

## **Section 1**

### **Introduction**

Throughout the history of Long Beach, the residents of Long Beach have dealt with the various natural hazards affecting the area. Historical photos, journal entries, and local newspapers show that the residents of the area have experienced earthquakes, floods, earth movements, windstorms, and tsunamis.

Although early in Long Beach history there were fewer people in the area, the natural hazards adversely affected the lives of those who depended on the land and climate conditions for food and welfare. As the population of the City continued to increase, the exposure to natural hazards created an even higher risk than had ever been experienced in Long Beach history.

The City of Long Beach is located in the southwest quadrant of Los Angeles County, and offers the benefits of living in a Mediterranean type of climate. The City is characterized by the unique and attractive landscape that makes the area so popular. However, the potential impacts of natural hazards associated with the terrain make the environment and population vulnerable to natural disasters.

The City is subject to earthquakes, flooding, earth movements, windstorms, and tsunamis. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters.

Following is a summary of the disaster events in Long Beach history:

- 1992 Civil Unrest - \$2,900,000 in federal public assistance.
- 1992 Winter Storms - \$200,000 in federal public assistance.
- 1993 Winter Storms - \$300,000 in federal public assistance.
- 1994 Northridge Earthquake - \$90,000 in federal public assistance.
- 1995 Flooding - \$597,149 in federal public assistance.
- 1998 – El Nino Storms - \$204,742 in federal public assistance.

### **Why Develop a Mitigation Plan?**

As the cost of damage from natural disasters continues to increase, the community realizes the importance of identifying effective ways to reduce vulnerability to disasters. Natural hazard mitigation plans assist communities in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the City.

The plan provides a set of action items to reduce risk from natural hazards

through education and outreach programs and to foster the development of partnerships, and implementation of preventative activities such as land use programs that restrict and control development in areas subject to damage from natural hazards.

The resources and information within the Mitigation Plan:

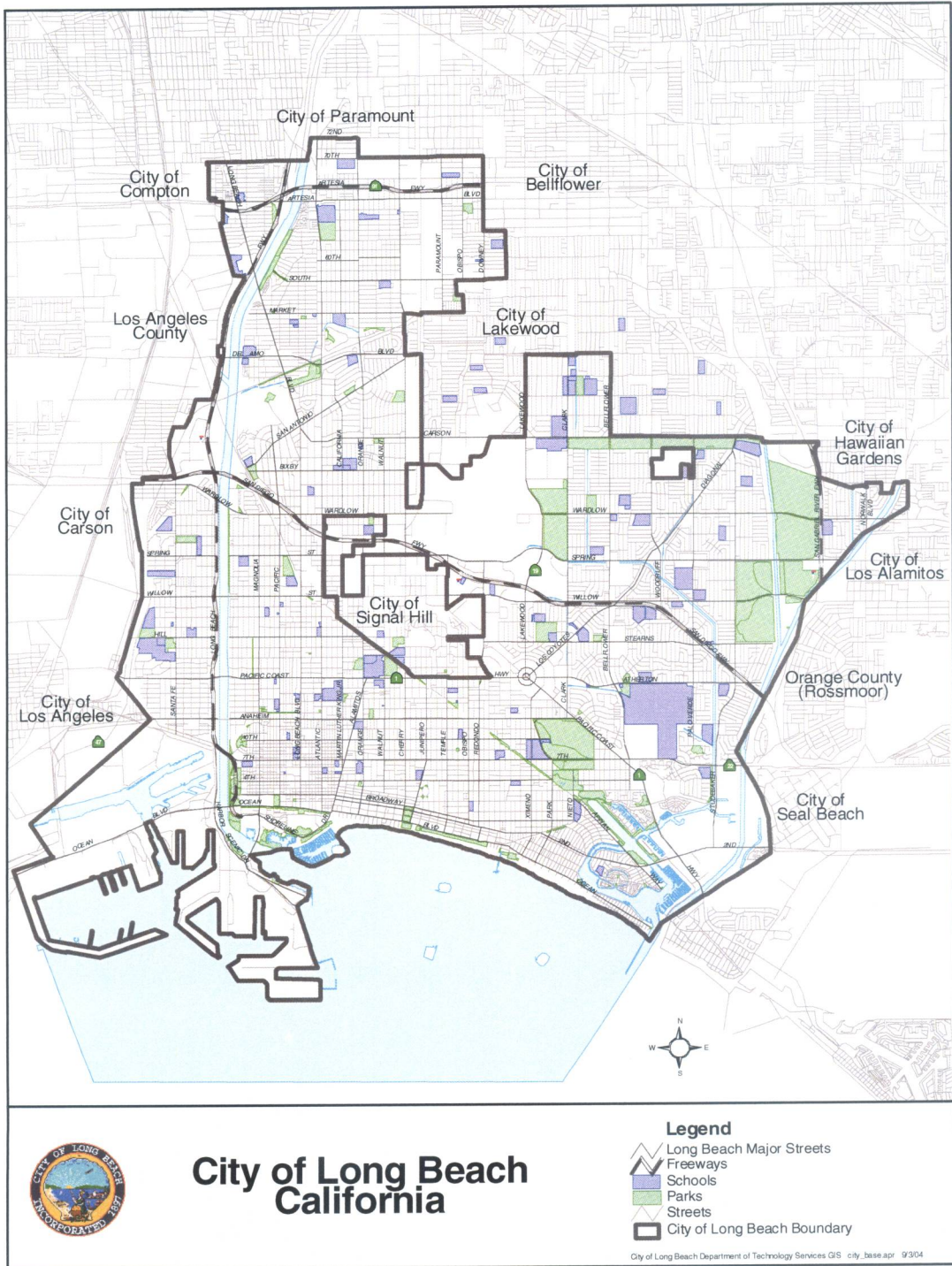
- (1) Establish a basis for coordination and collaboration among agencies and the public in City of Long Beach;
- (2) Identify and prioritize future mitigation projects; and
- (3) Assist in meeting the requirements of federal assistance programs.

The mitigation plan works in conjunction with other city plans, including the Multi-Hazard Functional Plan.

### **Whom Does the Mitigation Plan Affect?**

The City of Long Beach Natural Hazards Mitigation Plan affects the entire city. Map 1-1 shows major roads in the City of Long Beach. This plan provides a framework for planning for natural hazards. The resources and background information in the plan is applicable city-wide, and the goals and recommendations can lay groundwork for other local mitigation plans and partnerships.

**Map 1-1: Base Map of City of Long Beach  
(Source: City of Long Beach GIS)**



## **Natural Hazard Land Use Policy in California**

Planning for natural hazards should be an integral element of any city's land use planning program. All California cities and counties have General Plans and the implementing ordinances that are required to comply with the statewide planning regulations.

The continuing challenge faced by local officials and state government is to keep the network of local plans effective in responding to the changing conditions and needs of California's diverse communities, particularly in light of the very active seismic region in which we live.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards.

Planning for natural hazards, calls for local plans to include inventories, policies, and ordinances to guide development in hazard areas. These inventories should include the compendium of hazards facing the community, the built environment at risk, the personal property that may be damaged by hazard events and most of all, the people who live in the shadow of these hazards.

