CITY OF MORRO BAY

LOCAL HAZARD MITIGATION PLAN

Prepared by :

The Morro Bay Fire Department

September, 2006

EXECUTIVE SUMMARY

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. Often, the potential reality of hazards is not fully understood or realized until a major disaster occurs, and then significant resources are required to respond and recover from the damages. The Disaster Mitigation Act of 2000 (DMA2K) 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. Accordingly, the City of Morro Bay has prepared the Morro Bay Local Hazard Mitigation Plan (MBHMP) in order to assess the City's vulnerability to natural and human caused hazards, and to develop mitigation strategies that reduce the risks associated with those hazards.

The plan is arranged and prepared to satisfy recent federal requirements set forth by the Act. Compliance with these requirements will enable the City of Morro Bay to maintain eligibility for certain federal and state mitigation funds. The overall purpose of DMA2K was to establish a national program for pre-disaster mitigation, streamline administration of disaster relief at both the federal and state levels, and control federal costs of disaster assistance. Congress envisioned that implementation of these new requirements would result in the following key benefits:

- Reduction of loss of life and property, human suffering, economic disruption, and disaster costs.
- Prioritization of hazard mitigation planning at the local level, with an increased emphasis placed on planning and public involvement, assessing risks, implementing loss reduction measures, and ensuring critical services/facilities survive a disaster.
- Establishment of economic incentives, awareness and education via federal support to state, tribal, and local governments, that will result in forming community-based partnerships, implementing effective hazard mitigation measures, leveraging additional non-federal resources, and establishing commitments to long-term hazard mitigation efforts.

As noted above, the DMA2K legislation requires all local and county governments to develop a hazard mitigation plan in order to be eligible to receive certain federal mitigation funds including Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and Flood Mitigation Assistance Program (FMA) funds.

The primary purpose of this plan is to identify natural and human-caused hazards that impact the City of Morro Bay, assess the vulnerability and risk posed by those hazards to community-wide human and structural assets, develop strategies for mitigation of those identified hazards, present future maintenance procedures for the plan, and document the planning process.

This page has been intentionally left blank for the adopting resolution.

ACKNOWLEDGEMENTS

City of Morro Bay Council

Janice Peters, Mayor
Betty Winholtz, Council Member
Thad Baxley, Vice-Mayor
Melody DeMeritt, Councilmember
William Peirce, Council Member

City of Morro Bay Local Hazard Mitigation Planning Group

Nancy Castle, Resident/Businesswomen
Frank Cunningham, City Engineer
Chris Hinote, US Coast Guard
Stan House, Parks and Recreation Commission
Don Lockwood, Harbor Commission
Kirk McKay, US Coast Guard
Dan Reddell, Businessman
Mike Saindon, US Coast Guard
Ken Vesterfelt, Resident
John Weiss, Businessman

City of Morro Bay

Bob Hendrix, City Manager

City of Morro Bay Fire Department

Mike Pond, Fire Chief
Bob Neumann, Project Manager

TABLE OF CONTENTS

SECTION PAGE

I. INTRODUCTION

A. General Plan Description

City of Morro Bay officials and public servants recognize that natural and human-caused hazards pose a significant threat, at varying degrees of magnitude and frequency, to the safety and economic stability of the City and its residents. Often, the potential reality of hazards within the City is not fully understood or realized until a major disaster occurs, and then significant resources are required to respond and recover from the damages. City officials also understand that responding to disasters on a post-incident basis can result in increased costs, in terms of both financial and human losses. Accordingly, Morro Bay has prepared the City of Morro Bay Local Hazard Mitigation Plan (MBLMP) in order to assess the City's vulnerability to natural and human caused hazards, and to develop mitigation strategies that reduce the risks associated with those hazards.

Although this plan is meant to be a *multi-hazard* plan, its primary function is to address mitigation for natural hazards and other environmentally related, human caused events or incidents. One human caused hazard generally known as Terrorism is only generally addressed by this plan with regard to vulnerability, prevention or mitigation of its possible impacts. The term terrorism is defined as encompassing intentional, criminal or malicious acts involving Weapons of Mass Destruction (WMD's), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous material releases; and cyber-terrorism (attacks via computer means).
Biological Hazards, while not a requirement of the LHMP, have recently become of such heightened public concern that the planning group felt it important to include them in the discussion. While such terrorist acts and biological hazards may possibly occur, it is not the intent of the LMHMP to analyze vulnerability and provide effective mitigation measures for these specific events. Instead, mitigation for these hazards is deferred to other planning efforts sponsored by the Federal Department of Justice, and Federal, State, and County Health agencies and officials.

This plan is prepared to satisfy recent federal requirements set forth by the Disaster Mitigation Act of 2000 (DMA2K). Compliance with these requirements will enable Morro Bay to maintain eligibility for certain federal and state mitigation funds. Interim Final Rule citations of DMA2K rules are provided as appropriate in each section. Following this introductory section, the plan is divided into five primary sections as follows:

- Section 2 – Planning Process Documentation
- Section 3 – Risk Assessment
- Section 4 – Vulnerability Assessment
- Section 5 – Mitigation Strategy
- Section 6 – Plan Maintenance Procedures

B. Plan Purpose and Authority

The Disaster Mitigation Act of 2000 (DMA2K), commonly known as the 2000 Stafford Act Amendments, was approved by Congress on October 10, 2000. Section 322 is the DMA2K amendment to the Stafford Act that primarily deals with hazard mitigation planning as it relates to the development of local hazard mitigation plans. The DMA2K legislation was signed into law by the President on October 30, 2000 (Public Law 106-390). The Interim Final Rule for planning provisions (implemented at 44 CFR Part 201) was initially published in the Federal Register on

February 26, 2002. The Interim Final Rule was again published on October 1, 2002 to extend the planning deadline to November 1, 2004. Local hazard mitigation planning requirements are implemented in the Interim Final Rule at 44 CFR Part 201.6.

The overall purpose of DMA2K was to amend the Stafford Act in order to establish a national program for pre-disaster mitigation, streamline administration of disaster relief at both the federal and state levels, and control federal costs of disaster assistance. Congress envisioned that implementation of these new requirements would result in the following key benefits:

- Reduction of loss of life and property, human suffering, economic disruption, and disaster costs.
- Prioritization of hazard mitigation planning at the local level, with an increased emphasis placed on planning and public involvement, assessing risks, implementing loss reduction measures, and ensuring critical services/facilities survive a disaster.
- Establishment of economic incentives, awareness and education via federal support to state, tribal, and local governments, that will result in forming community-based partnerships, implementing effective hazard mitigation measures, leveraging additional non-Federal resources, and establishing commitments to long-term hazard mitigation efforts.

In general, the DMA2K legislation requires all local, county, and tribal governments to develop a hazard mitigation plan for their respective communities in order to be eligible to receive certain federal mitigation funds including Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and Flood Mitigation Assistance Program (FMA) funds.
In addition to satisfying the regulatory requirements of DMA2K, the primary purpose of this plan is to identify natural and human-caused hazards that impact Morro Bay, assess the vulnerability and risk posed by those hazards to community-wide human and structural assets, develop strategies for mitigation of those identified hazards, present future maintenance procedures for the plan, and document the planning process.

Funding for the development of the LHMP was provided through a grant received from the Federal Emergency Management Agency.

C. Community Description

1. Development History

Prehistoric Settlement

Morro Bay's proximity to the ocean and various creeks, and mild year round climate made it an ideal location for prehistoric people. Food was readily available and there were plentiful raw materials for the construction of shelters and goods. For these reasons, prehistoric settlements were widespread in Morro Bay.

Archaeological evidence suggests that Native Americans settled in northern Santa Barbara County and San Luis Obispo County more than 9,000 years ago. Following an annual cycle of hunting, fishing, fowling, and harvesting, the Native American peoples adapted to changing environmental conditions and grew into a large, complex society. Many ancestors of these people still reside in the Morro Bay area.

Evidence of the Native Americans is readily seen in the grinding stone mortars in Morro Bay State Park near the Natural History Museum and on "Turtle Rock" in Chorro Willows. Middens or trash heaps of shells and other debris are on the sand spit. However, to

protect against vandalism the precise locations of archaeological sites are generally confidential.

European Discovery

In 1542, Juan Rodriguez Cabrillo, a Portuguese navigator, sailed into the bay named "Los Esteros" to anchor near the rock named "El Moro" to supply his ship with wood and fresh water. Cabrillo was credited as the first European to discover the land of Upper California, including the area now known as Estero Bay and Morro Bay. Governor Gaspar de Portola explored the area further in 1769. The Town of Morro was formed on the mid 19th century, at which time the Embarcadero had already established itself as a prominent location for trade in produce by schooners to and from San Francisco. By 1870 the population of Morro Bay was about 200.

Early Times

Prior to the 1930's Morro Rock was an island with natural tidal channels on both sides. In 1935, the north entrance was closed by a rock revetment that connected the rock to shore at the Coleman Beach area.

Until the Second World War, the area known as the Embarcadero was relatively undeveloped. Most of the small community of Morro Bay was built on the bluff tops. In 1942, the Department of the Navy initiated a national defense project to construct an amphibious training base in Morro Bay. From 1942 to 1944, the north and south breakwaters, the two T-Piers, and the inner harbor revetment from Coleman Beach to the sandspit were constructed. In addition the federal government dredged the current Navy and Morro Channels and deposited the dredge spoils behind the inner harbor revetment to create the current Embarcadero Road area on what had previously been tidal flats.

In 1949, the old Navy base, including all waterfront facilities, was sold to the County of San Luis Obispo. Starting in the late 1940's, buildings began to be constructed on the Embarcadero and various docks and the T-Piers were used by a small but growing fishing fleet.

In the early 1950's, the County divided the old Navy base property and sold to PG&E the future Morro Bay Power Plant site that eventually led to the construction of the plant.

2. Community Character and Geography

The City of Morro Bay is a small coastal town in a rural setting. What makes Morro Bay unique is an image reminiscent of California fishing ports in the 1950's and 1960's, a fishing village nestled in an agricultural setting around a bay and harbor with Morro Rock towering over the entrance. Morro Bay's harbor provides a port of refuge, a working waterfront, commercial fishing and recreational boating facilities, shopping and sightseeing, bird watching, and eco-tourism, all of which make it a unique tourist and recreation destination.

The physical characteristics contributing to Morro Bay's unique identity and appearance include:

- The agricultural buffer around the town community isolating it from other urban development.
- The Harbor, the Bay and the natural coastal environment.
- The small town "fishing port" character.
- The beaches, sand spit and Morro Rock

In 1994, the Governor established Morro Bay as California's first State Estuary. In October 1995 Morro Bay was accepted into the National Estuary Program (NEP) primarily because of long-term grass-roots efforts and because it was the first ever State Estuary. The Morro Bay National Estuary Program (MBNEP) is one of 28 national programs currently working to safeguard the health of some of the nation's most important coastal areas. Like the NEP, the City of Morro Bay desires to protect and conserve the bay that bears its name.

The City is located on the central coast of California, bordering the Pacific Ocean. The community of Los Osos lies to the south and Cayucos to the north. To the east stretches a shallow agricultural valley bordered on the north by the Santa Lucia Coastal Range, the Seven Sisters on the south, and the City of San Luis Obispo to the east. The highest elevations in the vicinity are located in the Santa Lucia Coastal Range where many peaks are 2,000 to 3,400 feet above mean sea level (msl). The City's elevations range from sea level to a height of about 640 feet on Black Mountain. The vegetation throughout the City is characteristic of Central California Coastal Communities habitats (see Figure 5-3). The topography within the City is varied; from nearly level to rolling hills and a few steeper escarpments in the North Atascadero Beach area and Southern portions on Black Mountain.

A map showing the location of the City's urban services line, City limits, coastal zone boundary and sphere of influence is found in Appendix B.

3. Climate

This portion of the central coast of California generally has cool, foggy summers and low rainfall. The Pacific Ocean exerts a tremendous influence on temperature.

The area is characterized by a Coastal climate with a wet season from October to early April. In City of Morro Bay the total annual precipitation is approximately 20 to 25 inches. In winter, the average high temperatures range from the 50's to the 60's, with lows seldom reaching into the 30's. In summer, the average daily highs are in the 60's and 70's, lows are typically in the 50's and 60's.

4. Government

In 1964, the City of Morro Bay incorporated, assuming jurisdiction over the County's waterfront land and facilities, and trusteeship of the state granted tidelands along Embarcadero Road. Shortly after incorporation, the City prepared its own comprehensive General Plan.

The City of Morro Bay was organized, formed and incorporated under the laws of the State of California. It has a "Council-Manager" general law form of government where the

City Manager is appointed by the City Council and is the Chief Executive Officer of the Municipal Corporation. The Council acts as the Board of Directors of the Municipal Corporation and meets in a public forum where citizens may participate in the governmental process.

