City of La Habra Heights

Natural Hazards Mitigation Plan

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Prepares under contract with

Emergency Planning Consultants
San Diego, California
Carolyn J. Harshman, President

Special Recognition

The Disaster Management Area Coordinators (DMAC) of Los Angeles County prepared planning guidance materials that were utilized by the City of La Habra Heights in preparing this Natural Hazards Mitigation Plan. The City extends special recognition to DMAC Executive Director Michael Martinet for his editing contributions to the Hazard-Specific Sections. The DMAC materials were based on the Mitigation Plan from Clackamas County, Oregon. The City is grateful to DMAC and the Clackamas County Natural Hazards Mitigation Committee for their contributions to this project.

Special Thanks
Hazard Mitigation Planning Team:
City of La Habra Heights
- John F. Hendrickson, City Manager
- Bruce Douglas, Mayor Pro-Tem
- Lara Orchanian, Senior Management Analyst
- Sandra Massa-Lavitt, Community Development Director
- Barbara Doppieri, Planning Technician
- Patrick Lang, Deputy City Engineer
- John J. Nielsen, Fire Chief
- Jim Powderly, Fire Marshal

County of Los Angeles
- William Hernandez, Field Supervisor
- Gary Jenkins, Road Maintenance Supervisor

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La Habra Heights City Council:
- Ed Borrowe, Mayor
- Bruce Douglas, Mayor Pro-Tem
- Tela Millsap, Councilmember
- Fred Klein, Councilmember
- Stan Carroll, Councilmember

La Habra Heights City Manager:
- John F. Hendrickson

Mapping
Other than Internet-sourced maps, the City of La Habra Heights provided all of the maps included in this plan.

Consulting Services
Project Management and Planning Services for this project were provided under contract with Emergency Planning Consultants -

- Project Management Services:	Carolyn J. Harshman, President
- Planning Services:	Carolyn J. Harshman, President
	Timothy W. Harshman, Intern

List of Natural Hazards Mitigation Plan Tables, Maps, and Photos

Note: The maps in this plan were provided by the City of La Habra Heights or were acquired from public Internet sources. Care was taken in the creation of these maps, but they are provided "as is". The City of La Habra Heights cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these products (the maps). Although information from land surveys may have been used in the creation of these products, in no way does this product represent or constitute a land survey. Users are cautioned to field verify information on this product before making any decisions.

City of La Habra Heights Natural Hazards Mitigation Plan

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Executive Summary: Hazard Mitigation Action Plan

City of La Habra Heights

The City of La Habra Heights Natural Hazards Mitigation Plan includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The mitigation plan provides a list of activities that may assist City of La Habra Heights in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for earthquakes, wildfires, and flooding.

How is the Plan Organized?

The Mitigation Plan contains a Mitigation Actions Matrix, background on the purpose and methodology used to develop the mitigation plan, a profile of City of La Habra Heights, sections on two natural hazards that occur within the City, and a number of appendices. All of the sections are described in detail in Section 1, Introduction.

Who Participated in Developing the Plan?

The City of La Habra Heights Natural Hazards Mitigation Plan is the result of a collaborative planning effort between City of La Habra Heights, Los Angeles County Public Works and Sheriff's Departments, citizens, public agencies, non-profit organizations, the private sector, and regional and state organizations. Public participation played a key role in development of goals and action items. Interviews were conducted with stakeholders across the City, and public outreach activities were conducted to include City of La Habra Heights residents in plan development. A project Planning Team guided the process of developing the plan.

The Planning Team was comprised of the following individuals:

City of La Habra Heights	John Hendrickson, City Manager
	Bruce Douglas, Mayor Pro-Tem
	Lara Orchanian, Senior Management Analyst, City Manager's Office
	John J. Nielsen, Fire Chief, Fire Department
	Jim Powderly, Fire Marshall, Fire Department
	Sandra Massa-Lavitt, Community Development Director, Planning/Building Department
	Barbara Doppieri, Planning Technician, Planning/Building Department
County of Los Angeles	Patrick Lang, Deputy City Engineer, Public Works Department
	William Hernandez, Field Supervisor, Public Works Department
	Gary Jenkins, Road Maintenance Supervisor, Public Works Department
Emergency Planning Consultants	Carolyn J. Harshman, President

What is the Plan Mission?

The mission of the City of La Habra Heights Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the City towards building a Disaster Resistant Community.

What are the Plan Goals?

The plan goals describe the overall direction that City of La Habra Heights agencies, organizations, and citizens can take to work toward mitigating risk from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the Mitigation Actions Matrix.

Protect Life and Property

Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.

Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.

Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

Public Awareness

Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.

Provide information on tools; partnership opportunities, and funding resources to assist in implementing mitigation activities.

Natural Systems

Balance natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.

Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

Partnerships and Implementation

Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.

Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

Emergency Services

Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

How are the Action Items Organized?

The action items are a listing of activities in which City agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation (see Executive Summary, Attachment 1: Mitigation Actions Matrix).

The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan. Data collection and research and the public participation process resulted in the development of these action items (see Appendix B: Public Participation). The Matrix includes the following information for each action item:

Priority. The City has prioritized the Action Items in their order of priority with the High rating being something the City must do immediately, Medium is something while extremely important will be done as time and budget allows, Low priority is something that needs to be done but will be done on a volunteer basis or low priority basis.

Funding Source. The actions items will be funded through a variety of sources, possibly including: operating budget/general fund, development fees, Community Development Block Grant (CDBG), Hazard Mitigation Grant Program (HMGP), other Grants, private funding, Capital Improvement Program (CIP) and other funding opportunities including tax dollars.

Cost Benefit. The City has looked at the Action Items in the Mitigation Action Matrix and evaluated each item based on the cost of implementation verses the benefit to the community. Staff has rated these items as High, Medium or Low. With high being the most important action items that affects the Community the most. Medium while important to the Community will not necessarily affect the residents on a daily basis. Low is also important to the Community, but the Community will gain the smallest benefits from these action itmes.

Coordinating Organization. The Mitigation Actions Matrix assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – some are positions, others departments, and others Committees. No matter, the primary responsibility for implementing the action items falls to the entity shown as the "Coordinating Organization".

The coordinating organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

Timeline. Action items include both short and long-term activities. Each action item includes an estimate of the timeline for implementation.

Plan Goals Addressed. The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins. The plan goals are organized into the following five areas:

Protect Life and Property
Public Awareness
Natural Systems
Partnerships and Implementation
Emergency Services

How Will the Plan be Implemented, Monitored, and Evaluated?

The Plan Maintenance Section (Section 2) of this document details the formal process that will ensure that the City of La Habra Heights 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 La Habra Heights 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 & Safety Codes.

Plan Adoption

Adoption of the Natural Hazards Mitigation Plan by the local jurisdiction's governing body is one of the prime requirements for approval of the plan. Once the plan is completed, the City Council will be responsible for adopting the City of La Habra Heights Natural Hazards Mitigation Plan. The local agency governing body has the responsibility and authority to

promote sound public policy regarding natural hazards. The City Council will periodically need to re-adopt the plan as it is revised to meet changes in the natural hazard risks and exposures in the community. The approved Natural Hazards Mitigation Plan will be significant in the future growth and development of the community.

Coordinating Body

The City's existing Development Review Team will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Council (or City Manager) will assign representatives from City agencies, including, but not limited to, the current Planning Team members.

Convener

The City Council will adopt the City of La Habra Heights Natural Hazards Mitigation Plan and the Development Review Team will take responsibility for plan implementation. The City Manager will serve as a convener to facilitate the Development Review Team meetings, and will assign tasks such as updating and presenting the Plan to the members of the Review Team. Plan implementation and evaluation will be a shared responsibility among all of the Review Team members.

Implementation through Existing Programs

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

Economic Analysis of Mitigation Projects

The Federal Emergency Management Agency's approaches to identify costs and benefits associated with natural hazard mitigation strategies 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.

Formal Review Process

The City of La Habra Heights Natural Hazards Mitigation Plan will be evaluated 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 evaluation process includes a firm schedule and timeline, and identifies the local agencies and organizations participating in plan evaluation. The convener will be responsible for contacting the Review Team members and organizing the annual meeting. Team members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

Continued Public Involvement

City of La Habra Heights is dedicated to involving the public directly in the continual review and updates of the Natural Hazards Mitigation Plan. Copies of the Plan will be catalogued and made available at City Hall. The existence and location of these copies will be publicized in City newsletters. The Plan also includes the address and the phone number of the City Planning/Building Department, responsible for keeping track of public comments on the Plan.

Section 1 - Introduction

City of La Habra Heights

Throughout history, the residents of City of La Habra Heights have dealt with the various natural hazards affecting their area. Photos, journal entries, and newspapers from the 1800's show that the residents of the area dealt with earthquakes, wildfires and flooding.

Although 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 continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced.

The City of La Habra Heights is located in the southeastern portion of Los Angeles County, and offers the benefits of living in a Mediterranean type of climate. The City is located within the South Coast Air Basin. The basin's climate is semi-arid and characterized by moist, mild winters and hot, dry summers accompanied by sea breezes (Source: General Plan 7-3). The views of green hills and generous open spaces filled with trees, shrubs, grasslands, and thriving wildlife stand in sharp contrast to the dense suburban development within the neighboring cities (Source: General Plan 2-9). However, the potential impacts of natural hazards associated with the terrain make the environment and population vulnerable to natural disasters.

La Habra Heights was designed as large estates where avocado groves, orange groves and other fruit trees were prolific. The original Haas Avocado was propagated on our own West Road. The City has many prolific groves still in the City including Banana, Mango, Papaya and Macadamia Nuts.

The City is subject to earthquakes and wildfires. 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.

City of La Habra Heights most recently experienced large-scale destruction in 1987 during the Whittier Earthquake. The damage to City of La Habra Heights totaled $680,000 to public facilities. There have been many small fires over the years, but do to the prompt and professional attention of the Fire Department they have made quick work in putting out the fires.

Why Develop a Mitigation Plan?

As the costs of damages from natural disasters continue 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.

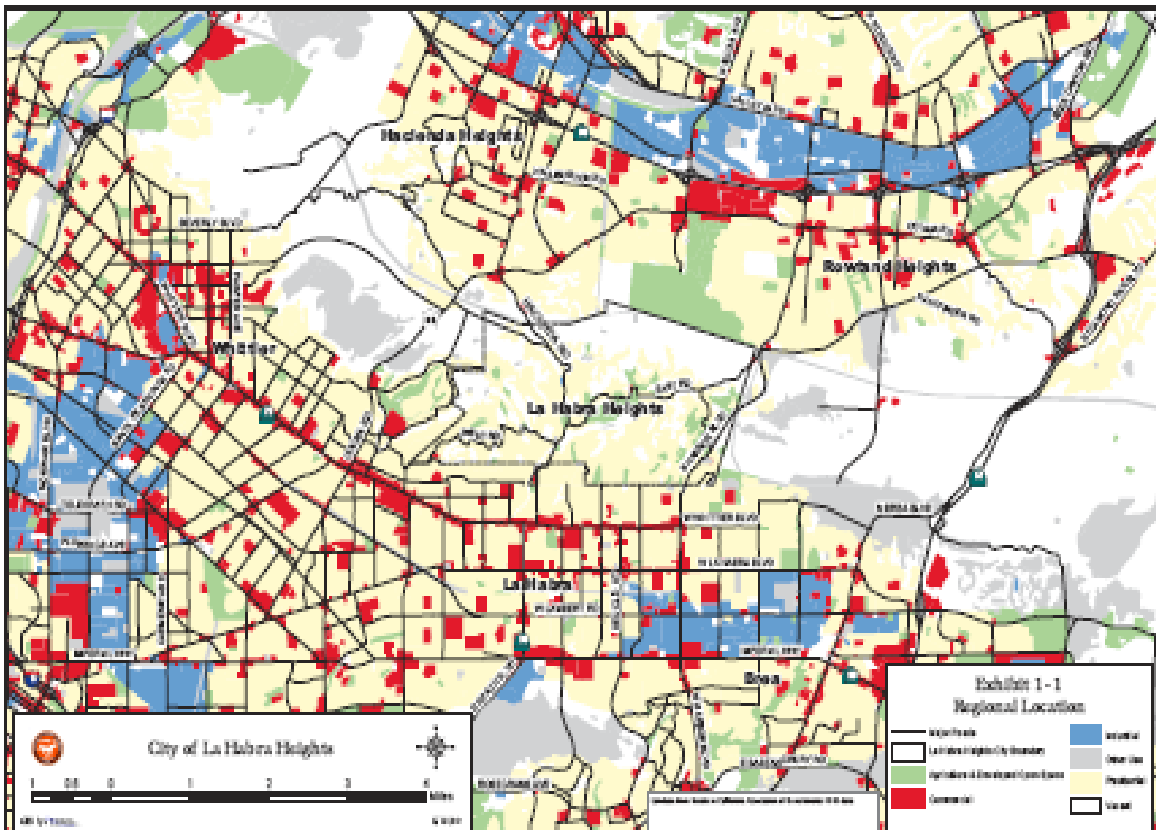
The resources and information within the Mitigation Plan:

(1) establish a basis for coordination and collaboration among agencies and the public in City of La Habra Heights;
(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 and the City's General Plan.

Whom Does the Mitigation Plan Affect?

The City of La Habra Heights Natural Hazards Mitigation Plan affects the entire city. Map 1-1 shows major roads in the City of La Habra Heights. 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 La Habra Heights (Source: City of La Habra Heights General Plan)

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

Plan Methodology

Information in the Mitigation Plan is based on research from a variety of sources. Staff from the City of La Habra Heights 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 Planning Team convened four times to guide development of the Mitigation Plan. The Team played an integral role in developing the mission, goals, and action items for the Mitigation Plan. The Team consisted of the following representatives:

City of La Habra Heights	John Hendrickson, City Manager
	Bruce Douglas, Mayor Pro-Tem
	Lara Orchanian, Senior Management Analyst, City Manager's Office
	John J. Nielsen, Fire Chief, Fire Department
	Jim Powderly, Fire Marshal, Fire Department
	Sandra Massa-Lavitt, Community Development Director, Planning/Building Department
	Barbara Doppieri, Planning Technician, Planning/Building Department
	Patrick Lang, Deputy City Engineer, Public Works Department
County of Los Angeles	William Hernandez, Field Supervisor, Public Works Department
	Gary Jenkins, Road Maintenance Supervisor, Public Works Department
Emergency Planning Consultants	Carolyn J. Harshman, President

Stakeholder Interviews:

City staff distributed copies of the Plan to 7 agencies and specialists from organizations interested in natural hazards planning. The agencies that contributed to the Plan process were: 1) City Staff, 2) L.A. County Sheriff's Department and 3) L.A. County Public Works. The City also distributed a survey to residents assessing the level of concern over

the various natural hazards. The data and support gained from the review process was very valuable to the overall planning effort. A complete listing of all Plan reviewers, number of surveys received from residents, sample survey and the survey results are 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, distribution of a natural hazards survey, and the City Council public hearings which are televised. In addition, the makeup of a Planning Team insured a constant exchange of data and input from outside organizations.

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) and the State of California Natural Hazards Mitigation Plan Guidance.

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 La Habra Heights staff collected data and compiled research on three hazards: earthquakes, wildfires and flooding. Research materials came from the City General Plan, the City's Threat Assessment contained in the Multi-Hazard Functional Plan, and federal, state and county agencies including OES and CDF. The City of La Habra Heights staff conducted research by referencing historical local newspapers, interviewing long time residents, long time City of La Habra Heights employees and locating pertinent information in historical documents. City staff identified current mitigation activities, resources and programs, and potential action items from research materials and stakeholder interviews.

Public Input

The City of La Habra Heights encouraged public participation and input in the Natural Hazards Mitigation Plan by posting its activities in the media. In addition, the City distributed surveys on natural hazards via the City Newsletter. During the review period for the Draft Plan, copies of the Plan were made available to interested citizens. Citizens were encouraged to review public copies of the Plan Draft and participate in the City Council public meeting that was held on October 14, 2004. Following is a summary of the public comments gathered during the City Council meeting:

During the meeting that was held on October 14, 2004, no one spoke at the public hearing. However, Mayor Pro-Tem Douglas noted that the residents are very aware of these hazards and hear about them and how we can mitigate them. Survey results and a sample survey are located in Appendix B –4.