## **Support for Natural Hazard Mitigation**

All mitigation is local, and the primary responsibility for development and implementation of risk reduction strategies and policies lies with local jurisdictions. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in natural hazards and natural hazard mitigation. Some of the key agencies include:

- The Governor's Office of Emergency Services (OES) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;
- The Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates this information on earthquake phenomena, and communicates this to end-users and the general public to increase earthquake awareness, reduce economic losses, and save lives.
- The California Division of Forestry (CDF) is responsible for all aspects of wildland fire protection on private, state, and administers forest practices regulations, including landslide mitigation, on non-federal lands.
- The California Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, the development of

partnerships aimed at reducing risk, and exceptions (based on science-based refinement of tsunami inundation zone delineation) to state mandated tsunami zone restrictions; and

- The California Division of Water Resources (DWR) plans, designs, constructs, operates, and maintains the State Water Project; regulates dams; provides flood protection and assists in emergency management. It also educates the public, serves local water needs by providing technical assistance.
- The California Seismic Safety Commission (CSSC) investigates and manages for the State of California earthquake related issues throughout the State through a comprehensive 11 point Loss Reduction Plan program, which serves as the State’s strategic plan, guiding State executive and legislative branches with overall implementation strategies and priorities for seismic safety. The Commission’s activities include but are not limited to promoting world-class earthquake research, sponsoring and/or reviewing earthquake related legislation, advising the Legislature and Governor on policies and programs needed to reduce earthquake risks throughout California, educating professionals and the general public about earthquake risk and how to better deal with them, and creating specialized committees of experts to investigate specific policy areas and recommend regulatory and policy changes.

**Plan Methodology**

Information in the Mitigation Plan is based on research from a variety of sources. Staff from the City of Long Beach conducted data research and analysis, facilitated Planning Team meetings and public outreach activities, and developed the final mitigation plan. The research methods and various contributions to the plan include:

**Input from the Planning Team:**

The Natural Hazards Mitigation Advisory Committee convened seven times to guide development of the Mitigation Plan. The Advisory Committee played an integral role in developing the mission, goals, and action items for the Mitigation Plan. The Advisory Committee consisted of representatives of 14 local agencies, including:

<b>City of Long Beach</b>	City Manager’s Office
	Fire Department
	Disaster Management
	Technology Services – GIS

	Planning & Building
	Community Development
	Police Department
	Public Works Department
	Harbor Department
	Water Department
	Department of Health and Human Services

**Stakeholder Interviews:**

City staff distributed copies of the Plan draft to 23 agencies and/or specialists from organizations interested in natural hazards planning. The data and support gained from the review process was very valuable to the overall planning effort. A complete listing of all stakeholders (reviewers) is located in Appendix B: Public Participation.

**State and federal guidelines and requirements for mitigation plans:**

Following are the Federal requirements for approval of a Natural Hazards Mitigation Plan:

- Open public involvement, with public meetings that introduce the process and project requirements.
- The public must be afforded opportunities for involvement in: identifying and assessing risk, drafting a plan, and public involvement in approval stages of the plan.
- Community cooperation, with opportunity for other local government agencies, the business community, educational institutions, and non-profits to participate in the process.
- Incorporation of local documents, including the local General Plan, the Zoning Ordinance, the Building Codes, and other pertinent documents.

The following components must be part of the planning process:

- Complete documentation of the planning process
- A detailed risk assessment on hazard exposures in the community
- A comprehensive mitigation strategy, which describes the goals & objectives, including proposed strategies, programs & actions to avoid long-term vulnerabilities
- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the plan and integration of the Natural Hazards Mitigation Plan into other planning mechanisms

- Formal adoption by the City Council
- Plan Review by both State OES and FEMA

These requirements are spelled out in greater detail in the following plan sections and supporting documentation.

Public participation opportunities were created through use of local media, the City's website, distribution of a natural hazards questionnaire, and the City Council public meeting. In addition, the makeup of the plan implementation Committee insures a constant exchange of data and input from outside organizations (see Section 2: Plan Maintenance).

Through its consultant, Emergency Planning Consultants, the City had access to numerous existing mitigation plans from around the country, as well as current FEMA hazard mitigation planning standards (386 series).

Other reference materials consisted of county and city mitigation plans, including:

- Clackamas County (Oregon) Natural Hazards Mitigation Plan
- Six County (Utah) Association of Governments
- Upper Arkansas Area Risk Assessment and Hazard Mitigation Plan
- Urbandale-Polk County, Iowa Plan
- Hamilton County, Ohio Plan
- Natural Hazard Planning Guidebook from Butler County, Ohio

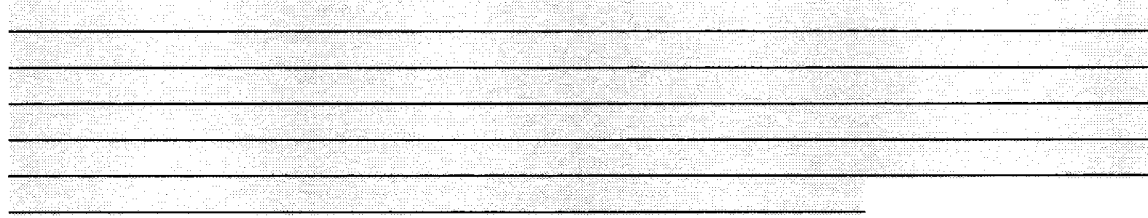
Hazard specific research: City of Long Beach staff collected data and compiled research on five hazards: earthquakes, flooding, earth movements, windstorms, and tsunamis. Research materials came from the City's General Plan, Threat Assessment contained in the Multi-Hazard Functional Plan, and state agencies including OES and CDF.

The City of Long Beach staff identified current mitigation activities, resources and programs, and potential action items from research materials and stakeholder interviews.

### **Public Input**

The City of Long Beach encouraged public participation and input in the Natural Hazards Mitigation Plan by posting its activities in the media and on the internet. In addition, the City distributed and received over 650 natural hazards questionnaires (see Appendix B for results). During the review period for the Draft Plan, copies of the Plan were distributed to interested residents. A public meeting on the Draft Plan was held before the City Council on October 19, 2004. Following is a summary of the comments gathered during the City Council meeting:

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The resources and information cited in the mitigation plan provide a strong local perspective and help identify strategies and activities to make City of Long Beach more disaster resistant.

### **How Is the Plan Used?**

Each section of the mitigation plan provides information and resources to assist people in understanding the City and the hazard-related issues facing citizens, businesses, and the environment. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future natural hazard events.

The structure of the plan enables people to use a section of interest to them. It also allows City government to review and update sections when new data becomes available. The ability to update individual sections of the mitigation plan places less of a financial burden on the City. Decision-makers can allocate funding and staff resources to selected pieces in need of review, thereby avoiding a full update, which can be costly and time-consuming. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to City of Long Beach.

The mitigation plan is organized into three parts. Part I contains an executive summary, Mitigation Actions Matrix, introduction, and plan maintenance section. Part II contains a city profile, risk assessment, and hazard-specific sections. Part III includes the appendices. Each section of the plan is described below.