Department heads administer specific functions of city government and are responsible to the City Manager. Such positions include a Public Works Director, City Attorney, Recreation and Parks Director, Harbor Director, Finance Director, Police and Fire Chiefs.

Government buildings in Morro Bay are predominately located in the downtown vicinity. They include City Hall, Public Services building, Community Center (housing Recreation & Parks), Fire Station, Police Station, Public Library, and Veteran's Hall.

The location of each of these facilities and general a description of each facility including the general use, year built, and value is found in Section 6 of this Plan.

5. Population & Growth/ Development Trends

The citizens of Morro Bay love the small coastal character of their town. In order to protect that character, in 1984 they passed Measure F, a voter initiative that imposes a hard population cap of 12,200. Measure F contemplated that a population of 12,200 would be reached by the year 2000. Actual experience has shown that the population of Morro Bay has grown only slightly during that period and currently stands at only approximately 10,510 despite the addition of hundreds of housing units in Morro Bay during the period since passage of Measure F.

Despite the addition of many housing units over the past decade and the lack of significant population pressure, housing prices in Morro Bay have increased from $146,000 for a median priced home in 1996 to $335,000 in 2003 for an increase of 228 percent. In 2006 the median price had increased to over $600,000. There are only approximately one hundred fifty infill residential lots available for future growth and it is possible that these lots will be completely built within the next few years. High prices and fewer building opportunities mean that affordable housing will be a significant challenge in the years to come. These facts combined with a well established community reluctance to expand municipal boundaries to accommodate future growth, will require infill development and increase density in order to provide even small amounts of affordable housing.

Table 1-2 shows the population breakdown vulnerable to potential hazards within the City (based on 2000 Census data). These numbers are the officially recorded population summary of the US Census Bureau, and are meant to demonstrate how the general composition of the City's people (children versus the elderly), merely for perspective. The total amount of population within the City is considered "vulnerable."

Table 1-2
Populations Potentially Vulnerable to Hazards

Jurisdiction	Population				Households
	Total	<19 years	19 - 65 years	66 +	Total
City of Morro Bay	10,350	1804	6268	2278	6251

Source: US Census Bureau.

6. Land Uses

Residential

The land use map identifies residential areas within the community that are characterized by four different density ranges. These designations are both intended to acknowledge the character of existing developed neighborhoods, and to relate the type of new residential development to the physical features of its location. The residential designations are as follows:

Low Density	-	up to 4 dwelling units per gross acre
Moderate Density	-	4 to 7 dwelling units per gross acre
Medium Density	-	7 to 15 dwelling units per gross acre
High Density	-	15 to 27 dwelling units per gross acre

The High Density Residential designation can also act as a transition area between commercial areas and lower density residential. Transitional uses may also be included, such as bed and breakfast establishments, cultural institutions, and other public and semi-public uses.

Commercial Uses

The commercial areas of Morro Bay are composed of four areas, each with a variety of uses. These areas include Downtown, Quintana Road, North Main Street, and the Embarcadero or Waterfront. Each has its own special character and function. A combination of limited available land, competition from Quintana Road, North Main Street, and areas outside the City have resulted on a decline in the importance of the downtown as the major shopping location. Downtown is now evolving toward tourist-oriented businesses. The Embarcadero with its tourist orientation remains strong economically but experiences seasonal fluctuations in business activity.

<u>Waterfront</u>

Morro Bay's Waterfront Area has a distinct character that is unique on the California coast. The Waterfront is a melding of commercial fishing/ocean dependant industry, visitor serving and recreational uses. The Waterfront is a landmark attraction for residents and tourists alike with views of Morro Rock, the Bay, and the sandspit. The

City's history revolves around the Waterfront. A working Waterfront makes this a highly desirable place to live.

T-Piers/Fishermen Working Area

This area is primarily devoted to the working fishing boats and shoreline support. There are a few restaurants and a series of parking lots. To the east the area is visually dominated by the Morro Bay Power Plant. Embarcadero is a divided roadway throughout this sub-area. This has also been the location of the Harbor Festival. The adjacent Front Street is a commercial area.

Embarcadero Visitors Area

This area contains the majority of the shopping and eating establishments as well as the most intense mix of pedestrian and vehicular traffic. Portions of this area also have commercial fishing and some wharf tie-ups. It may also be characterized by a relatively chaotic street system and a mix of architectural styles. It does have what most visitors and residents consider a positive mix of shops, waterfront, and pedestrian activity, combined with direct views of the bay, sandspit, and Morro Rock.

Tri W Property

The lack of competitive shopping for groceries led in 1986 to citizen approval of Measure B, which rezoned approximately 30 acres of the Tri W property to mixed commercial use. Measure D, 1988 (Ordinance 341) rezoned property on Quintana Road to facilitate a shopping center in the downtown area (now the Albertson's Center). In 1990 , Measure H (Ordinance 389) repealed the 1986 initiative, Measure B, and set the zoning and further limited uses on the Tri "W" property. To date no development has occurred on that property.

7. Infrastructure and Services

The utilities infrastructure in the City includes water provision, and wastewater collection and treatment. The public services infrastructure in the City include the fire protection and emergency services, police protection, public schools, libraries, the harbor and it's associated infrastructure, and solid waste collection and disposal. Tables found in Section 6 of this Plan describe the City's critical facilities and infrastructure throughout the study area and lists their approximate value.

Water Resources and Management

Historically, the City of Morro Bay has suffered from a lack of water resources. In 1992 voters determined that they would participate in the State Water Project through the Central Coast Water Authority. State water has been flowing to the community since 1997 and has become its primary supply. Secondary supply continues to be ground water, desalinated water and more recently, State water traded from other agencies.

A land use map can be located in Appendix B.1.

II. PLANNING PROCESS

A. Overview

The Planning Process is divided into four primary phases:

1. Organization of Resources: This entails assessing planning capabilities, securing political support, and soliciting community input and approval. Disaster planning is the responsibility of the City's Fire Department. In order to assist with the development of this plan the Fire Chief requested the establishment of a Hazard Mitigation Planning Group (HMPG). This Group was made up of local residents, business people, the non-profit sector, and other community stakeholders who were invited to participate in the mitigation planning and implementation process. This broad public participation enabled the development of mitigation actions that are supported by these various stakeholders and reflect the needs of the entire community. In addition it allowed the Department to capitalize on the experience and institutional knowledge base of the community members and groups, many of whom are long time residents of the City.

2. Assessing Risks: This involves identifying and evaluating hazard risk, by determining our community's exposure to hazards, the probability of potential damages, and the compilation of expected loss estimates.

3. Development of a Mitigation Plan: Goals, objectives and mitigation actions will be developed based on the findings in the first two steps. Identifying and prioritizing mitigation actions to reduce future disaster-related loss will be the focus of this phase.

4. Implementation and Monitoring: This phase entails adopting, implementing, assigning responsibility, monitoring, and reviewing the plan over time, to ensure the goals and objectives are being achieved.

Critical Points covered in these four phases include**:**

- Meeting with applicable agencies and staff members to identify known hazards in the community, such as earthquakes, erosion, landslides, drought/heat wave, severe storms, volcanoes, wildland fire, tsunami and flooding potential, and assessing the probability of each event.
- Reviewing historical data for repetitive natural events and their impacts such as earthquakes, wildland fires, erosion and flooding.
- Developing and proposing mitigation goals, measures, policies and actions.
- Determining land use patterns, critical facilities and infrastructure.
- Analyzing the vulnerability of land uses facilities and infrastructure to the identified hazards.
- Estimating potential dollar losses to vulnerable structures.
- Facilitating and documenting public participation.
- Outlining plan implementation procedures, prioritization, and a process for updating the plan.

B. Public Involvement

At the onset of the LHMP project, a Local Mitigation Planning Group (LMPG) was developed consisting of representatives from each of the three jurisdictions. Chamber of Commerce, law enforcement, fire department, local business, real estate, school district and City engineers were encouraged to be part of this local planning group.

Hazard Mitigation Planning Group

Name	Representing
Chief Mike Pond	Morro Bay Fire Department
Bob Neumann	Project Manager
John Weiss	Businessman-Coast Electronics
Frank Cunningham	City Engineer
Clyde Gains	Building Official
Chris Hinote	U.S. Coast Guard
Mike Saindon	U.S. Coast Guard
Dan Reddell	Businessman - Real Estate
Ken Vesterfelt	Citizen at Large
Nancy Castle	Businesswoman – AGP Video
Stan House	Parks and Recreation Commission
Don Lockwood	Harbor Commission

At the first planning group meeting, a thorough description of the LHMP planning and approval process was provided. At subsequent meetings, step-by-step progress was explained and discussed with planning group members in order to solicit feedback regarding mitigation plan priorities and planning determinations. In effort to share the planning process with the general public and obtain their feedback regarding areas of major concern, mitigation action prioritization and decision making the process was shared at two public meetings, one at the Veterans Hall and one at the Community Center. These public forums were televised and that program was re-broadcast a number of times throughout the community on the public access channel.

C. Directly Involved Parties – Jurisdiction Input

The jurisdiction participated throughout the planning process by sending a variety of representatives to participate in the Local Mitigation Planning Group. The City Council reviewed the plan and jurisdiction representatives provided input throughout the plan's development. Further participation occurred through interviewing multiple public officials and staff members in their areas of specific expertise (i.e. Public Works Director, City engineering staff, the Fire Chief, the Police Department staff, Community Development Director, City Finance Officer and the Building Official).

D. 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 geo-technical reports were reviewed and incorporated into this mitigation plan. The following sources were used:

- City of Morro Bay General Plan
- State Hazard Mitigation Plan
- San Luis Obispo County Hazard Mitigation Plan
- Los Osos Community Services District Hazard Mitigation Plan
- Local and State land use regulations
- Flood ordinances
- City of Morro Bay Drainage Plan
- City of Morro Bay Emergency Operations Plan.
- Past disaster declarations
- Flood Insurance Rate Maps (FIRM's)

E. Other Interested Parties

Additionally, neighboring communities and public agencies were invited to attend planning sessions and kept apprised of planning developments.

III. RISK ASSESSMENT

In developing a hazard profile, the HMPG utilized a process that included researching historic events, obtaining a variety of hazard maps, reviewing state and local disaster plans, and other local area mitigation plans. Each profile was outlined in three distinct areas. The first being the nature of the event, in other words what is likely to occur. The second being the past history of the event occurring in this City, and the third being the future probability of this event occurring again.

A. Hazard Identification

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

Natural	Man-Made
Agricultural: • Drought • Freeze • Insect Pests	Civil Disturbances
Earthquake	Dam Failure
Fire	Hazardous Materials Spills
Flood	Pollution
Landslides	Terrorism
Volcanoes	

Source: State of California Multi-Hazard Mitigation Plan July 2004

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 the City of Morro Bay and the immediately surrounding area.

The following table, found on the next page, summarizes the result of that process, with the top ranked hazards indicated by **bold** text.

Natural Hazards	Man-Made Hazards
Earthquake • Building/Structure Collapse • Water Tank Collapse • Liquefaction • Faulting	**Hazardous Materials (Hazmat)** • Accidental Spills and Releases • Radiological Incidences
Flood	Terrorism
Extreme Weather • Coastal Erosion • Drought • Freeze and Hail Storms • Windstorms	Water Tank Collapse (included in earthquake)
Landslide	
Tsunami	
Wildland Fire	
Biological Hazards	

B. Hazard Profiles

1. HAZARD PROFILE: EARTHQUAKE	
SEVERITY:	**HIGH**
PROBABILITY:	**MEDIUM**

Nature of Event

Earthquakes, which are not currently predictable, can occur at any time of the year, day or night. They are not limited to any particular region, but do occur more frequently in active geologic areas or regions. One of the most frightening and damaging naturally occurring events, they are defined as "…a sudden motion or trembling caused by an abrupt release of accumulated strain from the tectonic plates that comprise the earth's crust." This movement may take several different forms and can occur with varying degrees of intensity. The tectonic plates, are between 50 to 60 miles in thickness and move slowly and continuously over the earth's interior. The plates meet along their edges, where they move away, past or under each other at rates, varying from less than a fraction of an inch up to five inches per year. While this sounds small, at a rate of two inches per year, a distance of 30 miles would be covered in approximately one million years (FEMA, 1997).

Sometimes the movement of the tectonic plates is gradual. At other times it is quite rapid; a result of an accumulation of stress or energy built up over a long period of time. When this stress or energy grows strong enough the plates will shift or break free causing the ground above to shake. Often, a number of associated impacts will occur; building/structure collapse, faulting, land or rock slides, soil liquefaction and tsunamis are common during and immediately after a major ground movement.

