Section 9: Tsunami Hazards in the City of Long Beach

Why Are Tsunamis a Threat to Southern California?

History has shown that the probability of a tsunami in the planning area is an extremely low threat. However, if a tsunami should occur, the consequences would be great. The impact could cause loss of life, destroy thousands of high priced homes and greatly affect the City's downtown and coastal businesses, and impact tourism. Even if all residents and visitors were safely evacuated, the damage to property in this densely populated, high property value area would still be tremendous.

California's Tsunamis

"Since 1812, the California coast has had 14 tsunamis with wave heights higher than three feet; six of these were destructive. The Channel Islands were hit by a big tsunami in the early 1800s. The worst tsunami resulted from the 1964 Alaskan earthquake and caused 12 deaths and at least $17 million in damages in northern California."[1]

What are Tsunamis?

The phenomenon we call "tsunami" (soo-NAH-mee) is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves move across the deep ocean with a speed exceeding 500 miles per hour, and a wave height of only a few inches. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction up to 30 feet or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 100 feet. Even a tsunami 1-3 feet high can be very destructive and cause many deaths and injuries.

What causes Tsunami?

There are many causes of tsunamis but the most prevalent is earthquakes. In addition, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis.

Plate Tectonics

Plate Tectonic theory is based on an earth model characterized by a small number of lithospheric plates, 40 to 150 miles thick, which float on a viscous under-layer called the asthenosphere. These plates, which cover the entire surface of the earth and contain both the continents and sea floor, move relative to each other at rates of up to several inches per year. The region where two plates come in contact is called a plate boundary, and the way in which one plate moves relative to another determines the type of boundary: spreading, where the two plates move away from each other; subduction, where the two plates move toward each other and one slides beneath the other; and transform, where the two plates slide horizontally past each other. Subduction zones are characterized by deep ocean trenches, and the volcanic islands or volcanic mountain chains associated with the many subduction zones around the Pacific Rim are sometimes called the Ring of Fire.

Earthquakes and Tsunamis

An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.

Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean, and cause vertical movement of the sea floor over a large area, hundreds or thousands of square miles. "By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor."[2] The amount of vertical and horizontal motion of the sea floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the efficiency with which energy is transferred from the earth's crust to the ocean water are all part of the tsunami generation mechanism. The sudden vertical displacements over such large areas, disturb the ocean's surface, displace water, and generate destructive tsunami waves.[3] Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Rim region.

Tsunami Earthquakes

The September 2, 1992 earthquake (magnitude 7.2) was barely felt by residents along the coast of Nicaragua. Located well off-shore, the severity of shaking on a scale of I to XII, was mostly II along the coast, and reached III at only a few places. Twenty to 70 minutes after the earthquake occurred, a tsunami struck the coast of Nicaragua with wave amplitudes up to 13 feet above normal sea level in most places and a maximum run-up height of 35 ft. The waves caught coastal residents by complete surprise and caused many casualties and considerable property damage.

This tsunami was caused by a tsunami earthquake, an earthquake that produces an unusually large tsunami relative to the earthquake magnitude. Tsunami earthquakes are characterized by a very shallow focus, fault dislocations greater than several meters, and fault surfaces that are smaller than for a normal earthquake.

Tsunami earthquakes are also slow earthquakes, with slippage along the fault beneath the sea floor occurring more slowly than it would in a normal earthquake. The only known method to quickly recognize a tsunami earthquake is to estimate a parameter called the seismic moment using very long period seismic waves (more than 50 seconds/cycle). Two other destructive and deadly tsunamis from tsunami earthquakes have occurred in recent years in Java, Indonesia (June 2, 1994) and Peru (February 21, 1996).

> "Less frequently, tsunami waves can be generated from displacements of water resulting from rock falls, icefalls and sudden submarine landslides or slumps. Such events may be caused impulsively from the instability and sudden failure of submarine slopes, which are sometimes triggered by the ground motions of a strong earthquake. For example in the 1980's, earth moving and construction work of an airport runway along the coast of Southern France, triggered an underwater landslide, which generated destructive tsunami waves in the harbor of Thebes."[4]

Tsunami Characteristics

How Fast?

Unnoticed tsunami waves can travel at the speed of a commercial jet plane, over 500 miles per hour. They can move from one side of the Pacific Ocean to the other in less than a day. This great speed makes it important to be aware of the tsunami as soon as it is generated. Scientists can predict when a tsunami will arrive at various places by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the sea floor along the paths to those places. Tsunamis travel much slower in more shallow coastal waters where their wave heights begin to increase dramatically.

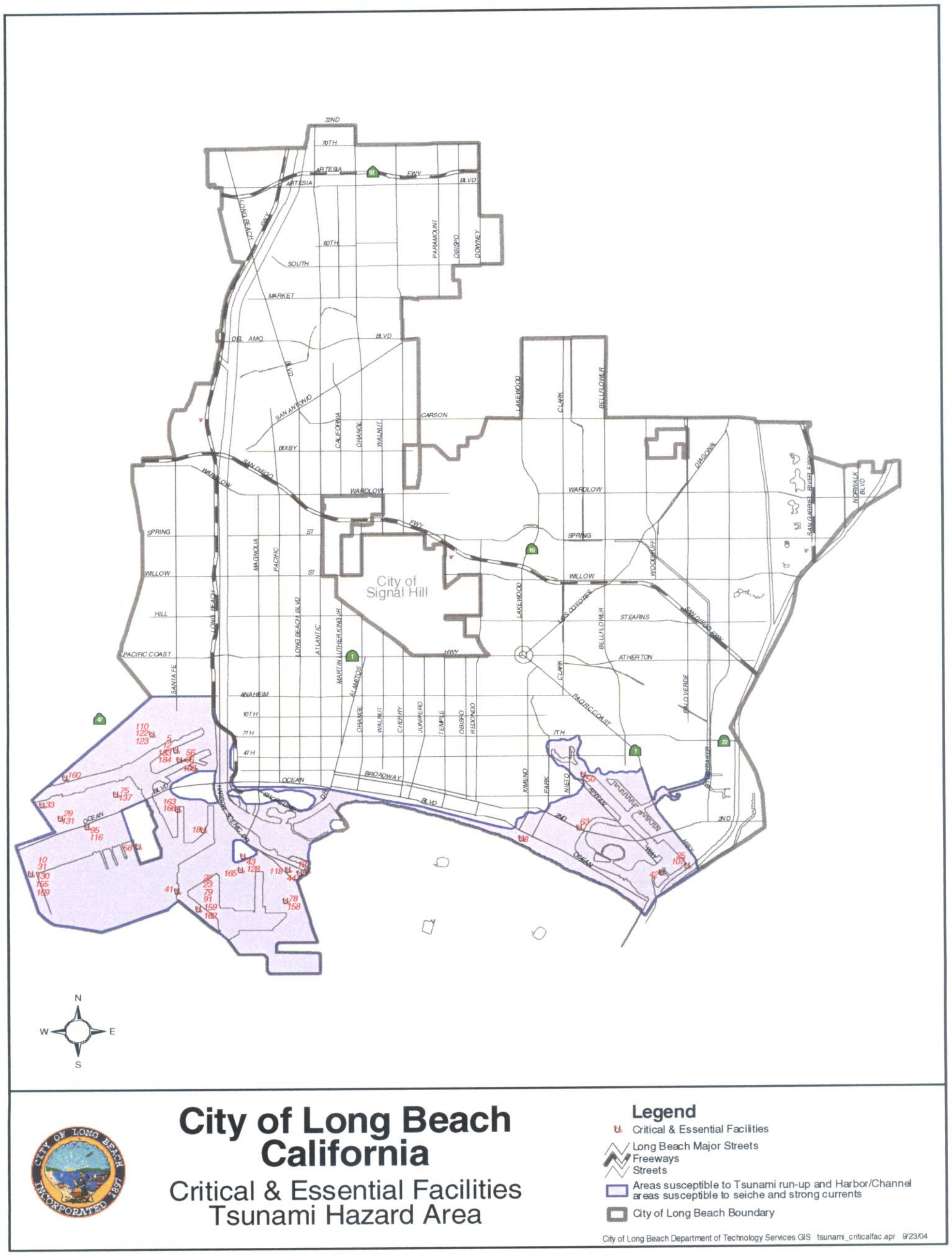
How Big?

Offshore and coastal features can determine the size and impact of tsunami waves. Reefs, bays, entrances to rivers, undersea features and the slope of the beach all help to modify the tsunami as it attacks the coastline. When the tsunami reaches the coast and moves inland, the water level can rise many feet. In extreme cases, water level has risen to more than 50 feet for tsunamis of distant origin and over 100 feet for tsunami waves generated near the earthquake's epicenter. The first wave may not be the largest in the series of waves. One coastal community may see no damaging wave activity while in another nearby community destructive waves can be large and violent. The flooding can extend inland by 1000 feet or more, covering large expanses of land with water and debris.

How Frequent?

Since scientists cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. However, by looking at past historical tsunamis and run-up maps, scientists know where tsunamis are most likely to be generated. Past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

Map 9-1: Facilities Map - Tsunami Hazard Area (Source: City of Long Beach GIS)



Types of Tsunamis

Pacific-wide and Regional Tsunamis

Tsunamis can be categorized as "local" and Pacific-wide. Typically, a Pacific-wide tsunami is generated by major vertical ocean bottom movement in offshore deep trenches. A "local" tsunami can be a component of the Pacific-wide tsunami in the area of the earthquake or a wave that is confined to the area of generation within a bay or harbor and caused by movement of the bay itself or landslides.