### **Part I: Mitigation Actions**

#### **Executive Summary: Hazard Mitigation Action Plan**

The Action Plan provides an overview of the mitigation plan mission, goals, and action items.

#### **Attachment 1: Mitigation Actions Matrix**

The plan action items are included in this section, and address multi-hazard issues, as well as hazard-specific activities that can be implemented to reduce risk and prevent loss from future natural hazard events.



## **Section 1: Introduction**

The Introduction describes the background and purpose of developing the mitigation plan for City of Long Beach.

## **Section 2: Plan Maintenance**

This section provides information on plan implementation, monitoring and evaluation.

## **Part II: Hazard Analysis**

### **Section 3: Community Profile**

This section presents the history, geography, demographics, and socioeconomics of the City of Long Beach. It serves as a tool to provide an historical perspective of natural hazards in the City.

### **Section 4: Risk Assessment**

This section provides information on hazard identification, vulnerability and risk associated with natural hazards in City of Long Beach.

### **Sections 5-9: Hazard-Specific Sections**

Hazard-Specific Sections on the five chronic hazards is addressed in this plan. Chronic hazards occur with some regularity and may be predicted through historic evidence and scientific methods. The chronic hazards addressed in the plan include:

- Section 5: Earthquake
- Section 6: Flooding
- Section 7: Earth Movement (Debris Flow & Landslides)
- Section 8: Windstorm
- Section 9: Tsunami

Each Hazard-Specific Section includes information on the history, hazard causes and characteristics, and hazard assessment.

## **Part III: Resources**

The plan appendices are designed to provide users of the City of Long Beach Natural Hazards Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and potential resources to assist them with implementation.

## **Appendix A: Plan Resource Directory**

The resource directory includes City, regional, state, and national resources and programs that may be of technical and/or financial assistance to City of Long Beach during plan implementation.

## **Appendix B: Public Participation**

This appendix includes specific information on the various public processes used during development of the plan.

## **Appendix C: Benefit/Cost Analysis**

This section describes FEMA's requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

## **Appendix D: List of Acronyms**

This section provides a list of acronyms for City, regional, state, and federal agencies and organizations that may be referred to within the City of Long Beach Natural Hazards Mitigation Plan.

## **Appendix E: Glossary**

This section provides a glossary of terms used throughout the plan.

## **Section 2:**

### **Plan Maintenance**

The Plan Maintenance Section details the formal process that will ensure that the Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this Section includes an explanation of how the City of Long Beach government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the City's General Plan, Capital Improvement Plans, and Building and Safety Codes.

### **Monitoring and Implementing the Plan**

#### **Plan Adoption**

The City Council will be responsible for adopting the Natural Hazards Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazards. Once the plan has been adopted, the City's Hazard Mitigation Coordinator will be responsible for submitting it to the State Hazard Mitigation Officer at The Governor's Office of Emergency Services. The Governor's Office of Emergency Services will then submit the plan to the Federal Emergency Management Agency (FEMA) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the City will gain eligibility for Hazard Mitigation Grant Program funds.

#### **Coordinating Body**

The City Manager will appoint an Executive Committee consisting of department managers that will be responsible for providing leadership and guidance to the Natural Hazards Mitigation Advisory Committee. The City Manager's Executive Committee (Executive Committee) will likely consist of managers from the following departments:

<b>City of Long Beach</b>	City Manager's Office
	Fire Department
	Disaster Management
	Technology Services – GIS
	Planning & Building
	Community Development

	Police Department
	Public Works Department
	Harbor Department
	Water Department
	Department of Health and Human Services

The Executive Committee will at least once a year to conduct the annual evaluation of the Mitigation Plan. The meetings will provide an opportunity to discuss the progress made by the Natural Hazards Mitigation Advisory Committee (Mitigation Committee).

**Convener**

Upon approval of the Plan by the City Council, the City Manager (or designee) will convene a joint meeting of the City Manager’s Executive Committee and the Mitigation Committee. The purpose of the joint meeting will be to clarify the roles and responsibilities of the two Committees, as well as to establish an annual schedule and assign tasks for implementing the Plan. The Mitigation Committee will serve as a working committee, while the Executive Committee will be ultimately responsible for implementation and evaluation of the Natural Hazards Mitigation Plan.

**Implementation through Existing Programs**

The City addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and City Building and Safety Codes. The Natural Hazards Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The City will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

The City’s Building & Safety Department is responsible for administering the Building & Safety Codes. In addition, the Executive Committee will work with other agencies at the state level to review, develop and ensure Building & Safety Codes that are adequate to mitigate or prevent damage by natural hazards. This is to ensure that life-safety criteria are met for new construction.

The goals and action items in the mitigation plan may be achieved through activities recommended in the City’s Capital Improvement Plans (CIP). Various City departments develop CIP plans, and review them on an annual basis. Upon annual review of the CIPs, the Executive Committee will work with the City departments to identify action items in the Natural Hazards Mitigation Plan consistent with CIP planning goals and integrate them where appropriate.

## **Economic Analysis of Mitigation Projects**

FEMA's approaches 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.

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.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide 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.

Given federal funding, the Executive Committee will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Team will use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix C: Benefit/Cost Analysis.

## **Evaluating and Updating the Plan**

### **Formal Review Process**

The Natural Hazards Mitigation Plan will be updated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The convener or designee will be responsible for contacting the Executive Committee members and organizing the annual meeting.

Members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The Executive Committee will review the goals and action items to determine their relevance to changing situations in the City, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Executive Mitigation Committee will also review the Risk Assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The convener will assign the duty of updating the plan to one or more of the Committee members. The designated members will have three months to make appropriate changes to the Plan before submitting it to the rest of the Committee and presenting it to the City Council (or other authority). The Committee will also notify all holders of the City's Plan when changes have been made. Every five years the updated Plan will be submitted to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review.

### **Continued Public Involvement**

The City is dedicated to involving the public directly in review and updates of the Natural Hazards Mitigation Plan. The City Manager's Executive Committee members will be responsible for the annual review and update of the plan.

The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all of the appropriate agencies in the City. The existence and location of these copies will be publicized in the quarterly city newsletter which reaches every household in the City. The plan also includes the address and the phone number of the City's Hazard Mitigation Coordinator, responsible for keeping track of public comments on the Plan.

In addition, copies of the Plan and any proposed changes will be posted on the City's Website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held after each annual evaluation or as deemed necessary by the Executive Committee. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The Committee will be responsible for using City resources to publicize the annual public meetings and maintain public involvement through the public access cable channel, website, and local newspapers.

## **Section 3:**

### **Community Profile**

#### **Why Plan for Natural Hazards in City of Long Beach?**

Natural hazards impact citizens, property, the environment, and the economy of the City of Long Beach. Earthquakes, flooding, earth movement, windstorm, and tsunamis have exposed City of Long Beach residents, businesses, and visitors to the financial and emotional costs of recovering after natural disasters. The risk associated with natural hazards increases as more people move to areas affected by natural hazards.

Even in those communities that are essentially “built-out” i.e., have little or no vacant land remaining for development; population density continues to increase when low density housing is replaced with medium and high density development projects.