Faulting

One of the secondary hazards from earthquakes is surface faulting, the movement of two sides of a fault at the earth's surface. Structures, especially roads, dams, bridges, pipelines and railways, are at high risk to damage from earthquakes. The separation of the earth's surface can be quite dramatic, especially when viewed from the air. Displacements of 3 to 4 feet are common and in rare occurrences have been reported as wide as 20 feet.

Building/ Structure Collapse

Earthquakes themselves are seldom the direct cause of death or injury. Collapsing structures, flying glass, falling objects and other "cascading events" can cause considerable life loss, injury, and damage. Modern construction practices can prevent or mitigate much of this damage. The structures that will most commonly receive damage and fail in earthquakes are of un-reinforced masonry construction, particularly two or more stories in height. The main characteristics leading to failure in such buildings are high rigidity, low tensile and shear strength, and low capacity for bearing reversed loads and stresses. The collapses of such buildings are often responsible for many casualties and the need for rescue. Other structural hazards that often cause casualties include falling bricks, plaster, un-braced cornices, parapets, and architectural ornamentation, as well as flying glass and interior objects.

Framed-type structures, predominant in residential areas in this City, are more flexible than masonry and are able to withstand the large deformations of a major earthquake. The weak points of such structures, particularly in pre-1950 construction, are the connections between sill plates and foundations. During major earthquakes, older frame structures have "slipped off" their foundation. Additionally, even well constructed buildings may "sink" during a major earthquake if foundations are built on areas susceptible to liquefaction (alluvial soils and high water content).

Liquefaction

Liquefaction is defined as the sudden loss of soil strength due to a rapid increase in soil pore water pressures resulting from seismic 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.

Source: SLO County Hazard Mitigation Plan

A majority of the City is underlain by beach and sand dune sediments and alluvial soils. These areas have a high potential for liquefaction activity during an earthquake. Areas

along the Embarcadero are known to have been filled in over the years with a variety of fill materials, and when combined with the high water table in the area, these areas are of some concern.

A map of the liquefaction hazards found in the study area is found in Appendix B.3.

History

California, given it's history, is often referred to as "Earthquake Country", every few seconds an earthquake occurs somewhere in the state. The vast majorities of these go totally unnoticed by the general populace and cause little if any damage. Earthquakes are classifies as follows:

Small	5.0 – 5.9 (Richter scale)
Moderate	6.0 – 6.9
Major	7.0 – 7.9
Great	8.0 - ?

Earthquakes of 6.5 magnitude or greater (generally considered moderate to heavy damage quakes) occur within the state on an average of once every four years. The last 8.0 magnitude earthquake occurring in the state was the 1906 San Francisco quake.

The following historic earthquakes have impacted San Luis Obispo County:
(Source: County of San Luis Obispo Local Hazard Mitigation Plan)

1830 San Luis Obispo Earthquake. This 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 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, in the City of Paso Robles, from damages caused by the earthquake.

Future Probability

There are a number of active or potentially active fault systems throughout the county and given the past history of earthquakes in the area, experts agree that the probability of a damaging earthquake occurring is Medium.

The known faults in the area are described as follows:

Cambria Fault

The northwesterly trending Cambria fault is approximately 64 kilometers long, including an 8 kilometer projection across Estero Bay. Hall and Prior (1975) show the fault coming back onshore near Morro Bay, and converging with the Oceanic and West Huasna faults 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 fault.

Source: The Safety Element of the San Luis Obispo County General Plan.

East Hausna Fault

The East Husana fault zone trends north-northwest for a distance of about 70 kilometers 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.

Source: The Safety Element of the San Luis Obispo County General Plan.

La Panza Fault

The northwest trending La Panza fault has been mapped for 71 kilometers along the western base of the La Panza Range (Jennings, 1994). The La Panza fault has been identified as a thrust or reverse fault by Clark and others (1994). The La Panza fault is considered potentially active (The Safety Element of the San Luis Obispo County General Plan). 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 Faults 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 an earthquake of 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 database of California faults by the California Division of Mines and Geology. While the fault is considered inactive (reference Jennings, per the San Luis Obispo County Safety Element, December 1999), the Bryson earthquake of 1952 is sometimes assigned to the Nacimiento fault zone, and would make the fault seismically active (reference: San Luis Obispo County Safety Element, December 1999). 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 extend from Monterey Bay southward to its juncture with the Nacimiento fault. The California Division of Mines and Geology considers the Rinconada fault to be potentially active. The Safety Element of the San Luis Obispo County General Plan lists the maximum moment magnitude as 7.3 for the Riconada.

San Andreas Fault

The San Andreas fault is an 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 known 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.

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 Fault within the county from time to time, most frequently in the Parkfield area. Generally, they are so small or in such isolated areas that they are not felt. However, a magnitude 6.0 earthquake did occur in September 2004 on the Parkfield segment. The Earthquake was felt in San Luis Obispo County but no significant damage was reported.

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. Most recently, a magnitude 6.5 earthquake, attributed to having occurred near the San Simeon/Oceanic/Hosgri Fault system struck at 11:15 A.M. on December 22, 2003. The epicenter was approximately 6 miles from the community of San Simeon. In addition to significant property and other damages, two fatalities resulted from damages caused by the earthquake. 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 (PG&E 1988), which is south of the Santa Maria River, off of Santa Barbara County. The fault is considered to be active. The Safety Element of the San Luis Obispo County General Plan lists the maximum moment magnitude as 7.3 for the Hosgri-San Simeon.

Active and potentially active faults in San Luis Obispo County are shown on the map found in Appendix B.4.

*** It is important to note that it is possible an earthquake could occur on an unknown fault in areas other than those currently known.**

Related Hazards – Cascading Effects

Earthquakes are often the cause of a wide variety of cascading impacts. Major disruptions in all forms of transportations systems are common place. The loss of everyday services such as communications systems, and electrical and natural gas distribution can cause long term impacts to an area. Flooding, hazardous material spills, landslides, and fires will require the immediate attention of first responders. Significant earth movement may cause tsunamis.

The community's water supply may fail. Earth movement may damage pipelines and cause above ground water tanks to collapse. It should be noted that recent surveys of the City's tanks revealed them to be sound and not a particular threat to the neighboring areas.

Risk Assessment Conclusion:

The greatest threat to this community from a natural hazard is that of a significant earthquake. The reasons for this are two-fold: First, the event itself can be catastrophic, and secondarily cascading effects (hazardous materials spills, flooding, fires, utility disruption, dam failure, liquefaction, landslides and structural hazards) can also significantly impact the safety of the public.

Based on the past history of damaging earthquakes and the fact that Morro Bay is located within a seismically active region, the probability is rated **MEDIUM**. Given the properties at risk and the cascading effects the severity is rated as **HIGH.**

2. HAZARD PROFILE: FLOOD	
SEVERITY:	**MEDIUM**
PROBABILITY:	**HIGH**

Nature of Event

Rainfall and inclement weather are primarily seasonal phenomena in the study area which boasts a mild Mediterranean climate. Generally the rainy season is from November through March. Typical rainfall amounts range from 20 to 25 inches over most of the study area, however much higher amounts can be expected in the coastal mountains to the east. Flooding generally occurs in response to heavy rainfall events when streams, rivers, and drainage channels overflow their banks. Even during moderately sized storms, flooding can also occur in low-lying areas that have poor drainage.

Many factors can increase the severity of floods including; fires in watershed areas, the placement of structures or fill material in flood-prone areas, and tidal influence in low lying coastal areas. Additionally, the construction of impervious surfaces such as roadways and rooftops will result in increased runoff.

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. Commonly misperceived, the following describes the Federal Emergency Management Agency's (FEMA) definition of "100-year flood": The term "100-year flood" is misleading. It is not a flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1 percent chance of being equaled or exceeded each year. Thus, a 100-year flood could occur more than once in a relatively short period of time.

Flood Probability Terms

Flood Recurrence Intervals	Percent Chance of Occurrence Annually
10 years	10.0%
50 years	2.0%
100 years	1.0%
500 years	0.2%

Source: FEMA, August 2001.

Areas within the 100 and 500 year flood plain of the study area are found in the San Luis Obispo County Flood Hazard Map found in Appendix B.5.

History

Over the years the study area has experienced severe flooding events that have resulted in extensive property damage. Historical floods include:

January-February, 1969. In January of 1969, a series of storms delivered rainfall totals that ranged from approximately 12 inches in various parts of the county over an eight-day period. In February, another series of storms delivered another 5 to 10 inches. The Army Corp of Engineers reported that: "…….severe damages were sustained by streets, highways, and utilities throughout the County. The sewage-treatment plants at Morro Bay, Avila Beach, and Pismo Beach were inundated by both floods. The destruction and damage of sewer lines and sewage-treatment plants at many locations posed a threat to the lives and health of many residents. Debris and raw sewage piled up on the beaches and carried in the streams posed serious threats to health until emergency cleanup operations were completed."

January, 1973. Much like the floods of 1969, the 1973 storm produced a ten-hour period of unusually heavy rainfall. Many creeks and streams through out the County overtopped their banks and inundated a number of areas.

January and March, 1995. A series of powerful and slow-moving storms brought heavy rain and strong winds to all of Central California. Serious flooding occurred in all coastal and many inland streams. San Luis Obispo Creek caused damage in the City of San Luis Obispo, and especially near the ocean, where the San Luis Bay Golf Course and other properties received extensive damage. Cambria was completely inundated, with water as deep as six feet on Main Street. In Morro Bay 12 inches of rain fell in a 24 hour period. The community was isolated as Highway 41 was closed due to rockslides and Highway 1 was impassable due to flooding at San Bernardo Creek to the south and at Morro Creek within the City.

March, 2001. Central and Southern California were significantly impacted by a powerful storm that delivered up to 6 inches of rain in some of the coastal areas of San Luis Obispo County. The mountain area of the county received even more, with reports of up to 13 inches. The heavy rain produced numerous flooding incidents.

December, 2004. A quick moving and powerful storm brought flash flooding and heavy rain to the Central Coast of California. Rainfall amounts ranged from 1 to 3 inches on the coastal plains to 3 to 6 inches in the more mountainous regions of the county. Flooding problems were reported through out the county.

Future Probability

Areas with a past history of flooding have a high probability of future flooding. Areas of concern include the following creek drainage systems: Chorro Creek, the Morro/Little Morro Creek convergence, No-Name Creek, Alva Paul Creek, Toro Creek, and San Bernardo Creek flow into and/or near the City.

Chorro Creek is the largest and runs along the southern boundary of the City near two mobile home parks. Morro Creek runs parallel to Highway 41. Little Morro Creek runs parallel to Little Morro Creek Road and combines with Morro Creek within the City near Main Street. No-Name Creek runs through the City along Island Street. Alva Paul runs through the City along Whidbey

and Yerba Buena Streets. Toro Creek runs along the farthest northern boundary of the City. San Bernardo Creek runs under Highway 1 south of the City. As seen in the 1995 Floods, these creeks can present varying hazards and can block access to and egress from the City. When rainfall and surface run-off from a storm exceeds a drainage system's capacity to adequately channel and contain the water flooding may occur. Potential flood areas include: the South Bay Boulevard area between Highway 1 and State Park Road; the area between Highway 41/Atascadero Road and Radcliff Avenue; low-lying sections of Island Street and Beachcomber; Highway 1, at the northern City limits; and, Highway 1 south of the City limits.

Related Hazards – Cascading Effects

In addition to the threat of standing and running water, storms may pose other, more serious threats to the City. Because of the largely unconsolidated nature of the sedimentary soils found in the City, washout of the materials on which bridges and roads are built on may be a major problem. Stream and Creek channel banks currently abut several roads. In addition, slumping of hillsides may result in sections of roads being blocked or carried away. High winds often accompany winter storms and may cause significant damage to the community. Other problems and hazards associated with flooding and inclement weather include; utility disruptions, broken power lines lying on the ground, trees damaged and blown down, and transportation route disruptions.

Risk Assessment Conclusion

While it is impossible to predict future long range weather patterns, it is certain that the location of the City, adjacent to the Pacific Ocean and surround by the mountains to the East, will continue to have a significant exposure to major winter storms and flooding. Therefore, the probability is **HIGH** and the severity, based on the fact that only limited areas of the City are exposed, is **MEDIUM.**

A Flood Plain map is found in Appendix B.5.

3. HAZARD PROFILE: HAZARDOUS MATERIALS	
SEVERITY:	**HIGH**
PROBABILITY:	**LOW**

Nature of Event

Hazardous materials are in wide use, and are found in both large and small quantities most everywhere in our modern society. This type of incident differs from other emergency situations because of the wide range of causes and influencing factors, as well as the pervasiveness of the potential threat.