The last large tsunami that caused widespread death and destruction throughout the Pacific was generated by an earthquake located off the coast of Chile in 1960. It caused loss of life and property damage not only along the Chile coast but also in Hawaii and as far away as Japan. The Great Alaskan Earthquake of 1964 killed 106 people and produced deadly tsunami waves in Alaska, Oregon and California.

In July 1993, a tsunami generated in the Sea of Japan killed over 120 people in Japan. Damage also occurred in Korea and Russia but spared other countries since the tsunami wave energy was confined within the Sea of Japan. The 1993 Japan Sea tsunami is known as a "regional event" since its impact was confined to a relatively small area. For people living along the northwestern coast of Japan, the tsunami waves followed the earthquake within a few minutes.

During the 1990's, destructive regional tsunamis also occurred in Nicaragua, Indonesia, the Philippines, Papua New Guinea, and Peru, killing thousands of people. Others caused property damage in Chile and Mexico. Some damage also occurred in the far field in the Marquesas Islands (French Polynesia) from the July 30, 1995, Chilean and February 21, 1996, Peruvian tsunamis.

In less than a day, tsunamis can travel from one side of the Pacific to the other. However, people living near areas where large earthquakes occur may find that the tsunami waves will reach their shores within minutes of the earthquake. For these reasons, the tsunami threat to many areas such as Alaska, the Philippines, Japan and the United States West Coast can be immediate (for tsunamis from nearby earthquakes which take only a few minutes to reach coastal areas) or less urgent (for tsunamis from distant earthquakes which take from three to 22 hours to reach coastal areas).

History of Regional Tsunamis

Local

The local tsunami may be the most serious threat as it strikes suddenly, sometimes before the earthquake shaking stops. Alaska has had six serious local tsunamis in the last 80 years and Japan has had many more.

Local History of Tsunamis

Tsunamis have been reported since ancient times. They have been documented extensively in California since 1806. Although the majority of tsunamis have occurred in Northern California, Southern California has been impacted as well. In the 1930's, four tsunamis struck the Los Angeles and Orange Counties, as well as along San Diego's coastal areas. In Orange County the tsunami wave reached heights of 20 feet or more above sea level. In 1964, following the Alaska 8.2 earthquake, tidal surges of approximately 4 feet to 5 feet hit the Huntington Harbor area causing moderate damage.

Personal Interview
Name: *Bill Richardson*
Title: *City of Huntington Beach Lifeguard*
Year: *1964 – Alaska Good Friday Earthquake and Tsunami*
(paraphrased by Glorria Morrison)
I was on the lifeguard in the tower on the pier. We received warning by phone from the Fire Department who had received information from the National Weather Service. We were told to tell folks on the pier and beach that if the situation escalated they would be advised to evacuate the area and that they should be prepared to move quickly.

I witnessed heavy tidal surges on the beaches. The tide changed in 10 minutes from what it normally was to a very different tide. Normally it takes six hours to change and in 10 minutes it sucked water out and when it came in, it went over the berm, ¾ of the way across the beach. The accelerated tide within one hour came and went twice. The highs were extreme and the lows were extreme, very like our astronomical tides. I monitored the radio and heard of all the docks breaking loose in the harbor. The current was so strong and movement of water that the radio was being overwhelmed with calls for response. Only the two islands of Admiralty and Gilbert existed at the time.

Bill Richardson referred me to Walt Snyder, a Lifeguard Lt. at the time. Walt was in Huntington Harbor during this event.

Personal Interview
Name: *Walt Snyder*
Title: *City of Huntington Beach City Lifeguard, Lt. in the Harbor*
Year: *1964 – Alaska Good Friday Earthquake and Tsunami*
(paraphrased by Glorria Morrison)

I was called out at daybreak due to the tidal surges in the Huntington Harbor. I got in the City's only rescue boat. The tidal surges were huge and making whirlpools. They were moving at a much faster and higher rate than normal tide.

When the surges would come in, they would tear the boats away from their *moorings. Then when the surges would go out, they would take the boats through the bridge at Pacific Coast Highway to the Seal Beach (Anaheim Landing Bridge) and when they hit the pilings it would tear the boats apart. The high tides were carrying the boats into the weapons station. When surges retreated, the boats would end up on dry land at the weapons station --- high and dry and broken up.*

In 1964 there were only about 200-300 boats in the harbor and today Walt estimated there are 3,500 plus boats. There were only 300-400 homes then and now he estimates an excess of 5,000. This occurred during a low tide. The sea wall in Huntington Harbor is 9'. Had this occurred during a high tide, Walt stated the surges would have easily gone over the sea walls and damaged many homes.

Table 9-1 Tsunami Events in California 1930-2004

Tsunami Events In California 1930-2004

Date	Location	Maximum Run up*(m)	Earthquake Magnitude
08/31/1930	Redondo Beach	6.10	5.2
08/31/1930	Santa Monica	6.10	5.2
08/31/1930	Venice	6.10	5.2
03/11/1933	La Jolla	0.10	6.3
03/11/1933	Long Beach	0.10	6.3
08/21/1934	Newport Beach	12.00	Unknown
02/09/1941	San Diego	Unknown	6.6
10/18/1989	Monterey	0.40	7.1
10/18/1989	Moss Landing	1.00	7.1
10/18/1989	Santa Cruz	0.10	7.1
04/25/1992	Arena Cove	0.10	7.1
04/25/1992	Monterey	0.10	7.1
09/01/1994	Crescent City	0.14	7.1
11/04/2000	Point Arguello	5.00	

Source: Worldwide Tsunami Database www.ngdc.noaa.gov

* Maximum Run-Up (M)-The maximum water height above sea level in meters. The run- up is the height the tsunami reached above a reference level such as mean sea level. It is not always clear which reference level was used.

Tsunami Hazard Assessment

Hazard Identification

According to the City's General Plan Public Safety Element, the threat of significant damage associated with a tsunami is considered to be low to moderate. The Element includes the following section on the topic of tsunamis:

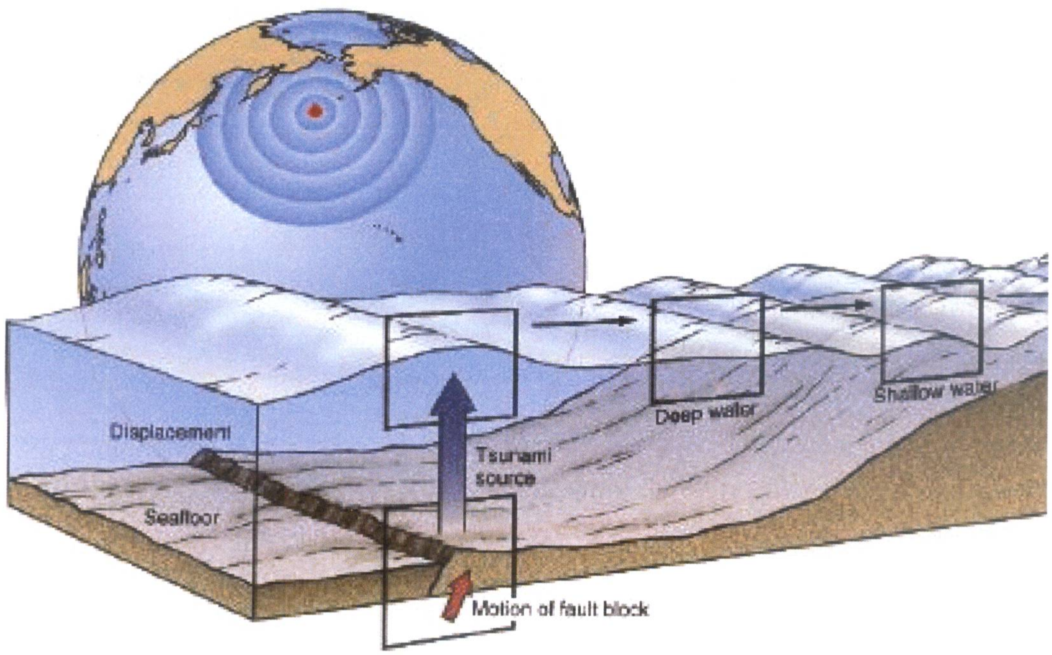
> "A tsunami is a sea wave usually generated by a large submarine earthquake. A seiche is similar to a tsunami, but is generated in an enclosed body of water such as a harbor, lake, or swimming pool. The potential damage, of course, is much greater from a tsunami than a seiche. Tsunamis travel across the ocean as long, low waves.
>
> Traveling at almost 500 mph in the Pacific, such a wave in the open causes no problems, and, in fact, the slope of the wave front may be imperceptible to a ship at sea. However, as the tsunami approaches the coastline, it is affected by shallow bottom topography and the configuration of the coastline which transform it into very high and potentially devastating waves. If large waves do not occur, strong currents can cause extensive damage. By comparison to many other areas of southern California, Long Beach is somewhat protected by the surrounding geography and the breakwater. As a substantial warning time of perhaps as much as 6 to 12 hours would be anticipated, the potential for death or injury from a tsunami is not considered great. Substantial shoreline property damage would likely occur, however. Major damage would be to boats, harbor facilities and sea-front structures. In terms of probability, published estimates of recurrence intervals indicate maximum wave heights of 3 to 6 feet for 50 and 100 year recurrence intervals."

Damage Factors of Tsunamis

Tsunamis cause damage in three ways: inundation, wave impact on structures, and erosion.