The resources and information cited in the mitigation plan provide a strong local perspective and help identify strategies and activities to make the City 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 La Habra Heights.

The mitigation plan is organized into three parts. Part I contains an executive summary, Mitigation Actions Matrix, introduction, and plan maintenance. Part II contains the community 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 Hazard Mitigation 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 La Habra Heights.

Section 2: Plan Maintenance

The Plan Maintenance section provides information on plan implementation, monitoring and evaluation.

Part II: Hazard Analysis

Section 3: Community Profile

The Community Profile presents the history, geography, demographics, and socioeconomics of the City of La Habra Heights. 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 La Habra Heights.

Sections 5-6: Hazard-Specific Sections

Hazard-Specific Sections on the two 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: Wildfires
Section 7: Flooding Hazards

Each of the hazard-specific sections 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 La Habra Heights 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 La Habra Heights 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 La Habra Heights Natural Hazards Mitigation Plan.

Appendix E: Glossary

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

Section 2 - Plan Maintenance

City of La Habra Heights

The Plan Maintenance Section of this document 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 La Habra Heights 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 reviewed, the City Manager 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. Once FEMA has given a tentative approval of the plan, City staff may place the LHMP on City Council Agenda for adoption by resolution.

Coordinating Body

The City's existing Development Review Team will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The City Council (or other authority) will assign representatives from City agencies, including, but not limited to, the current Hazard Mitigation Planning Team members. The City's Development Review Team consists of members from the following City agencies:

City of La Habra Heights	Sandra Massa-Lavitt, Community Development Director, Planning/Building Department
	Barbara Doppieri, Planning Technician, Planning/Building Department
	Jim Powderly, Fire Marshal, Fire Department
	Patrick Lang, Deputy City Engineer, Public Works Department
	Elie Farah, P.E., Plan Checker
	Craig Melicher, City Engineer,

The Development Review Team meets on a weekly basis, however it is expected that the Team will discuss the Plan no less than quarterly. The meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan.

Convener

The City Council will adopt the Natural Hazards Mitigation Plan, and the Development Review Team will take responsibility for plan implementation. The City Manager (or designee) will serve as a convener to facilitate the Team meetings, and will assign tasks such as updating and presenting the Plan to the members of the Team. Plan implementation and evaluation will be a shared responsibility among all of the Team members.

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 Development Review Team will work with other agencies at the state level to review, develop and ensure Building & Safety Codes that are adequate to mitigate or present 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 Team 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.

Within six months of formal adoption of the Mitigation Plan, the recommendations listed above will be incorporated into the process of existing planning mechanisms at the City level. The meetings of the Development Review Team will provide an opportunity for Team members to report back on the progress made on the integration of mitigation planning elements into the City's planning documents and procedures.

Economic Analysis of Mitigation Projects

At the Hazard Mitigation Advisory Committee's first implementation meeting, the Committee will refer to the STAPLEE Tool (Plan Maintenance – Attachment 1) to guide the implementation of the Mitigation Plan. At that time, appropriate funding sources will be identified for the "top ten" priority action items.

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 Development Review Team 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 evaluated 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 evaluation process includes a firm schedule and timeline, and identifies the local agencies and organizations participating in plan evaluation. The convener or designee will be responsible for contacting the Development Review Team members and organizing the annual meeting.

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

The Team 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 Team 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 Team members. The designated Team members will have three months to make appropriate changes to the Plan before submitting it to the Team members, and presenting it to the City Council (or other authority). The Team 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 Development Review Team members are 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 departments in the City. The existence and location of these copies will be publicized in the quarterly City newsletter that reaches every household in the City. The plan also includes the address and the phone number of the Administrative Offices of the City, responsible for keeping track of public comments on the Plan.

A public meeting will also be held after each annual evaluation or as deemed necessary by the Development Review Team. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. City Administration 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.

Plan Maintenance – Attachment 1: Simplified STAPLEE Worksheet

Simplified STAPLEE Worksheet – Prioritizing Mitigation Actions (Social, Technical, Administrative, Political, Legal, Economic, Environmental)

1. Fill in the goal. Use a separate worksheet for each goal. The considerations under each criterion are suggested ones to use; you can revise these to reflect your own considerations.

2. Fill in the action items associated with the goal.

3. **Scoring:** For each action item, indicate a plus (+) for favorable, and a negative (-) for less favorable.

When you complete the scoring, add up the positives to establish your priorities. For STAPLEE categories that do not apply, fill in N/A for not applicable. Only leave a blank if you do not know an answer – seek the input of an expert.

Goal: _____

STAPLEE Category	**S (Social)**		**T (Technical)**			**A (Administrative)**			**P (Political)**		
Categories (right) **Action Items (below)**	**Community Acceptance**	**Effect on Segment of Population**	**Technical Feasibility**	**Long-term Solution**	**Secondary Impacts**	**Staffing**	**Funding Allocated**	**Maintenance/ Operations**	**Political Support**	**Local Champion**	**Public Support**
1.											
2.											
3.											
4.											
5.											
6.											

STAPLEE Categories	L (Legal)			E (Economic)				E (Environmental)				
Categories (right) Action Items (below)	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
1.												
2.												
3.												
4.												
5.												
6.												

Section 3 – Community Profile

City of La Habra Heights

Why Plan for Natural Hazards in City of La Habra Heights?

Natural hazards impact citizens, property, the environment, and the economy of City of La Habra Heights. Earthquakes and wildfires have exposed City of La Habra Heights residents and businesses 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 La Habra Heights has an area of 6.2 square miles and is located in the southeast section of Los Angeles County. It is located approximately 25 miles east of the City of Los Angeles. The City is bordered on the south by the City of La Habra and by the City of Whittier, on the east and north by unincorporated Los Angeles County areas (Rowland Heights and Hacienda Heights), and on the west by the City of Whittier (Source: General Plan 2-9).

The City has no hospitals, no facilities that produce hazardous materials, no major freeways or major transportation corridors, no public schools, and one private school, three private pre-schools, and one adult day care center (Source: Threat Summary 1-32). Over 20% of the City's land area is committed to permanent, public natural open space. Another 20% of the City's land area is committed to recreational open space (Source: General Plan 1-1). In addition to the high proportion of developed lots and large areas of dedicated open space, earthquake fault lines and very steep slopes in many areas of the City preclude new construction.

As buildable land becomes scarce within La Habra Heights, steep terrain on remaining lots creates temptation to employ excessive grading techniques including large retaining walls, in order to provide pads for housing sites and accessory residential uses (Source: General Plan 2-3).

Elevations in the City range from a high of 1400 feet to a low of 400 feet (Source: General Plan Map 1-2).

Community Profile

The City of La Habra Heights is rich in history. The European presence in the area was marked with the establishment of the local missions in San Fernando, San Gabriel and San Juan Capistrano. A land grant from the government of Mexico was obtained for the area in October of 1839 called the "Rancho Canada de la Habra". The area that was to become La Habra Heights was first developed by Edwin Hart in the 1920's. The City of La Habra Heights was incorporated in 1978 so that the residents could control their destiny and preserve the minimum one-acre zoning and the rural character (Source: General Plan 1-2).

The City's narrow, winding roads, without conventional curbs, gutters or sidewalks, are a point of pride to La Habra Heights' residents (Source: General Plan 4-1) For historical reasons, sufficient north-south arterials within the region have not been developed. The main roads are Hacienda Road and Harbor Boulevard (run North and South) (Source: General Plan 4-2, 10). The Puente Hills and the roadway corridors such as Hacienda Road, East Road, West Road and Harbor Boulevard provide scenic resources for La Habra Heights (Source: General Plan 3-2).

Major Rivers

The nearest major river is the San Gabriel River. The City of La Habra Heights has no known areas of riverine flooding (Source: General Plan 5-4).

Climate

The City is located within the South Coast Air Basin. The basin's climate is semi-arid and characterized by moist, mild winters and hot, dry summers accompanied by sea breezes. Wind patterns vary seasonally with westerly winds predominant in the summer months and northeasterly winds in the winter months. Local Southern California weather is affected by winter storms moving along the Pacific Coast, warm tropical air masses, and hot dry Santa Ana winds caused by high-pressure systems in the Great Basin. The daily temperatures may range from 40 to 90 degrees F with an average annual temperature of 64.4 degrees (Source: General Plan 7-3).

Rainfall in the City averages 15 to 18 inches of rain per year with most of this precipitation occurring during the winter months (Source: General Plan 7-3).

Furthermore, actual rainfall in Southern California tends to fall in large amounts during sporadic and often heavy storms rather than consistently over storms at somewhat regular intervals. In short, rainfall in Southern California might be characterized as feast or famine within a single year. Because the metropolitan basin is largely built out, water originating in higher elevation communities can have a sudden impact on adjoining communities that have a lower elevation.

Minerals and Soils

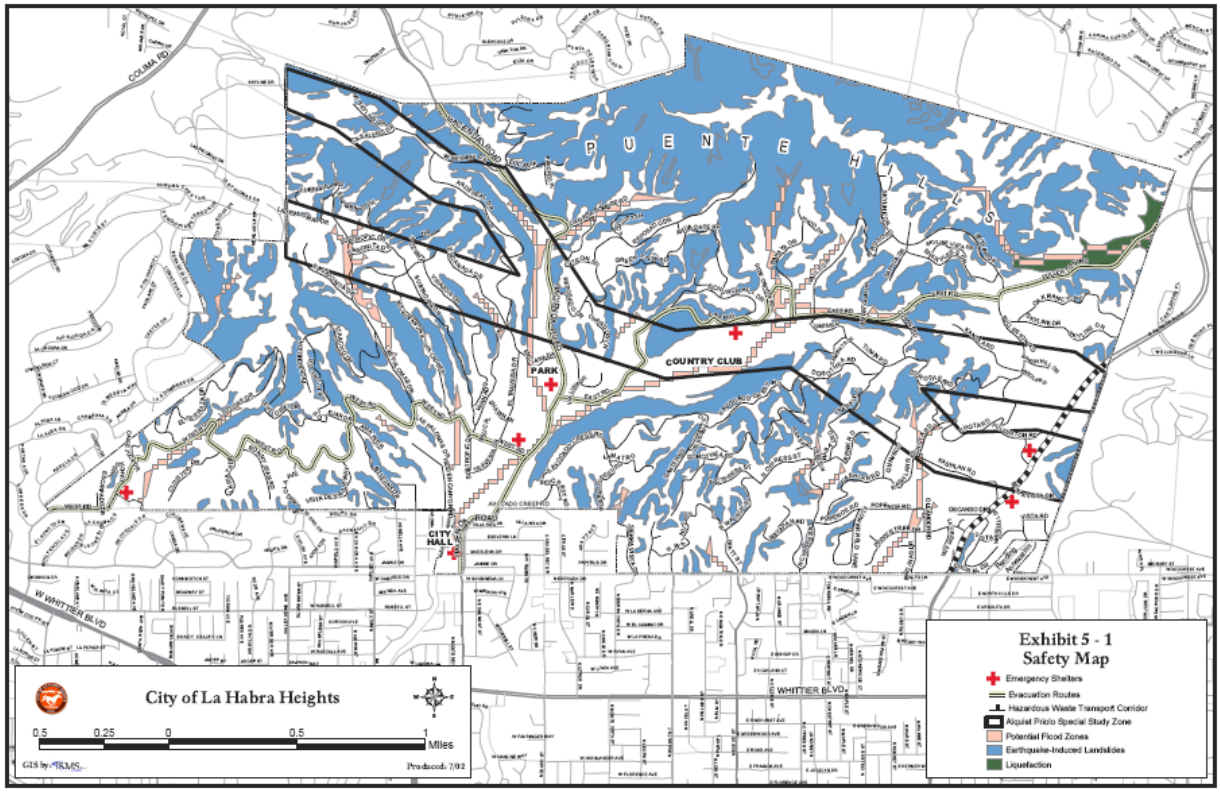
The characteristics of the minerals and soils present in City of La Habra Heights indicate the potential types of hazards that may occur. Rock hardness and soil characteristics can

determine whether or not an area will be prone to geologic hazards such as earthquakes, liquefaction and landslides. While there may be some identified landslide areas in La Habra Heights, there has been little noticeable damage to date. More information on landslides is presented in Section 5: Earthquake.

The surface material includes unconsolidated, fine-grained deposits of silt, sand, gravel and sea bed deposits. Sandy silt and silt containing clay are moderately dense and firm, and may be prone to liquefaction, an earthquake related hazard. Basaltic lava consists mainly of weathered and non-weathered, dense, fine-grained basalt. Though the characteristics of this lava may offer solid foundation support, landslides are common in many of these areas where weathered residual soil overlies the basalt. Understanding the geologic characteristics of City of La Habra Heights is an important step in hazard mitigation and avoiding at-risk development.

Other Significant Geologic Features

City of La Habra Heights, 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 La Habra Heights are the:

San Andreas
San Jacinto
Whittier

Elsinore
Newport Inglewood
Puente Hills

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 that 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[1]. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the Long Beach earthquake of 1933, the San Fernando Earthquake of 1971, 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 La Habra Heights has liquefaction and earthquake-induced landslide zones in portions of the City as shown on USGS Seismic Hazard Maps (see Section 5: Earthquake).

Population and Demographics

City of La Habra Heights has a population of about 5,712 (Source: Census 2000) in an area of 6.39 square miles.

As the number of people living in La Habra Heights increases, the community's exposure also increases, changing how we prepare for and respond to natural hazards. For example, more people living on the urban fringe can increase risk of fire. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage. But an urban/wildland fire is not the only exposure to the City of La Habra Heights. 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.

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,

[1] Peacock, Simon M., http://aamc.geo.lsa.umich.edu/eduQuakes/EQpredLab/EQprediction.peacock.html

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.[2]

According the 2000 census figures, the demographic make up of the city is as follows (Source: Census 2000):

	City of La Habra Heights
Caucasian	72.4%
Hispanic	13.6%
African American	1.2%
Asian	18.4%
Native American	0.3%

Although the percentage of poverty in City of La Habra Heights (3.4%) is about 30% that of the state's (13.7%), 2.7% of the people living in poverty in City of La Habra Heights are under 18 years old, and 1.9% are over 65 (Source: Census 2000).

Vulnerable populations, including seniors, disabled citizens, 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 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.

[2] www.fema.gov

The City of La Habra Heights General Plan adopted in 2004 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.

Housing and Community Development

In the City of La Habra Heights the demand for housing is slowly gaining on the available supply, and the recent low interest rates have further fueled a pent up demand. Currently there are 1,951 housing units in the City of La Habra Heights. There are 1,864 single family homes (98.4% of available housing units) currently available. As for multiple unit homes, they account for 1.6% of the total existing housing units at 31 units. There are 1,777 owner occupied units in the City of La Habra Heights and 110 renter occupied units. Approximately 94.2% of the units are owned in La Habra Heights and 5.8% of the units are being rented.

	City of La Habra Heights
Development Type (Source: General Plan)	
Residential	68%
Open Space	20%
Public Facilities	6
Housing Type (Source: Census 2000)	
Single-Family	98.4%
Multi-Residential (20+ units)	0%
Housing Statistics (Source: Census 2000)	
Total Available Housing Units	1,951
Owner-Occupied Housing	94.2%
Average Household Size	3.03

Based on existing land use designations and development, the City is over 90% developed. (Source: General Plan 1-2)

The average home value in the City of La Habra Heights is estimated at $464,300 (Source:

Census 2000).

Employment and Industry

The following table is based on data collected from the 2000 Census:

	City of La Habra Heights
Principal Employment Activities	
Management (professional and related occupations)	57.7%
Service Occupations	8.9%
Sales and Office Occupations	22.3%
Construction	7.4%
Production, Transportation, and Material Moving	3.0%
Major Industries	
Education, Health & Social Services	21.1%
Manufacturing	13.9%
Retail Trade	8.4%
Professional, Scientific, Management, Administrative	14.3%

Transportation and Commuting Patterns

Private automobiles are the dominant means of transportation in Southern California and in the City of La Habra Heights. The only scheduled mass transit services within the City are the school buses that serve the children of La Habra Heights. Dial-A-Ride, available only to the aged and disabled, and taxicabs offer some mobility (Source: General Plan 4-4).