Accidents, either spills or releases, may occur at fixed facilities such as; chemical plants, refineries, warehouse or storage facilities, manufacturing sites, nuclear power plants, and dispensing facilities. Quite typically fixed facilities, as a matter of law, will have some degree of spill or accidental release contingency plan in place to help assist emergency personnel responding to a hazardous material event at the facility. First responders may have access to site specific plans and maps including lists of chemicals on site. These plans are maintained by the local fire departments and are carried on emergency response vehicles and stored at the fire stations.

Accidents involving these substances can also occur along any land, water, or air transportation route. They are not confined to urban and/or manufacturing areas, as accidental spills or releases of pesticides and fertilizer is quite common in the rural areas of the country.

These substances may be highly toxic, reactive, corrosive, flammable, radioactive or infectious. Because of their nearly ubiquitous presence, there are hundreds of HAZMAT release events annually in the U.S. that contaminate air, soil, and groundwater resources, potentially triggering millions of dollars in clean-up costs, human and wildlife injuries, and occasionally cause human deaths (FEMA, 1997).

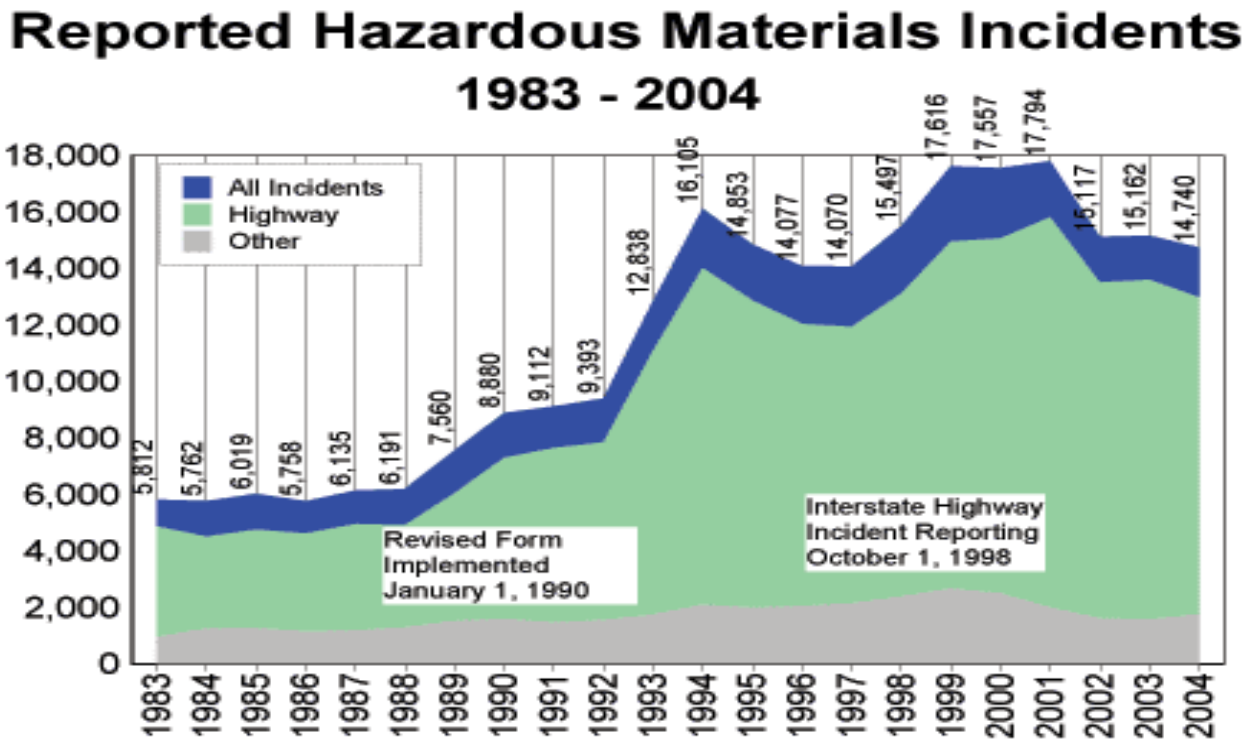
History

The nation has a significant history of hazardous materials events. The US Department of Transportation reported 1,142 hazardous material incidents occurring in the California transportation system in 2005. Of these, 999 occurred on roadways, 55 on railroads, with remainder on water, or air carriers. Twelve significant injuries occurred and 1 fatality was reported. Damages totaled $3,079,349.

A review of the Fire Department responses to Hazardous Materials spills and releases indicates the department responded to 17 calls for service in 2005.

One of the highest profile spills in the county occurred in Morro Bay when on October 3, 2001. An anhydrous ammonia leak developed in a refrigeration system that was being dismantled at a fish handling facility just above the harbor. The incident resulted in the temporary evacuation of an estimated 3000 people for approximately 9 hours.

National Statistics



Source: Pipeline and Hazardous Material Safety Administration

Future Probability

The study area is considered by most to be some what removed from the multiple risks of hazardous material emergencies normally associated with a more urbanized environments. However, upon a closer review, one discovers quite a large collection of fixed facilities either in or closely adjacent to the study area. They can be broken down into the following:

Accidental Spills and Releases

While a large number of industrial complexes normally associated with a high occurrence of hazardous materials emergencies do not exist, small fixed facilities often contain these materials in sufficient quantity to cause a considerable threat to the community at large. Informal surveys conducted by the County Office of Emergency Services have indicated the presence of the following classifications of hazardous materials: explosives, poisons, corrosives, flammable liquids, combustible liquids, cryogenics, compressed gasses (flammable and non-flammable), radioactive materials, and oxidizers. Pesticides are stored at several sites especially in agricultural areas that surround the City. Ironically, a significant danger to life and property develops from a substance over which most people express little concern - flammable liquids and flammable compressed gas (more specifically, gasoline and liquid propane gas) Large pressurized natural gas pipe lines traverse the City and present a very minimal threat.

Transportation Issues
Perhaps the largest threat as indicated by the chart above, and one over which the City has the least control, is that of a spill or release from a transportation accident. The study area is served by two State Highways; 1 and 41. Vehicles on these routes may carry small amounts of hazardous materials through and into the study area each year, but not the larger amounts found in neighboring communities that are bisected by Highway 101 and the rail road. The effects of a major catastrophic hazardous material emergency from a land based transportation accident in the City of Morro Bay are limited.

Air and Water transportation of hazardous materials involves the smallest quantity but still poses a potential hazard, especially in the harbor area where the ecological consequences could be significant.

Abandoned Pipelines
An abandoned Texaco/Valley Oil pipeline runs parallel with North Atascadero Beach, along Hatters Ave, under the freeway, through the old Texaco bulk plant then east through Del Mar Park heading for the Central Valley. Parts of the pipeline have been filled in place.

The Morro Bay power plant has submerged marine pipelines running west from the plant into the ocean, to their marine terminal. The described pipelines do not present a hazardous materials threat of any consequence; however they do represent a possible pollution hazard to both the ocean and the surrounding soils.

A Chevron tank farm facility, now abandoned, is partially within the City limits. It is currently in process of being decommissioned and the site cleaned of any soil contamination.

In North Morro Bay the U.S. Navy has a pipeline terminal, no longer in use, which is located off Panorama Street, with tanks and a pipeline that extends to the Lemoore Naval Air Station.

Radiological Incidences
The accidental spill or release of a radioactive material at either a fixed facility or in a transportation accident does not pose a threat to the study area. With the exception of the Diablo Canyon Nuclear Power Plant, which is addressed in a section below, the quantities found are usually small and well regulated. The use of radioactive material in some sort of a terrorist's weapon such as a "dirty bomb" is considered remote based on the population of the county and the distance separating it from any sort of a major metropolitan area.

Defined as a material made up of unstable atoms which give off excess energy as they decay into the following:

> **Alpha Particles** can not travel more than a few inches in air; can be completely stopped by a sheet of ordinary paper or the outer most layer of dead skin that covers the body, and present internal hazards if ingested they ingested through eating, drinking, or breathing.
>
> **Beta Particles** can travel farther than Alpha particles but generally do not penetrate to vital organs. Exposure outside of the body is normally thought of as a slight danger.
>
> **Gamma waves is** radiation transmitted through space as waves, it is pure energy and the most penetrating type of radiation. It can affect all human tissues and organs and will have distinct and short term symptoms such as skin irritation, nausea and vomiting, high fever, hair loss, and dermal burns. Thick materials such as lead, steel, and concrete, are used for shielding Gamma waves.

Neighboring Threat - Diablo Canyon Nuclear Power Plant

The effects of hazardous materials spills or releases maybe carried far from the accident site; therefore it is prudent to review the Diablo Canyon Power Plant which is an electricity-generating nuclear power located approximately 7 miles south of the study area, adjacent to the community of Avila Beach. Two Westinghouse designed, 4-Loop pressurized-water nuclear reactors are operated by Pacific Gas & Electric Company. Together, the twin 1,100 megawatt reactors produce about 18,000 gigawatts of electricity annually, supplying the electrical needs of more than 2.2 million people.

Diablo Canyon is designed to withstand a significant earthquake from four faults, including the San Andreas and Hosgri faults. Equipped with advanced seismic monitoring and safety systems, the plant is designed to shutdown safely in the event of significant ground motion.

The plant draws its secondary cooling water from the Pacific Ocean, and during heavy storms both units are throttled back to 80% power to prevent kelp from entering the cooling water intake.

The Diablo Canyon Power Plant has extensive precautionary measures in place in the unlikely event of an emergency. If warranted, coordinated emergency plans for the plant, San Luis Obispo County, and State of California and the federal government would be activated immediately.

The federal government developed a classification system to help officials respond appropriately in emergency situations. PG&E and other officials use this system to respond as required by their emergency plans.

There are four classifications, beginning with an Unusual Event (UE). A UE is declared for any abnormal condition, including abnormal site conditions not directly related to safe operation of the plant. Plant operators would document the incident and notify selected PG&E managers, as well as local, state, and federal agencies. Personnel would also correct the abnormal condition, or continue to monitor the situation until it is corrected. If there were potential safety problems at the plant, an Alert, the next highest level of emergency, would be declared. At this level, emergency response personnel would assemble at emergency facilities to manage the emergency.

Should the situation escalate, it would be classified as a Site-Area-Emergency, or General Emergency, the most severe of the four emergency classifications.

Local residents and visitors would be notified of any emergency that required public response by Emergency Alert System bulletins and/or Early Warning System Sirens.

Source: PG& E

A map of the emergency planning zones can be located in Appendix B.6.

Relationships to other Hazards- Cascading Effects

Hazardous materials events can be very problematic due to the following: 1) The need to evacuate large areas of a community, 2) There is a high fear factor associated with hazardous materials and 3) A significant amount of resources is needed to contain and clean up spills and releases.

Risk Assessment Conclusion

Hazardous Material emergencies have occurred and will continue to occur within the study area. The potential for a large hazardous material emergency exists primarily through transportation accidents of surface vehicles on major highways and railroads which are not located in the study area. In addition there are very few fixed facilities located in the City; therefore the probability for a disastrous hazardous material emergency is **LOW.**

The local resources to handle a hazardous materials emergency are limited. When a hazardous material emergency occurs in the county the technical resources larger urban communities may draw upon are not immediately available. The county has established joint powers Hazardous Materials Response Team. This HAZMAT team is made up of individuals from a variety of participating fire departments in the county including the Morro Bay Fire Department. This team takes time to assemble and respond causing delays of up to two - three hours before a functional team may be at the scene. It is estimated that significant out-of-county assistance will not be available for a period of at least four to five hours. Therefore, the severity for extreme risk to life and property, if such an emergency does occur, is **HIGH.**

Source: City of Morro Bay Multi-Hazard Emergency Response Plan

4. HAZARD PROFILE: LANDSLIDE	
SEVERITY:	**MEDIUM**
PROBABILITY:	**HIGH**

Nature of Event

Landslides occur within every state in the U.S. They are a geological hazard caused by a broad range of ground movement such as rock falls, deep failure of slopes, and shallow debris flows. The downward movement of earth material is part of the ongoing natural erosion process which can be influenced by a variety of factors affecting the slope's stability. While the primary cause of landslides is gravity acting on an over-steepened slope, other contributing factors exist:

- Erosion by creeks, streams, or ocean waves at the base of steep slopes.
- Rock and soil slopes are weakened through saturation by heavy rains.
- Earthquakes that create stresses and make weak slopes fail.
- Excess weight from accumulation of rain, from waste piles, or from man-made structures may stress weak slopes to failure and other structures.

  (Source: USGS Landslides Hazard Program)

Landslides, rockslides, and debris flows are continuously occurring on all slopes. Some landslides are slow moving and cause gradual damage, while others are rapid and cause unexpected property damage and loss of life. Slopes ranging from 34 to 37 degrees have the greatest potential for sliding. The length of the slope has little significance with respect to slide potential. As population growth expands over these land surfaces, these processes increasingly become a concern.