The inevitability of natural hazards, and the growing population and activity within the City create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future natural hazard events. Identifying the risks posed by natural hazards, and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses can work together with the City to create a natural hazards mitigation plan that addresses the potential impacts of hazard events.

#### **Geography and the Environment**

City of Long Beach has an area of 52 square miles and overlooks San Pedro Bay on the south coast of Los Angeles County. Long Beach is 22 miles south of downtown Los Angeles and 10 miles southwest of Anaheim.

According to the City’s Multi-Hazard Functional Plan, the elevation ranges from a high of 60 feet in the northern portion of the City to a low of sea level along the coast.

#### **Community Profile**

The area comprising the City of Long Beach was first settled in 1888 and the City itself was incorporated on December 3, 1897.

The City is served by the following major highways:

710 Long Beach Freeway (North/South)  
405 San Diego Freeway (North/South)

605 San Gabriel River Freeway (North/South)  
Route 1 Pacific Coast Highway (along coastline)  
22 Garden Grove Freeway  
47 Terminal Island Freeway (East/West)

The Alameda Corridor railroad serves the city with tracks in the area that parallels the 710 Freeway along the western border of the City. Passenger transportation is provided by Metro Blue Line: Long Beach to Los Angeles and Metro Green Line: northern tip of Redondo Beach to Norwalk.

### **Major Rivers**

The nearest major rivers are the Los Angeles River and the San Gabriel River. These Rivers have the potential to impact the City of Long Beach. Flood control measures to cope with infrequent but intense rainfall have been taken throughout the entire Los Angeles Basin. These flood control activities are under the auspices of the Los Angeles County Flood Control District and the U.S. Army Corps of Engineers, which work in conjunction with local municipalities. The City of Long Beach, like other local governments, must take certain measures to qualify for the National Flood Insurance Program of the Federal Department of Federal Emergency Management Agency (see Hazard-Specific Section: Flooding).

### **Climate**

The climate of Long Beach, which is to the south of the San Gabriel Mountains, is considered subtropical. The precipitation contributing to the Los Angeles River Basin is primarily in the form of orographic rainfall associated with extra-tropical cyclones during the months between December and March. Snowfall is common at elevations above 5,000 feet during major storms followed by rapid melting. Major storms consist of one to several frontal systems which can last up to four or more days. Precipitation is greatly intensified due to the San Gabriel Mountains which lie in the path of storms moving from the west of southwest. Steep canyons and gradients in the mountains contribute to rapid concentrations of storm runoff quantities. The average annual rainfall ranges from 13.8 inches at sea level to 28.2 inches in the San Gabriel Mountains (source: City of Long Beach Multi-Hazard Functional Plan).

Average temperatures in the City of Long Beach range from a low of 46 degrees in the winter months to a high of 83 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures and very low humidity.



## **Minerals and Soils**

The characteristics of the minerals and soils present in City of Long Beach indicate potential types of hazards that may occur. Rock hardness and soil characteristics can determine whether or not an area will be prone to geologic hazards such as earthquakes, liquefaction and landslides.

According to the City's Public Safety Element of the General Plan, the City is located on the coastal margin of the Los Angeles Basin which is underlain by over 15,000 feet of stratified sedimentary rocks of marine origin. This marine section is composed of interbedded units of sandstone, siltstone, and shale. The central portion of Long Beach has been elevated by regional uplift and local folding and faulting.

The physiographic features within the City can be separated into six rather distinct areas:

- 1) The row of low hills extending from Bixby Knolls southeasterly to Seal Beach and including Signal and Reservoir Hills;
- 2) The broad, slightly elevated marine terrace lying south of this row of Hills;
- 3) The Los Angeles River floodplain, known as the Dominguez Gap, lying along the western side of Long Beach;
- 4) The San Gabriel River floodplain and channel, known as the Alamitos Gap, in the northeasterly portion of the City;
- 5) The alluvial plain lying to the north of Bixby Knolls and Signal Hill; and
- 6) The coastal area including the sea bluffs, beach and barrier bars across the gap areas. The latter area along the seaward portions of the gap areas have been highly modified by dredging and landfill operations associated with construction of recreational and harbor facilities. The gap areas are of particular concern because of the large landfill areas and the shallow groundwater conditions.

## **Other Significant Geologic Features**

The City of Long Beach, like most of the Los Angeles Basin, lie over the area of one or more known earthquake faults, and potentially many more unknown faults, particularly so-called lateral or blind thrust faults.

The major faults that have the potential to affect the greater Los Angeles Basin, and therefore the City of Long Beach are the:

San Andreas  
Newport - Inglewood  
Palos Verdes

The Los Angeles Basin has a history of powerful and relatively frequent earthquakes, dating back to the powerful 8.0+ San Andreas earthquake of 1857 which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large (8.0+) earthquakes occur on the San Andreas fault at intervals between 45 and 332 years with an average interval of 140 years<sup>1</sup>. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the 1933 Long Beach Earthquake, the 1971 San Fernando Earthquake, the 1987 Whittier Earthquake and the 1994 Northridge Earthquake.

In addition, many areas in the Los Angeles Basin have sandy soils that are subject to liquefaction. The City of Long Beach has liquefaction zones that are discussed in Section 5: Earthquake.

The City of Long Beach also has areas with potential for earth movement (see Section 7: Earth Movement).

### **Population and Demographics**

According to the City's General Plan 2001 Housing Element, the City has a population of 481,000 in an area of 52 square miles.

The increasing number of people living in City of Long Beach creates more community exposure, and changes how agencies prepare for and respond to natural hazards. In the 1987 publication, Fire Following Earthquake issued by the All Industry Research Advisory Council, Charles Scawthorn explains how a post-earthquake urban conflagration would develop. The conflagration would be started by fires resulting from earthquake damage, but made much worse by the loss of pressure in the fire mains, caused by either lack of electricity to power water pumps, and /or loss of water pressure resulting from broken fire mains.

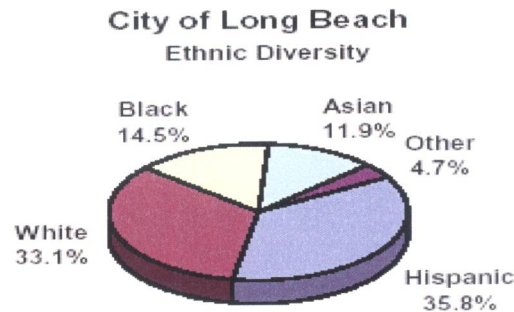
Furthermore, increased density can affect risk. For example, narrower streets are more difficult for emergency service vehicles to navigate, the higher ratio of residents to emergency responders affects response times, and homes located closer together increase the chances of fires spreading.

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<sup>1</sup> Peacock, Simon M.,  
<http://aamc.geo.lsa.umich.edu/eduQuakes/EQpredLab/EQprediction.peacock.html>

Natural hazards do not discriminate, but the impacts in terms of vulnerability and the ability to recover vary greatly among the population. According to Peggy Stahl of the Federal Emergency Management Agency (FEMA) Preparedness, Training, and Exercise Directorate, 80% of the disaster burden falls on the public, and within that number, a disproportionate burden is placed upon special needs groups: women, children, minorities, and the poor.<sup>2</sup>

According to the City's General Plan 2001 Housing Element, the demographic make up of the City is as follows:



The ethnic and cultural diversity suggests a need to address multi-cultural needs and services.