> "Strong, tsunami-induced currents lead to the erosion of foundations and the collapse of bridges and sea walls. Flotation and drag forces move houses and overturn railroad cars. Considerable damage is caused by the resultant floating debris, including boats and cars that become dangerous projectiles that may crash into buildings, break power lines, and may start fires. Fires from damaged ships in ports or from ruptured coastal oil storage tanks and refinery facilities can cause damage greater than that inflicted directly by the tsunami. Of increasing concern is the potential effect of tsunami draw down, when receding waters uncover cooling water intakes of nuclear power plants."[5]

Figure 9-1: Tsunami Formation



According to the Tsunami Run-up Maps for nearby coastal communities, the entire coastline would be significantly to severely impacted by a tsunami. During the summer months, the City of Long Beach can attract over 17,000 people a day in August. In addition there are approximately 100 shipping lines in its harbor. If a tsunami were to occur it could devastate the entire coastal area.

Tsunami Watches and Warnings

Warning System
The tsunami warning system in the United States is a function of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service. Development of the tsunami warning system was impelled by the disastrous waves generated in Alaska in April 1946, which surprised Hawaii and the U.S. West Coast, taking a heavy toll in life and property.

The disastrous 1964 tsunami resulted in the development of a regional warning system in Alaska. The Alaska Tsunami Warning Center is in Palmer, Alaska. This facility is the nerve center for an elaborate telemetry network of remote seismic stations in Alaska, Washington, California, Colorado, and other locations. Tidal data is also telemetered directly to the ATWC from eight Alaskan locations. Tidal data from Canada, Washington, Oregon, and California are available via telephone, teletype, and computer readout.

Notification
The National Warning System (NAWAS) is an integral part of the Alaska Tsunami Warning Center. Reports of major earthquakes occurring anywhere in the Pacific Basin that may generate seismic sea waves are transmitted to the Honolulu Observatory for evaluation. An Alaska Tsunami Warning Center is also in place for public notification of earthquakes in the Pacific Basin near Alaska, Canada, and Northern California. The Observatory Staff determines action to be taken and relays warnings over the NAWAS circuits to inform and warn West Coast states. The State NAWAS circuit is used to relay the information to the Los Angeles County Operational Area warning center which will in turn relay the information to local warning points in coastal areas. The same information is also transmitted to local jurisdictions over appropriate radio systems, teletype, and telephone circuits to ensure maximum dissemination.

Los Angeles County will use the Emergency Alert System (EAS) and Emergency News Network (ENN) to warn the public about an anticipated tsunami.

A Tsunami Watch Bulletin is issued if an earthquake has occurred in the Pacific Basin and could cause a tsunami. A Tsunami Warning Bulletin is issued when an earthquake has occurred and a tsunami is spreading across the Pacific Ocean. When a threat no longer exists, a Cancellation Bulletin is issued.

Vulnerability and Risk
With an analysis of tsunami events depicted in the "Local History" section, we can deduce the common tsunami impact areas will include impacts on life, property, infrastructure and transportation.

Community Tsunami Issues

What is Susceptible to Tsunami?

The possibility of a tsunami impacting the City of Long Beach has not been fully examined. A thorough investigation of the likelihood and impacts of a tsunami on the Long Beach coastline is worthy of consideration. Once the vulnerabilities are better understood, the City should consider updating its emergency response plans and re-train its response staffs, as needed.

Life and Property
Based on the "local" history events of tsunamis we can conclude that approximately 1% of the City would be heavily impacted. The largest impact on the community from a tsunami event would be from loss of and property damage to infrastructure.

Using the Tsunami Warning and Watch Bulletin would provide time to allow coastal residents to evacuate and seek higher ground for shelter. This would greatly reduce injuries and loss of life.

Development
Property along the coast could also be devastated. City of Long Beach coastal area is home to millions of dollars worth of industrial and commercial structures. In addition, the area is scattered with infrastructure that serves the entire coastal region. A large tsunami could potentially destroy or damage hundreds of commercial and industrial facilities. A tsunami could have a catastrophic impact on the Port of Long Beach and the overall economy.

Industrial properties in and near the Port of Long Beach would be significantly impacted – perhaps for an extended period of time. Additionally, the ships in the harbor and the supportive facilities on shore could be damaged and negatively impacted.

During summer months up to tens of thousands people a day come into the community to stay in the hotels and shop at coastal shopping facilities. The local government relies heavily on tourism and sales tax. A tsunami event could impact businesses by damaging property and by interrupting business and services. Any residential or commercial structure with weak reinforcement could be susceptible to damage.

Infrastructure
Tsunamis (and earthquakes) can damage buildings, power lines, and other property and infrastructure due to flooding. Tsunamis can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Damage to public water and sewer systems, transportation networks, and flood channels would greatly impact daily life for residents.

Roads blocked by objects during a tsunami may have severe consequences to people who are attempting to evacuate or who need emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from tsunamis related to both physical damages and interrupted services.

End Notes

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1. http://education.sdsc.edu/optiputer/htmlLinks/california_tsunami.html

2. http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1

3. Ibid

4. Ibid

5. Ibid

Appendix A:
Master Resource Directory

The Resource Directory provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The City Manager's Executive Committee may look to the organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

The City Manager's Executive Committee will continue to add contact information for organizations currently engaged in hazard mitigation activities. This section may also be used by various community members interested in hazard mitigation information and projects.

American Public Works Association			
Level: National	Hazard: Multi	http://www.apwa.net	
2345 Grand Boulevard		Suite 500	
Kansas City, MO 64108-2641		Ph: 816-472-6100	Fx: 816-472-1610
Notes: The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.			

Association of State Floodplain Managers			
Level: Federal	Hazard: Flood	www.floods.org	
2809 Fish Hatchery Road			
Madison, WI 53713		Ph: 608-274-0123	Fx:
Notes: The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery			

Building Seismic Safety Council (BSSC)			
Level: National	Hazard: Earthquake	www.bssconline.org	
1090 Vermont Ave., NW		Suite 700	
Washington, DC 20005		Ph: 202-289-7800	Fx: 202-289-109
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.			

California Department of Transportation (CalTrans)		
Level: State	Hazard: Multi	http://www.dot.ca.gov/
120 S. Spring Street		
Los Angeles, CA 90012		Ph: 213-897-3656 Fx:

Notes: CalTrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, Caltrans is also involved in the support of intercity passenger rail service in California.

California Resources Agency		
Level: State	Hazard: Multi	http://resources.ca.gov/
1416 Ninth Street		Suite 1311
Sacramento, CA 95814		Ph: 916-653-5656 Fx:

Notes: The California Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.

California Division of Forestry (CDF)		
Level: State	Hazard: Multi	http://www.fire.ca.gov/php/index.php
210 W. San Jacinto		
Perris CA 92570		Ph: 909-940-6900 Fx:

Notes: The California Department of Forestry and Fire Protection protects over 31 million acres of California's privately-owned wildlands. CDF emphasizes the management and protection of California's natural resources.

California Division of Mines and Geology (DMG)		
Level: State	Hazard: Multi	www.consrv.ca.gov/cgs/index.htm
801 K Street		MS 12-30
Sacramento, CA 95814		Ph: 916-445-1825 Fx: 916-445-5718

Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.

California Environmental Resources Evaluation System (CERES)			
Level: State	Hazard: Multi	http://ceres.ca.gov/	
900 N St.		Suite 250	
Sacramento, Ca. 95814		Ph: 916-653-2238	Fx:
Notes: CERES is an excellent website for access to environmental information and websites.			

California Department of Water Resources (DWR)			
Level: State	Hazard: Flood	http://wwwdwr.water.ca.gov	
1416 9th Street			
Sacramento, CA 95814		Ph: 916-653-6192	Fx:
Notes: The Department of Water Resources manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.			

California Department of Conservation: Southern California Regional Office			
Level: State	Hazard: Multi	www.consrv.ca.gov	
655 S. Hope Street		#700	
Los Angeles, CA 90017-2321		Ph: 213-239-0878	Fx: 213-239-0984
Notes: The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.			

California Planning Information Network			
Level: State	Hazard: Multi	www.calpin.ca.gov	
		Ph:	Fx:
Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the- minute updates.			

EPA, Region 9			
Level: Regional	Hazard: Multi	http://www.epa.gov/region09	
75 Hawthorne Street			
San Francisco, CA 94105		Ph: 415-947-8000	Fx: 415-947-3553

Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.

Federal Emergency Management Agency, Region IX			
Level: Federal	Hazard: Multi	www.fema.gov	
1111 Broadway		Suite 1200	
Oakland, CA 94607		Ph: 510-627-7100	Fx: 510-627-7112

Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.

Federal Emergency Management Agency, Mitigation Division			
Level: Federal	Hazard: Multi	www.fema.gov/fima/planhowto.shtm	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:

Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

Floodplain Management Association			
Level: Federal	Hazard: Flood	www.floodplain.org	
P.O. Box 50891			
Sparks, NV 89435-0891		Ph: 775-626-6389	Fx: 775-626-6389

Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.

Gateway Cities Partnership		
Level: Regional	Hazard: Multi	www.gatewaycities.org
7300 Alondra Boulevard		Suite 202
Paramount, CA 90723		Ph: 562-817-0820 Fx:
Notes: Gateway Cities Partnership is a 501 C 3 non-profit Community Development Corporation for the Gateway Cities region of southeast LA County. The region comprises 27 cities that roughly speaking extends from Montebello on the north to Long Beach on the South, the Alameda Corridor on the west to the Orange County line on the east.		

Governor's Office of Emergency Services (OES)		
Level: State	Hazard: Multi	www.oes.ca.gov
P.O. Box 419047		
Rancho Cordova, CA 95741-9047		Ph: 916 845- 8911 Fx: 916 845- 8910
Notes: The Governor's Office of Emergency Services coordinates overall state agency response to major disasters in support of local government. The office is responsible for assuring the state's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts.		