Slope stability is dependent upon several interrelating factors including rock type, pore water pressure, slope steepness, and natural or man-made undercutting. While development on an unstable slope can substantially increase the frequency and extent of slope instability hazards, slope stability can be improved through artificial modifications. Grading and the addition of deep rooting plants, and/or specifically engineered structures can prevent damage. Knowledge of these relationships can reduce hazard vulnerability.

History

There is a well documented history of landslide activity in the study area. Landslides activity is observable all along the Highway 1 corridor from San Luis Obispo, through the community of Morro Bay, and on north to San Simeon. In 1983, and again in 1995 very wet winters led to significant slope movement in the North Morro Bay area, north of Highway 41 and east of Highway 1, a number of slides caused the total destruction of homes, considerable damage of others, and damage to pipelines, driveways, and roadways.

Future Probability

Numerous studies have documented unstable, landslide prone slopes in the Morro Bay area generally east of Highway 1 and north of Highway 41. Many of the landslides mapped in the area are associated with the Franciscan geology complex, which is known to be prone to land slide activity. The landslide hazards that have impacted residential development and community infrastructure 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 and future landslide hazards.

A map, found in Appendix B.7, outlines the landslides hazards found in the County.

Related Hazards – Cascading Effects

As recently demonstrated by a mud flow in Ventura County (La Conchita), many cascading effects will occur such as; structural collapse, entombment, and disruption of transportation routes. Additionally, debris or mud flows may pick up trees, houses, and cars, thus blocking bridges and tributaries resulting in flooding along its path.

Risk Assessment Conclusion

Given the past history and the naturally occur conditions, the probability for this event reoccurring in certain portions of the City is rated as **HIGH.** The limited number of vulnerable structures, and the slow moving nature of the past occurrences, results in a **LOW** severity rating.

5. HAZARD PROFILE: WILDLAND FIRE	
SEVERITY:	**MEDIUM**
PROBABILITY:	**LOW**

Nature of Event

A wildland fire is an uncontrolled fire spreading through naturally occurring vegetation. Left unchecked, wildland fires may spread rapidly and can cause significant property damage and the occasional life loss. In the study area, wildland fires are most typically started by people, as lighting is a relatively rare occurrence. Fire ignitions in this area are most often the result of carelessness. Arson, in the wildland fire areas in this community has not been problematic to date.

Three factors contribute to wildland fire spread:

- Topography: Canyons, hillsides, river bottoms, ridges and other "lay of the land" features will have a dramatic effect on fire spread. Aspect or orientation of the fuel beds also plays an important role, in general south facing slopes are subject to greater solar radiation, making them drier and thereby intensifying wildland fire behavior.
- Weather: In this region weather plays a key factor in the wildland fire potential. Rain fall occurs primarily between the months of November and April, and ranges between 20 to 25 inches per year. Summers are typically cool with fog and or high humidity the norm. Wind in the area, a key factor in spread, is quite predictable and is usually moisture laden due to the close proximity of the ocean. The fall season will see dryer and warmer days, this in combination of the lack of rainfall, will see the fire hazard threat increase.
- Fuel: Fuels are classified into three risk categories: Very High, High and Moderate.

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

The arrangement of the fuel on the land is also an important consideration. By breaking up or thinning fuel beds one can slow the rapid spread rates of wildfires. In addition the removal of certain fuels in the horizontal plane can prevent fires from "laddering" into the tops of tress where it may burn hotter and be more difficult to contain.

History

Historically, wildland fires in San Luis Obispo County have burned thousands of acres and caused considerable property loss with an occasional life loss. The majority of these large fires have occurred in the northern and central interior portions of the county. Within the City limits of Morro Bay the largest fire in recent memory was approximately 7 acres. Large fires on the coastal side of the county occur less frequently. Past large fires in the coastal areas of the county include:

FIRE HISTORY

Las Pilitas	July 1985	75,000 acres $1.2M	12 homes, loss of some buildings	The Las Pilitas fire started in the central portion of the county and burned into coastal mountains behind the City of Arroyo Grande.
Highway 41 Fire	August 1994	49,000 acres $10M	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
Logan Fire	August 1997	50,000 acres $6M	unknown	The Logan Fire burned in the coastal mountains to the east of the study area in fuels and topography similar to those found in portions of the study area.

Future Probability

The generally mild coastal climate keeps the wildland fire threat in the study area at a minimum. In addition, the majority of the topography is level or slightly sloped and well developed in both residential and commercial land uses. A limited amount of wildland urban interface does exist in the City. In these areas, the correct combination of weather, topography and fuel, could make them susceptible to wildfire activity.

As noted in the chart above, in 1994 the Highway 41 Fire started in the mountains directly behind the City of Morro Bay and spread all along the Highway 41 and 1 corridors to Atascadero and the Men's Colony. While this threat was short lived, it demonstrates that, given the right series of circumstances, the potential does exist for a wildland fire to burn into or start within the City.

The open lands in and adjoining the City have been categorized by the California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (FRAP), as being of a medium Fire Hazard. The areas that are at risk from a large-scale wildland fire are, for the most

part, located on the edge of the City limits. These "fringe" areas are where there is the most potential for a wild fire to cause significant property damage, however most of these lands are grazed by cattle and the fuel loads are kept to a minimum. The neighborhoods bordering the Morro Bay State Park and Black Hill area also constitute wildfire urban interface problem. This potential is compounded by; the heavier fuels that naturally occur in this area, the slopes, recent tree kill from disease, and the number of older wood roofed and sided homes in the area. As a result, the potential exists, though limited, for a major fire that could quickly overrun the capabilities of both the City's and other local government fire departments.

Related Hazards- Cascading Effects

The ensuing effects of wildland fires can be devastating beyond the obvious loss of vegetation and depletion of forest resources. Soil, waterways and land can sustain lasting damage from large intense fires. Extreme heat can cause soil to lose its ability to absorb moisture and subsequently support life. These soils quickly erode, and as a result, enhance siltation of rivers and streams, thus increasing flood potential, damaging marine life, and diminishing water quality. Further, the risk of landslide hazard increases once land has been depleted of vegetation. Calamitous debris flows can ensue, as seen subsequent to the 2003 Southern California wildland fires.

Risk Assessment Conclusion

While in certain locations the fuels and the topography exist to allow an unchecked wildfire to become quite a threat, the strong coastal weather influence diminishes this hazard much of the time. Therefore, the probability is **LOW,** and the severity is **MEDIUM.**

A Fire Hazard zone map of the area is found in Appendix B.8.

6. HAZARD PROFILE: BIOLOGICAL AGENTS (Naturally Occurring)	
SEVERITY:	**VARIED**
PROBABILITY:	**HIGH**

Nature of Event

The following diseases caused by naturally occurring biological agents (bacteria, parasites and viruses) are of greatest concern for the County of San Luis Obispo and the study areas at this time per the San Luis Obispo County Public Health Department Epidemiologist:

- Brucellosis
- Chlamydia
- Coccidioidomycosis
- Cryptosporidosis
- Foodborne/Waterborne Illnesses
- Pandemic Influenza
- Noroviruses
- Rabies
- Tuberculosis
- West Nile Virus

Brucellosis

Brucellosis is a systemic bacterial disease characterized by ongoing irregular fever, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss and generalized aching. This disease may last for several days to longer than one year. This disease is caused by the bacterial genus Brucella and is predominantly an occupational disease of those working with infected animals (cows, sheep and goats) and their tissues. Ultimate control of human brucellosis rests on the elimination of the disease among domestic animals.

Chlamydial Infections

Chlamydiae are increasingly recognized as important pathogens responsible for a number of sexually transmitted diseases, with infant eye and lung infections consequent to maternal genital infection. A major challenge in controlling this bacterial infection is the fact that up to 70% of sexually active women with Chlamydial infections are asymptomatic. Preventive measures include: 1) Health and sex education, 2) Safe sex practices and 3) Routine screening.

Coccidioidomycosis (Valley Fever)

Coccidioidomycosis is caused by Coccidioides immitis/posadasii. Primary infections are common in arid and semi-arid regions of the southwestern United States. Drought followed by heavy rains or dust clod-generating events such as construction or earthquakes can causes outbreaks of coccidioidomycosis in endemic areas. Clinical manifestations associated with this disease include: 1) self-limiting pulmonary infections, 2) pulmonary complications, and 3) extra pulmonary disease. In endemic areas prevention resides with dust control measures (plant grass, oil unpaved airfields, wear face masks, keep soils moist).

Cryptosporidiosis

Cryptosporidiosis is a parasitic infection caused by Cryptosporidium parvum. It is transmitted to humans via the fecal-oral route, which includes person to person, animal to person, waterborne,

and foodborne transmission. The major symptom humans experience is diarrhea. Preventative measures include: 1) Educating the public in personal hygiene, 2) Disposing of feces in a sanitary manner; using care when handling animal or human feces., 3) Boil drinking water supplies for 1 minute (chemical disinfectants are not effective), 4) Removing infected persons from food handling jobs and 5) Removing infected children from day care settings.

Foodborne and Waterborne Illness

Foodborne 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 the study area. They are listed in order of most frequent threat to SLO County.

- Staphylococcus Aureus
- Salmonella
- Campylobacter
- Giardia
- Hepatitis A
- E.coli 0157:H7
- Shigella

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.

Influenza (Pandemic)

Influenza Viruses have for centuries threatened the health of animals and humans worldwide. This virus's diversity and propensity for mutation have prevented the development of both a universal vaccine and highly effective antiviral drugs. The current worldwide fear is that a pandemic could occur if a new strain of influenza virus emerges that has 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. Three human influenza pandemics have already 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 infect.

The animal population serves as a reservoir for new influenza viruses. A new influenza strain (H5N1) is currently spreading through bird populations across Asia, Africa and Europe. Thus far, the virus as infected over 200 people, with a mortality rate of over 50 percent.

Norovirus Infection (Viral Gastroenteritis/Viral Diarrhea)

Norovirus (previously known as Norwalk-like viruses) cause acute gastroenteritis in humans. Patients experience nausea, vomiting, diarrhea and stomach cramping. This disease is usually not serious providing attention is paid to patient hydration. This virus is however very contagious and can easily spread from person to person. Preventative measures include: 1) good hand washing practices, 2) Carefully washing fruits, vegetables, and steaming oysters, 3) thoroughly cleaning and disinfecting contaminated surfaces with bleach based cleaner, 4) Immediately removing and washing contaminated clothing or linens, and 5) Infected persons should not prepare food.

Rabies
Rabies is an infectious viral disease that affects the nervous system of humans and other mammals. People get rabies from the bite of a rabid animal. Any wild mammal (bat, skunk, fox, coyote, and raccoon) can have rabies and transmit it to people. In San Luis Obispo County Rabies virus is a concern because of the close proximity of wild animals to the humans. There have been no human cases of Rabies in this County to date. This virus is predominantly found in the bat and skunk population. Many bat caves exist in the Morro Bay area. Because rabies is a fatal disease, the goal of public health is to prevent human exposure to rabies by; 1) education, and 2) anti-rabies treatment if exposure occurs.

Tuberculosis
Tuberculosis (TB) is a disease caused by the highly infectious bacterium Mycobacterium tuberculosis. It is a major cause of disability and death in many parts of the world. TB is spread through the air from one person to another. This bacterium usually attacks the lungs, but has the ability to attack any part of the body. The treatment regimen for infected patients involves multiple drug therapy for a minimum of 6 months. If not properly treated, TB can be fatal. Preventative measures include: 1)Promptly identify and treating infectious patients, 2)Public education, 3) Reducing overcrowding, and 4) Providing outreach services for direct supervision of patient therapy.

West Nile Virus (Encephalitis)
West Nile virus (WNV) is a mosquito-borne disease that could potentially cause serious illness in humans. Mosquitoes become carriers when they feed on infected birds. These infected mosquitoes can then spread the virus to humans and other animals by biting. Although WNV has been common in Africa, west Asia, and the Middle East for decades, it did not appear in the United States until 1999 and in California until 2002. In 2004, WNV activity was observed in all 58 counties in California and 830 human infections were identified. WNV causes a seasonal epidemic in North America that flares up in the summer and continues into the fall. About 1 in 150 people infected with WNV will develop severe illness.

West Nile Virus (WNV) History
In 2005:

- 54 counties reported WNV activity in California**.**
- 935 individuals from 40 counties were infected with WNV resulting in 19 fatalities.