The percentage of residents living below poverty level in the City of Long Beach is 24.4% in 2003 according to the most recent census estimates. Out of all these residents, 37.7% are under 18 years old, and 11.0% are over 65. The overall median income in Long Beach is \$36,662, compared to a national median of \$43,318.

Vulnerable populations, including seniors, disabled residents, women, and children, as well as those people living in poverty, may be disproportionately impacted by natural hazards.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of natural hazards recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from governmental funds used to rebuild private structures. Discussions about

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<sup>2</sup> [www.fema.gov](http://www.fema.gov)

natural hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

### **Land and Development**

Development in southern California from the earliest days was a cycle of boom and bust. The Second World War however dramatically changed that cycle. Military personnel and defense workers came to southern California to fill the logistical needs created by the war effort. The available housing was rapidly exhausted and existing commercial centers proved inadequate for the influx of people. Immediately after the war, construction began on the freeway system, and the face of southern California was forever changed. Home developments and shopping centers sprung up everywhere and within a few decades the central basin of Los Angeles County was virtually built out. This pushed new development further and further away from the urban center.

The General Plan addresses the use and development of private land, including residential and commercial areas. This plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality; growth management; conservation of natural resources; clean water and open spaces.

The environment of most Los Angeles County cities is nearly identical with that of their immediate neighbors and the transition from one incorporated municipality to another is seamless to most people. Seamless too are the exposures to the natural hazards that affect all of southern California.

### **Housing and Community Development**

**(Source: City of Long Beach General Plan, 2000 Census, and 2004 Technical Background Report for the City's General Plan Update)**

<b>Development Type (Major Categories)</b>	
Residential	47.4%
Commercial	8.6%
Institutional	6.6%
Industrial	6.2%
Open Space & Parks	7.5%
<b>Housing Type</b>	
Single-Family	46%
Multi-Residential	15.5%

(20+ units)	
Mobilehomes	1.3%
<b>Housing Statistics</b>	
Total Available Housing Units	171,632
Owner-Occupied Housing	95%
Average Household Size	2.77
Average Home Value	\$375,000

**Employment and Industry  
(Source: 2000 Census)**

<b>Principal Employment Activities</b>	
Management (professional and related occupations)	34.3%
Sales and Office Occupations	27.2%
Service Occupations	15.8%
Production, Transportation, and Material Moving	14.8%
Construction	7.7%
<b>Major Industries</b>	
Education, Health & Social Services	21.1%
Manufacturing	14.4%
Professional	10.7%
Retail Trade	10.3%
Finance, Insurance, Real Estate	9.5%

The City of Long Beach municipal government employs approximately 5,942 staff members. The largest public employer is Long Beach Unified School District with 11,096 employees. The largest private employer in the City is Boeing which manufactures commercial and military aircraft, employing approximately 10,500.

The Port of Long Beach opened in 1911 and has been developed and managed by the City of Long Beach Harbor Department with their staff of approximately 350 employees. The Board of Harbor Commissioners acts as a landlord and leases or assigns the facilities to private firms who operate the port facilities. The net income from this activity is invested in port development. These development plans for the next decade will require a \$2 billion investment.

Currently, the Port provides 30,000 jobs, or one in eight jobs in Long Beach. It offers 316,000 jobs, or one in twenty-two jobs available in the five county southern California regions. Nationally, 1.4 million jobs are related to the Long Beach-generated trade. Also, the City of Long Beach is home to the second busiest container port in the Western Hemisphere. The Port processes over 65 million metric ton of cargo annually worth nearly \$95.9 billion. This computation reflects the handling of more than 4.6 million containers (TEU's) which on average is equivalent of 12,000, 20-ft container (TEU) each day. Map 3-1 illustrates the location of the major employers in the City of Long Beach.

Mitigation activities are needed at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from surrounding areas to industrial and business centers. This creates a greater dependency on roads, communications, accessibility and emergency plans to reunite people with their families. Before a natural hazard event, large and small businesses can develop strategies to prepare for natural hazards, respond efficiently, and prevent loss of life and property.

### **Transportation and Commuting Patterns**

Private automobiles are the dominant means of transportation in Long Beach. However, the City of Long Beach meets its public transportation needs through a mixture of a regional transit system (MTA), and various city contracted bus systems. MTA provides both bus and light rail service to the City of Long Beach and to the Los Angeles County metropolitan area. The Metro Blue Line runs from Long Beach to Los Angeles, while the Metro Green Line runs from the northern portion of Redondo Beach to Norwalk. In addition to this service, the City promotes alternative transportation activities.

According to the 2001 Housing Element, the City has a population of 481,000 and with a daytime population around 26,729 individuals or 20% +. Within one mile of downtown Long Beach, the population is measured at 165,113. At five miles from downtown Long Beach, the population is measured greater at 363,937. The mean travel time to work for the residents of the City of Long Beach is 28.7 minutes (2000 Census).

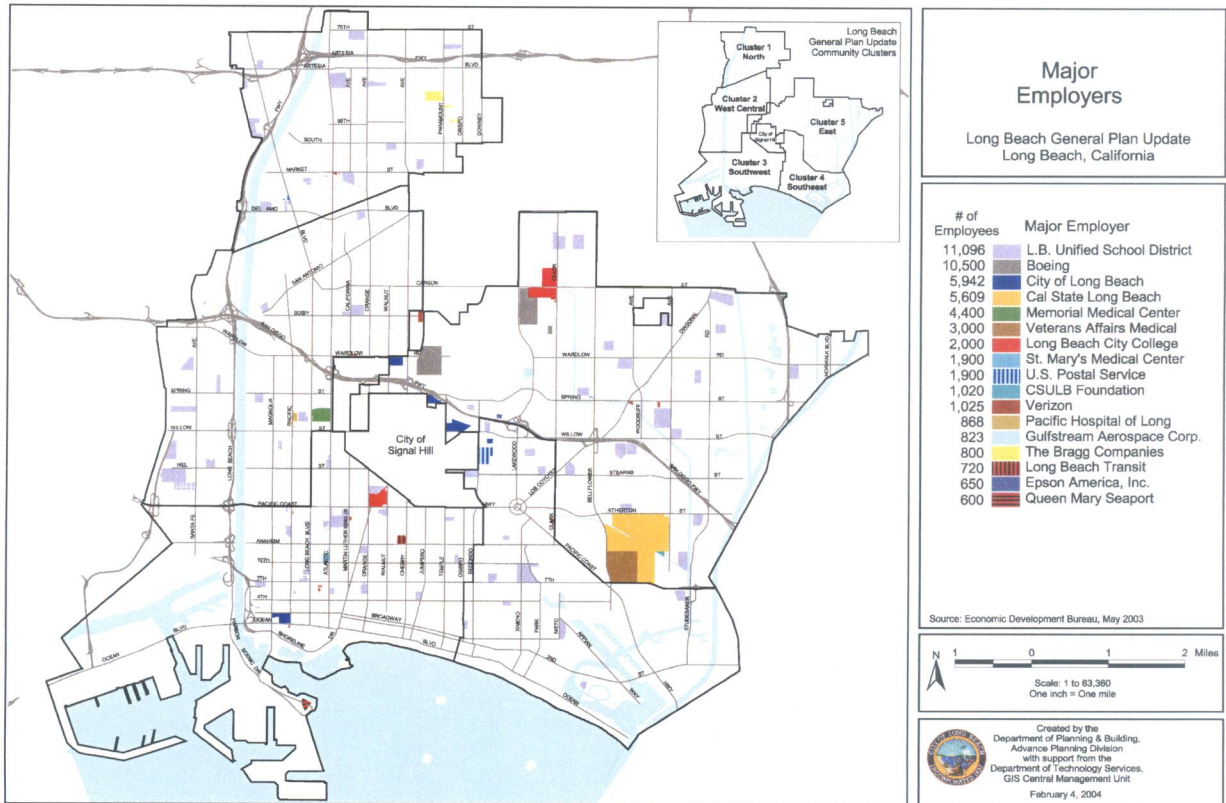
As stated in the City's General Plan, the City of Long Beach is served by the Interstate 5, Freeways 105, 110, 405, 605, and 710 connecting the City to