According to the 2000 Census, the City has a population of 5,712 and the mean travel time to work for the residents of the City is 38.1 minutes.

The City is served by Interstates 5 to the south, 605 to the west, 57 to the east and the 60 to the north connecting the city to adjoining parts of Los Angeles County. The City of La Habra Heights has 42 miles of local roads.

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

Section 4 – Risk Assessment

City of La Habra Heights

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 three levels of a risk assessment are as follows:

1) Hazard Identification

The Planning Team considered a range of natural hazards facing the region including: Earthquakes, Flooding, Earth Movement, Windstorms, Wildfire, Tsunami, and Drought. The attached Ranking Your Hazards - Attachment 1 handout guided the Team in prioritizing the natural hazards with the highest probability of significantly impacting the City of La Habra Heights. The Team agreed that any hazards receiving a Team average score of "3" or higher would be included in the Natural Hazards Mitigation Plan. Utilizing the ranking technique, the Team identified: Earthquakes, Wildfires, and Flooding as the most prominent hazards facing the community.

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 La Habra Heights identified three major hazards that affect this geographic area. These hazards are – earthquakes, wildfires, and flooding - were identified through an extensive process that utilized input from the Planning Team. The geographic extent of each of the identified hazards has been identified by the City of La Habra Heights utilizing the maps contained in Sections 5: Earthquake Hazards, Section 6: Wildland/Urban Interface Fire Hazard, Section 7: Flooding Hazards and the MHFP Threat Assessment.

2) Profiling Hazard Events

The process describes 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-specific section.

Vulnerability: Location, Extent, and Probability*

Hazard	Location (Where)	Extent (How Big)	Probability (How Often)*
Earthquake	Entire project area	According to USGS, there is a 60% chance in the next 30 years of an earthquake measuring greater than 6.7 occurring in southern California.	Moderate
Wildfire	Northern portion of the project area	California CDF-FRAP wildfire rating is "Moderate"	Moderate
Urban Flooding	Las Palomas Drive El Cajonita Drive Benik Road Valle Drive Hacienda Boulevard	In severe weather conditions, these locations could be impacted by a combination of runoffs from blocked drainage systems and flooded sewerage/septic systems.	Low-Moderate
* Probability is defined as: Low = 1:500 years, Moderate = 1:100 years, High = 1:10 years			

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, including information on vulnerability to the identified hazards.

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.

Data was not available to make vulnerability determinations in terms of dollar losses. The Mitigation Actions Matrix (Executive Summary – Attachment 1) includes an action item to conduct such an assessment in the future.

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 City of La Habra Heights in the 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 City of La Habra Heights 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 section 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. Action items throughout the hazard sections provide recommendations to collect further data to map hazard locations and conduct hazard assessments.

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 two hazards profiled in the mitigation plan, including earthquakes and wildfires. The Federal criteria for risk assessment and information on how the City of La Habra Heights Natural Hazards Mitigation Plan meets those criteria is outlined in Table 4-1 below.

Table 4-1: Federal Criteria for Risk Assessment

Section 322 Plan Requirement	**How is this addressed?**
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

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: 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, critical facilities that, if damaged, could cause serious secondary impacts may also be considered "critical." A hazardous material facility is one example of this 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. The following table illustrates the critical and essential facilities serving the City of La Habra Heights:

Table 4-2: City of La Habra Heights Critical and Essential Facilities Vulnerable to Hazards

EQ	Wildfire	Flood	Facility	Address
X	X	X	Fire Station #1	1245 N. Hacienda Road La Habra Heights
X	X	X	Sheriff's Substation (trailer)	1245 N. Hacienda Road La Habra Heights
X	X	X	(Gymnasium)Designated Shelter	1885 N. Hacienda Road La Habra Heights
X	X	X	City Hall	1245 N. Hacienda Road La Habra Heights
X	X	X	City Roads (i.e., Hacienda, East, West and Fullerton)	Throughout the City 42 Miles
X	X	X	Radio Tower	16700 Skyline

The City has run a preliminary estimate on the value of these facilities. The Fire Station, Sheriff Substation and the City Hall facility we are estimating the value at $10,000,000.00. The Gymnasium at the Park we are estimating a value of $1,600,000.00. The Radio Tower for our Fire Department we are estimating a value of $2,000,000.00. The City Roads we are estimating a range of value, depending on the scope of damage from $9.2 Million to $213 Million.

Summary

The City of La Habra Heights is prone to earthquakes, fire and flooding. However, there are facilities such as: City Hall, Fire Station #1 and The Park that are not prone to flooding during a heavy rain season. We are prone to earthquakes since some fault lines run through our City. Due to the City's low density and geographic extent it is evident that during dry seasons, heat waves and severe winds the City is prone to fires. 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.

Risk Assessment - Attachment 1

Ranking Your Hazards

It is important to keep in mind that your rankings should be based on a hazard event that would overwhelm your jurisdiction's ability to respond effectively.

For each hazard listed assign a score. Place a number in the appropriate box.

Hazard Scoring	
1	An event of that magnitude is not likely to occur
2	There is a slight chance that an event of that magnitude will occur
3	It is possible that an event of that magnitude will occur
4	An event of that magnitude has occurred here in the past and is likely to occur again
5	There is a high probability that an event of that magnitude will occur

Identify any additional hazards for the jurisdiction at the end of the list labeled as "Other Hazard."

Hazard	***Score***
Earthquake	
Flooding	
Wildfire	
Windstorm	
Earth Movement (Landslide/Debris Flow)	
Tsunami	
Drought	
Other Hazard _____	
Other Hazard _____	
Other Hazard _____	
Other Hazard _____	
Other Hazard _____	
Other Hazard _____	

Early on during the planning process this worksheet was used to identify and determine the impacts of the natural disasters that may affect the City of La Habra Heights. Each planning team member was given a task to discuss potential scenarios as an example in order to rank the hazards listed above from high to low.

Section 5 – Earthquake Hazards

City of La Habra Heights

Why Are Earthquakes a Threat?

The most recent significant earthquake event affecting Southern California was the January 17th 1994 Northridge Earthquake. At 4:31 A.M. on Monday, January 17, a moderate but very damaging earthquake with a magnitude of 6.7 struck the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures.

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into the 10's of billions of dollars.

The October 1, 1987 the M6.0 Whittier Narrows Earthquake was felt throughout the City of La Habra Heights, resulting in nearly $700,000 in damages to City-owned public facilities. The total damages for the region was estimated at $522 million (2000 dollars).

57 people were killed and more than 1,500 people seriously injured. For days afterward, thousands of homes and businesses were without electricity; tens of thousands had no gas; and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. 66,500 buildings were inspected. Nearly 4,000 were severely damaged and over 11,000 were moderately damaged. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Extensive damage was caused by ground shaking, but earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion in large portions of Los Angeles County resulted in record economic losses.

Historical and geological records show that California has a long history of seismic events. Southern California is probably best known for the San Andreas Fault, a 400 mile long fault running from the Mexican border to a point offshore, west of San Francisco. "Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 130 year intervals on the southern San Andreas Fault. As the last large earthquake on the Southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades."[1]

But San Andreas is only one of dozens of known earthquake faults that crisscross Southern California. Some of the better known faults include the Newport-Inglewood, Whittier, Chatsworth, Elsinore, Hollywood, Los Alamitos, Puente Hills, and Palos Verdes faults. Beyond the known faults, there are a potentially large number of "blind" faults that underlie the surface of Southern California. One such blind fault was involved in the Whittier Narrows earthquake in October 1987.

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have

the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is relatively remote from the urban centers of Southern California.

For decades, partnerships have flourished between the USGS, Cal Tech, the California Geological Survey and universities to share research and educational efforts with Californians. Tremendous earthquake mapping and mitigation efforts have been made in California in the past two decades, and public awareness has risen remarkably during this time. Major federal, state, and local government agencies and private organizations support earthquake risk reduction, and have made significant contributions in reducing the adverse impacts of earthquakes. Despite the progress, the majority of California communities remain unprepared because there is a general lack of understanding regarding earthquake hazards among Californians.

La Habra Heights is located in the western Puente Hills, which was formed of seabed deposits uplifted and faulted over at least the last several hundred thousand years. The Whittier Fault traverses the entire City from east to west. The consequence of the geologic history is seen in the steep and, in many cases, landslide-susceptible slopes. Further, the proximity of the Whittier Fault provides energy sufficient to liquefy susceptible low-lying soils, trigger landslides or significantly damage structures. The surface geology is complicated by its geologic history, and soils susceptible to shrink-swell behavior or erosional sensitivity are common. These geologic conditions present numerous constraints to development. Unreinforced concrete or masonry structures are particularly susceptible to failure during earthquakes. Fortunately, an inventory of non-residential structures in the City reveals there are no unreinforced masonry structures.

The hillside areas that comprise most of La Habra Heights pose wildfire, landslide, erosion, flood, and debris flow hazards.

Table 5-1: Earthquake Events in the Southern California Region

Southern California Region Earthquakes with a Magnitude 5.0 or Greater			
1769	Los Angeles Basin	1916	Tejon Pass Region
1800	San Diego Region	1918	San Jacinto
1812	Wrightwood	1923	San Bernardino Region
1812	Santa Barbara Channel	1925	Santa Barbara
1827	Los Angeles Region	1933	Long Beach
1855	Los Angeles Region	1941	Carpenteria
1857	Great Fort Tejon Earthquake	1952	Kern County

1858	San Bernardino Region	1954	W. of Wheeler Ridge
1862	San Diego Region	1971	San Fernando
1892	San Jacinto or Elsinore Fault	1973	Point Mugu
1893	Pico Canyon	1986	North Palm Springs
1894	Lytle Creek Region	1987	Whittier Narrows
1894	E. of San Diego	1992	Landers
1899	Lytle Creek Region	1992	Big Bear
1899	San Jacinto and Hemet	1994	Northridge
1907	San Bernardino Region	1999	Hector Mine
1910	Glen Ivy Hot Springs		

Source:
http://geology.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fpasadena.wr.usgs.gov%2Finfo%2Fcahist_eqs.html

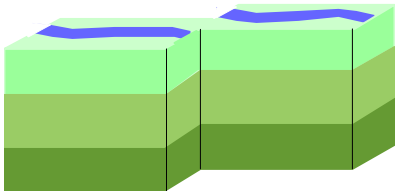
To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes is based on observations and felt reports, and is dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (7.9) and the Owens Valley in 1872 (7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two 7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because the occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

History of Earthquake Events in Southern California

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below three. No community in Southern California is beyond the reach of a damaging earthquake. Figure 5-1 describes the historical earthquake events that have affected Southern California.

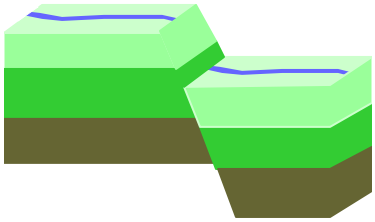
Figure 5-1: Causes and Characteristics of Earthquakes in Southern California

Earthquake Faults



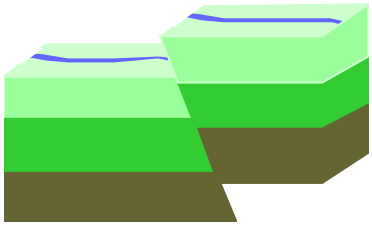
A fault is a fracture along between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.

Strike-slip



Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.

Dip-slip



Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault. Thrust faults have a reverse fault with a dip of 45 ° or less.

Dr. Kerry Sieh of Cal Tech has investigated the San Andreas Fault at Pallett Creek. "The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains unknown." [2] Damage from a great quake on the San Andreas would be widespread throughout Southern California.

Earthquake Related Hazards

Ground shaking, landslides, liquefaction, and amplification are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

Earthquake-Induced Landslides

Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities

necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

Within La Habra Heights most of our roads wrap around the edges of the mountains. During a major event there potentially could be major road failure or multiple failures due to a landslides taking the road with it, or a landslide dropping away from a road and leaving no base to support the road.

Liquefaction

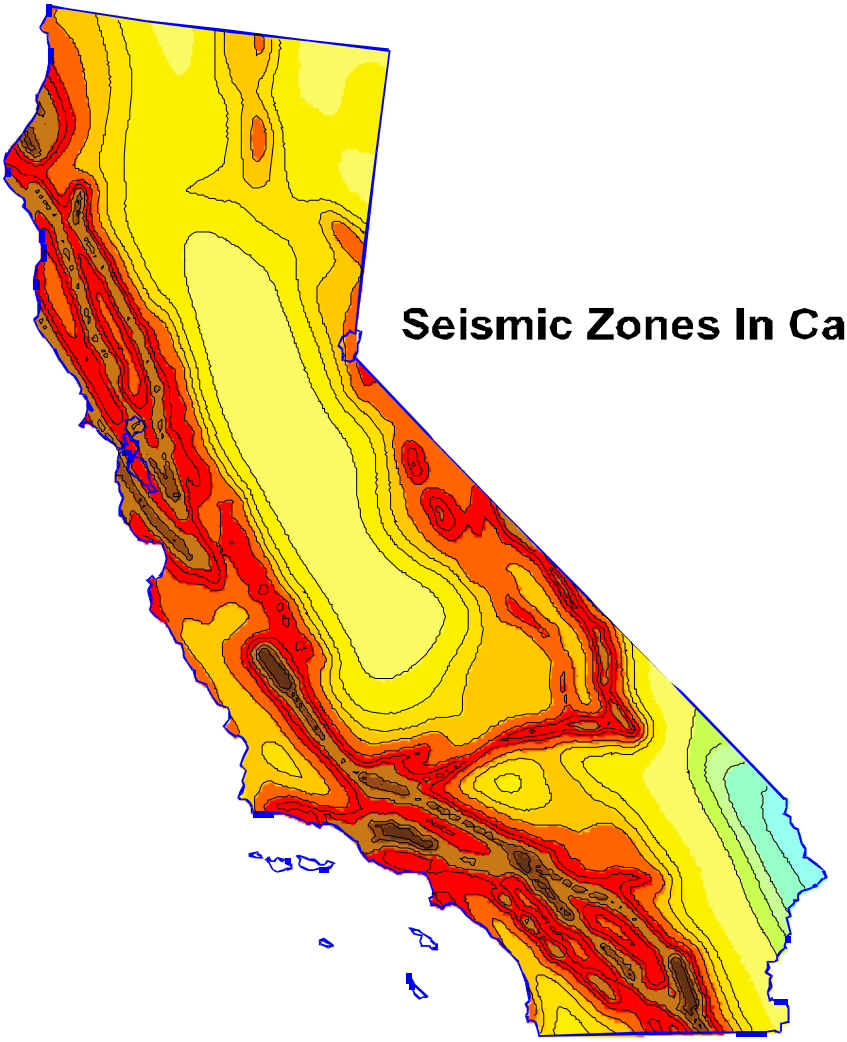
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

In the case of Liquefaction the City feels the greatest damage will be to foundations and chimneys. During the Whittier earthquake the City lost over 200 chimneys and many residential homes suffered foundation damage. Within our City LeFlore Canyon, Las Palomas Canyon, Subtropic Canyon, Encanada Canyon, Valle Drive potentially all could suffer liquefaction. According to the local septic contractors that work within the City, most of the seepage pits they drill are sandy soil. In addition with Occidental Oil drilling within our City, and pumping water back into the well to force the oil to the surface this could affect the water table. Failed septic systems and failed sewer lines rupturing will also compound the damages.