WNV Virus Activity 2005

Area	Humans	Horses	Dead Birds	Mosquito Pools	Sentinel Chickens (WNV/SLE)
San Luis Obispo County	0	13	41	2	4
State of California	935	456	3,046	1,242	1,053

Thus far in 2006:

- WNV has been detected in 7 of 58 California Counties.
- **19** dead birds have tested positive for WNV in 2006, from Orange, Sacramento, San Diego, San Mateo, Santa Clara, and Ventura counties.
- **5** mosquito samples** have tested positive for WNV in 2006, from Riverside County.
- There has been no WNV Activity in SLO County.

History

The following bacterial, viral and parasitic infections have been reported for the past decade for San Luis Obispo County (Because data specific to the study areas is not available and the same biological agents of concern for the study area are of concern for the county, this section will address the entire County).

Total Cases by Year for San Luis Obispo County

DISEASE	YEAR										
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AIDS	10	2	4	3	3	3	2	1	0	0	0
Amebias	4	1	4	3	0	2	0	1	1	1	0
Brucellosis	0	0	0	0	0	0	0	0	1	2	0
Campylobacter	61	61	34	30	37	33	29	30	43	54	11
Chlamydia	224	233	341	266	324	293	467	511	470	549	160
Coccidiomycosis	53	38	28	32	44	77	41	75	72	116	36
Cryptosporidiosis	2	0	0	0	3	5	3	10	53	6	3
E-Coli	2	4	2	0	4	2	2	2	2	6	2
Gonorrhea	44	37	31	31	26	21	30	60	37	49	14
Giardia	51	58	51	34	22	29	12	12	11	19	6
Hepatitis A	19	25	9	2	9	3	7	4	4	5	3
Hepatitis B – Acute	9	2	0	2	0	1	1	1	6	4	0
Hepatitis B – Total	42	17	23	40	32	40	67	37	41	94	36
Hepatitis C – Correctional	0	0	0	79	149	179	946	459	190	277	84
Hepatitis C – Non-Correc.	3	75	162	132	105	152	267	153	212	226	66
Hepatitis C –Total	3	75	162	211	254	331	1213	612	402	503	150
Meningitis – Bacterial	2	7	3	1	5	4	6	4	4	7	1
Meningitis – Viral	13	35	50	13	13	17	12	28	29	22	3
Meningitis – Fungal	1	0	2	2	0	0	0	0	0	3	1
Meningitis – Unknown	1	0	1	0	1	0	1	3	2	1	0
Meninigococcal Meninigitis	1	2	1	3	0	0	0	1	0	0	0
Meninigococcemia	4	1	3	1	0	2	0	0	0	1	1
Pertussis	6	9	2	1	0	2	1	1	0	109	24
Salmonella	43	35	33	12	19	23	17	22	25	23	8
Shigellosis – B	2	5	2	0	2	4	0	1	1	1	1
Shigellosis- D	1	3	5	2	0	1	2	1	0	2	2
Syphilis	19	3	4	2	7	0	12	11	12	13	8
Tuberculosis	10	9	8	6	0	12	7	8	4	8	-

Provided by the San Luis Obispo Public Health Department

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 West Nile Virus. Surveillance efforts throughout California have been extensive including; human and horse case detection, WNV testing of mosquitoes, sentinel chicken flocks, and dead birds. However, because San Luis Obispo County is one of the few remaining counties in California **without** a Vector Control District, the risk of West Nile Virus and other vector borne diseases increases.

Of greatest concern to all health agencies at this time is a Pandemic Influenza outbreak. Federal, State and Local governments are all at present actively engaged in pandemic influenza preparedness planning efforts. The San Luis Obispo Public Health Department has recently hired a contractor to construct Pandemic Influenza Plans for the County. Additionally, this agency has already completed composition of a Strategic National Stockpile Plan. These preparedness measures will 'in theory' help in the prevention, early detection and treatment should such an outbreak occur.

Risk Assessment Conclusion

The probability of an outbreak of an infectious disease within the study area 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, therefore it **VARIES**. Past history dictates that a pandemic Influenza outbreak would unquestionably receive a **HIGH** severity rating.

The absence of a Vector Control District within San Luis Obispo County delays the detection of and response to West Nile Virus and other vector borne diseases.

7. HAZARD PROFILE: TSUNAMI

SEVERITY:	**LOW**
PROBABILITY:	**LOW**

Nature of Event

Tsunamis are a series of ocean waves generated by vertical movement of the sea floor. The movement is typically caused by earthquake related faulting, but can also result from submarine landslides or volcanic eruptions. San Luis Obispo County could be affected by a tsunami caused by fault related ground displacement on a local, near or offshore fault, or on a more distant fault. Common sources of tsunamis affecting California in the past have been earthquakes on faults off the coast of Chile and the North American coast (up to Alaska).

In the open ocean, tsunami waves have a long wavelength (distance from the crest of one wave to the crest of the succeeding wave) normally over 100 miles, and very low amplitude (height from crest to trough). As these waves approach shallow water, their speed is decreased from a deep-water speed of over 600 miles per hour to less than 30 miles per hour. The wave energy is transferred from wave speed to wave height. Thus, waves as high as 100 feet have been formed. Tsunamis are a unique hazard because the arrival time of a wave generated far out to sea can be predicted fairly accurately. Unfortunately, the intensity of the wave when it reaches shore cannot be accurately predicted. Tsunamis are sometimes preceded by a trough or recession of ocean water that can attract people to the shore to examine what appears to be a very low tide. These recessions can also cause problems when the water returns, for moored boats that are grounded.

Seiches are 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, large landslides and local basin reflections of tsunami. Seiches can result in the creation of long-period waves that can cause water to overtop containment features or cause seiche run-up on adjacent landmasses, similar to tsunami run-up. The intensity of the damage caused by a seiche is proportional to the magnitude and proximity of the event causing the seiche. Freeboard is defined as the vertical distance from the free surface of water to the edge of the containment structure.

History

The largest recorded tsunami to affect California was caused by an earthquake in the Santa Barbara Channel in 1812. Resulting tsunami run-up was reported to have been up to 50 feet above sea level at Gaviota, and 35 feet at Santa Barbara.

In Crescent City, California, in 1964, tsunami waves of up to 20 feet, a result of an Alaskan earthquake, caused over 11 million dollars in property damage and resulted in 11 deaths. The impact of this tsunami was also felt in Morro bay with damage to docks and fueling stations.

The historic record shows local tsunamis have resulted from distant sources. Houston and Garcia in a 1978 study estimated the Cayucos/Morro Bay coastline 100- and 500- year tsunami run-ups, based on distant source generation (such as the Aleutian or Chile- Peru Trenches), is approximately 9.5 feet to 24.2 feet, respectively. Those run-ups were calculated using astronomical high tides, and are consistent with recorded tsunamis that have occurred in

Crescent City and other locations along the California coast. However, according to Kilbourne and Mualchin (1980), the worst case scenario would occur if a tsunami occurred during a meteorological tide (storm surge), which would add an estimated 14.5 feet to the run-up calculated by Houston and Garcia. Thus, with a worst case scenario, the estimated tsunami run-up for the 100-year and 500-year event would be no greater than 50 feet above mean sea level.

Historical Occurrence Table

Location	Date of Incident	Intensity	Initial 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 Beach	4/1/1946	Height: 1.3 meters Source Magnitude: (Ms) 7.3	Tsunami, Source location: Alaska Source Event: E. Aleutian Islands Travel time: 5 hours, 36 minutes
Morro Bay	4/1/1946	Height: 1.5 meters Source Mag.: (Ms) 7.3	Tsunami, Source location: Alaska Source Event: E. Aleutian Islands Travel time: 5 hours, 36 minutes
Avila Beach	11/4/1952	Height: 1.4 meters Source Mag.: (Ms) 8.2 (Mw) 9	Tsunami< Source location: Russia Source event: Kamchatka Travel time: 8 hours, 36 minutes
Pismo Beach	5/22/1960	Height: 1.4 meters Source Mag.: (Mw)9.5	Tsunami, Source location: Chile Source event: Central Chile
Avila Bch& Morro Bay	3/28/1964	Height: 1.6 meters Source Mag.: (Mw)9.2	Tsunami, Source location: Alaska Source Event: Gulf of Alaska Travel time: 5 hours, 10 minutes

Source: County Safety Element NCDC: National Climatic Data Center NOAA: National Oceanic & Atmospheric Administration

Future Probability

Large tsunamis have not been common on the Central Coast of California. Thus, few incidences have been recorded and the historical record is not extensive enough to develop accurate reoccurrence predictions. The potential tsunami hazard for the San Luis Obispo County coastal areas is greatest for those communities or portions of communities located below the estimated elevations for the 100-to 500-year events, that is, below elevation 50 feet above mean sea level. In general, much of the Coast of San Luis Obispo County is protected from tsunami hazards by wide beaches, coastal dunes, or sea cliffs that provide protection for

coastal developments. Coastal developments most vulnerable to the tsunami hazards are those located near mouths of streams that drain into the Pacific Ocean. The potential for damage to coastal structures would likely increase if the tsunami event were to coincide with a high tide, storm related waves, or large winter storm runoff.

Tsunami hazard exists in the following locations within the City:

- Morro Creek, Alva Paul Creek, and Chorro Creek
- Atascadero Beach (from Morro Rock to North Point)
- The harbor area and the Embarcadero.

Areas that boarder the City and maybe impacted include; Cayucos Creek, Little Cayucos Creek, Old Creek and Willow Creek in Cayucos.

Cascading Effects

A moderate to heavily damaging tsunami may cause the following problems:

- Mass Injuries
- Emergency Medical Services Disruptions, Including Hospitals
- School Disruptions
- Hazardous Materials Releases
- Fires
- Need for Short Term Evacuations
- Utility Disruptions: Gas, Electric, Water, Sanitation
- Transportation System Disruptions
- Traffic Management Problems
- Communication Disruptions
- Disease and Health Hazards
- Loss of Commerce and Government Resources

Risk Assessment Conclusion

The past Tsunami history and the limited amount of exposed area results in a rating of **LOW** for both probability and severity.

An updated tsunami inundation map is currently in process, once received it will be placed in Appendix B.9.

8. HAZARD PROFILE: EXTREME WEATHER				
SEVERITY	Varies:	**LOW**	**to**	**HIGH**
PROBABILITY				**HIGH**

Nature of Event

In the study area the following extreme weather events or conditions have been know to occur; coastal erosion, freeze, hail storms, and wind storms.

Coastal Erosion

Coastal erosion is the common phrase referring to the loss of landmass into a sea or lake due to natural processes such as waves, winds and tides, or even due to human interference. Large storm-generated waves typically cause coastal erosion, which may take the form of long-term losses of sediment and rocks, or merely in the temporary redistribution of coastal sediments.
On rocky coasts, coastal erosion can result in dramatic rock formations in areas where the coastline contains stones with different resistances to erosion. The softer areas become eroded much faster than the harder ones, which can result in interesting landforms such as tunnels, bridges, columns, and pillars.
On sedimentary coasts such as the one found in the study areas, coastal erosion typically poses more of a danger to human settlements than it does to nature itself.

Drought

A drought, or an extreme dry period, is an extended period 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** is brought about when there is insufficient moisture for average crop or range production. This condition can arise, even in times of average precipitation, owing to soil conditions or agricultural techniques.
- **Hydrologic drought** is brought about when the water reserves available in sources such as aquifers, lakes, and reservoirs falls below the statistical average. This condition can arise, even in times of average (or above average) precipitation, when increased usage of water diminishes the reserves.

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. They can be

quite destructive, especially in urban areas where falling trees and branches can result in considerable property damage.

Hail Storms
Hail is precipitation in the form ball or irregular lumps, always produced by convective clouds, nearly always cumulonimbus. They can vary in size from pea size all the way up to grapefruit size 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.
Hail storms cause an incredible amount of damage to property notably to automobiles, skylights, and glass-roofed structures. The damage to crops can also be significant. Fortunately hail very rarely kills anyone, however each year dozens of people are injured when they are not able to find adequate shelter.

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 the early morning temperatures to the normal 45 to 55 degree range. Rarely a threat to human life, the major impact will be to agricultural operations where crop damage to high value products such as strawberries, citrus, and row crops can be extensive.

History

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

HISTORIC EXTREME WEATHER EVENTS

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 airmass 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	1997 to present (events number more than 20)		Heavy Surf. 1998 event: An extended heavy surf event, produced by a series of Pacific storms, battered coastal areas of Central and Southern California. Along the coast of San Luis Obispo, waves as high as 25 feet were reported. Elsewhere, coastal areas reported 12 to 15 foot waves producing some degree of damage across these areas. In Port San Luis, widespread shoreline erosion was reported. In Morro Bay significant damage has occurred to the breakwater and jetties at the harbor entrance.