adjoining parts of Los Angeles County. The City's 815 mile road system includes 259 miles of arterial highways, 556 miles of local roads, and 165 bridges.

As daily transit rises, there is an increased risk that a natural hazard event will disrupt the travel plans of residents across the region, as well as local, regional and national commercial traffic.

Localized flooding can render roads unusable. A severe winter storm has the potential to disrupt the daily driving routine of hundreds of thousands of people. Natural hazards can disrupt automobile traffic and shut down local and regional transit systems.

**Map 3-1: Major Employers in the City of Long Beach**  
 (Source: City of Long Beach Department of Planning and Building-Advanced Planning)



## **Municipal Services**

The City provides a full range of municipal services, including police and fire, public health and environmental services, library, parks, recreation and related social services, engineering and public works, sanitation, general administration, planning and community development, public improvements, and gas, water, airport and towing services. The City also operates and maintains a world-class international deep-water harbor, a nationally recognized convention center, several beaches and marinas. Long Beach is one of only three cities in California with its own Health Department and Energy Department and the only city in California with its own Oil Department, which manages close to 2,000 oil wells.

The City has 6.5 miles of beaches, 468 acres of navigable waterways, and two City- owned and operated marinas. The City of Long Beach hosts an abundance of cultural and recreational opportunities including the Convention Center, Cruise ship terminals, the Queen Mary which attracts 1.5 million visitors annually, and lastly, the Long Beach Aquarium, drawing over five million visitors a year.

Specific tourism events include:

- Toyota Grand Prix of Long Beach is held annually in April to an estimated audience of 225,000 racing enthusiasts.
- Gay Pride Parade is a 3-day event held annually in May with crowds as high as 100,000.
- Long Beach International City Marathon is held annually and attracts 10,000 participants.
- Jazz Festival is held annually in September with an audience of 6000-8000 jazz fans.
- The Sea Festival, a citywide-city sponsored annual event with 20,000+ attendees.
- Belmont Shores Christmas Parade, held in December, with an audience of 10,000 participants/viewers.
- Belmont Shores Car Show, an auto showcase that attracts 10,000 automobile enthusiasts.



## **Section 4:**

### **Risk Assessment**

#### **What is a Risk Assessment?**

Conducting a risk assessment can provide information: on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from natural hazard events. Specifically, the five levels of a risk assessment are as follows:

##### **1) Hazard Identification**

This is the description of the geographic extent, potential intensity and the probability of occurrence of a given hazard. Maps are frequently used to display hazard identification data. The City of Long Beach identified five major hazards that affect this geographic area. These hazards – earthquakes, flooding, earth movement, windstorms, and tsunamis - were identified through an extensive process that utilized input from the Natural Hazards Mitigation Advisory Committee. The geographic extent of each of the identified hazards has been identified by the City utilizing the maps contained in the City's General Plan and the MHFP Threat Assessment that are illustrated in the tables, maps, and photos listed on page iii.

##### **2) Profiling Hazard Events**

The maps help to describe the causes and characteristics of each hazard and what part of the City's population, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section. For a full description of the history of hazard specific events, please see the appropriate hazard chapter.

##### **3) Vulnerability Assessment/Inventorying Assets**

This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these facilities provide critical products and services to the general public that are necessary to preserve the welfare and quality of life in the City and fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified and are illustrated in Table 4-2 (Risk Assessment – Attachment 1).

##### **4) Risk Analysis**

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to

measure the effects of hazards on assets. For each hazard where data was available, quantitative estimates for potential losses have been included in the Hazard-Specific Sections.

### **5) Assessing Vulnerability/ Analyzing Development Trends**

This step provides a general description of land uses and development trends within the community so that mitigation options can be considered in land use planning and future land use decisions. This plan provides comprehensive description of the character of the City in Section 3: Community Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of the City can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this mitigation plan into other community development plans.

Hazard assessments are subject to the availability of hazard-specific data. Gathering data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each Hazard-Specific Section of the plan includes a discussion on hazard identification using data and information from City, County or State agency sources.

Regardless of the data available for hazard assessments, there are numerous strategies the City can take to reduce risk. These strategies are described in the action items detailed in each hazard section of this Plan. Mitigation strategies can further reduce disruption to critical services, reduce the risk to human life, and alleviate damage to personal and public property and infrastructure.

### **Federal Requirements for Risk Assessment**

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201 include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are five hazards profiled in the mitigation plan, including earthquake, flooding, earth movement, windstorms, and tsunamis. The Federal criteria for risk assessment and information on how the City's Natural Hazards Mitigation Plan meets those criteria is outlined in Table 4-1.

**Table 4-1: Federal Criteria for Risk Assessment**

<b>Section 322 Plan Requirement</b>	<b>How is this addressed?</b>
Identifying Hazards	Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent data are available; the existing maps identifying the location of the hazard were utilized. The Executive Summary and the Risk Assessment sections of the plan include a list of the hazard maps.
Profiling Hazard Events	Each hazard section includes documentation of the history, and causes and characteristics of the hazard in the City.
Assessing Vulnerability: Identifying Assets	Where data is available, the vulnerability assessment for each hazard addressed in the mitigation plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas in the City in the Community Issues section. Each hazard section also identifies potential mitigation strategies.
Assessing Vulnerability: Estimating Potential Losses:	The Risk Assessment Section of this mitigation plan identifies key critical facilities in the City and includes a map of these facilities. Vulnerability assessments have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available.
Assessing Vulnerability: Analyzing Development Trends	The Community Profile Section of this plan provides a description of the development trends in the City, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns.

**Critical and Essential Facilities**

Critical facilities are those critical to government response and recovery activities (i.e., life safety and property and environmental protection) including: 911 centers, emergency operations centers, police and fire stations, public works facilities, communications centers, sewer and water facilities, hospitals, bridges and roads, and shelters. Also, facilities that, if damaged, could cause serious secondary impacts may also be considered "critical."