Amplification

Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk.[3] Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

Map 5-1: Seismic Zones in California



Seismic Zones In California

Darker Shaded Areas indicate Greater Potential Shaking

Source: USGS Website

Earthquake Hazard Assessment

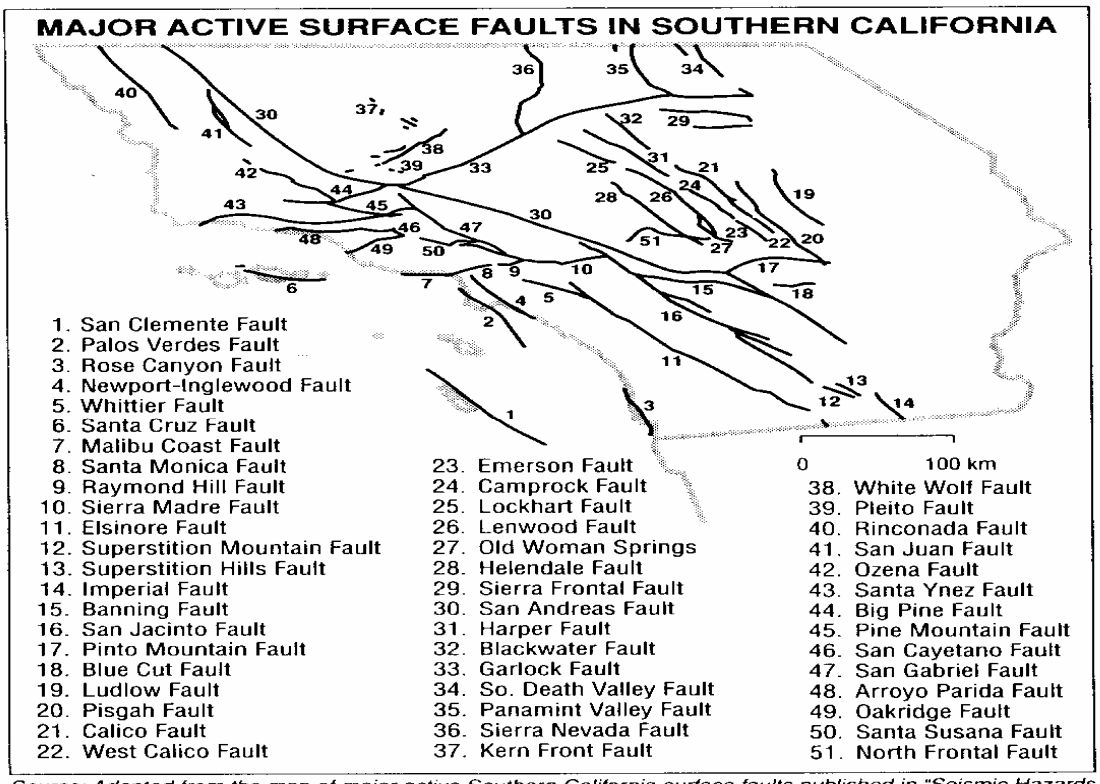
Hazard Identification

In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, Cal Tech, the California Geological Survey as well as a number of universities and private foundations.

These organizations, in partnership with other state and federal agencies, have undertaken a rigorous program in California to identify seismic hazards and risks including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. Seismic hazard maps have been published and are available for many communities in California through the State Division of Mines and Geology. Map 5-2 illustrates the known earthquake faults in Southern California.

The fault that runs through La Habra Heights was as a result of the 1987 Whittier earthquake. The fault runs west to east. As the fault come into the City from Whittier it actually is two faults. They travel parallel with each other through one third of the City. In the middle of the City the two faults appear to join together. They continue for another one third of the City where over a dry lake bed they split apart. They leave the City on the west side as two faults. As they exit the City they enter an unincorporated area of Los Angeles County that is a former old site of approximately 2,700 acres. In addition there are 95 other potentially active faults in the Los Angeles Region that could impact La Habra Heights.

Map 5-2: Major Active Surface Faults in Southern California



Source: Adapted from the map of major active Southern California surface faults published in "Seismic Hazards in Southern California: Probable Earthquakes, 1994-2024," Southern California Earthquake Center.

In California, each earthquake is followed by revisions and improvements in the Building Codes. The 1933 Long Beach resulted in the Field Act, affecting school construction. The 1971 Sylmar Earthquake brought another set of increased structural standards. Similar re-evaluations occurred after the 1989 Loma Prieta and 1994 Northridge Earthquakes. These code changes have resulted in stronger and more earthquake resistant structures.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Surface rupture is the most easily avoided seismic hazard.[4]

La Habra Heights using the Alquist-Priolo Earthquake Fault Zone watches development projects very closely if they are in a Fault Zone. As we adopt the Los Angeles County Building Code as our Building Code there are specific standards within the code that deal with development within a fault zone. Deeper footings, special strapping, stronger structures and seismic shut off valves for gas meters all of these tools are used to increase safety within the fault zone.

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.[5] The State Department of Conservation operates the Seismic Mapping Program for California. Extensive information is available at their website:
http://gmw.consrv.ca.gov/shmp/index.htm

Hazards within La Habra Heights include surface rupture, ground failure, slope failure, liquefaction, ground motion, structural collapse and infrastructure damage. The unique beauty and character of La Habra Heights result largely from its winding roads, natural landform, and densely vegetated hills and valleys. The hills and valleys, in turn, result from the underlying tectonic activity. The extent of the risk potentially will affect every property within the City.

Vulnerability Assessment

The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. In La Habra Heights risk from earthquake damage are large stocks of old buildings, water, and natural gas pipelines; petroleum pipelines; and other critical facilities and private property located within the City. The relative or secondary earthquake hazards, which are liquefaction, ground shaking, amplification, and earthquake-induced landslides, can be just as devastating as the earthquake.

The California Geological Survey has identified areas most vulnerable to liquefaction. Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures.

The City of La Habra Heights has liquefaction and earthquake-induced landslide zones as shown on Map 5-3: Liquefaction and Earthquake-Induced Landslide Area in the City of La Habra Heights. The liquefaction prone areas are located in the northeastern portion of the city. The landslide induced areas are sprinkled throughout the entire City on all of the down hill slopes. The City sits on the south side of a ridgeline of mountains that runs from Whittier Narrows all the way out to the Cleveland National Forest. The average slope of lot ranges from flat lots in the bottom of valleys to 65% sloped lots on the ridgelines.

Map 5-3: Whittier M6.8 Fault Earthquake Planning Scenario (Source: California Geological Survey) depicts the projected shaking intensities for a M6.8 earthquake on the Whittier Fault. The estimated building damage and economic loss to the entire county for this projected event totals $26 billion (2002 dollars)

There are approximately 2,238 residential parcels within the City of La Habra Heights. The City consists of 42 miles of roads. There are approximately 1,900 residential homes

within the City. 20% of the City is deeded open space. There is one golf club of about 90 acres in size. Four churches and one pre-school. In addition Occidental Oil runs the oil extraction business of the City. The potential loss from a major event could be estimated as high as $10 million for City Hall and Fire Station. Damage estimate for the Park would be approximately $1.5 million. Potential damage in LHH could be ($507,100,000.00).

Map 5-3: Whittier M6.8 Fault Earthquake Planning Scenario
(Source: California Geological Survey)

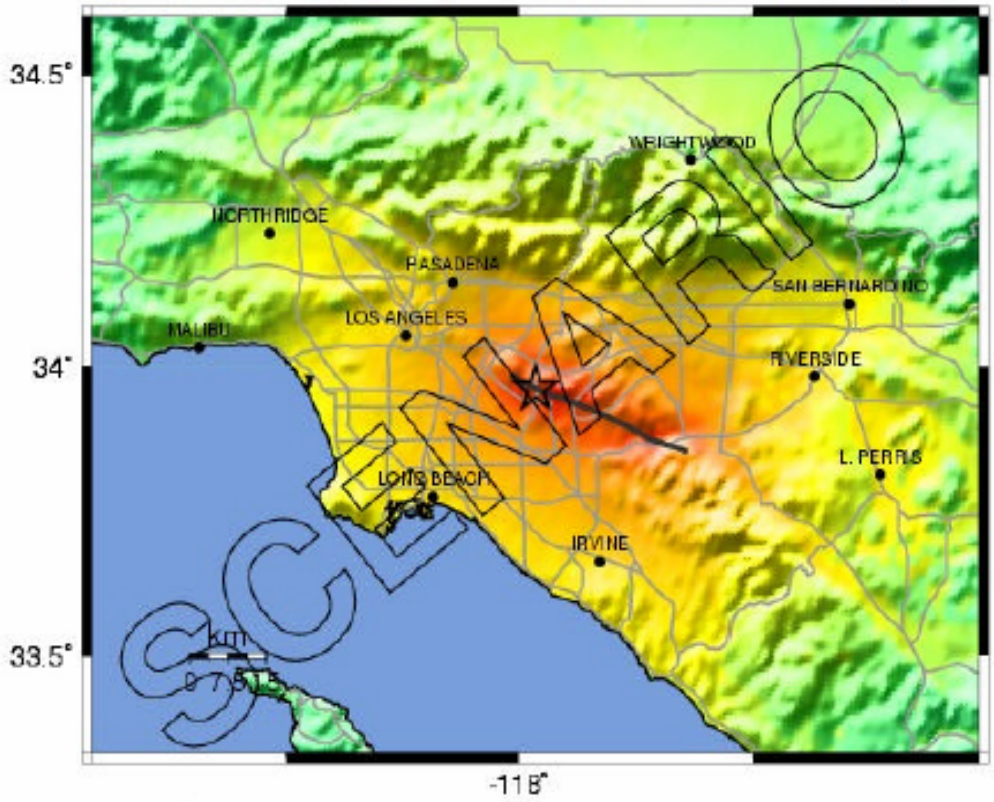
SCENARIO: S-11

Whittier M6.8 Fault Scenario

-- Earthquake Planning Scenario --

Rapid Instrumental Intensity Map for Whittier M6.8 Fault Scenario

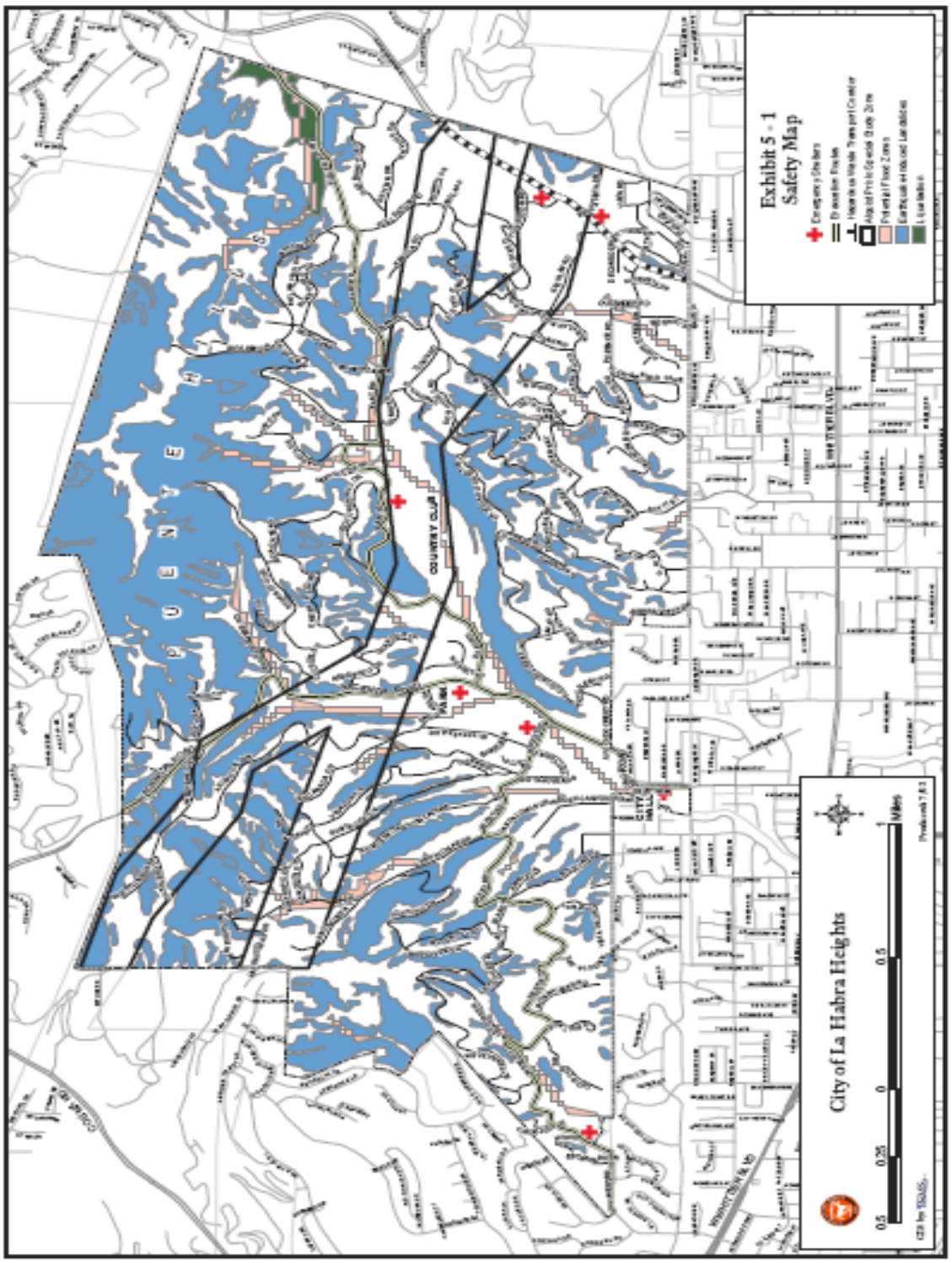
Scenario Date: Mon Mar 11, 2002 04:00:00 AM PST M 6.8 N33.96 W117.96 Depth: 10.0km



PLANNING SCENARIO ONLY -- PROCESSED: Tue Jul 30, 2002 02:45:43 PM PDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Map 5-4: Liquefaction and EQ-Induced Landslide Areas in the City of La Habra Heights
(Source: General Map)



Southern California has many active landslide areas, and a large earthquake could trigger accelerated movement in these slide areas, in addition to jarring loose other unknown areas of landslide risk.

In 2004 the City of La Habra Heights adopted a new General Plan. Within this Plan is a Safety Element. This Safety Element addressed both natural and man-made hazards such as wildfire, earthquakes, landslides, crime, traffic, and hazardous materials/waste contamination. In dealing with these issues, it is prudent to consider prevention as the first step in hazard mitigation. Prevention may be accomplished by the elimination of the hazard, isolation/avoidance of the hazard or through the regulation of land uses and structures in known hazard areas. The hazard must be planned for when prevention is not possible. Emergency planning includes the formation of strategies to minimize human injury, property damage, and economic and social disruption. This Safety Element addressed measures necessary to return the functions of the City to normal conditions soon after a disaster. It also established policies that addressed public safety issues in the City. This element serves as the Safety Plan, identifying standards and policies to protect public safety and outlining facilities and services that will serve the emergency needs of the City. This Element has located known hazard areas and available evacuation routes. It indicates peak water supply requirements, minimum road standards, brush clearance requirements, and other factors affecting safety procedures. On October 5, 2006 the City adopted a new Municipal Code that implements these General Plan policies. The City is now using the General Plan and the Municipal Code in the implementation Program. The implementation plan establishes a generalized framework for the Plans long-range implementation by setting the stage for the preparation of new ordinances or the revision of existing ordinances or regulations throughout the life of the Plan.

Risk Analysis

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time[6]. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake.[7] The HAZUS software is available from FEMA at no cost.

The City of La Habra Heights is made up of 6.39 square miles of land. There are approximately 2,200 single family residences within the City. Approximately 6,000 residents live in the City. We have four (4) churches. One Christian Pre-School, a private golf club and an oil company that is actively pumping oil out of the City. The City has one Community Center that was built before 1950 and these building house the City Hall site and the only Fire Station the City has. The City also owns a City Park that has one

very large gymnasium. This gymnasium was damage in the Whittier earthquake and this building was severly damaged. Over the last few years the building has been retrofitted. On the Park site in addition to the gymnasium there is a gazebo, a horse announcers booth and a storage garage. Across the top of the City is a wildlife corridor. La Habra Heights housing stock is aged with more than 50% of the homes being built prior to 1978. The roads within the City are the original oil road where the oil was hauled out of the City in barrels on wagons by mules. Most of the roads are less than 20 feet in width. Many roads are extremely steep with several road in excess of a 20% slope around sharp curves or with one side of the road up against the hill and the other side on the edge of the slope. The older housing stock has not been retrofitted to withstand a major earthquake and foundation damage would likely be severe. The average slope of the parcels also are extreme. Some lots are fairly flat, most are sloped with some exceeding 65% slopes. New construction imbeds the foundations into bedrock. Older construction may have simple built on the slopes.