Source: National Climatic Data Center

Future Probability

Give the past occurrences it is reasonable to predict that these types of events will occur again throughout the study area. While it is impossible to predict when they will occur, it is prudent to plan for the eventuality of the events.

Of specific concern for Morro Bay is the combination of high winds, winter storms and the resultant high surf.

The northern beach portions of Morro Bay are protected from serious erosion by a wide gentle sloping which is backed by a low series of small sand dunes. Erosion may occur each winter with the onslaught of large winter surf, however natural process return the sand to the beach during the summer months. The infrastructure of the harbor entrance is a different matter. Large winter storms may have serious impacts on the jetties and breakwater that are an integral part of maintaining a safe navigable entrance to the harbor. The southern portions of the City and the Bay itself are protected by a wide beach and large series of tall sand dunes.

Related hazards - Cascading effects

The resultant hazards occurring from extreme weather events can be many and varied. Some examples include:

Flooding as a result of freezing can be damaging. Extreme low temperatures may cause pipes to freeze and later crack as they thaw out when temperatures return to normal ranges. Periods of drought can have significant environmental impacts such as wildfires and dust storms. The latter can increase the opportunity for plant, animal and human disease. Additionally, both drought and extended periods of cold weather can result in economic consequences to the study areas agricultural industry.

Risk Assessment Conclusion

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. High winds and large waves will batter the coast and can result in significant damage to the harbor mouth infra structure.
The oceans 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.

Given the past history of both occurrence and damage, and based on the wide range of occurring events this section is rated as **VARYING** from **LOW to HIGH** in severity and **HIGH** in probability.

9. HAZARD PROFILE: TERRORISM	
SEVERITY	**MEDIUM**
PROBABILITY	**LOW**

Nature of Event

Terrorism is defined by the U.S. Department of Defense (DoD) as: "The calculated use of unlawful violence or threat of unlawful violence to inculcate fear intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological."

The use of terrorism ranges from individual acts of wanton damage or destruction of individuals or property, to extremely sophisticated operations carried out by highly organized violent groups with social, environmental, religious, economic, or political agendas.

Methods of terrorism may include:

- Biological Agents
- Nuclear weapons or Devices (dirty bombs)
- Incendiary Devices
- Chemical Agents (nerve gas, choking agents)
- Explosive Devices

The use of such weapons could result in mass casualties, long term contamination, as well as wreak havoc on the City, State and National economies.

History

The devastating attacks on the World Trade Center Building in New York City and the Alfred P. Murrah Federal Building in Oklahoma City shocked our nation into the realizing that there are no domestic safe havens from acts of terrorism. These attacks weakened American's sense of safety and security.

California has a long standing history of combating both domestic and international terrorists. The rationale behind these acts has been predominantly issue-oriented. Recently, expressions of hatred for existing forms of government has increasingly been the motive behind terrorist acts.

While the study area has no history of terrorism, a significant terrorism event occurred within the County in1976 when the Symbionese Liberation Army bombed Hearst Castle. The remoteness and small population size of the County still does not make it immune from these types of actions.

Future Probability

The accessibility of basic shelf-type chemicals and mail order biological research materials, coupled with access to even the most unsophisticated laboratory facilities, could enable the individual extremist or an organized terrorist group to manufacture highly lethal substances or to

create less sophisticated weapons of mass destruction. The freedom of movement and virtually unrestricted access to government officials, buildings, and critical infrastructure within California provides a terrorist with the opportunity and conditions of anonymity to deliver such devastation.

Potential targets of terrorism within and nearby the study area include symbolic and historic structures, public buildings and assembly areas, institutions of higher learning, chemical/hazardous materials storage facilities and the railway system. Additionally, an attack on the neighboring Diablo Canyon Nuclear Power Plant could result in a significant release of radioactive materials impacting the study area - a fear shared by many community members.

Risk Assessment Conclusion

Law enforcement officials have deemed the probability of a terrorist act within this study area to be **LOW**, a result of the small population and the study area's significant distance from major metropolitan areas. If one of a number of terrorist activities did occur within the study area, the consequences could range from negligible to severe, resulting in a **MEDIUM** severity rating.

A terrorist attack on the Diablo Canyon Nuclear Power Plant is deemed the areas greatest threat with potentially lethal consequences. However, the very presence of this well protected power plant near the study area has engendered a large number of requisite NPP preparedness exercises and drills enabling the County of San Luis Obispo to be significantly more prepared to respond to a terrorist threat than other jurisdictions of comparable size.

IV. VULNERABILITY ASSESSMENT

A. Critical Structures and Infrastructure

The vulnerability assessment is a summary of the losses that could be expected should the hazard impact the City's vulnerable structures. This section will include:

1. A description of the critical buildings and infrastructure within the study areas
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 from earthquakes and flooding

Critical Facilities and Infrastructure

Critical facilities and infrastructure are those systems within the community whose incapacity or destruction would have a debilitating affect on the community's ability to recover from the event. The 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, historical buildings will be classified as non-critical facilities. Although their relevance to the City and its 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 the vulnerability assessment.

B. Vulnerable Populations

TABLE 4-1: POPULATIONS POTENTIALLY VULNERABLE TO HAZARDS

Jurisdiction	Population				Households
	Total	<19 years	19 - 65 years	66 +	Total
City of Morro Bay	10,350	1804	6268	2278	6251

Source: US Census Bureau.

C. Inventory of Assets

TABLE 4-2: CRITICAL BUILDINGS, FACILITIES AND INFRASTRUCTURE

		No. of Facilities	Estimated Value of Facilities
Essential Facilities	Hospitals / Other Medical Facilities	0	0
	Police Stations	1	$ 1.42 M
	Fire Stations	2	$ 1.1 M
	City Hall	1	$ .690 M
	City Services/Admin Building	1	$ .622 M
	Community Center/ Emerg. Ops. Center	1	$ 3.3 M
	Corporation Yard – Shops & Infrastructure	1	$ 1.14 M
	Harbor and Associated infrastructures	1	$ 5.32 M
	Highways (miles of primary)	11	$ 1.65 M
	Bridges	3	$ 5.5 M
Lifeline Utility Systems	Potable Water (Desalinization Plant)	1	$ 4.14 M
	Wastewater System	1	$ 35.14 M
	Reservoirs/ Water tanks	Multiple	$ 1.43 M
High Value Facilities	Morro Bay Power Plant (privately held)	1	$65.0 M
	Veterans Hall	1	$ 6.03 M
Residential Units	Single Family	4986	$3.18 B
TOTAL			$ 3.89 B

Source: City of Morro Bay Insurance Schedule, 2005

BY TYPE AND ESTIMATED VALUE, 2005

D. Loss Estimations

TABLE 4-3: CRITICAL BUILDINGS, FACILITIES AND INFRASTRUCTURE LOSS BY FLOOD OR EARTHQUAKE

		Flood Loss @ 50 %	Earthquake Loss @ 100%
Essential Facilities	Hospitals / Other Medical Facilities	0	0
	Police Stations	0	$ 1.42 M
	Fire Stations	$.247	$ 1.1 M
	City Hall	0	$ .690 M
	City Services/Admin Building	0	$ .622 M
	Community Center/ Emerg. Ops. Center	0	$ 3.3 M
	Corporation Yard – Shops & Infrastructure	$.57	$ 1.14 M
	Harbor and Associated infrastructures	$2.66	$ 5.32 M
	Highways (miles of primary)	0	$ 1.65 M
	Bridges	0	$ 5.5 M
Lifeline Utility Systems	Potable Water (Desalinization Plant)	$2.07	$ 4.14 M
	Wastewater System	$17.57	$ 35.14 M
	Reservoirs/ Water tanks	0	$ 1.43 M
High Value Facilities	Morro Bay Power Plant (privately held)	$33 M	S65.0 M
	Veterans Hall	0	$ 6.03 M
Single Family Residential Units (SFR)	221 SFR in Flood Zone (2000 sq.ft. @ 130/ft by .50%) 4986 SFR in Earthquake (4986x$.637m)	$ 28.73 M	$3.18 B
TOTALS		$84.85 M	$ 3.89 B

Source: City of Morro Bay Insurance Schedule, 2005

E. Hazards Impact to Vulnerable Structures

TABLE 4-4: HAZARDS IMPACT TO VULNERABLE STRUCTURES - CITY OF MORRO BAY

CRITICAL STRUCTURES AND INFRASTRUCTURE			IDENTIFIED HAZARDS POTENTIALLY IMPACTING CRITICAL FACILITIES AND INFRASTRUCTURE								
CATEGORY	**BUILDING**	**LOCATION**	**EARTHQUAKE**	**FLOOD**	**LANDSLIDE**	**TSUNAMI**	**WILDLAND FIRE**	**EXTREME WEATHER**	**HAZARDOUS MATERIALS**	**BIOLOGICAL AGENTS**	**TERRORISM**
GOVERN-MENT	**City Hall**	595 Harbor St	X					X	X	X	X
	Pub. Service Building	955 Shasta	X					X	X	X	X
	Council Chambers	209 Surf	X					X	X	X	X
	Corporation Yard	170 Atascadero Rd.	X	X		X		X	X	X	X
SAFETY SERVICES	**Police Department**	850 Morro Bay	X					X	X	X	X
	Harbor Patrol	1275 Embarcadero	X			X		X	X	X	X
	Fire Station 1	715 Harbor	X					X	X	X	X
	Fire Station 2	490 Bonita	X			X		X	X	X	
COMMUNITY FACILITIES	**Community Center & Emerg. Ops. Cntr.**	1001 Kennedy Way	X					X	X	X	X
	Sewage Treatment Plant	160 Atascadero Rd.	X	X		X		X	X	X	X
	Water Treatment	176 Atascadero Rd.	X	X		X		X	X	X	X
	Library	625 Harbor	X					X	X	X	X

F. Methodology 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.

Earthquakes can extensively damage a wide area therefore all critical structures and infrastructure were calculated at a 100% value.

Flooding damage takes place in specific areas and the damage is historically less severe than that of an earthquake. Thus, the loss estimate as a result of flood damage was calculated at a 50% level. To determine the number of critical structures and infrastructure at risk, a combination of field surveys, aerial photos, GIS maps, FIRM maps and Google Earth software were used.

G. Development Trend Analysis

A thorough description of the City's development trends may be found in Section 1, page 11.

Any new development in this jurisdiction will be in fill in nature and will be contingent upon meeting all current regulatory processes. In general it will be vulnerable only to area-wide hazards such as terrorism, significant hazardous materials spills, and earthquakes.

V. MITIGATION STRATEGY

The HMPG developed a strategy for mitigating the hazard risks identified and summarized in the table above. The mitigation strategy provides the "*what, when, and how*" of actions that will reduce or possibly remove the community's exposure to hazard risks, and is categorized into the following components:

- **Capability Assessment**
- **Goals and Objectives**
- **Mitigation Actions/Projects**
- **Implementation Strategy**

A. Capability Assessment

An important component of the Mitigation Strategy is an understanding of the resources available to the jurisdiction 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 the agency. The third component of the Assessment is the City'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.

1. Legal and Regulatory

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

2. Administrative and Technical

The City 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.

3. 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.

The City of Morro Bay has the necessary budgetary tools and practices in place to facilitate handling appropriate funds; however funding sources are very limited.

4. Physical Assets

Fire Department

Fire prevention and suppression services are provided by the City of Morro Bay Fire Department (MBFD), a fire and emergency service organization. The Department provides fire suppression, emergency medical care, hazardous materials emergency intervention and control, water rescue, entrapment extrication, fire safety inspections of businesses, public fire safety education, fire investigation, and disaster management and planning. MBFD operates from a temporary fire station located at 695 Harbor Blvd, which is located in downtown business district. The old fire station located at 715 Harbor was significantly damaged in the 2003 San Simeon Earthquake and a new facility is currently in the planning stages at the old location.

The Insurance Service Office (ISO), a national rating service sponsored by fire insurance carriers to measure fire fighting capability to reduce structural fire losses, provides rankings of fire fighting capability on a scale of 1-10 with 1 being best level of service and 10 being no service at all. The ISO assigned the City of Morro Bay community a class 5 rating. Staffing is provide by 10 full time professional firefighters, 20 part time reserve firefighters, and 1 administrative assistant.

Police Department

The City of Morro Bay Police Department (MBPD) provides law enforcement services for the City. According to MPBD the department is staffed (17 sworn officers including the Chief and Commander and one reserve officer) to serve the entire population of City of Morro Bay at a ratio of 1.7 officers per 1,000 residents. This does not take into account the department's service population which increases significantly through tourists on weekends and holidays.