A significant hazardous materials facility is one example of such a “secondary impact” type of critical facility.

Essential facilities are those facilities that are vital to the continued delivery of key government services or that may significantly impact the public’s ability to recover from the emergency. These facilities may include: buildings such as the jail, law enforcement center, public services building, community corrections center, the courthouse, and juvenile services building and other public facilities such as schools. Table 4-2 illustrates the critical and essential facilities serving the City of Long Beach that are vulnerable to the identified natural hazards.

### **Summary**

Natural hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Natural hazard mitigation for industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of natural hazards.

**Table 4-2: Critical Essential Facilities Vulnerable to Natural Hazards**

ADDRESS	NAME	FLOOD	TSUNAMI	EQ	EM
One World Trade Center	LONG BEACH WORLD TRADE CENTER			X	
3601 Dock Street (POLB)	DOW CHEMICAL / VOPAK	X	X	X	
901 W. 12th Street	AIR PRODUCTS AND CHEMICAL			X	
709 W. 16th Street	PACIFIC GAS EXCHANGE	X		X	
6801 2nd Street	LB WATER DEPT - SEAWATER DESAL TEST FACILITY			X	
598 E. Anaheim Street	SHELL OIL CO			X	
2400 E. Artesia Blvd.	EDGINGTON OIL COMPANY INC			X	
4901 E. Carson Street	LONG BEACH CITY COLLEGE			X	
3976 Cherry Avenue	AIR GAS INDUSTRIES			X	
4150 Donald Douglas Drive	GULFSTREAM AEROSPACE CORP.			X	
420 Henry Ford Avenue	TIDELANDS OIL - TERMINAL ISLAND	X	X	X	
1445 Judson Avenue	GLOBAL OIL PRODUCTION LLC	X		X	
3495 Lakewood Blvd.	GULFSTREAM AEROSPACE			X	
3855 Lakewood Blvd.	THE BOEING COMPANY			X	
6605 Long Beach Blvd.	EQUILON #135454			X	
1920 Luggar Way	PETRO DIAMOND TERMINAL CO		X	X	
1305 E. Pacific Coast Highway	LONG BEACH CITY COLLEGE			X	
1790 Palo Verde Avenue, #A	TEXACO REFINING AND MARKETING			X	
5843 Paramount Blvd.	GLOBE GAS CORPORATION			X	
5905 Paramount Blvd.	ARCO TERMINAL SERVICES CORP			X	
230 S. Pico Avenue	TIDELANDS OIL - Z WATER INJECTION PLANT			X	
1300 Pier B Street	ARCO TERMINAL SERVICES CORP			X	
1850 Pier B Street	NATIONAL GYPSUM COMPANY		X	X	
1400 Pier C Street, #B-56-57	ARCO TERMINAL SERVICES CORP	X		X	
1405 Pier C Street, #C73	WORLD OIL CO	X		X	
228 Pier D Avenue	TIDELANDS OIL - X&Y TANK FARM	X		X	
1150 Pier E Street	TIDELANDS OIL - WATER INJECTION PLANT	X		X	
750 Pier F Avenue	TIDELANDS OIL - MICELLAR PLANT		X	X	
1004 Pier F Avenue	CHEMOIL LONG BEACH MARINE TERMINAL		X	X	
1390 Pier F Avenue	TIDELANDS OIL - WATER INJECTION PLANT		X	X	
1280 Pier J Avenue	TIDELANDS OIL - J WATER INJECTION PLANT		X	X	
700 E. Shoreline Drive	SHORELINE MARINE FUEL			X	

**Table 4-2: Critical Essential Facilities Vulnerable to Natural Hazards**

ADDRESS	NAME	FLOOD	TSUNAMI	EQ	EM
3333 E. Spring Street	GULFSTREAM AEROSPACE			X	
692 Studebaker Road	EDISON PIPELINE & TERMINAL (EPTC)			X	
3014 Studebaker Road	TOSCO AL-SAL OIL COMP.			X	
300 Pier T Avenue (POLB)	BP / ARCO TERMINAL 1		X	X	
1300 Pier B Street (POLB)	BP / ARCO TERMINAL 2		X	X	
1400 West Pier C Street (POLB)	BP / ARCO TERMINAL 3	X	X	X	
1004 Pier F Avenue Berth 209-2	CHEM-OIL MARINE TERMINAL		X	X	
2665 W. Seaside Avenue (Pier T)	NRG LONG BEACH GENERATION PLANT	X	X	X	
1920 Luggier Way (POLB)	PETRO-DIAMOND TERMINAL COMPANY		X	X	
949 Pier G Avenue (POLB)	TIDELANDS OIL PRODUCTION CO (TOPCO)		X	X	
228 Pier D Avenue (POLB)	TOPKO X-Y TANK FARM	X	X	X	
2402 E. Anaheim Street (POLB)	VALERO WILMINGTON REFINERY		X	X	
1405 Pier C Street (POLB)	WORLD OIL LONG BEACH BERTH C73	X	X	X	
3605 E. Spring St.	LONG BEACH TERMINAL II JET CENTER			X	
5003 E 7th Street Long Beach, 9	BREITBURN			X	
2665 W. Seaside Blvd	LONG BEACH GENERATION, LLC	X	X	X	
6801 Westminster Avenue	HAYNES GENERATING STATION			X	
690 N. Studebaker Rd.	AES PLANT			X	
3605 E. Spring St.	FED EX			X	
1200 Pier E Street (POLB)	CALIFORNIA UNITED TERMINAL		X	X	
231 Windsor Way (POLB)	CARNIVAL CRUISE LINES		X	X	
320 Golden Shore Drive (POLB)	CATALINA EXPRESS - CATALINA LANDING			X	
301 Hanjin Road (POLB)	HANJIN SHIPPING	X	X	X	
1281 Pier J Avenue (POLB)	INTERNATIONAL TRANSPORTATION SERVICE, INC.		X	X	
1171 Pier F Avenue (POLB)	LONG BEACH CONTAINER TERMINAL		X	X	
1521 Pier C Street (POLB)	MATSON TERMINAL	X	X	X	
1521 Pier J Avenue (POLB)	PACIFIC CONTAINER TERMINAL		X	X	
2401 E. Wardlow	BOEING FLIGHT SECURITY OPS, C-17			X	
5001 Airport Plaza Drive, Suite 1	FEDERAL EXPRESS (LOADING CENTER)			X	
4150 Donald Douglas Drive	GULFSTREAM AEROSPACE CORPORATION			X	
1250 Bellflower Boulevard	CALIFORNIA STATE UNIVERSITY, LONG BEACH			X	
6204 E. 2nd Street	CITY OF LONG BEACH MARINE MAINTENANCE		X	X	