For greater Southern California there are multiple worst case scenarios, depending on which fault might rupture, and which communities are in proximity to the fault. But damage will not necessarily be limited to immediately adjoining communities. Depending on the hypocenter of the earthquake, seismic waves may be transmitted through the ground to unsuspecting communities. In the Northridge 1994 earthquake, Santa Monica suffered extensive damage, even though there was a range of mountains between it and the origin of the earthquake.

Damages for a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, ten's of thousands of older existing buildings were built under much less rigid codes. California has laws affecting unreinforced masonry buildings (URM's) and although many building owners have retrofitted their buildings, hundreds of pre-1933 buildings still have not been brought up to current standards. The City of La Habra Heights has 5 unreinforced masonry buildings.

Non-structural bracing of equipment and contents is often the most cost-effective type of seismic mitigation. Inexpensive bracing and anchoring may be the most cost effective way to protect expensive equipment. Non-structural bracing of equipment and furnishings will also reduce the chance of injury for the occupants of a building.

Community Earthquake Issues

What is Susceptible to Earthquakes?

Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by the city

Nearly 50% of the City's housing stock was built prior to the 1950s. Of course these buildings were built before the Alquist-Priolo requirements went into place and this will be major damage for the City. The City Hall/Community Center/Fire Department and Gymnasium as well were all built in the late 40s early 50s. The City's road are the original oil roads created by the oil companies. They have rarely had much work done to them and they as well could become a significant event. In addition La Habra Heights is an agricultural community where the keeping of large animals is of major importants to all of the residents. There is no commercial base within the City or major businesses.

Dams

There are a total of 103 dams in Los Angeles County, owned by 23 agencies or organizations, ranging from the Federal government to Homeowner's Associations.[8] These dams hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

The community of La Habra Heights is not subject to dam inundation by any of the dams or reservoirs located in the Los Angeles Basin.

Buildings

The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damages is great. In most California communities, including the City of La Habra Heights, many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings. Fortunately La Habra Heights does not have any unreinforced masonry buildings. Our Gymnasium was damaged in a previous earthquake and has now been retrofitted.

Infrastructure and Communication

Residents in the City of La Habra Heights commute frequently by automobiles and public transportation such as buses and light rail. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers.

La Habra Heights does not have any bridges of major concern that would sever a road. There are small bridges from the City streets to private property. The roads would be more affected by landslides and liquefaction. There is virtually no public transportation within our City and we are several miles from the nearest freeway. La Habra Heights greatest star is their volunteerism. The City's Fire Department is the greatest volunteerism system.

Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will affect them differently. Bridges built before the mid-1970' s have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

Much of the interstate highway system was built in the mid to late 1960's. CalTrans has retrofitted most bridges on the freeway systems; however there are still some county maintained bridges that are not retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. CalTrans checks when the bridges are inspected because they administer the Federal funds for bridge projects.

Damage to Lifelines

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be usable after earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

If there were a major event, La Habra Heights would be shut off for many days without assistance from the outside. However the residents are use to disruption of services. On frequent occasions, high winds, fires, rain storms, traffic mishaps, and other conditions disrupt the flow of services to the City's residents.

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Many critical facilities are housed in older buildings that are not up to current seismic codes. See Section 1, Introduction for critical and essential facilities vulnerable to earthquakes.

Our Critical Services is of major concern to everyone within our City. We contract our Law Enforcement with the Los Angeles County Sheriff's Department. We are assigned one Deputy. Our Fire Department consists of one Fire Station, 7 engines, Paramedic

Squad, and one Command Vehicle a crew of 10 fire fighters, one captain and 2 Paramedics and 2 Ambulance Drivers. The replacement cost of each of these vehicles is estimated at $400,000 per unit.

Businesses
Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses.

Forty percent of businesses do not reopen after a disaster and another twenty-five percent fail within one year according to the Federal Emergency Management Agency (FEMA). Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster.[9]

Business activity consists of one oil company, one golf club, one pre school, and two day care centers.

Individual Preparedness
Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the City of La Habra Heights, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured, and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake. Additionally, it is important that building occupants be familiar with gas shut off procedures.

The City has a very active volunteer Emergency Preparedness Committee. They are active at all major City events with a booth to promote emergency preparedness. Each month they give a presentation at the local City Council Meeting which is televised throughout the community.

Death and Injury
Death and injury can occur both inside and outside of buildings due to collapsed buildings falling equipment, furniture, debris, and structural materials. Downed power lines and broken water, gas lines, and broken water reservoirs can also endanger human life.

Fire
Downed power lines or broken gas mains may trigger fires. When fire stations suffer building or lifeline damage, quick response to extinguish fires is less likely. Furthermore, major incidents will demand a larger share of resources, and initially smaller fires and problems will receive little or insufficient resources in the initial hours after a major earthquake event. Loss of electricity may cause a loss of water pressure in some communities, further hampering fire fighting ability.

Debris

After damage to a variety of structures, much time is spent cleaning up bricks, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing a strong debris management strategy is essential in post-disaster recovery. Disasters do not exempt the City of La Habra Heights from compliance with AB 939 regulations.

Existing Mitigation Activities
Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

City of La Habra Heights Building Codes
Implementation of earthquake mitigation policy most often takes place at the local government level. The City of La Habra Heights Department of Planning/Building Department enforces building codes pertaining to earthquake hazards.

The following sections of the UBC address the earthquake hazard:

1605.1 (Distribution of Horizontal Shear);
1605.2 (Stability against Overturning);
1626 (Seismic);
1605.3 (Anchorage); and
1632, 1633, 1633.9 deal with specific earthquake hazards.

With the adoption of the new General Plan and the new Municipal Code it has placed more emphasis on emergency services for the City of La Habra Heights Planning/Building Departments which enforce the zoning and land use regulations relating to earthquake hazards.

Generally, these codes seek to discourage development in areas that could be prone to flooding, landslide, wildfire and / or seismic hazards; and where development is permitted, that the applicable construction standards are met. Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

Coordination among Building Officials
The City of La Habra Heights adopts the Los Angeles County Building Codes as our Building Code standards. These codes set the minimum design and construction standards for new buildings. The City of La Habra Heights adopted the most recent seismic standards in its building code, which requires that new buildings be built at a higher seismic standard.

Historically the City also requires that site-specific seismic hazard investigations be performed for new essential facilities, major structures, hazardous facilities, and special occupancy structures such as schools, hospitals, and emergency response facilities.

Businesses/Private Sector
Natural hazards have a devastating impact on businesses. In fact, of all businesses which close following a disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.[10] The Institute of Business and Home Safety has developed "Open for Business", which is a disaster planning toolkit to help guide businesses in preparing for and dealing with the adverse affects natural hazards. The kit integrates protection from natural disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

Hospitals
"The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted that: "Hospitals, that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds." (Health and Safety Code Section 129680)

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

The moderate Magnitude 6.7 Northridge Earthquake in 1994 caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals that had been built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was still extensive in those post-1973 buildings.

Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to the public after disasters). SB 1953 applies to all urgent

care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with sub gradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005)

The Seismic Safety Commission Evaluation of the State's Hospital Seismic Safety Policies

In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD that revealed that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk.".[11]

The City of La Habra Heights is isolated from any hospitals to the north. The nearest hospital to the north Queen of the Valley Hospital is about 5-6 miles away in north West Covina. Therefore La Habra Heights uses Whittier Presbyterian Hospital in Whittier about 5 miles away and to the south St. Jude Hospital in Fullerton two Cities away.

California Earthquake Mitigation Legislation

California is painfully aware of the threats it faces from earthquakes. Dating back to the 19th Century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even more densely developed, the risk will continue to increase. For decades the legislature has passed laws to strengthen the built environment and protect the citizens. Table 5-4 provides a sampling of some of the 200 plus laws in the State's codes.

Table 5-4: Partial List of the Over 200 California Laws on Earthquake Safety

Government Code Section 8870-8870.95	Creates Seismic Safety Commission.
Government Code Section 8876.1-8876.10	Established the California Center for Earthquake Engineering Research.
Public Resources Code Section 2800-2804.6	Authorized a prototype earthquake prediction system along the Central San Andreas Fault near the City of Parkfield.
Public Resources Code Section 2810-2815	Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project.
Health and Safety Code Section 16100-16110	The Seismic Safety Commission and State Architect will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings.

Government Code Section 8871-8871.5	Established the California Earthquake Hazards Reduction Act of 1986.
Health and Safety Code Section 130000-130025	Defined earthquake performance standards for hospitals.
Public Resources Code Section 2805-2808	Established the California Earthquake Education Project.
Government Code Section 8899.10-8899.16	Established the Earthquake Research Evaluation Conference.
Public Resources Code Section 2621-2630 2621.	Established the Alquist-Priolo Earthquake Fault Zoning Act.
Government Code Section 8878.50-8878.52 8878.50.	Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990.
Education Code Section 35295-35297 35295.	Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools.
Health and Safety Code Section 19160-19169	Established standards for seismic retrofitting of unreinforced masonry buildings.
Health and Safety Code Section 1596.80-1596.879	Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan.
Source: http://www.leginfo.ca.gov/calaw.html	

Earthquake Education

Earthquake research and education activities are conducted at several major universities in the Southern California region, including Cal Tech, USC, UCLA, UCSB, UCI, and UCSB. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern California, Los Angeles, CA 90089, Telephone: (213) 740-5843, Fax: (213) 740-0011, Email: SCEinfo@usc.edu, Website: http://www.scec.org. The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

In addition, Los Angeles County along with other Southern California counties, sponsors the Emergency Survival Program (ESP), an educational program for learning how to prepare for earthquakes and other disasters. Many school districts have very active emergency preparedness programs that include earthquake drills and periodic disaster response team exercises.

End Notes

[1] http://pubs.usgs.gov/gip/earthq3/when.html

[2] http://www.gps.caltech.edu/~sieh/home.html

[3] Planning for Natural Hazards: The California Technical Resource Guide, Department of Land Conservation and Development (July 2000)

[4] http://www.consrv.ca.gov/CGS/rghm/ap/

[5] Ibid

[6] Burby, R. (Ed.) Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities (1998), Washington D.C., Joseph Henry Press.

[7] FEMA HAZUS http://www.fema.gov/hazus/hazus2.htm (May 2001).

[8] Source: Los Angeles County Public Works Department, March 2004

[9] http://www.chamber101.com/programs_committee/natural_disasters/DisasterPreparedness/Forty.htm

[10] Institute for Business and Home Safety Resources (April 2001),

[11] http://www.seismic.ca.gov/pub/CSSC_2001-04_Hospital.pdf

Section 6 – Wildland/Urban Interface Fire Hazard

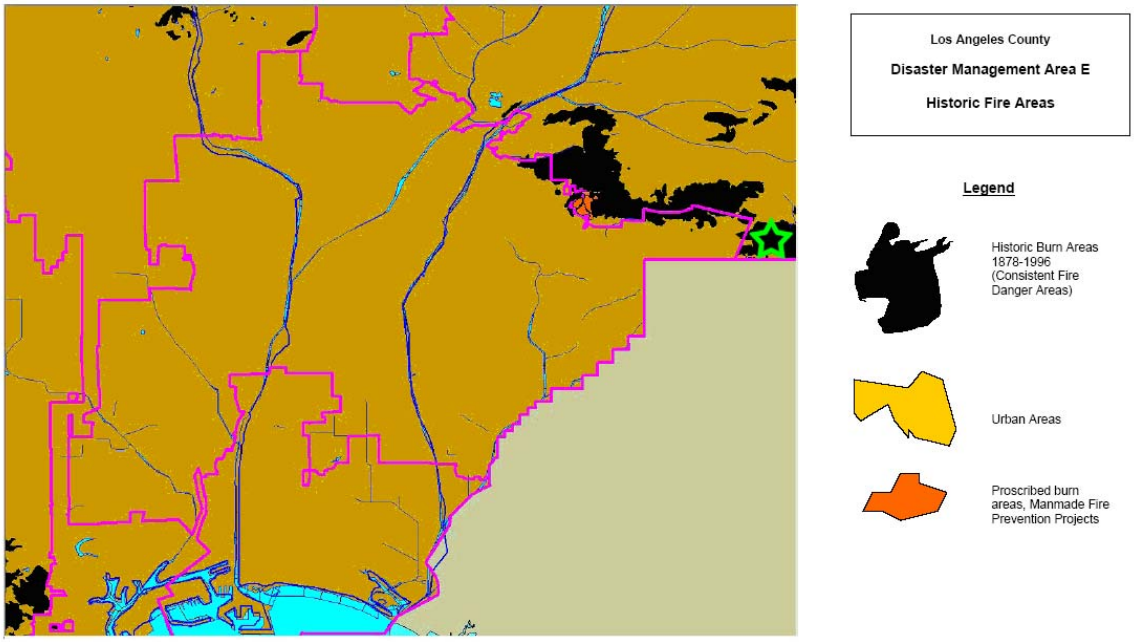
City of La Habra Heights

Why are Wildfires a Threat to Southern California?

For thousands of years, fires have been a natural part of the ecosystem in Southern California. However, wildfires present a substantial hazard to life and property in communities built within or adjacent to hillsides and mountainous areas. There is a huge potential for losses due to wildland/urban interface fires in Southern California. According to the California Division of Forestry (CDF), there were over seven thousand reportable fires in California in 2003, with over one million acres burned.[1] According to CDF statistics, in the October 2003 Firestorms, over 4,800 homes were destroyed and 22 lives were lost.[2]

The City of La Habra Heights was most recently impacted by the 1957 Los Palomas Fire, which took the lives of several inmates involved in fighting the fire (Source: Fire Chief, La Habra Heights). The map below depicts historical fires in the vicinity of La Habra Heights.

Map 6-1: Los Angeles County – Area E Historical Fires
(Source: Los Angeles County Hazard Mitigation Plan)



The 2003 Southern California Fires

The fall of 2003 marked the most destructive wildfire season in California history. In a ten day period, 12 separate fires raged across Southern California in Los Angeles, Riverside, San Bernardino, San Diego and Ventura counties. The massive "Cedar" fire in San Diego County alone consumed of 2,800 homes and burned over a quarter of a million acres.

Table 6-1: October 2003 Firestorm Statistics

County	Fire Name	Date Began	Acres Burned	Homes Lost	Homes Damaged	Lives Lost
Riverside	Pass	10/21/03	2,397	3	7	0
Los Angeles	Padua	10/21/03	10,446	59	0	0
San Bernardino	Grand Prix	10/21/03	69,894	136	71	0
San Diego	Roblar 2	10/21/03	8,592	0	0	0
Ventura	Piru	10/23/03	63,991	8	0	0
Los Angeles	Verdale	10/24/03	8,650	1	0	0
Ventura	Simi	10/25/03	108,204	300	11	0
San Diego	Cedar	10/25/03	273,246	2,820	63	14
San Bernardino	Old	10/25/03	91,281	1,003	7	6
San Diego	Otay / Mine	10/26/03	46,000	6	11	0
Riverside	Mountain	10/26/03	10,000	61	0	0
San Diego	Paradise	10/26/03	56,700	415	15	2
Total Losses			**749,401**	**4,812**	**185**	**22**

Source: http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

Historic Fires in Southern California

Large fires have been part of the Southern California landscape for millennia. "Written documents reveal that during the 19th century human settlement of southern California altered the fire regime of coastal California by increasing the fire frequency. This was an era of very limited fire suppression, and yet like today, large crown fires covering tens of thousands of acres were not uncommon. One of the largest fires in Los Angeles County (60,000 acres) occurred in 1878, and the largest fire in Orange County's history, in 1889, was over half a million acres."[3]

Table 6-2: Large Historic Fires in California 1961-2003

	Fire Name	**Date**	**County**	**Acres**	**Structures**	**Deaths**
1	Tunnel	October 1991	Alameda	1,600	2,900	25
2	Cedar	October 2003	San Diego	273,246	2,820	14
3	Old	October 2003	San Bernardino	91,281	1,003	6
4	Jones	October 1999	Shasta	26,200	954	1

5	Paint	June 1990	Santa Barbara	4,900	641	1
6	Fountain	August 1992	Shasta	63,960	636	0
7	City of Berkeley	September 1923	Alameda	130	584	0
8	Bel Air	November 1961	Los Angeles	6,090	484	0
9	Laguna Fire	October 1993	Orange	14,437	441	0
10	Paradise	October 2003	San Diego	56,700	415	2
11	Laguna	September 1970	San Diego	175,425	382	5
12	Panorama	November 1980	San Bernardino	23,600	325	4
13	Topanga	November 1993	Los Angeles	18,000	323	3
14	49er	September 1988	Nevada	33,700	312	0
15	Simi	October 2003	Ventura	108,204	300	0
16	Sycamore	July 1977	Santa Barbara	805	234	0
17	Canyon	September 1999	Shasta	2,580	230	0
18	Kannan	October 1978	Los Angeles	25,385	224	0
19	Kinneloa	October 1993	Los Angeles	5,485	196	1
19	Grand Prix	October 2003	San Bernardino	59,448	196	0
20	Old Gulch	August 1992	Calaveras	17,386	170	0

http://www.fire.ca.gov/FireEmergencyResponse/HistoricalStatistics/PDF/20LSTRUCTURES.pdf

"Structures" is meant to include all loss - homes and outbuildings, etc.