Harbor Department

The Harbor Provides, search and rescue, surf rescue, marine fire fighting, towing, code enforcement, and animal rescue with in the harbor. Additionally it provides general administration and facilities maintenance for the harbor. The Department provides a high level of service in community education (water safety programs), public outreach, and community relations for boaters, beach users, and waterfront visitors. The Harbor Department is also involved with resource management for the City's beaches and natural resources including coordination with state and federal regulatory agencies. The Department provides a site to dispose of waste oil, empty oilcans and oil absorbent pads to boaters. Another responsibility is coordination of federal dredging activities and administration of tidelands leases. The Harbor Patrol is staffed sunup to sunset, seven days a week with 30-minute callback for after hour service/emergency.

Harbor Department Staffing:

Permanent Employees	Part-time Contract Employees
Harbor Director	4-6 Reserve Harbor Patrol Officers
Chief Harbor Patrol Officer	1 Maintenance Worker
Harbor Business Coordinator	8-10 Beach Lifeguards (summer only)
4 Harbor Patrol Officers	
Office Assistant IV	

Emergency Services Equipment:

Police Department Vehicles	Fire Department Vehicles	Harbor Patrol
5 Marked Patrol Units	2 Fire Engines (Type 1 rated)	3 Patrol Boats
2 Detective units	1 Fire Ladder Truck (Type 1 rated)	3 Pick-up Trucks
2 Pool Vehicles	1 Fire Engine (Type 2 and 3rated)	2 Personal Water Craft
2 Volunteer Units	2 Utility Pick-ups	
1 DARE Vehicle	1 Urban Search & Rescue Trailer	
2 Command Vehicles	1 Mass Casualty Trailer	
	1 Command Vehicle	
	1 Squad/Rescue Unit	

B. Goals, Objectives and Mitigation Actions

The Hazard Mitigation Planning Group assessed the City's capabilities regarding legal, regulatory, technical expertise, and financial resources. The Group then worked with the Fire Chief and the City Engineer to develop the following set of goals, objectives and mitigation actions for review by the City Council.

Goal 1.	**Promote disaster-resistant future development.**
Objective 1.1	Continue to adopt, update, develop, and support the jurisdiction's general plans, master plans, ordinances, and codes to limit development in hazard areas or build to standards that will prevent or reduce damage.
Objective 1.2	Adopt and support codes that protect existing infrastructure and assets in hazard areas.
Mitigation Action 1.A	Educate the planning staff, city administrative staff and elected officials on the importance of keeping up to date on trends and developments in disaster preparedness. Attendance at seminars and lectures on the specific hazards would enable staff to make appropriate recommendations to the governing bodies as they go about the process of approving new developments.
Goal 2.	**Promote understanding and support for hazard mitigation by key stakeholders and the public within the City of Morro Bay.**
Objective 2.1	Provide education to key stakeholders and the public to increase awareness of hazards and opportunities for mitigating hazards.
Objective 2.2	Promote partnerships between the state, counties and local governments to identify, prioritize, and implement mitigation actions.
Objective 2.3	Promote hazard mitigation in the business, residential, academic, and agricultural communities.
Objective 2.4	Monitor and publicize the outcome of effective mitigation actions employed to gain public acceptance.
Mitigation Action 2.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 3.	**Build and support local capacity and commitment to minimize the City of Morro Bay's vulnerability to potential hazards.**
Objective 3.1	Improve existing capabilities to warn the public of emergency situations.
Objective 3.2	Develop programs to enhance the safety of residents, students and staff within the community.
Objective 3.3	Continue to support the applicable City departments in their ability to respond effectively to major emergencies.
Mitigation Action 3.A	Train the police and fire department supervisors and officers on the activation of the County's early warning system.
Mitigation Action 3.B	Support the development of the County Regional Community Emergency Response Team (CERT) in the local areas.
Mitigation Action 3.C	Survey the applicable department heads as to their perceived disaster preparedness needs. Convene a special meeting of the Disaster Council to prioritize these needs and develop funding strategies.
Mitigation Action 3.D	Task the Disaster Council with developing a Continuity of Operations Plan (COOP) for the City.

Goal 4.	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to flooding.**
Objective 4.1	Implement policies, procedures and regulations which reduce the exposure to flood hazards.
Objective 4.2	Protect the improved property, natural resources and life vulnerable to flood hazards.
Objective 4.3	Reduce the vulnerability of community assets, particularly critical facilities, located in the 100-year floodplain.
Objective 4.4	Continue to support and fund creek maintenance activities such as monitoring, noticing property owners of hazardous conditions, and performing routine creek maintenance as needed and as permitted by the California Department of Fish and Game.

Mitigation Action 4.A	Continue to work cooperatively with the state and federal flood-related agencies.
Mitigation Action 4.B	Maintain compliance with the National Flood Insurance Program (NFIP) requirements.
Mitigation Action 4.C	Continue to participate and support the San Luis Resource Conservation District (RCD) County Flood Control Zone
Mitigation Action 4.D	Restrict construction of essential service facilities in the 100-year flood plain areas.

Goal 5.	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to tsunamis.**
Objective 5.1	Develop a comprehensive approach to reducing the level of damage and losses resulting from tsunamis.
Objective 5.2	Protect the improved property, natural resources and life vulnerable to a tsunami event.
Mitigation Action 5.A	Review the current Tsunami Plan and update it as necessary to ensure consistency with the recently adopted SLO County Tsunami Plan.
Mitigation Action 5.B	Educate the public about tsunami dangers and appropriate response actions.
Mitigation Action 5.C	Post evacuation route signs as outlined by the recently adopted County Tsunami Plan.
Mitigation Action 5.D	Restrict construction of essential service facilities in the tsunami inundation zone.

Goal 6.	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to wildland fires.**
Objective 6.1	Develop a comprehensive approach to reducing the level of damage and losses due to wildland fires.
Objective 6.2	Protect the improved property, natural resources and life vulnerable to the effects of wildland fires.
Objective 6.3	Educate the public about wildland fire dangers and mitigation measures.
Mitigation Action 6.A	Work with the San Luis Obispo County Fire Safe Council to initiate fuel thinning and chipping projects in the Black Mountain area within the City limits.
Mitigation Action 6.B	Continue to support the City's weed abatement program.
Mitigation Action 6.C	Continue to enforce codes and ordinances that eliminate the use of wood shake roofs.
Mitigation Action 6.D	Develop codes and ordinances that require fire sprinkler systems in all new structures built in the wildland urban interface areas of the City.
Goal 7.	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to earthquakes.**
Objective 7.1	Develop a comprehensive approach to reducing the level of damage and losses due to earthquakes.
Objective 7.2	Protect the improved property, natural resources and life vulnerable to the effects of earthquakes.
Mitigation Action 7.A	Perform a safety review of all current City structures and facilities paying close attention to disaster proofing of all facilities. Convene the Disaster Council to prioritize the findings of the safety review and research funding strategies.
Mitigation Action 7.B	Require property owners of URM buildings to post approved signage on site.

Goal 8.	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to the accidental spills and releases of Hazardous Materials.**
Objective 8.1	Support the existing comprehensive approach to reducing the level of damage and losses due to the accidental spills and releases of Hazardous Materials.
Objective 8.2	Protect the improved property, natural resources and life vulnerable to the accidental spills and releases of Hazardous Materials.
Mitigation Action 8.A	Establish a goal of sending one fire department employee every three years through the California Specialized Training Institute Hazardous Materials Specialist program so that they may become a member of the county's hazardous materials response team.
Goal . 9	**Minimize the level of damage and losses to people, existing and future critical facilities and infrastructure due to biological agent threats.**
Objective 9.1	Develop a comprehensive approach to minimizing the loss of human life, livestock and agricultural products due to biological agent threats.
Mitigation Action 9.A	Participate in the public education process of human and agricultural health related issues as available.
Mitigation Action 9.B	Encourage broad participation in County public and agricultural health associated emergency preparedness exercises.
Mitigation Action 9.C	Increase involvement of special needs populations (disabled, elderly) in education and disaster preparedness activities.
Mitigation Action 9.D	Support establishment of a Vector Control District in San Luis Obispo County.

C. Prioritization of Mitigation Actions

The Mitigation actions were prioritized based upon, 1) overall life threat and, 2) the STAPLE+E criteria which factor into account the social, technical, administrative, political, legal, economic and environmental concerns. Key stakeholders utilized these criteria to establish ratings of HIGH, MEDIUM and LOW for each mitigation action.

D. Implementation Strategy

Once the LHMP has received formal adoption by the City, 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:

MITIGATION ACTION		IMPLEMENTATION STRATEGY			
ID	**NAME**	**RESPONSIBLE DEPARTMENT**	**FUNDING SOURCES**	**COMPLE-TION DATE**	**PRIORITY**
1.A	Educate Staff	All	General Fund	Ongoing	Medium
2.A	Educate Public	All	General Fund	Ongoing	Medium
3.A	E. A. S.	FD/PD	General Fund	07/01/07	Medium
3.B	(CERT)	FD	Grant	Ongoing	Medium
3.C	Safety Survey	FD	None Required (NR)	01/01/07	High
3.D	COOP	FD	NR	01/ 01/09	High
4.A	Work Cooperatively with State/Federal Agencies	ALL	NR	Ongoing	Medium
4.B	National Flood Insurance Program	CD/PS	NR	Ongoing	Medium
4.C	Flood Zone	AD/CD	NR	Ongoing	High
4.D	Flood Restrictions	CD	NR	07/01/08	Medium
5.A	Update Tsunami Plan	FD	NR	07/01/07	Medium
5.B	Educate Public on Tsunami Plan	FD	NR	07/01/07	Medium
5.C	Evacuation Route	FD/PS	Grant	07/01/07	Medium
5.D	Zone Restrictions	CD	NR	07/01/08	Medium
6.A	Fuel Reduction	FD	Grant	07/01/08	Medium
6.B	Weed Abatement	FD	NR	Ongoing	Medium
6.C	Fire Sprinklers	CD/FD	NR	07/01/08	Medium
6.D	Wood Roofs	CD/FD	NR	07/01/08	Medium
7.A	Safety Review	FD	NR	03/01/07	High
7.B	URM Signs	PS	NR	07/01/07	High
8.A	Hazmat Team Training	FD	Grant	07/01/09	Medium
9.A	Public Education	Admin/FD	NR	Ongoing	Medium
9.B	Emergency Preparedness Exercises	Admin/FD	NR	Ongoing	Medium
9.C	Involve special needs	Admin/FD	NR	Ongoing	Medium
9.D	Support Vector Control District	Admin/FD	NR	Ongoing	Medium

VI. PLAN MAINTENANCE

A. Plan Monitoring, Evaluating and Updating

While the Mitigation Plan was prepared as a collaborative effort between the Local Hazard Mitigation Planning Group, the task of monitoring, evaluating, and updating the Plan shall be the responsibility of the City Fire Department.

The Fire Chief and the Public Service Director will be responsible for an annual review of the progress in implementing the Hazard Mitigation Plan. This assessment will include an evaluation of the following:

- Plan implementation progress.
- Identification of any problems and suggestions for improvements.
- The availability of resources for implementation of the Plan.
- Significant changes in the severity or probability of the various hazards.
- Major changes in zoning, planning and land uses.

The findings from this review will be presented annually to the City Administrative Manager in memorandum format.

The Disaster Mitigation Act of 2000 requires updating the hazard mitigation plan every five years at the local level. To ensure compliancy, four years post adoption of the Plan, the City Fire Chief will undertake the following activities:

- Work with City staff to thoroughly review and update the jurisdiction's risk to natural and man-made hazards.
- Review current and past annual reports.
- Review and revise the Mitigation Strategy.
- Prepare a new Action Plan.
- Update the Hazard Mitigation Plan and submit it to the City Council for adoption.

B. Implementation Through Existing Plans and Programs

The City of Morro Bay has established land use planning, development standards, capital improvement plans, building and fire codes and additional regulatory processes that enables it to guide and control development with in the community. Within two years of the adoption of this plan, the Fire Chief in conjunction with the Community Development Department will modify the existing regulations so that they reflect the goals established by the Hazard Mitigation Plan.

The City Manager will require applicable department heads to review the approved plan to facilitate awareness of the hazards and the goals present. Should deficiencies or discrepancies be found they will be reported back to the Fire Chief. The Fire Chief will conduct periodic reviews of the planning documents, development guidelines, emergency response plans, and land use policies and will provide technical assistance as needed.

C. Continued Public Involvement

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

- Post a copy of the Plan on the City Website.
- Copies of the Plan will be available in the offices of the City Manager and Police and Fire Departments, and the SLO County Office of Emergency Services.
- The Plan will contain the address and phone number of the City Fire Chief who is responsible for monitoring public comments and accepting suggestions regarding Plan revisions. (The final plan will advise the public of this methodology)
- The City will identify opportunities to educate the public about the plan and its goals at public events such as festivals, chamber of commerce events, and neighborhood meetings.