**Table 4-2: Critical Essential Facilities Vulnerable to Natural Hazards**

ADDRESS	NAME	FLOOD	TSUNAMI	EQ	EM
3980 E. 7th Street	VERIZON CALIFORNIA INCORPORATED			X	
1411 W. 14th Street	NEXTEL COMMUNICATIONS	X		X	
3333 Airport Way	LBUSD - FOOD SERVICE BRANCH			X	
1126 Loma Avenue	SO CALIF EDISON CO (SUBSTATION)			X	
4300 Long Beach Blvd.	NEXTEL COMMUNICATIONS			X	
555 E. Ocean Blvd.	NEXTEL COMMUNICATIONS			X	
415 W. Ocean Blvd.	LONG BEACH MUNICIPAL COURTS			X	
501 W. Ocean Blvd.	GLEN ANDERSON FEDERAL BLDG. GENERAL SVS ADM.			X	
3050 Orange Avenue	NEXTEL COMMUNICATIONS			X	
3090 Pacific Avenue	AIRTOUCH CELLULAR			X	
6801 Westminster Avenue	DEPT OF WATER & POWER-HAYNES			X	
3500 Nimitz Road (POLB)	DEFENSE FUEL SUPPLY POINT, PIER T12		X	X	
700 block of Hanjin Way (POLB)	SUB-STATION PIER A		X	X	
2400 E Spring Street Long Beach	CNG	X		X	
1800 E Wardlow Road Long Beach	CNG (WATER)			X	
400 West Broadway Long Beach	CNG (POLICE)			X	
120 Henry Ford Ave Long Beach	CNG (SERRF)	X		X	
120 Henry Ford Ave Long Beach	SERRF	X		X	
1835 Santa Fe Ave.	WEST POLICE DIVISION			X	
1259 Pier F Avenue (POLB)	JACOBSEN PILOT SERVICE, INC.		X	X	
2700 Nimitz Road (POLB)	SEA LAUNCH		X	X	
2980 Nimitz Road, Pier T (POLB)	U.S. DEPARTMENT OF TRANSPORTATION		X	X	
4100 East Donald Douglas Drive	LONG BEACH TERMINAL/DAUGHERTY FIELD			X	
4600 East Spring St.	UNITED PARCEL SERVICE (LOADING CENTER)			X	
2600 Temple Avenue	FLEET SERVICES REPAIR SHOP			X	
2760 Studebaker Road	PARK MAINTENANCE/ADMINISTRATION			X	
2400 Spring E. Street	LONG BEACH ENERGY CORPORATE YD.			X	
700 E. Shoreline Drive	MARINA FUEL DOCK			X	
4320 Olympic Plaza	BEACH MAINTENANCE YARD	X	X	X	
2249 Argonne Avenue	FIRE TRAINING FACILITY			X	
300 East Ocean Blvd.	LONG BEACH CONVENTION AND ENTERTAINMENT CENTER			X	
401 Golden Shore 4th Floor	OFFICE OF THE CSU CHANCELLOR			X	

Table 4-2: Critical Essential Facilities Vulnerable to Natural Hazards

ADDRESS	NAME	FLOOD	TSUNAMI	EQ	EM
4225 Donald Douglas Drive	TRANSPORTATION SECURITY ADMINISTRATION			X	
2525 GRAND AVE	CITY OF LONG BEACH HEALTH DEPARTMENT			X	
3820 CHERRY AVE	MILLER FAMILY HEALTH EDUCATION CENTER			X	
1835 Santa Fe Avenue	POLICE SUBSTATION, WEST DIVISION			X	
1725 San Francisco Avenue	PUBLIC SERVICE YARD			X	
6204 East 2nd Street	MARINA FUEL DOCK/RESCUE BOATS		X	X	
4100 East Donald Douglas Drive	LONG BEACH - DAUGHERTY FIELD			X	
925 Harbour Plz	FIRE DEPARTMENT HEADQUARTERS		X	X	
100 Long Beach Blvd.	LONG BEACH POLICE DEPARTMENT--HEADQUARTERS			X	
333 W. Ocean Blvd.	LONG BEACH CITY HALL			X	
6509 GUNDRY AVE	FIRE STATION #12			X	
225 MARINA DR	FIRE BOAT STATION #21		X	X	
1645 E 3RD ST	FIRE STATION #2			X	
411 LOMA AVE	FIRE STATION #4			X	
7575 E. WARDLOW RD	FIRE STATION #5			X	
2295 ELM AVE	FIRE STATION #7			X	
5365 E 2ND ST	FIRE STATION #8	X		X	
3917 LONG BEACH BLVD	FIRE STATION #9			X	
PIER F, BERTH 202	FIRE BOAT STATION #15	X	X	X	
2241 ARGONNE AVE	FIRE STATION #17			X	
3361 PALO VERDE AVE	FIRE STATION #18			X	
6340 ATHON ST	FIRE STATION #22			X	
611 PIER T AVE	FIRE STATION #24		X	X	
237 MAGNOLIA AVE	FIRE STATION #1			X	
1222 DAISY AVE	FIRE STATION #3			X	
2990 REDONDO AVE	ECOC			X	
5580 CHERRY AVE	TELECOMMUNICATIONS FACILITY			X	
100 N. Long Beach Blvd.	SOUTH POLICE DIVISION			X	
3501 Lakewood Blvd.	LONG BEACH POLICE DEPT. FIELD SUPPORT			X	
3440 California Ave.	VERIZON			X	
5077 Lew Davis Street	VERIZON			X	
3605 E. Spring St.	FED EX			X	



**Table 4-2: Critical Essential Facilities Vulnerable to Natural Hazards**

ADDRESS	NAME	FLOOD	TSUNAMI	EQ	EM
1050 Linden Ave, Box 887	ST. MARY MEDICAL CENTER (TRAUMA CENTER)			X	
2776 Pacific Avenue	PACIFIC HOSPITAL OF LONG BEACH			X	
100 East Wardlow Road	HARBOR VIEW HOSPITAL			X	
1200 Pier E Street (POLB)	CALIFORNIA UNITED TERMINAL		X	X	
231 Windsor Way (POLB)	CARNIVAL CRUISE LINES		X	X	
320 Golden Shore Drive (POLB)	CATALINA EXPRESS - CATALINA LANDING			X	
301 Hanjin Road (POLB)	HANJIN SHIPPING	X		X	
1281 Pier J Avenue (POLB)	INTERNATIONAL TRANSPORTATION SERVICE, INC.		X	X	
1259 Pier F Avenue (POLB)	JACOBSEN PILOT SERVICE, INC.		X	X	
1171 Pier F Avenue (POLB)	LONG BEACH CONTAINER TERMINAL		X	X	
1521 Pier C Street (POLB)	MATSON TERMINAL	X		X	
1521 Pier J Avenue (POLB)	PACIFIC CONTAINER TERMINAL		X	X	
925 Harbor Plaza (POLB)	PORT OF LONG BEACH ADMINISTRATION BLDG.		X	X	
2700 Nimitz Road (POLB)	SEA LAUNCH		X	X	
2980 Nimitz Road, Pier T (POLB)	U.S. DEPARTMENT OF TRANSPORTATION		X	X	
4100 East Donald Douglas Drive	LONG BEACH TERMINAL/DAUGHERTY FIELD			X	
2401 E. Wardlow	BOEING FLIGHT SECURITY OPS, C-17			X	
5001 Airport Plaza Drive, Suite 1	FEDERAL EXPRESS (LOADING CENTER)			X	
4150 Donald Douglas Drive	GULFSTREAM AEROSPACE CORPORATION			X	