During the 2002 fire season, more than 6.9 million acres of public and private lands burned in the US, resulting in loss of property, damage to resources and disruption of community services.[4] Taxpayers spent more than $1.6 billion[5] to combat more than 88,400 fires nationwide. Many of these fires burned in wildland/urban interface areas and exceeded the fire suppression capabilities of those areas. Table 6-3 illustrates fire suppression costs for state, private and federal lands.

Table 6-3: National Fire Suppression Costs

Year	Suppression Costs	Acres Burned	Structures Burned
2000	$1.3 billion	8,422,237	861
2001	$0.5 billion	3,570,911	731
2002	$1.6 billion	6,937,584	815

http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

Wildfire Characteristics

There are three categories of interface fire:[6] The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas; the mixed wildland/urban interface is characterized by isolated homes, subdivisions and small communities situated predominantly in wildland settings; and the occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. Certain conditions must be present for significant interface fires to occur. The most common conditions include: hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought and development.

Southern California has two distinct areas of risk for wildland fire. The foothills and lower mountain areas are most often covered with scrub brush or chaparral. The higher elevations of mountains also have heavily forested terrain. The lower elevations covered with chaparral create one type of exposure.

> "Past fire suppression is not to blame for causing large shrub land wildfires, nor has it proven effective in halting them."" said Dr. Jon Keeley, a USGS fire researcher who studies both southern California shrub lands and Sierra Nevada forests. ""Under Santa Ana conditions, fires carry through all chaparral regardless of age class. Therefore, prescribed burning programs over large areas to remove old stands and maintain young growth as bands of firebreaks resistant to ignition are futile at stopping these wildfires."[7]

The higher elevations of Southern California's mountains are typically heavily forested. The magnitude of the 2003 fires is the result of three primary factors: (1) severe drought, accompanied by a series of storms that produce thousands of lightning strikes and windy conditions; (2) an infestation of bark beetles that has killed thousands of mature trees; and (3) the effects of wildfire suppression over the past century that has led to buildup of brush and small diameter trees in the forests.

> "When Lewis and Clark explored the Northwest, the forests were relatively open, with 20 to 25 mature trees per acre. Periodically, lightning would start fires that would clear out underbrush and small trees, renewing the forests. Today's forests are completely different, with as many as 400 trees crowded onto each acre, along with thick undergrowth. This density of growth makes forests susceptible to disease, drought and severe wildfires. Instead of restoring forests, these wildfires destroy them and it can take decades to recover. This radical change in our forests is the result of nearly a century of well-intentioned but misguided management."[8]

The Interface

La Habra Heights single most important challenge is wildfire hazard. Dense vegetation found throughout La Habra Heights, coupled with very steep slopes, results in increase threat of wildfire. The entire City is rated as a Very High Fire Severity Zone by the State Fire Marshal's office. This designation applies to areas containing steep slopes, high fuel loads, and fire conducive climate. Steep canyon are largely undeveloped and, as a consequence, are often densely packed with native and exotic plant species.

Increasing numbers of homes being built on the urban/wildland interface and every year the growing population has expanded further and further into the hills and mountains, including forest lands. The increased "interface" between urban/suburban areas and the open spaces created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage.

The City has a very active Weed Abatement Program to try and combat this property. The new General Plan and new Municipal Code went into great details with requirements on weed clearance. Recently the City Council adopted a Resolution requiring year round weed abatement rather than yearly abatement.

Fuel

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading", or the amount of available vegetative fuel.

The type of fuel also influences wildfire. Chaparral is a primary fuel of Southern California wildfires. Chaparral habitat ranges in elevation from near sea level to over 5,000' in Southern California. Chaparral communities experience long dry summers and receive most of their annual precipitation from winter rains. Although chaparral is often considered as a single species, there are two distinct types; hard chaparral and soft chaparral. Within these two types are dozens of different plants, each with its own particular characteristics.

"Fire has been important in the life cycle of chaparral communities for over 2 million years; however, the true nature of the "fire cycle" has been subject to interpretation. In a period of 750 years, it generally thought that fire occurs once every 65 years in coastal drainages and once every 30 to 35 years inland."[9]

"The vegetation of chaparral communities has evolved to a point it requires fire to spawn regeneration. Many species invite fire through the production of plant materials with large surface-to-volume ratios, volatile oils and through periodic die-back of vegetation. These species have further adapted to possess special reproductive mechanisms following

fire. Several species produce vast quantities of seeds which lie dormant until fire triggers germination. The parent plant which produces these seeds defends itself from fire by a thick layer of bark which allows enough of the plant to survive so that the plant can crown sprout following the blaze. In general, chaparral community plants have adapted to fire through the following methods; a) fire induced flowering; b) bud production and sprouting subsequent to fire; c) in-soil seed storage and fire stimulated germination; and d) on plant seed storage and fire stimulated dispersal."[10]

An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread. After decades of fire suppression "dog-hair" thickets have accumulated, which enable high intensity fires to flare and spread rapidly.

Topography

Topography influences the movement of air, thereby directing a fire course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of dry, south-facing slopes produces up slope drafts that can complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

The City is comprised of winding roads, natural landform, and densely vegetated hills and valleys. The hills and valley, in turn, result from the underlying tectonic activity.

Weather

Weather patterns combined with certain geographic locations can create a favorable climate for wildfire activity. Areas where annual precipitation is less than 30 inches per year are extremely fire susceptible.[11] High-risk areas in Southern California share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. The so-called "Santa Ana" winds, which are heated by compression as they flow down to Southern California from Utah, create a particularly high risk, as they can rapidly spread what might otherwise be a small fire.

La Habra Heights has the typical weather of Southern California, however because of the steep canyons wind is an overwhelming consideration. The Weather Conditions can be of a tropical nature and tropical fruits grow well within the City. However, several times a years the City is put under a Red Flag warning due to the heat and lack of humidity.

Drought

Recent concerns about the effects of climate change are present in La Habra Heights, particularly drought, is contributing to concerns about wildfire vulnerability. The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. This year throughout the City there are many trees that have died because of a lack of water. January and February are our wettest months of the year, and this year we virtually have had little to no rain. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and may contribute to additional fires, or additional difficulties in fighting fires.

Development

La Habra Heights started as the subdivision of very large lots. Over the years the lots have reduced in size. The Municipal Code sets a minimum lot size for a parcel of land to one acre. Growth and development over the last few years has been booming. However, development seems to have slowed slightly over the last few months. The large size lots offer the owners privacy far from public roads, scenic views that are nestled in vegetation with large surrounding areas of grass, brush and trees. The scrubland and forested areas is increasing the number of human-made structures in Southern California interface areas. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation and use natural materials. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and fire fighting difficult. The scenic views found along the mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself.

Wildfire Hazard Assessment

Wildfire Hazard Identification

Wildfire hazard areas are commonly identified in regions of the wildland/urban interface. Ranges of the wildfire hazard are further determined by the ease of fire ignition due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control such as the surrounding fuel load, weather, topography and property characteristics. Generally, hazard identification rating systems are based on weighted factors of fuels, weather and topography.

Table 6-4 illustrates a rating system to identify wildfire hazard risk (with a score of 3 equaling the most danger and a score of 1 equaling the least danger.)

Table 6-4: Sample Hazard Identification Rating System

Category	Indicator	Rating
Roads and Signage	Steep; narrow; poorly signed	3
	One or two of the above	2
	Meets all requirements	1
Water Supply	None, except domestic	3
	Hydrant, tank, or pool over 500 feet away	2
	Hydrant, tank, or pool within 500 feet	1
Location of the Structure	Top of steep slope with brush/grass below	3
	Mid-slope with clearance	2
	Level with lawn, or watered groundcover	1
Exterior Construction	Combustible roofing, open eaves, Combustible siding	3
	One or two of the above	2
	Non-combustible roof, boxed eaves, non-combustible siding	1

In order to determine the "base hazard factor" of specific wildfire hazard sites and interface regions, several factors must be taken into account. Categories used to assess the base hazard factor include:

Topographic location, characteristics and fuels
Site/building construction and design
Site/region fuel profile (landscaping)
Defensible space
Accessibility
Fire protection response
Water availability

The use of Geographic Information System (GIS) technology in recent years has been a great asset to fire hazard assessment, allowing further integration of fuels, weather and topography data for such ends as fire behavior prediction, watershed evaluation, mitigation strategies and hazard mapping.

The City of La Habra Heights is comprised of very large lots (over one acre in size) recent development within the City has grown from 4,000—6,000 square foot homes to 6,000-8,000 square foot homes. There are however exceptions. The City has three homes that exceed 14,000 square feet. Development in the future will become more complicated. The remaining vacant lots within the City will be Engineering challenges. What we are more likely to see will be tearing down of old homes and rebuild of new homes. This will be good because the new construction will meet higher construction standards and with new homes comes new landscaping and the opportunity to rid the parcel of old dead vegetation.

Vulnerability and Risk
Southern California residents are served by a variety of local fire departments as well as county, state and federal fire resources. Data that includes the location of interface areas in the county can be used to assess the population and total value of property at risk from wildfire and direct these fire agencies in fire prevention and response.

Key factors included in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence and weather, as well as occurrences of drought.

The National Wildland/Urban Fire Protection Program has developed the Wildland/Urban Fire Hazard Assessment Methodology tool for communities to assess their risk to wildfire. For more information on wildfire hazard assessment refer to http://www.Firewise.org.

Community Wildfire Issues

What is Susceptible to Wildfire?

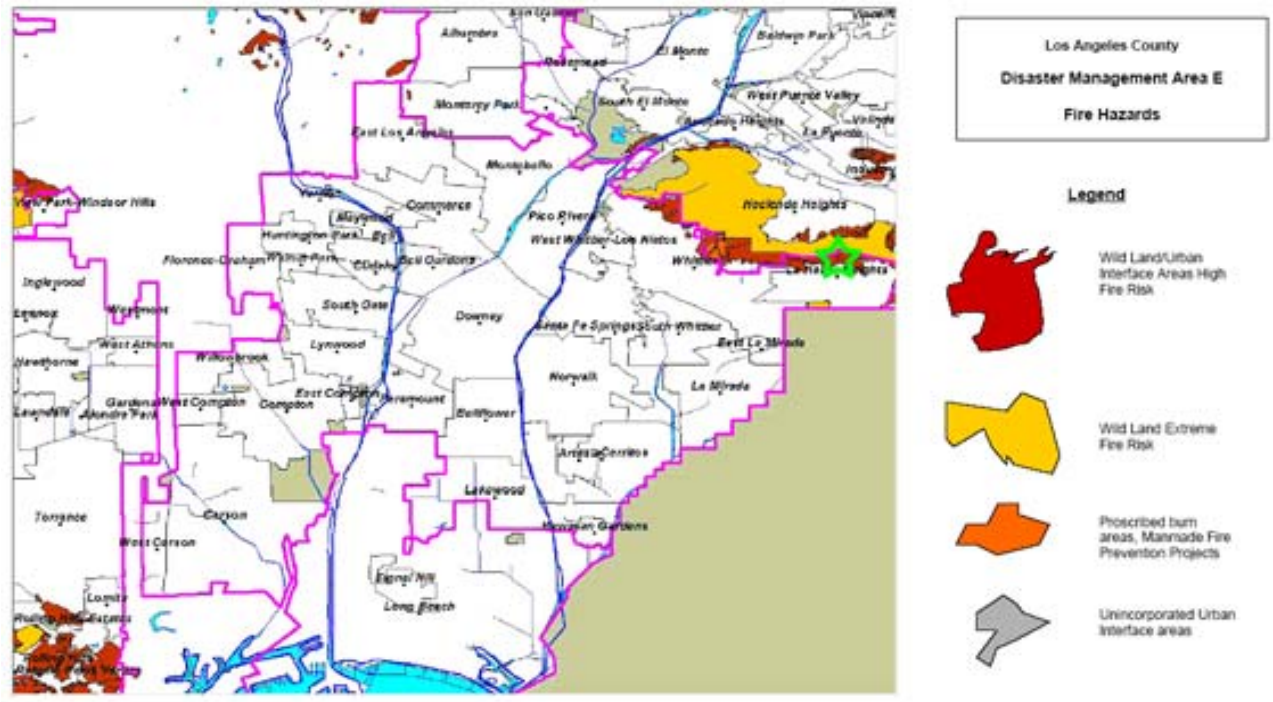
Growth and Development in the Interface
The hills and mountainous areas of Southern California are considered to be interface areas. The development of homes and other structures is encroaching onto the wildlands and is expanding the wildland/urban interface. The interface neighborhoods are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation and natural fuels.

Twenty percent of the City of La Habra Heights is designated open space. The Puente Hills Landfill Native Habitat Preservation Authority runs across the top of the City. There are approximately 2,200 parcels within the City that are all zoned Residential/Agricultural. There is one golf course, one nursery, resource production, four churches a pre school, a park and the Community Center. Due to the City's topographical features, most roads wrap around the mountain ridgelines. The roads are extremely narrow and in some cases barely 14 feet wide.

Wildfire Threat to La Habra Heights
The wildfire threat to the City of La Habra Heights is considerable. The General Plan (Safety Element) points out that the hillside areas that comprise most of La Habra Heights pose wildfire, landslide, erosion, flood, and debris flow hazards. The Element goes on to say the dense vegetation found throughout the community, coupled with very steep slopes, results in increased threat of wildfire. The entire City is located within a Zone 4 Hazard designation. The Zone 4 designation is applied by the Los Angeles County Fire Marshall in accordance with the California Fire Code, and denotes areas of "Very High Fire Hazard Severity". This designation applies to areas containing steep slopes, high fuel loads, and fire conducive climate. These conditions coupled with low emergency water storage capacities, low peak water delivery capability, abundance

natural fuels, unmaintained brush along roadways, narrow roads, and the existence of narrow, steep, poorly identified and sharply curved roads creates a dangerous situation. Mayor Pro Tem Douglas noted that the residents are very aware of these hazards and hear about them and how we can mitigate them.

Map 6-2: Los Angeles County – Area E Fire Hazards
(Source: Los Angeles County Hazard Mitigation Plan)



The City Council has tried to control the threat of fire with regulation contained in the new Municipal Code that deal with the brush clearance within 30 feet of a structure, 30 feet to 100 feet and 100 feet to 200 feet. In addition, they require tree limbs be trimmed from chimneys, dry or dead vegetation, vegetation near roadways, fire prevention around structures and fences, interior fire sprinklers on new development, attic areas greater than 50 square feet of floor area, natural gas seismic shut-off valves, adequate fire-flow. With this new code they also implemented year round weed abatement, not just weed abatement in the spring time.