Greater Antelope Valley Economic Alliance		
Level: Regional	Hazard: Multi	
42060 N. Tenth Street West		
Lancaster, CA 93534		Ph: 661-945-2741 Fx: 661-945-7711
Notes: The Greater Antelope Valley Economic Alliance, (GA VEA) is a 501 (c)(6) nonprofit organization with a 501(c)(3) affiliated organization the Antelope Valley Economic Research and Education Foundation. GA VEA is a public-private partnership of business, local governments, education, non-profit organizations and health care organizations that was founded in 1999 with the goal of attracting good paying jobs to the Antelope Valley in order to build a sustainable economy.		

Landslide Hazards Program, USGS		
Level: Federal	Hazard: Landslide	http://landslides.usgs.gov/index.html
12201 Sunrise Valley Drive		MS 906
Reston, VA 20192		Ph: 703-648- 4000 Fx:

Notes: The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.

Los Angeles County Economic Development Corporation		
Level: Regional	Hazard: Multi	www.laedc.org
444 S. Flower Street		34th Floor
Los Angeles, CA 90071		Ph: 213-236-4813 Fx: 213- 623-0281

Notes: The LAEDC is a private, non-profit 501 (c) 3 organization established in 1981 with the mission to attract, retain and grow businesses and jobs in the Los Angeles region. The LAEDC is widely relied upon for its Southern California Economic Forecasts and Industry Trend Reports. Lead by the renowned Jack Kyser (Sr. Vice President, Chief Economist) his team of researchers produces numerous publications to help business, media and government navigate the LA region's diverse economy.

Los Angeles County Public Works Department		
Level: County	Hazard: Multi	http://ladpw.org
900 S. Fremont Ave.		
Alhambra, CA 91803		Ph: 626-458-5100 Fx:

Notes: The Los Angeles County Department of Public Works protects property and promotes public safety through Flood Control, Water Conservation, Road Maintenance, Bridges, Buses and Bicycle Trails, Building and Safety, Land Development, Waterworks, Sewers, Engineering, Capital Projects and Airports

National Wildland/Urban Interface Fire Program			
Level: Federal	Hazard: Wildfire	www.firewise.org/	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617 770-0700
Notes: FIREWISE maintains a Website designed for people who live in wildfire- prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences.			

National Resources Conservation Service			
Level: Federal	Hazard: Multi	http://www.nrcs.usda.gov/	
14th and Independence Ave., SW		Room 5105-A	
Washington, DC 20250		Ph: 202-720-7246	Fx: 202-720-7690
Notes: NRCS assists owners of America's private land with conserving their soil, water, and other natural resources, by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases.			

National Interagency Fire Center (NIFC)			
Level: Federal	Hazard: Wildfire	www.nifc.gov	
3833 S. Development Ave.			
Boise, Idaho 83705-5354		Ph: 208-387- 5512	Fx:
Notes: The NIFC in Boise, Idaho is the nation's support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations.			

National Fire Protection Association (NFPA)			
Level: National	Hazard: Wildfire	http://www.nfpa.org/catalog/home/index.asp	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617 770-0700
Notes: The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training and education			

National Floodplain Insurance Program (NFIP)		
Level: Federal	Hazard: Flood	www.fema.gov/nfip/
500 C Street, S.W.		
Washington, D.C. 20472		Ph: 202-566-1600 Fx:

Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities providing citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

National Oceanic /Atmospheric Administration		
Level: Federal	Hazard: Multi	www.noaa.gov
14th Street & Constitution Ave NW		Rm 6013
Washington, DC 20230		Ph: 202-482-6090 Fx: 202-482-3154

Notes: NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

National Weather Service, Office of Hydrologic Development		
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/
1325 East West Highway		SSMC2
Silver Spring, MD 20910		Ph: 301-713-1658 Fx: 301-713-0963

Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service (NWS) products by: infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers

National Weather Service

Level: Federal	Hazard: Multi	http://www.nws.noaa.gov/
520 North Elevar Street		
Oxnard, CA 93030		Ph: 805-988- 6615 Fx:

Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.

San Gabriel Valley Economic Partnership

Level: Regional	Hazard: Multi	www.valleynet.org
4900 Rivergrade Road		Suite A310
Irwindale, CA 91706		Ph: 626-856-3400 Fx: 626-856-5115

Notes: The San Gabriel Valley Economic Partnership is a non-profit corporation representing both public and private sectors. The Partnership is the exclusive source for San Gabriel Valley-specific information, expertise, consulting, products, services, and events. It is the single organization in the Valley with the mission to sustain and build the regional economy for the mutual benefit of all thirty cities, chambers of commerce, academic institutions, businesses and residents.

Sanitation Districts of Los Angeles County

Level: County	Hazard: Flood	http://www.lacsd.ora/
1955 Workman Mill Road		
Whittier, CA 90607		Ph:562-699-7411 x2301 Fx:

Notes: The Sanitation Districts provide wastewater and solid waste management for over half the population of Los Angeles County and turn waste products into resources such as reclaimed water, energy, and recyclable materials.

Santa Monica Mountains Conservancy			
Level: Regional	Hazard: Multi	http://smmc.ca.gov/	
570 West Avenue Twenty-Six		Suite 100	
Los Angeles, CA 90065		Ph: 323-221-8900	Fx:

Notes: The Santa Monica Mountains Conservancy helps to preserve over 55,000 acres of parkland in both wilderness and urban settings, and has improved more than 114 public recreational facilities throughout Southern California.

South Bay Economic Development Partnership			
Level: Regional	Hazard: Multi	www.southbaypartnership.com	
3858 Carson Street		Suite 110	
Torrance, CA 90503		Ph: 310-792-0323	Fx: 310-543-9886

Notes: The South Bay Economic Development Partnership is a collaboration of business, labor, education and government. Its primary goal is to plan an implement an economic development and marketing strategy designed to retain and create jobs and stimulate economic growth in the South Bay of Los Angeles County.

South Coast Air Quality Management District (AQMD)			
Level: Regional	Hazard: Multi	www.aqmd.gov	
21865 E. Copley Drive			
Diamond Bar, CA 91765		Ph: 800-CUT-SMOG	Fx:

Notes: AQMD is a regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties and parts of Riverside and San Bernardino Counties.

Southern California Earthquake Center (SCEC)

Level: Regional | Hazard: Earthquake | www.scec.org

3651 Trousdale Parkway | Suite 169

Los Angeles, CA 90089-0742 | Ph: 213-740-5843 | Fx: 213/740-0011

Notes: The Southern California Earthquake Center (SCEC) gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.

Southern California Association of Governments (SCAG)

Level: Regional | Hazard: Multi | www.scag.ca.gov

818 W. Seventh Street | 12th Floor

Los Angeles, CA 90017 | Ph: 213-236-1800 | Fx: 213-236-1825

Notes: The Southern California Association of Governments functions as the Metropolitan Planning Organization for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.

State Fire Marshal (SFM)

Level: State | Hazard: Wildfire | http://osfm.fire.ca.gov

1131 "S" Street

Sacramento, CA 95814 | Ph: 916-445-8200 | Fx: 916-445-8509

Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CDF) by focusing on fire prevention. SFM regulates buildings in which people live, controls substances which may, cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; regulates hazardous liquid pipelines; reviews regulations and building standards; and trains and educates in fire protection methods and responsibilities.

The Community Rating System (CRS)		
Level: Federal	Hazard: Flood	http://www.fema.gov/nfip/crs.shtm
500 C Street, S.W.		
Washington, D.C. 20472		Ph: 202-566-1600 Fx:

Notes: The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the County would receive reduced NFIP flood insurance premiums if the County implements floodplain management practices that qualify it for a CRS rating. For further information on the CRS, visit FEMA's website.

United States Geological Survey		
Level: Federal	Hazard: Multi	http://www.usgs.gov/
345 Middlefield Road		
Menlo Park, CA 94025		Ph: 650-853-8300 Fx:

Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

U.S. Army Corps of Engineers		
Level: Federal	Hazard: Multi	http://www.usace.army.mil
P.O. Box 532711		
Los Angeles CA 90053- 2325		Ph: 213-452- 3921 Fx:

Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building and operating water resources and other civil works projects.

USDA Forest Service		
Level: Federal	Hazard: Wildfire	http://www.fs.fed.us
1400 Independence Ave. SW		
Washington, D.C. 20250-0002		Ph: 202-205-8333 Fx:

Notes: The Forest Service is an agency of the U.S. Department of Agriculture. The Forest Service manages public lands in national forests and grasslands.

USGS Water Resources		
Level: Federal	Hazard: Multi	www.water.usgs.gov
6000 J Street		Placer Hall
Sacramento, CA 95819-6129		Ph: 916-278-3000 Fx: 916-278-3070
Notes: The USGS Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.		

Western States Seismic Policy Council (WSSPC)		
Level: Regional	Hazard: Earthquake	www.wsspc.org/home.html
125 California Avenue		Suite D201, #1
Palo Alto, CA 94306		Ph: 650-330-1101 Fx: 650-326-1769
Notes: WSSPC is a regional earthquake consortium funded mainly by FEMA. Its website is a great resource, with information clearly categorized - from policy to engineering to education.		

Westside Economic Collaborative C/O Pacific Western Bank		
Level: Regional	Hazard: Multi	http://www.westside-la.or
120 Wilshire Boulevard		
Santa Monica, CA 90401		Ph: 310-458-1521 Fx: 310-458-6479
Notes: The Westside Economic Development Collaborative is the first Westside regional economic development corporation. The Westside EDC functions as an information gatherer and resource center, as well as a forum, through bringing business, government, and residents together to address issues affecting the region: Economic Diversity, Transportation, Housing, Workforce Training and Retraining, Lifelong Learning, Tourism, and Embracing Diversity.		

