action Minimal=1 Moderate=2 High=3	Practicality (based on STAPLE+E criteria) Low=1 Medium=2 High=3	Relative Risk (Product of Risk Components)
1.A	3	2	3	18

In assessing and evaluating each strategy, San Luis Obispo County considered the following factors:

- The benefit justified the cost
- The availability of financial resources
- The availability of staff resources
- Impact on County department functions
- Strategies reflect the goals and objectives

C. Implementation Strategy

Once the LHMP has received formal adoption by the Board of Supervisors, the following action plan, agreed upon by the Local Hazard Mitigation Planning Group, will be used to ensure the Plan is fully implemented and remains an active and relevant document. Actual implementation may be dependent upon funding availability.

ACTION PLAN FOR SAN LUIS OBISPO COUNTY

MITIGATION ACTION		IMPLEMENTATION STRATEGY			
ID	**DESCRIPTION**	**RESPONSIBLE DEPARTMENT**	**FUNDING SOURCES**	**COMPLE-TION DATE**	**PRIORITY**
1.A	Educate Public and Stakeholders	OES - Lead All Support	General Fund	Ongoing	Medium
2.A	Educate Planning Staff	OES – Lead All Support	None Required	Ongoing	Medium
2. B	Continuing Disaster Education for all staff	OES –Lead All Support	None Required	Ongoing	Medium
3.A	EOC training for Sheriff, CAL FIRE and key staff members	OES –Lead CAL- County Fire & Sheriff's Dept	General Fund	07/01/12	High
3.B	SOP Development (Storm Response)	OES	General Fund	07/01/12	High
3.C	Update County Emergency Operations Plan	OES	General Fund	07/01/12	Medium
3.D	CERT Support	OES	None Required	Ongoing	Low
3.E	Survey Department Heads regarding Emergency Preparedness Needs	OES	None Required	07/01/12	Medium
4.A	Review and expand flood policies, procedures and regulations	OES	General Fund	Ongoing	Low
4.B	Identify flood prone areas and define options under Community Drainage	Public Works	General Fund	Ongoing	High

	Studies				
4.C	Maintain NFIP compliance	Planning &Building Depart.	None Required	Ongoing	Low
4.D	Update and enhance Emergency Response Plans for AG Creek Levee System. Implement AG Waterway Management Plan	Public Works	None Required	Ongoing	Medium
4. E	Restrict Construction in 100 year flood plain	Planning & Building Depart.	None Required	Ongoing	High
4.F	Work with flood agencies for funding improvements	Public Works	Grant	Ongoing	High
5.A	Education and Enforcement of PRC4291 defensible space rules	County Fire	State Direct Funding or General Fund	Ongoing	High
5.B	Improve GIS Mapping and Tracking	County Fire	General Fund	Ongoing	Medium
5.C	Fuel Thinning and Chipping Projects	County Fire	Grant	07/01/12	Medium
5.D	Create and Maintain Fuel Breaks	County Fire	Grant	07/01/12	Medium
5.E	Community Wildfire Protection Plan Development	County Fire	Grant	07/01/12	High
6.A	Recent Earthquake Fault Line Mapping	OES Working with GIS Group	Grant PG & E	07/01/12	High
6.B	Earthquake Preparedness Exercises	OES	General Fund	07/01/12	Low
6.C	Monitor PG&E Earthquake Study Progress	OES	None Required	07/01/12	High
7.A	Update Tsunami Plans, Maps and Evacuation Processes	OES	Grant	07/01/12	Low

7.B	Tsunami Plan and Policy Training	OES	Grant & General Fund	07/01/12	Low
7.C	Inundation Area Pre-Response Plans	OES	Grant	07/01/12	Low
7.D	Study Feasibility of Tsunami Area Warning Signs	OES	Grant	07/01/12	Medium
8.A	Healthcare Worker Education	Public Health Department	General Fund	Ongoing	Medium
8.B	General Public and Patient Education	Public Health Department	General Fund	Ongoing	Medium
8.C	Involve Special Needs	Public Health Department	None Required	Ongoing	High
8.D	Support Vector Control District	PH Public Health Department & Agriculture Commission	None Required	07/01/12	Low
9.A	Pest Detection, Exclusion and Eradication	Agriculture Commission	General Fund	Ongoing	Medium
9.B	General Public Education	Agriculture Commission	General Fund	Ongoing	Medium
9.C	Rapid Response Efforts	Agriculture Commission	General Fund	Ongoing	Medium

D. Implementation Through Existing Plans and Programs

The County of San Luis Obispo currently uses comprehensive land use planning, capital improvements planning, and building codes to guide and control development within the County. This LHMP will be provided to those responsible for the County's General Plan development mechanisms to insure that consistency is maintained. Whenever there are substantive changes to this LHMP, those involved in other relevant planning mechanisms in the County will be included in the review process.

Even though individual Mitigation Actions have been assigned to a principle department to ensure implementation, general administrative oversight of the action plan rests with the Office of Emergency Services, unless otherwise assigned by the County Administrative Office or the Board of Supervisors.

E. Plan Monitoring, Evaluating and Updating

The County of San Luis Obispo has developed a method to ensure that regular review and update of its Local Hazard Mitigation Plan (LHMP) occurs. FEMA regulations require an update every five years. The County Office of Emergency Services will communicate with the LHMP planning group members to see if their elements of the plan are up-to-date.

The Planning Team will review each goal and objective to determine its:

- Relevance to the evolving situation in San Luis Obispo County
- Consistency with changes in State and Federal policy
- Relevance to current and expected conditions.

The Planning Team will review the risk assessment portion of the plan to determine if the information should be updated or modified. The parties responsible for the various implementation actions will report on:

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

The County of San Luis Obispo is committed to involving the public in the continual reshaping and updating of the Local Hazard Mitigation Plan. The Planning Team members are responsible for the review and update of the plan. Although they represent the public to some extent, the public will be able to directly comment on and provide feedback about the plan.

F. Continued Public Involvement

The County understands the necessity of involving the public in the ongoing Hazard Mitigation Plan review and updating process. The following actions will be undertaken:

- Copies of the plan will be kept on hand at County Office of Emergency Services and the County library.

- Post a copy of the Plan on the County Website.