In the event of a wildfire, vegetation, structures and other flammables can merge into unwieldy and unpredictable events. Factors important to the fighting of such fires include access, firebreaks, proximity of water sources, distance from a fire station and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons:

Combustible roofing material
Wood construction
Structures with no defensible space
Fire department with poor access to structures
Subdivisions located in heavy natural fuel types
Structures located on steep slopes covered with flammable vegetation
Limited water supply
Winds over 30 miles per hour
Poor weed abatement

Disruption of Critical Services
Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional during a wildfire event. See Section 4, Risk Assessment Table 4-2 for a listing of critical and essential facilities and their vulnerability to wildfire.

The City is concerned with the Critical Services. The Community Center (City Hall) and Fire Station are both located at the same site. These buildings are more than 50 years old and recently the City has been considering their condition and future use. The Park houses our Gymnasium. The Park would be the location of our Designated Shelter. This building was rehabilitated about 7-8 years ago. Using C.L.E.E.P funds the City through the Los Angeles County Sheriff's Department purchased a mobile trailer for use as a Sheriff's Substation.

Road Access
Road access is a major issue for all emergency service providers. As development encroaches into the rural areas of the county, the number of houses without adequate turn-around space is increasing. In many areas, there is not adequate space for emergency vehicle turnarounds in single-family residential neighborhoods, causing emergency workers to have difficulty doing their jobs because they cannot access houses. As fire trucks are large, firefighters are challenged by narrow roads and limited access when there is inadequate turn around space, the fire fighters can only work to remove the occupants, but cannot safely remain to save the threatened structures.

Within the City we have 42 miles of roads. These roads consists of two Roads that connect Los Angeles County to the north with Orange County to the South. The rest of the roads are small roads often with only the ability for one car to pass at a time. These roads are narrow and do not provide adequate turn around spaces for the fire trucks. In addition in a major fire the home owners will be trying to get their large animals out of the City and fire trucks will not be able to pass horse trailers on most of our roads,

Water Supply
Fire fighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained fire fighting flows.

The La Habra Heights Water Company water distribution system generally meets all capacity and distribution requirements. However, total storage capacity is presently reported to be 30 percent less than the Metropolitan Water District recommendation. Further, the water system's peak delivery capability meets the City's requirement of 750 gallons per minute (gpm) for two hours but does not meet the County requirements of 1,500 gpm for two hours.

Interface Fire Education Programs and Enforcement

Fire protection in urban/wildland interface areas may rely heavily more on the landowner's personal initiative to take measures to protect his or her own property. Therefore, public education and awareness may play a greater role in interface areas. In those areas with strict fire codes, property owners who are resist maintaining the minimum brush clearances may be cited for failure to clear brush.

The Need for Mitigation Programs

Continued development into the interface areas will have growing impacts on the wildland/urban interface. Periodically, the historical losses from wildfires in Southern California have been catastrophic, with deadly and expensive fires going back decades. The continued growth and development increases the public need for natural hazards mitigation planning in Southern California.

La Habra Heights saw the direct affect of a wildfire in 1957 and we do not want to see that happen again. The General Plan has become more aggressive with Fire Prevention regulations and this was continued in the new Municipal Code. A fire in our small community would be devastating. While the older residents remember 1957 as the urban population moves into this rural community they need to be educated about how important the control of Fire Hazards are within the City and that it is up to each resident and each City employee to do their part to protect the City as a whole.

Wildfire Endnotes

[1] http://www.fire.ca.gov/php/2003fireseasonstats_v2.asp

[2] http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

[3] http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

[4] http://www.nifc.gov/stats/wildlandfirestats.html

[5] http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

[6] Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000) Department of Land Conservation and Development

[7] http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

[8] Overgrown Forests Require Preventive Measures, By Gale A. Norton (Secretary of the Interior), USA Today Editorial, August 21, 2002

[9] http://www.coastal.ca.gov/fire/ucsbfire.html

[10] Ibid

[11] Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000), Department of Land Conservation and Development

Section 7 – Flooding Hazards

City of La Habra Heights

Why are Floods a Threat to the City of La Habra Heights?

To date, the Federal Emergency Management Agency has not mapped flood zones within La Habra Heights. However, the geologic history and terrain characteristics of La Habra Heights resulted in numerous valleys and other areas where channeled water may pose localized flood hazards. Le Flore Canyon, Las Palomas Canyon, Encanada Canyon, Hacienda Road and Valle Drive are good examples of areas that tend to retain water. The City has only limited infrastructure designed to efficiently contain floodwater. With the City's Safety Element of the General Plan it is stated that it is not economically feasible to develop such facilities in areas that have already been developed.

Portions of the City of La Habra Heights are prone to urban/flash flooding, also sometimes referred to as ponding, due to debris accumulation in storm drains and in flood control channels and basins, and inadequate culverts and drainage systems. Homes and other structure built in drainage channels before incorporation are particularly susceptible to urban/flash flooding. Much of the City is susceptible to mud slides as a result of ground saturation following prolonged or heavy rains.

The City's Multi-Hazard Functional Plan states that there are five areas that considered at risk due to urban/flash flooding, including:

- Las Palomas Drive
- El Cajonita Drive
- Benik Road
- Valle Drive
- Hacienda Boulevard

The City of La Habra Heights was most recently affected by the flooding in 1996 during heavy El Nino rains. Streets and flood control channels were at or above capacity. However, there was only sporadic flooding of homes with minimal monetary loss.

History of Flooding in the City of La Habra Heights

The geologic history and terrain characteristics of La Habra Heights resulted in numerous valleys and other areas where channeled water may pose localized flood hazards. Further, the City has only limited infrastructure designed to efficiently contain floodwater. There has been ponding of water on Las Palomas Drive. The biggest issue is the failure of residents to clear the natural drainage channels running through their properties of debris before a big storm.

The City is not affected by the rivers in Southern California as they are located several miles away to the west.

Historic Flooding in Los Angeles County

Records show that since 1811, the Los Angeles River has flooded 30 times, on average once every 6.1 years. But averages are deceiving, for the Los Angeles basin goes through periods of drought and then periods of above average rainfall. Between 1889 and 1891 the river flooded every year, and from 1941 to 1945, the river flooded 5 times.

Conversely, from 1896 to 1914, a period of 18 years, and again from 1944 to 1969, a period of 25 years, the river did not have serious floods.[1]

Table 6-1: Major Floods of the Los Angeles River

Major Floods of the Los Angeles River	
1811	Flooding
1815	Flooding
1825	L.A. River changed its course back from the Ballona wetlands to San Pedro
1832	Heavy flooding
1861-62	Heavy flooding. Fifty inches of rain falls during December and January.
1867	Floods create a large, temporary lake out to Ballona Creek.
1876	The Novician Deluge
1884	Heavy flooding causes the river to change course again, turning east to Vernon and then southward to San Pedro.
1888-1891	Annual floods
1914	Heavy flooding. Great damage to the harbor.
1921	Flooding
1927	Moderate flood
1934	Moderate flood starting January 1. Forty dead in La Canada.
1938	Great County-wide flood with 4 days of rain. Most rain on day 4.
1941-44	L.A. River floods five times.
1952	Moderate flooding
1969	One heavy flood after 9 day storm. One moderate flood.
1978	Two moderate floods
1979	Los Angeles experiences severe flooding and mudslides.
1980	Flood tops banks of river in Long Beach. Sepulveda Basin spillway almost opened.
1983	Flooding kills six people.
1992	15 year flood. Motorists trapped in Sepulveda basin. Six people dead.
1994	Heavy flooding
Sources: http://www.lalc.k12.ca.us/target/units/river/tour/hist.html and (http://www.losangelesalmanac.com/topics/History/hi01i.htm)	

The towering mountains of La Habra Heights that give us our spectacular views also wrings a great deal of rain out of the storm clouds that pass through. Because the mountains are so steep, the rainwater moves rapidly down the slopes and across the coastal plains on its way to the ocean.

"The Santa Monica, Santa Susana and Verdugo Mountains, which surround three sides of the valley, seldom reach heights above three thousand feet. The Western San Gabriel Mountains, in contrast, have elevations of more than seven thousand feet. These higher ridges often trap eastern-moving winter storms. Although downtown Los Angeles averages just fifteen inches of rain a year, some mountain peaks in the San Gabriels receive more than forty inches of precipitation annually"[2]

Naturally, this rainfall moves rapidly down streams, often with severe consequences for anything in its path. In extreme cases, flood-generated debris flows will roar down a canyon at speeds near 40 miles per hour with a wall of mud, debris and water tens of feet high.

In Southern California, stories of floods, debris flows, persons buried alive under tons of mud and rock and persons swept away to their death in a river flowing at thirty-five miles an hour are without end.

What Factors Create Flood Risk?

Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course. In the City of La Habra Heights, geography and climate combine to create some chronic seasonal or flooding conditions**.**

The City's Multi-Hazard Functional Plan states that there are five areas that considered at risk due to urban/flash flooding, including:

- Las Palomas Drive
- El Cajonita Drive
- Benik Road
- Valle Drive
- Hacienda Boulevard

Winter Rainfall

Over the last 125 years, the average annual rainfall in Los Angeles is 14.9 inches. But the term "average" means very little as the annual rainfall during this time period has ranged from only 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884. In fact, in only fifteen of the past 125 years, has the annual rainfall been within plus or minus 10% of the 14.9 inch average. And in only 38 years has the annual rainfall been within plus or minus 20% of the 14.9 inch average. This makes the Los Angeles basin a land of extremes in terms of annual precipitation.

Monsoons

Another relatively regular source for heavy rainfall, particularly in the mountains and adjoining cities is from summer tropical storms. Table 6-2 lists tropical storms that have had significant rainfall in the past century, and the general areas affected by these storms. These tropical storms usually coincide with El Niño years.

Table 6-2: Tropical Cyclones of Southern California

Tropical cyclones that have affected Southern California during the 20th Century			
Month-Year	**Date(s)**	**Area(s) Affected**	**Rainfall**
July 1902	20th & 21st	Deserts & Southern Mountains	up to 2"
Aug. 1906	18th & 19th	Deserts & Southern Mountains	up to 5"
Sept. 1910	15th	Mountains of Santa Barbara County	2"
Aug. 1921	20th & 21st	Deserts & Southern Mountains	up to 2"
Sept. 1921	30th	Deserts	up to 4"
Sept. 1929	18th	Southern Mountains & Deserts	up to 4"
Sept. 1932	28th - Oct 1st	Mountains & Deserts, 15 Fatalities	up to 7
Aug. 1935	25th	Southern Valleys, Mountains & Deserts	up to 2"
Sept. 1939	4th - 7th	Southern Mountains, Southern & Eastern Deserts	up to 7
	11th & 12th	Deserts, Central & Southern Mountains	up to 4"
	19th - 21st	Deserts, Central & Southern Mountains	up to 3"
	25th	Long Beach, W/ Sustained Winds of 50 Mph	5"
		Surrounding Mountains	6 to 12"
Sept. 1945	9th & 10th	Central & Southern Mountains	up to 2”
Sept. 1946	30th - Oct 1st	Southern Mountains	up to 4"
Aug. 1951	27th - 29th	Southern Mountains & Deserts	2 to 5"
Sept. 1952	19th - 21st	Central & Southern Mountains	up to 2"
July 1954	17th - 19th	Deserts & Southern Mountains	up to 2"
July 1958	28th & 29th	Deserts & Southern Mountains	up to 2"
Sept. 1960	9th & 10th	Julian	3.40"
Sept. 1963	17th - 19th	Central & Southern Mountains	up to 7"
Sept. 1967	1st - 3rd	Southern Mountains & Deserts	2"
Oct. 1972	6th	Southeast Deserts	up to 2"
Sept. 1976	10th & 11th	Central & Southern Mountains. Ocotillo, CA was Destroyed 3 Fatalities	6 to 12"
Aug. 1977	n/a	Los Angeles	2"
		Mountains	up to 8"
Oct. 1977	6th & 7th	Southern Mountains & Deserts	up to 2
Sept. 1978	5th & 6th	Mountains	3"
Sept. 1982	24th - 26th	Mountains	up to 4"

Tropical cyclones that have affected Southern California during the 20th Century			
Sept. 1983	20th & 21st	Southern Mountains & Deserts	up to 3"
http://www.fema.gov/nwz97/eln_scal.shtm			

Geography and Geology

Most of La Habra Heights valleys are full of boulders, rocks, gravel, sand and silt. Combine this with existing working septic systems and a rainfall can cause extensive damage.

The greater Los Angeles Basin is the product of rainstorms and erosion for millennia. "Most of the mountains that ring the valleys and coastal plain are deeply fractured faults and, as they (the mountains) grew taller, their brittle slopes were continually eroded. Rivers and streams carried boulders, rocks, gravel, sand, and silt down these slopes to the valleys and coastal plain….In places these sediments are as much as twenty thousand feet thick"[3].

Much of the coastal plain rests on the ancient rock debris and sediment washed down from the mountains. This sediment can act as a sponge, absorbing vast quantities of rain in those years when heavy rains follow a dry period. But like a sponge that is near saturation, the same soil fills up rapidly when a heavy rain follows a period of relatively wet weather. So even in some years of heavy rain, flooding is minimal because the ground is relatively dry. The same amount of rain following a wet period of time can cause extensive flooding.

The greater Los Angeles basin is for all intents and purposes developed. This leaves precious little open land to absorb rainfall. This lack of open ground forces water to remain on the surface and rapidly accumulate. If it were not for the massive flood control system with its concrete lined river and stream beds, flooding would be a much more common occurrence. And the tendency is towards even less and less open land. In-fill building is becoming a much more common practice in many areas. Developers tear down an older home which typically covers up to 40% of the lot size and replacing it with three or four town homes or apartments which may cover 90-95% of the lot.

Another potential source of flooding is "asphalt creep." The street space between the curbs of a street is a part of the flood control system. Water leaves property and accumulates in the streets, where it is directed towards the underground portion of the flood control system. The carrying capacity of the street is determined by the width of the street and the height of the curbs along the street. Often, when streets are being resurfaced, a one to two inch layer of asphalt is laid down over the existing asphalt. This added layer of asphalt subtracts from the rated capacity of the street to carry water. Thus the original engineered capacity of the entire storm drain system is marginally reduced over time. Subsequent re-paving of the street will further reduce the engineered capacity even more.

Flood Terminology

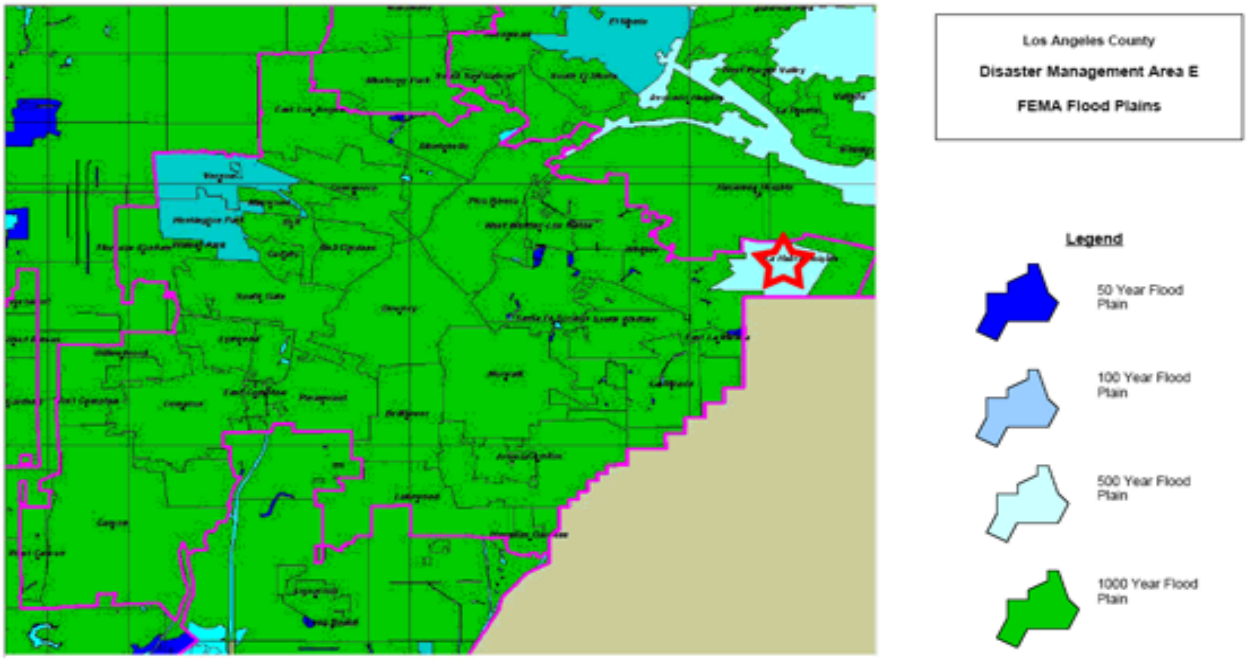
Floodplain

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The floodplain is made up of two sections: the floodway and the flood fringe. The City is now extremely aware of the Floodplain and we take extreme cautions when approving development projects near Floodplains.