Appendix B:
Public Participation

Public participation is a key component to any strategic planning process. It is very important that such broad-reaching plans not be written in isolation. Agency participation offers an opportunity for impacted departments and organizations to provide expertise and insight into the planning process. Citizen participation offers citizens the chance to voice their ideas, interests, and opinions. The Federal Emergency Management Agency also requires public input during the development of mitigation plans.

The Natural Hazards Mitigation Plan integrates a cross-section of public input throughout the planning process. To accomplish this goal, the Natural Hazards Mitigation Committee developed a public participation process through five components: (1) developing an Mitigation Committee comprised of knowledgeable individuals representative of several City departments and outside agencies; (2) distributing and analyzing a questionnaire to verify the primary concerns of citizens and business owners as relates to natural hazards; (3) soliciting the assistance of local media representatives and community newsletters to announce the progress of the planning activities and to announce the availability of the Draft Natural Hazards Mitigation Plan; (4) creating opportunities for the citizens and public agencies to review the Draft Natural Hazards Mitigation Plan; (5) conducting a public meeting at the City Council where the public had an opportunity to express their views concerning the Draft Natural Hazards Mitigation Plan.

Integrating public participation during the development of the Natural Hazards Mitigation Plan has ultimately resulted in increased public awareness. Through public involvement, the mitigation plan reflects community issues, concerns, and new ideas and perspectives on mitigation opportunities and plan action items.

Natural Hazards Mitigation Committee

Hazard mitigation in the City of Long Beach has been overseen by the Mitigation Committee, which consisted of representatives from various City departments and outside agencies. The members have an understanding of how the community is structured and how residents, businesses, and the environment may be affected by natural hazard events. The Mitigation Committee guided the development of the Plan, and assisted in developing plan goals and action items, identifying stakeholders and plan reviewers, and sharing local expertise to create a more comprehensive plan.

Meeting Summaries of Activities

January 9th, 2004 - Casey Chel, Disaster Manager LBFD sends a brief to Fire Chief Terry Harbour outline DMA 2000.

January 12th, 2004 - Fire Chief Terry Harbour contact Deputy City Manger Reginald Harrison and advises him of the DMA 2000 requirements and recommends that the City send representatives to the January 15th DMA 2000 Workshop.

January 15th, 2004 - The City of Long Beach sends three representatives to the workshop. JERI SNOW - Disaster Mgmt.

TOM MODICA - CITY MANAGERS OFFICE

- COMMUNITY DEVELOPMENT

January 22nd, 2004 - Deputy City Manger Harrison assigns Fire Chief as chairman of DMA 2000 project.

January 28th, 2004 - Fire Chief Harbor attends 4 hr. DMA 2000 presentation in San Marino.

February 2nd, 2004 - The Fire Chief meets with the City Manager, defines plan, magnitude of project abd Nov. 1st deadline.

February 11th, 2004 - The Fire Chief and Casey Chel (D-Prep) meet with all City Department Heads to explain project, timeline and criticality of project.

March 22nd, 2004 - Captain Brandt, LBFD appointed as City of Long Beach Natural Hazard Coordinator and the process of forming a team and gathering information begins.

April 1st, 2004 - Requests sent to all City Departments & Outside Agencies for participation on the Natural Hazard Mitigation Committee.

April 26th, 2004 - Kick-off meeting for Natural Hazard Mitigation Advisory Committee - Introduction of members present, overview of project & timeline, requests for city documents and needs for the project.

June 1st, 2004 - 2nd meeting of advisory committee - gathering of requested documents, status of council resolution(June 15th, 2004), status of questionnaire on city website, status of questionnaires at high traffic areas(police community centers, libraries, senior centers).

June 28th, 2004 - 3rd meeting of advisory committee - gathering of required documents, Council resolution passed June 15th, 2004, questionnaires continue to come in, website updated and refreshed, status of consultant contract - EPC.

Facilitation Initiated by Emergency Planning Consultant

Meeting #1: Pre-Training July 26, 2004
The meeting was held at the Long Beach Emergency Operations Center. Emergency Planning Consultants (EPC) delivered pre-training to the Natural Hazard Mitigation Advisory Committee. The pre-training consisted of the history of the Disaster Mitigation Act of 2000, the purpose and role of hazard mitigation, and the planning process. The Pre-Training lasted approximately 1 hour.

Meeting #2: Kick-Off Meeting July 26, 2004
EPC facilitated a workshop where participants had an opportunity to learn about various natural hazards, assess and rank the local threats, examine hazard maps, and complete the FEMA Worksheets contained in FEMA 386-2 Understanding Your Risks. Part of the discussion included a presentation by EPC of historical disaster events across the country. Those slides served as a backdrop for discussing potential mitigation activities.

There was an extensive discussion on various methods of engaging the public in the mitigation process. The Mitigation Committee prepared a draft media release and discussed a public opinion survey that the Mitigation Committee had already distributed to City staff. EPC committed to revising the media release. The Kick-Off Meeting lasted approximately 4 hours.

Meeting #3 Pre-Training: Mitigation August 30, 2004
The meeting was held at Long Beach Emergency Operations Center. EPC delivered pre-training to the Mitigation Committee. The pre-training consisted of the concepts and issues related to developing mitigation actions. The pre-training lasted approximately 1 hour.

Meeting #4 Mitigation Actions August 30, 2004
EPC delivered the Draft Hazard Analysis and the Mitigation Committee discussed missing information, data, and maps. EPC distributed copies of the Mitigation Actions Planning Tools to assist the Team in developing Goals and Action Items appropriate to their natural hazards. The Planning Tools provided a process for collecting the mitigation actions presently in practice in the City of Long Beach, as well as identifying future mitigation actions.

A brainstorming process was conducted to develop the goals for the Plan. The Mitigation Committee agreed on goals for the Mitigation Plan. Following a discussion of alternative ranking techniques, the Mitigation Committee agreed to cluster the rankings of the Mitigation Actions by type of actions as follows: #1 Multi-Hazard, #2 Earthquake, #3 Flooding, #4 Earth Movement, #5 Windstorm, and #6 Tsunami.

The next task was to examine a FEMA-approved Mitigation Plan to get an idea of how mitigation actions are written. Each of the jurisdictions was pleased to announce the broad range of mitigation actions already being practiced. The Planning Tools, developed by EPC, consisted of nearly 300 mitigation actions gathered from dozens of Mitigation Plans across the country.

The Mitigation Committee broke into pairs to develop mitigation actions, utilizing the sample plans and Planning Tools list. Because of the plan samples and Tools, the process of identifying appropriate mitigations actions was accomplished in a very efficient manner.

Public Meetings

City of Long Beach conducted one public meeting where the Draft Natural Hazards Mitigation Plan was presented and discussed. The City Council (October 19, 2004) was particularly impressed with the range of mitigation actions already in practice throughout the City. The City Council was very supportive of the overall goal established by the Mitigation Committee to become a Disaster Resistant Community. The results of the citizen questionnaire were discussed and the City Council commended the Mitigation Committee for its expeditious efforts to satisfy the DMA 2000 requirements.

Invitation Process

The Mitigation Committee identified possible public notice sources. A press release was submitted to the local daily and weekly print media. The local community access cable television channel also carried the meeting announcement. A notice was also placed in the quarterly city newsletter that is mailed to all residents.

Results of Public Meetings

The Mitigation Committee Chair began the presentation by providing an overview of meeting objectives to the participants. The participants were encouraged to present their views and make suggestions on possible mitigation actions. The Committee Chair presented the staff report on the Plan, including an overview of the Hazard Analysis, Mitigation Goals, and Mitigation Actions. The staff presentation concluded with a summary of the input received during the public review of the document. The Committee Chair then fielded questions from the City Council. The meeting lasted approximately 1 hour and was aired on City of Long Beach cable access for approximately one month.

The City Council was unanimous in their adoption of the City of Long Beach Natural Hazards Mitigation Plan on October 19, 2004.

Attachments:
- Questionnaire Results
- Media Releases
- Hazard and Vulnerability Assessment Tool – Memorial Health Services

Appendix B – Attachment 1
City Council Resolution

Council Resolution Directing Preparation of Mitigation Plan

RESOLUTION NO. C-28386

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LONG BEACH IN SUPPORT OF DEVELOPMENT OF A NATURAL HAZARD MITIGATION PLAN IN ACCORDANCE WITH THE FEDERAL DISASTER MITIGATION ACT OF 2000 (PUBLIC LAW 106-390)

WHEREAS, in the Fall of 2003, Southern California experienced the most costly fire in the State's history, burning over 3,500 homes and over 750,000 acres of wildland, resulting in damage from which it will take communities years to recover; and

WHEREAS, in December 2003, a large 6.5 magnitude earthquake devastated Paso Robles, California, in the Central Coast region, and had this event occurred in an urbanized area such as Long Beach, California, it would have resulted in significant loss of life and billions of dollars in damages; and

WHEREAS, disaster resiliency, the ability to "bounce back" quickly from an extreme natural event (such as earthquake, flood or winds) without permanent, intolerable damage or disruption of natural, economic, social or structural systems and without massive amount of outside assistance, is more often being included as another component of community sustainability; and

WHEREAS, sustainability emphasizes planning as a primary approach to involve local citizens, obtain broad input, and develop real goals and action plans on how to mitigate against damage caused by the natural hazards facing every California community; and

WHEREAS, there are actions that can be undertaken to address hazards, no matter how large or small, that can support disaster resiliency and sustainability in

Robert E. Shannon
City Attorney of Long Beach
333 West Ocean Boulevard
Long Beach, California 90802-4664
Telephone (562) 570-2200

NOW, THEREFORE, the City Council of the City of Long Beach resolves as follows:

Section 1. That the City Council of the City of Long Beach does hereby authorize and support the development of a Natural Hazard Mitigation Plan, establishing goals and objectives to ensure the health, safety and welfare of its citizens, even in the event of a natural disaster.

Sec. 2. That the Natural Hazard Mitigation Plan shall be a collection of analyses, policies, and actions on how the community will grow and change in the future and will serve as a blueprint for how it can achieve sustainability and disaster resiliency.

The plan will be the result of a process involving city departments, local agencies, business people, landowners, developers, and citizens and will reflect local values and concerns.

Sec. 3. That the Natural Hazard Mitigation Plan shall meet the program criteria of the Stafford Act as amended (Disaster Mitigation Act of 2000) in order that the City of Long Beach will be eligible for future pre-disaster and post-disaster mitigation program funds to ensure the health, safety and welfare of its citizens.

Sec. 4. This resolution shall take effect immediately upon its adoption by the City Council, and the City Clerk shall certify to the vote adopting this resolution.

I hereby certify that the foregoing resolution was adopted by the City Council of the City of Long Beach at its meeting of ______June 15______, 2004,

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Robert E. Shannon
City Attorney of Long Beach
333 West Ocean Boulevard
Long Beach, California 90802-4664
Telephone (562) 570-2200

by the following vote:

Ayes:	Councilmembers:	Lowenthal, Baker, Colonna, Kell, Richardson, Reyes Uranga, Lerch.
Noes:	Councilmembers:	None.
Absent:	Councilmembers:	Carroll, Webb.

[signature]

City Clerk

Robert E. Shannon
City Attorney of Long Beach
333 West Ocean Boulevard
Long Beach, California 90802-4664
Telephone (562) 570-2200

JCP:sek
05-27-04
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The City of Long Beach distributed a questionnaire to the City's employees and residents through the various departments. The questionnaire asked participants a wide range of questions. Although all of the data gathered will be utilized in future public awareness campaigns and other outreach activities, the following table summarized the "concerns" expressed about the following natural hazards: earthquakes, flooding, earth movement, windstorms, and tsunami. A total of approximately 700 employees and residents participated in the questionnaire, yielding the following results:

Appendix B-Attachment 2
Questionnaire Results

	Very Concerned	Moderately Concerned	Somewhat Concerned	Not Concerned
Earthquake	274	161	47	20
Flooding	63	105	125	174
Earth Movement	18	36	73	335
Windstorm	48	86	143	80
Tsunami	36	42	88	297

Appendix B-Attachment 3
Media Releases

Press-Telegram September 11, 2004

L.B. readies emergency plan

By Tracy Manzer
Staff writer

Long Beach may not flood as often as a Mississippi river town, and it certainly is lucky not to be hammered by hurricanes and tornadoes like the South and Midwest.

Nonetheless, planning for natural disasters remains crucial and city is asking for the public's two cents.

The new Natural Hazards Mitigation Plan identifies key areas that could be affected by a number of natural disasters, including earthquakes, floods, tsunamis, wind storms and landslides, and what can be done in advance to either avoid the problem, or reduce threats, said Richard Brandt, the city's hazard mitigation coordinator and a Long Beach Fire Department captain.

The plan – required by the Federal Emergency Management Agency – was created with the help of several city departments and spearheaded by the Long Beach Fire Department. All municipal entities and special school districts were told to create a plan by Nov. 1, Brandt said.

Agencies that do not comply will not qualify for FEMA disaster funds, Brandt said.

"FEMA would rather give pre-disaster funds than post-disaster funds because in the long run it would be more cost-effective," Brandt said.

For example, if thecity has 10 buildings that need to be retrofitted in case of an earthquake, it can note those structures in the plans and qualify for federal funds to complete the retrofit work before disaster strikes. Such federally funded work includes the retrofit job being done on the Long Beach Fire Station No. 1 and Long Beach Police Department Headquarters.

This does not mean, however, that in the event of a disaster, the city would not qualify for further assistance, Brandt said.

"What's happened in the past, on the East Coast now with the hurricanes and in Mississippi where people keep building houses in floodplains, the river rises and wipes out that town," Brandt said. "FEMA then goes in and rebuilds the town, and the next year they go through it all over again. They would rather give that town the money now to move houses from the floodplains onto the high plains. They're starting to force these cities not to build on floodplains, not to build right on the oceanfront or on an urban interface."

On Tuesday, the Long Beach plan will be available for public review at all city libraries and the City Clerk's Office at City Hall, 333 W. Ocean Blvd and online at **www.longbeach.gov**. Users can click on the Fire Department link and then click on the disaster management link.

Residents and business owners are encouraged to send in comments over the following two weeks. Public feedback will be included in the document and presented to the City Council for adoption in early October, Brandt said.

For information, call Brandt at **(562) 57[illegible]-2547.**

Appendix B – Attachment 4
Hazard and Vulnerability Assessment Tool
Memorial Health Services

HAZARD AND VULNERABILITY ASSESSMENT TOOL
NATURALLY OCCURRING EVENTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 = N/A 1 = High 2 = Moderate 3 = Low or none*	*0 - 100%*
Hurricane	0	0	0	0	0	0	0	0%
Tornado	0	0	0	0	0	0	0	0%
Severe Thunderstorm	1	1	2	1	3	3	3	24%
Snow Fall	0	0	0	0	0	0	0	0%
Blizzard	0	0	0	0	0	0	0	0%
Ice Storm	0	0	0	0	0	0	0	0%
Earthquake	3	3	3	3	2	2	2	83%
Tidal Wave	1	1	1	1	0	0	0	6%
Temperature Extremes	2	2	2	2	1	1	1	33%
Drought	1	1	1	1	3	3	3	22%
Flood, External	2	2	2	2	1	3	3	48%
Wild Fire	1	1	1	1	0	3	0	11%
Landslide	0	0	0	0	0	0	0	0%
Dam Inundation	0	0	0	0	0	0	0	
Volcano	0	0	0	0	0	0	0	0%
Epidemic	2	2	1	1	1	1	1	26%
AVERAGE SCORE	0.81	0.81	0.81	0.75	0.69	1.00	0.81	7%

*Threat increases with percentage.

RISK =	PROBABILITY *	SEVERITY
0.07	0.27	0.27

Appendix B – Attachment 5
List of Plan Reviewers:

Orange County Fire Authority 1 Fire Authority Road Irvine, CA 92602	Long Beach Unified School District Emergency Preparedness Supervisor Cathy Coy 5250 Los Coyotes Diagonal Long Beach, CA 90815-1925
Aquarium of the Pacific Safety Supervisor Matt Ankley 100 Aquarium Way Long Beach, CA 90802	City of Signal Hill Signal Hill Police Department Sgt. Peterson 2175 Cherry Avenue Signal Hill, CA 90755
City of Seal Beach Director of Public Works 211 8th Street Seal Beach, CA 90740	City of Los Alamitos Emergency Preparedness 3201 Katella Avenue Los Alamitos, CA 90720
City of Lakewood Emergency Preparedness 5050 Clark Avenue Lakewood, CA 90712	City of Compton 205 South Willowbrook Ave. Compton, CA 90220
City of Bellflower Public Safety Department 16600 Civic Center Drive Bellflower, CA 90706	City of Carson Hazard Mitigation Attn: Eileen Edgerton 701 East Carson Street Carson, CA 90745
City of Los Angeles Emergency Preparedness Department 200 N. Spring Street Room 1533 Los Angeles, CA 90012	Los Angeles County Hazard Mitigation 1275 N. Eastern Avenue Los Angeles, CA 90053
City of Hawaiian Gardens 21815 Pioneer Blvd. Hawaiian Gardens, CA 90716	City of Paramount Assistant Director Christopher S. Cash Public Works Department 16400 Colorado Avenue Paramount, CA 90723
City of Huntington Beach Emergency Services Coordinator Gloria Morrison 2000 Main Street Huntington Beach, CA 92647	Long Beach Area Chamber of Commerce Randy Gordon, President 1 World Trade Center, Suite 206 Long Beach, CA 90831

Image Cat, Inc. Attn: Charles Huyat 400 Oceangate Ste. 1050 Long Beach, CA 90802	El Dorado Realty, Inc. Attn: Ron Beeler 3810 Orange Avenue Long Beach, CA 90807
Jeffery Reardon Consulting Geologist 8136 Foxhall Drive Huntington Beach, CA 92646	Phil Watts Applied Fluids Engineering 5710 East 7th Street Long Beach, 90803
Area DMAC Coordinator Brenda Hunemiller - Area D Office of Disaster Management 724 North Alameda Avenue Azusa, CA 91702	Area DMAC Coordinator Fan Abel – Area E Office of Emergency Planning 13700 LaMirada Blvd. LaMirada, CA 90638
Area DMAC Coordinator Mike Martinet – Area G Emergency Management Office 320 Knob Hill Redondo Beach, CA 90277	
Long Beach Fire Department Deputy Chief Patalano Operations	Long Beach Fire Department Deputy Chief Wilson Support
Long Beach Fire Department Deputy Chief Giles Fire Prevention	Long Beach Fire Department Annete Hough Administration Officer

Appendix C: Benefit/Cost Analysis

Benefit/Cost Analysis is a key mechanism used by the California Office of Emergency Services (OES), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This Appendix outlines several approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?
Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred.

Evaluating natural hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.

Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are Some Economic Analysis Approaches for Mitigation Strategies?
The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

Benefit/Cost Analysis
Benefit/Cost Analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

Cost-Effectiveness Analysis
Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in public sector mitigation activities
Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and non-market benefits.

Investing in private sector mitigation activities
Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether

a private entity or a public agency, are required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

> Estimating the costs and benefits of a hazard mitigation strategy can be a complex process.
>
> Employing the services of a specialist can assist in this process.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

How can an Economic Analysis be conducted?

Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

1. Identify the Alternatives: Alternatives for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits: Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.

- **Estimate the benefits.** Projecting the benefits or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- **Consider costs and benefits to society and the environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Alternatives: Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.

- **Internal Rate of Return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

How are Benefits of Mitigation Calculated?

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owner as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies

- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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Appendix D: Acronyms

Federal Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council
b/ca	benefit/cost analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System
DOE	Department of Energy
EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent
GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United States, Department of)
IBHS	Institute for Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team
NCDC	National Climate Data Center
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan (also known as "409 Plan")
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service

SBA	Small Business Administration
SHMO	State Hazard Mitigation Officer
TOR	Transfer of Development Rights
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

California Acronyms

A&W	Alert and Warning
AA	Administering Areas
AAR	After Action Report
ARC	American Red Cross
ARP	Accidental Risk Prevention
ATC20	Applied Technology Council20
ATC21	Applied Technology Council21
BCP	Budget Change Proposal
BSA	California Bureau of State Audits
CAER	Community Awareness & Emergency Response
CalARP	California Accidental Release Prevention
CalBO	California Building Officials
CalEPA	California Environmental Protection Agency
CalREP	California Radiological Emergency Plan
CALSTARS	California State Accounting Reporting System
CalTRANS	California Department of Transportation
CBO	Community Based Organization
CD	Civil Defense
CDF	California Department of Forestry and Fire Protection
CDMG	California Division of Mines and Geology
CEC	California Energy Commission
CEPEC	California Earthquake Prediction Evaluation Council
CESRS	California Emergency Services Radio System
CHIP	California Hazardous Identification Program
CHMIRS	California Hazardous Materials Incident Reporting System
CHP	California Highway Patrol
CLETS	California Law Enforcement Telecommunications System
CSTI	California Specialized Training Institute
CUEA	California Utilities Emergency Association
CUPA	Certified Unified Program Agency
DAD	Disaster Assistance Division (California Office of Emergency

	Services)
DFO	Disaster Field Office
DGS	California Department of General Services
DHSRHB	California Department of Health Services, Radiological Health Branch
DO	Duty Officer
DOC	Department Operations Center
DOF	California Department of Finance
DOJ	California Department of Justice
DPA	California Department of Personnel Administration
DPIG	Disaster Preparedness Improvement Grant
DR	Disaster Response
DSA	Division of the State Architect
DSR	Damage Survey Report
DSW	Disaster Service Worker
DWR	California Department of Water Resources
EAS	Emergency Alerting System
EDIS	Emergency Digital Information System
EERI	Earthquake Engineering Research Institute
EMA	Emergency Management Assistance
EMI	Emergency Management Institute
EMMA	Emergency Managers Mutual Aid
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPEDAT	Early Post Earthquake Damage Assessment Tool
EPI	Emergency Public Information
EPIC	Emergency Public Information Council
ESC	Emergency Services Coordinator
FAY	Federal Award Year
FDAA	Federal Disaster Assistance Administration
FEAT	Governor's Flood Emergency Action Team
FEMA	Federal Emergency Management Agency
FFY	Federal Fiscal Year
FIR	Final Inspection Reports
FIRESCOPE	Firefighting Resources of Southern California Organized for Potential Emergencies
FMA	Flood Management Assistance
FSR	Feasibility Study Report
FY	Fiscal Year
GIS	Geographical Information System
HAZMAT	Hazardous Materials
HAZMIT	Hazardous Mitigation
HAZUS	Hazards United States (an earthquake damage assessment prediction tool)
HAD	Housing and Community Development

HEICS	Hospital Emergency Incident Command System
HEPG	Hospital Emergency Planning Guidance
HIA	Hazard Identification and Analysis Unit
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
IDE	Initial Damage Estimate
IA	Individual Assistance
IFG	Individual & Family Grant (program)
IRG	Incident Response Geographic Information System
IPA	Information and Public Affairs (of state Office of Emergency Services)
LAN	Local Area Network
LEMMA	Law Enforcement Master Mutual Aid
LEPC	Local Emergency Planning Committee
MARAC	Mutual Aid Regional Advisory Council
MHFP	Multi-Hazard Functional Plan
MHID	Multi-Hazard Identification
MOU	Memorandum of Understanding
NBC	Nuclear, Biological, Chemical
NEMA	National Emergency Management Agency
NEMIS	National Emergency Management Information System
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Association
NPP	Nuclear Power Plant
NSF	National Science Foundation
NWS	National Weather Service
OA	Operational Area
OASIS	Operational Area Satellite Information System
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
OES	California Governor's Office of Emergency Services
OSHPD	Office of Statewide Health Planning and Development
OSPR	Oil Spill Prevention and Response
PA	Public Assistance
PC	Personal Computer
PDA	Preliminary Damage Assessment
PIO	Public Information Office
POST	Police Officer Standards and Training
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)
PSA	Public Service Announcement
PTAB	Planning and Technological Assistance Branch
PTR	Project Time Report
RA	Regional Administrator (OES)
RADEF	Radiological Defense (program)

RAMP	Regional Assessment of Mitigation Priorities
RAPID	Railroad Accident Prevention & Immediate Deployment
RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REOC	Regional Emergency Operations Center
REPI	Reserve Emergency Public Information
RES	Regional Emergency Staff
RIMS	Response Information Management System
RMP	Risk Management Plan
RPU	Radiological Preparedness Unit (OES)
RRT	Regional Response Team
SAM	State Administrative Manual
SARA	Superfund Amendments & Reauthorization Act
SAVP	Safety Assessment Volunteer Program
SBA	Small Business Administration
SCO	California State Controller's Office
SEMS	Standardized Emergency Management System
SEPIC	State Emergency Public Information Committee
SLA	State and Local Assistance
SONGS	San Onofre Nuclear Generating Station
SOP	Standard Operating Procedure
SWEPC	Statewide Emergency Planning Committee
TEC	Travel Expense Claim
TRU	Transuranic
TTT	Train the Trainer
UPA	Unified Program Account
UPS	Uninterrupted Power Source
USAR	Urban Search and Rescue
USGS	United States Geological Survey
WC	California State Warning Center
WAN	Wide Area Network
WIPP	Waste Isolation Pilot Project

Appendix E: Glossary

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.
Asset	Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.
Base Flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.
Building	A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Coastal High Hazard Area	Area, usually along an open coast, bay, or inlet that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.
Coastal Zones	The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.
Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.
Computer-Aided Design And Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.

Contour	A line of equal ground elevation on a topographic (contour) map.
Critical Facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.
Debris	The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.
Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.
Displacement Time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.
Duration	How long a hazard event lasts.
Earthquake	A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.
Erosion	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Erosion Hazard Area	Area anticipated being lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential Facility	Elements important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Extent	The size of an area affected by a hazard or hazard event.

Extratropical Cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000-mile wide storms are not uncommon.
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.
Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.
Fire Potential Index (FPI)	Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.
Flash Flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.
Flood	A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
Flood Depth	Height of the flood water surface above the ground surface.
Flood Elevation	Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.
Flood Hazard Area	The area shown to be inundated by a flood of a given magnitude on a map.
Flood Insurance Rate Map (FIRM)	Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS)	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.
Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.
Fujita Scale of Tornado Intensity	Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained.
Functional Downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Geographic Area Impacted	The physical area in which the effects of the hazard are experienced.
Geographic Information Systems (GIS)	A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.
Ground Motion	The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions
Hazard	A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.
Hazard Event	A specific occurrence of a particular type of hazard.
Hazard Identification	The process of identifying hazards that threaten an area.

Hazard Mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.
Hazard Profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
HAZUS (Hazards U.S.)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.
Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hydrology	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams.
Intensity	A measure of the effects of a hazard event at a particular place.
Landslide	Downward movement of a slope and materials under the force of gravity.
Lateral Spreads	Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.
Liquefaction	Results when the soil supporting structures liquefies. This can cause structures to tip and topple.

Lowest Floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
Mitigation Plan	A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.
National Flood Insurance Program (NFIP)	Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.
National Geodetic Vertical Datum of 1929 (NGVD)	Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.
National Weather Service (NWS)	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.
Nor'easter	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.
Outflow	Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.
Planimetric	Describes maps that indicate only man-made features like buildings.
Planning	The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.
Probability	A statistical measure of the likelihood that a hazard event will occur.
Recurrence Interval	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.

Repetitive Loss Property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.
Replacement Value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.
Richter Scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.
Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Riverine	Of or produced by a river.
Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.
Scarp	A steep slope.
Scour	Removal of soil or fill material by the flow of flood waters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.
Seismicity	Describes the likelihood of an area being subject to earthquakes.
Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

State Hazard Mitigation Officer (SHMO)	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.
Storm Surge	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.
Structure	Something constructed. (See also Building)
Substantial Damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceeds 50 percent of the market value of the structure before the damage.
Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.
Tornado	A violently rotating column of air extending from a thunderstorm to the ground.
Tropical Cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
Tropical Depression	A tropical cyclone with maximum sustained winds of less than 39 mph.
Tropical Storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.
Tsunami	Great sea wave produced by submarine earth movement or volcanic eruption.

Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Vulnerability Assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
Water Displacement	When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.
Wave Run-up	The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.
Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

Appendix F:
Critical and Essential Facilities Map ID Index
(Source: City of Long Beach GIS)

ID	Name
1	AES PLANT
2	AIR GAS INDUSTRIES
3	AIR PRODUCTS AND CHEMICAL
4	AIRTOUCH CELLULAR
5	ARCO TERMINAL SERVICES CORP
6	ARCO TERMINAL SERVICES CORP
7	ARCO TERMINAL SERVICES CORP
8	BEACH MAINTENANCE YARD
9	BOEING FLIGHT SECURITY OPS, C-17
10	BP / ARCO TERMINAL 1
11	BP / ARCO TERMINAL 2
12	BP / ARCO TERMINAL 3
13	BREITBURN
14	CA ARMY NATIONAL GUARD
15	CA ARMY NATIONAL GUARD
16	CALIFORNIA NATIONAL GUARD
17	CALIFORNIA STATE UNIVERSITY, LONG BEACH
18	CALIFORNIA UNITED TERMINAL
19	CARNIVAL CRUISE LINES
20	CATALINA EXPRESS - CATALINA LANDING
21	CHARTER HOSPITAL
22	CHEM-OIL MARINE TERMINAL
23	CHEMOIL LONG BEACH MARINE TERMINAL
24	CITY OF LONG BEACH - GAS DEPARTMENT
25	CITY OF LONG BEACH MARINE MAINTENANCE
26	CITY OF LONG BEACH-WATER DEPT
27	CNG
28	CNG (POLICE)
29	CNG (SERRF)
30	CNG (WATER)
31	DEFENSE FUEL SUPPLY POINT, PIER T12
32	DEPT OF WATER & POWER-HAYNES
33	DOW CHEMICAL / VOPAK
34	EAST POLICE DIVISION
35	EDGINGTON OIL COMPANY INC
36	EDISON PIPELINE & TERMINAL (EPTC)
37	EQUILON #135454
38	F A A - TRAFFIC CONTROL TOWER
39	FED EX
40	FEDERAL EXPRESS (LOADING CENTER)
41	FIRE BOAT STATION #15
42	FIRE BOAT STATION #21
43	FIRE DEPARTMENT HEADQUARTERS
44	FIRE STATION # 6
45	FIRE STATION #1
46	FIRE STATION #10
47	FIRE STATION #11
48	FIRE STATION #12
49	FIRE STATION #13
50	FIRE STATION #14
51	FIRE STATION #16
52	FIRE STATION #17
53	FIRE STATION #18
54	FIRE STATION #19
55	FIRE STATION #2
56	FIRE STATION #20
57	FIRE STATION #22
58	FIRE STATION #24
59	FIRE STATION #3
60	FIRE STATION #4
61	FIRE STATION #5
62	FIRE STATION #7
63	FIRE STATION #8
64	FIRE STATION #9
65	FIRE TRAINING FACILITY
66	FIREBOAT STATION #20
67	FLEET SERVICES REPAIR SHOP
68	GLEN ANDERSON FEDERAL BLDG. GENERAL SVS ADM.
69	GLOBAL OIL PRODUCTION LLC
70	GLOBE GAS CORPORATION
71	GULFSTREAM AEROSPACE
72	GULFSTREAM AEROSPACE
73	GULFSTREAM AEROSPACE CORP.
74	GULFSTREAM AEROSPACE CORPORATION
75	HANJIN SHIPPING
76	HARBOR VIEW HOSPITAL
77	HAYNES GENERATING STATION
78	INTERNATIONAL TRANSPORTATION SERVICE, INC.
79	JACOBSEN PILOT SERVICE, INC.
80	KAISER PERMANENTE
81	L A COUNTY PUBLIC WORKS
82	L A COUNTY PUBLIC WORKS
83	L A COUNTY PUBLIC WORKS MARKET PUMP STATION
84	LB WATER DEPT - SEAWATER DESAL TEST FACILITY
85	LBUSD - FOOD SERVICE BRANCH
86	LONG BEACH -DAUGHERTY FIELD
87	LONG BEACH CITY COLLEGE
88	LONG BEACH CITY COLLEGE
89	LONG BEACH CITY HALL
90	LONG BEACH COMMUNITY HOSPITAL
91	LONG BEACH CONTAINER TERMINAL
92	LONG BEACH CONVENTION AND ENTERTAINMENT CENTER
93	LONG BEACH ENERGY
94	LONG BEACH ENERGY CORPORATE YD.
95	LONG BEACH GENERATION, LLC
96	LONG BEACH MUNICIPAL COURTS
97	LONG BEACH POLICE DEPARTMENT--HEADQUARTERS
98	LONG BEACH POLICE DEPT. FIELD SUPPORT
99	LONG BEACH TERMINAL II JET CENTER
100	LONG BEACH TERMINAL/DAUGHERTY FIELD
101	LONG BEACH TRAFFIC SIGNAL CONTROL
102	LONG BEACH WATER - OPERATIONS CENTER
103	LONG BEACH WATER RECLAMATION PLANT
104	LONG BEACH WORLD TRADE CENTER
105	LOS ANGELES SHERIFF'S AERO BUREAU
106	MARINA FUEL DOCK
107	MARINA FUEL DOCK/RESCUE BOATS
108	MATSON TERMINAL
109	MEMORIAL MEDICAL CENTER (TRAUMA CENTER)
110	NATIONAL GYPSUM COMPANY
111	NEXTEL COMMUNICATIONS
112	NEXTEL COMMUNICATIONS
113	NEXTEL COMMUNICATIONS
114	NEXTEL COMMUNICATIONS
115	NORTH POLICE DIVISION
116	NRG LONG BEACH GENERATION PLANT
117	OFFICE OF THE CSU CHANCELLOR
118	PACIFIC CONTAINER TERMINAL
119	PACIFIC GAS EXCHANGE
120	PACIFIC HOSPITAL OF LONG BEACH
121	PARK MAINTENANCE/ADMINISTRATION
122	PETRO DIAMOND TERMINAL CO
123	PETRO-DIAMOND TERMINAL COMPANY
124	POLICE HEADQUARTERS
125	POLICE HELIPORT
126	POLICE SUBSTATION, NORTH DIVISION
127	POLICE SUBSTATION, WEST DIVISION
128	PORT OF LONG BEACH ADMINISTRATION BLDG.
129	PUBLIC SERVICE YARD
130	SEA LAUNCH
131	SERRF
132	SHELL OIL CO
133	SHORELINE MARINE FUEL
134	SO CALIF EDISON CO (SUBSTATION)
135	SO CALIF EDISON CO (SUBSTATION)
136	SO CALIF EDISON CO (SUBSTATION)
137	SO CALIF EDISON CO (SUBSTATION)
138	SO CALIF EDISON CO (SUBSTATION)
139	SO CALIF EDISON CO (SUBSTATION)
140	SO CALIF EDISON CO (SUBSTATION)
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142	SO CALIF EDISON CO (SUBSTATION)
143	SO CALIF EDISON CO (SUBSTATION)
144	SO CALIF EDISON CO (SUBSTATION)
145	SO CALIF EDISON CO (SUBSTATION)
146	SO CALIF EDISON CO (SUBSTATION)
147	SO CALIF EDISON CO (SUBSTATION)
148	SO CALIF EDISON CO (SUBSTATION)
149	SO CALIF EDISON CO (SUBSTATION)
150	SO CALIF EDISON CO (SUBSTATION)
151	SO CALIF EDISON CO (SUBSTATION)
152	SO CALIF EDISON CO (SUBSTATION)
153	SOUTH POLICE DIVISION
154	ST. MARY MEDICAL CENTER (TRAUMA CENTER)
155	SUB-STATION PIER A
156	TEXACO REFINING AND MARKETING
157	THE BOEING COMPANY
158	TIDELANDS OIL - J WATER INJECTION PLANT
159	TIDELANDS OIL - MICELLAR PLANT
160	TIDELANDS OIL - TERMINAL ISLAND
161	TIDELANDS OIL - WATER INJECTION PLANT
162	TIDELANDS OIL - WATER INJECTION PLANT
163	TIDELANDS OIL - X&Y TANK FARM
164	TIDELANDS OIL - Z WATER INJECTION PLANT
165	TIDELANDS OIL PRODUCTION CO (TOPCO)
166	TOPKO X-Y TANK FARM
167	TOSCO AL-SAL OIL COMP.
168	TRANSPORTATION SECURITY ADMINISTRATION
169	U.S. DEPARTMENT OF TRANSPORTATION
170	UNITED PARCEL SERVICE (LOADING CENTER)
171	VALERO WILMINGTON REFINERY
172	VERIZON
173	VERIZON
174	VERIZON CALIF. INCORP.
175	VERIZON CALIF. INCORP.
176	VERIZON CALIFORNIA INCORPORATED
177	VERIZON CALIFORNIA INCORPORATED
178	VERIZON CALIFORNIA INCORPORATED
179	VERIZON CALIFORNIA INCORPORATED
180	VERIZON CALIFORNIA INCORPORATED
181	VERIZON CALIFORNIA INCORPORATED
182	WEST POLICE DIVISION
183	WORLD OIL CO
184	WORLD OIL LONG BEACH BERTH C73
185	CITY OF LONG BEACH HEALTH DEPARTMENT
186	MILLER FAMILY HEALTH EDUCATION CENTER
187	ECOC
188	CITY OF LONG BEACH TELECOMMUNICATIONS FACILITY

City of Long Beach
California

Critical & Essential Facilities
Map ID Index

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