100-Year Flood

The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. FEMA has not mapped any flood hazard zones within the boundaries of the City of La Habra Heights, however the map below from the Los Angeles County Hazard Mitigation Plan indicates the City is located in a 500-year flood zone area.

Map 6-1 Los Angeles County FEMA Floodplains
(Source: Los Angeles County Hazard Mitigation Plan)



Floodway

The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For NFIP purposes, floodways are defined as the channel of a river or stream, and the overbank areas adjacent to the channel. The floodway

carries the bulk of the flood water downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures that would obstruct or divert flood flows onto other properties.

The City of La Habra Heights regulations prohibit all development in the floodway. The NFIP floodway definition is "the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

Development
The City of La Habra Heights Floodplain Ordinance to defines development as "any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations located within the area of special flood hazard." The definition of development for floodplain purposes is generally broader and includes more activities than the definition of development used in other sections of local land use ordinances.

Base Flood Elevation (BFE)
The term "Base Flood Elevation" refers to the elevation (normally measured in feet above sea level) that the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities choose to use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation; while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes. The regulations of the NFIP focus on development in the 100-year floodplain.

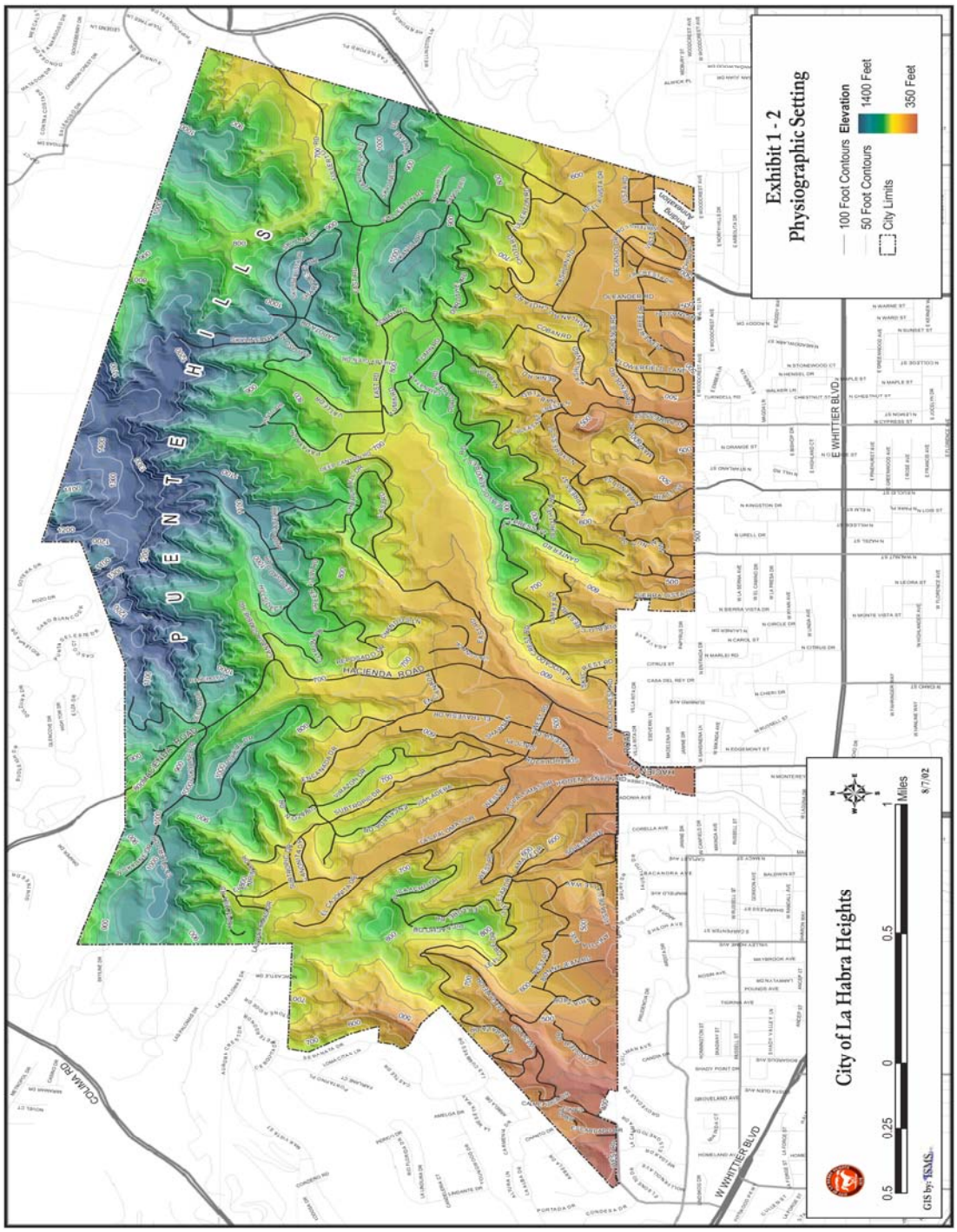
Characteristics of Flooding
Only one type of flooding affects the City of La Habra Heights: urban flooding (see descriptions below). The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

Urban Flooding
As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in flood waters that rise very rapidly and peak with violent force.
During periods of urban flooding, streets can become swift moving rivers, with water backing up into structures. Storm drains often back up with vegetative debris causing additional, localized flooding.

Following is a topographic map from the City's General Plan (Safety Element). The map

clearly identifies the areas prone to urban runoff due to elevation differences.

Map 6-2: Physiographic Setting
(Source: City of La Habra Heights General Plan – Safety Element)



Dam Failure Flooding

The City of La Habra Heights has no dams within the City, however the City could be impacted by other City's dams mostly in the lower level areas with damage caused by ponding. However, staff feels this would be an extremely rare occurrence.

Loss of life and damage to structures, roads, and utilities may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. The Multi-Hazard Functional Plan states that the City is not subject to dam failure. Because dam failure can have severe consequences, FEMA requires that all dam owners develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. Other communities in the vicinity are vulnerable to damages associated with dam failure.

Although there may be coordination with county officials in the development of the EAP, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner.

There have been a total of 45 dam failures in California, since the 19th century. The significant dam failures in Southern California are listed in Table 6-3.

Table 6-3: Dam Failures in Southern California

Dam Failures in Southern California			
Sheffield	Santa Barbara	1925	Earthquake slide
Puddingstone	Pomona	1926	Overtopping during construction
Lake Hemet	Palm Springs	1927	Overtopping
Saint Francis	San Francisquito Canyon	1928	Sudden failure at full capacity through foundation, 426 deaths
Cogswell	Monrovia	1934	Breaching of concrete cover
Baldwin Hills	Los Angeles	1963	Leak through embankment turned into washout, 5 deaths
http://cee.engr.ucdavis.edu/faculty/lund/dams/Dam_History_Page/Failures.htm			

The two most significant dam failures are the St. Francis Dam in 1928 and the Baldwin Hills Dam in 1963.

> "The failure of the St. Francis Dam, and the resulting loss of over 500 lives in the path of a roaring wall of water, was a scandal that resulted in the almost complete destruction of the reputation of its builder, William Mulholland.

Mulholland was an immigrant from Ireland who rose up through the ranks of the city's water department to the position of chief engineer. It was he who proposed, designed, and supervised the construction of the Los Angeles Aqueduct, which brought water from the Owens Valley to the city. The St. Francis Dam, built in 1926, was 180 feet high and 600 feet long; it was located near Saugus in the San Francisquito Canyon.

The dam gave way on March 12, 1928, three minutes before midnight. Its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. 65 miles of valley was devastated before the water finally made its way into the ocean between Oxnard and Ventura. At its peak the wall of water was said to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed: livestock, structures, railways, bridges, and orchards. By the time it was over, parts of Ventura County lay under 70 feet of mud and debris. Over 500 people were killed and damage estimates topped $20 million."[4]

The Baldwin Hills dam failed during the daylight hours, and was one of the first disaster events documented a live helicopter broadcast.

"The Baldwin Hills Dam collapsed with the fury of a thousand cloudbursts, sending a 50-foot wall of water down Cloverdale Avenue and slamming into homes and cars on Dec. 14, 1963.

Five people were killed. Sixty-five hillside houses were ripped apart, and 210 homes and apartments were damaged. The flood swept northward in a V-shaped path roughly bounded by La Brea Avenue and Jefferson and La Cienega boulevards.

Photo 6-1: Baldwin Hills Dam

Baldwin Hills Dam - Dark spot in upper right hand quadrant shows the beginning of the break in the dam.

The earthen dam that created a 19-acre reservoir to supply drinking water for West Los Angeles residents ruptured at 3:38 p.m. As a pencil-thin crack widened to a 75-foot gash, 292 million gallons surged out. It took 77 minutes for the lake to empty. But it took a generation for the neighborhood below to recover. And two decades passed before the Baldwin Hills ridge top was reborn.
The cascade caused an unexpected ripple effect that is still being felt in Los Angeles and beyond. It foreshadowed the end of urban-area earthen dams as a major element of the Department of Water and Power's water storage system. It prompted a tightening of Division of Safety of Dams control over reservoirs throughout the state.

The live telecast of the collapse from a KTLA-TV helicopter is considered the precursor to airborne news coverage that is now routine everywhere."[5]

Debris Flows

Another flood related hazard that can affect certain parts of the Southern California region are debris flows. Most typically debris flows occur in mountain canyons and the foothills against the San Gabriel Mountains. However, any hilly or mountainous area with intense rainfall and the proper geologic conditions may experience one of these very sudden and devastating events. "Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snow melt. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. Debris flows from many different sources can combine in channels, and their destructive power may be greatly increased. They continue flowing down hills and through channels, growing in volume with the addition of water, sand, mud, boulders, trees, and other materials. When the flows reach flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas."[6]

This is one of the most import hazards to the City of La Habra Heights. The City has to clear all of the natural drainage courses to ensure that debris flow does not occur. Mudslides are relatively common within La Habra Heights during extreme rain conditions. It is when the debris or mud gets into the drainage channels and blocks the flow of water that the City suffers damages.

What is the Effect of Development on Floods?
When structures or fill are placed in the floodway or floodplain water is displaced. Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. When structures or materials are added to the floodway or floodplain and no fill is removed to compensate, serious problems can arise. Flood waters may be forced away from historic floodplain areas. As a result, other existing floodplain areas may experience flood waters that rise above historic levels.

As La Habra Heights rarely has a tract development and most of our development is custom single family residences temporary and permanent erosion control are a critical part of every development.

Local governments must require engineer certification to ensure that proposed developments will not adversely affect the flood carrying capacity of the Special Flood Hazard Area (SFHA). Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the development and implementation of storm water management systems to ensure that these runoff waters are dealt with effectively.

How are Flood-Prone Areas Identified?
Flood maps and Flood Insurance Studies (FIS) are often used to identify flood-prone areas. The NFIP was established in 1968 as a means of providing low-cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations that focus on building codes and sound floodplain management. In the City of La Habra Heights, the NFIP has not mapped any flood hazards.

Through the plan check process, the County of Los Angeles Public Works Department assures the City's compliance with the requirements of the National Flood Insurance Program (NFIP). The County requires that an analysis of the impact on the existing floodplain be performed. The consultant is required to demonstrate that the cumulative effect of the encroachment does/does not cause a rise of more than 1-foot above the base flood elevation, while ensuring that the structure is "protected from flooding."

Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS) Floodplain maps

are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A Flood Insurance Rate Map (FIRM) is the official map produced by FEMA which delineates SFHA in communities where NFIP regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases they also include base flood elevations (BFEs) and areas located within the 500-year floodplain. Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA.

FEMA flood maps are not entirely accurate. These studies and maps represent flood risk at the point in time when FEMA completed the studies, and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. FEMA has not yet mapped any flood hazards in the City. Man-made and natural changes to the environment have changed the dynamics of storm water run-off since then.

Flood Mapping Methods and Techniques

Although many communities rely exclusively on FIRMs to characterize the risk of flooding in their area, there are some flood-prone areas that are not mapped but remain susceptible to flooding. These areas include locations next to small creeks, local drainage areas, and areas susceptible to manmade flooding.

Communities find it particularly useful to overlay flood hazard areas on tax assessment parcel maps. This allows a community to evaluate the flood hazard risk for a specific parcel during review of a development request. Coordination between FEMA and local planning jurisdictions is the key to making a strong connection with GIS technology for the purpose of flood hazard mapping.

FEMA and the Environmental Systems Research Institute (ESRI), a private company, have formed a partnership to provide multi-hazard maps and information to the public via the Internet. ESRI produces GIS software, including ArcViewC9 and ArcInfoC9 . The ESRI web site has information on GIS technology and downloadable maps. The hazards maps provided on the ESRI site are intended to assist communities in evaluating geographic information about natural hazards. Flood information for most communities is available on the ESRI web site. Visit www.esri.com for more information.

Hazard Assessment

Hazard Identification
Hazard identification is the first phase of flood-hazard assessment. Identification is the process of estimating: (1) the geographic extent of the floodplain (i.e., the area at risk from flooding); (2) the intensity of the flooding that can be expected in specific areas of the floodplain; and (3) the probability of occurrence of flood events. This process usually results in the creation of a floodplain map. Floodplain maps provide detailed information that can assist jurisdictions in making policies and land-use decisions.

Data Sources
The 500-year flood hazard shown on page 7 was acquired from the Los Angeles County Hazard Mitigation Plan.

Vulnerability Assessment
Vulnerability assessment is the second step of flood-hazard assessment. It combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, and 500-year) are not readily available, calculating a community's vulnerability to flood events is not straightforward. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

Risk Analysis
Risk analysis is the third and most advanced phase of a hazard assessment. It builds upon the hazard identification and vulnerability assessment. Any future flood risk analysis for the City of La Habra Heights should include two components: (1) the life and value of property that may incur losses from a flood event (defined through the vulnerability assessment); and (2) the number and type of flood events expected to occur over time. Within the broad components of a risk analysis, it is possible to predict the severity of damage from a range of events. Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events. The data used to develop these models is based on hydrological analysis of landscape features. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that can be expected from a flood event.

Using GIS technology and flow velocity models, it is possible to map the damage that can be expected from flood events over time. It is also possible to pinpoint the effects of certain flood events on individual properties. At the time of publication of this plan, data was insufficient to conduct a risk analysis for flood events in the City of La Habra Heights. However, the current mapping projects will result in better data that will assist in understanding risk.

Community Flood Issues

What is Susceptible to Damage during a Flood Event?
The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage have been limited to those areas prone to urban flooding (see earlier discussion).

The geologic history and terrain characteristics of La Habra Heights resulted in numerous valleys and other areas where channeled water may pose localized flood hazards. The City has only limited infrastructure designed to efficiently contain flood water. It is not economically feasible to develop such facilities in the already developed community. Areas in which localized flood hazard or ponding may result can be delineated based upon topography and the size of watershed. Flooding can damage private property, City Streets, storm drains and drainage courses.

Property Loss Resulting from Flooding Events
The type of property damage caused by flood events depends on the depth and velocity of the flood waters. Faster moving flood waters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris. Extensive damage can be caused by basement flooding and landslide damage related to soil saturation from flood events. Most flood damage is caused by water saturating materials susceptible to loss (i.e., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances). In many cases, flood damage to homes renders them unlivable.

The City has in the past suffered damages to City roads because of water flow, undermininig of the roads or water induced landslides.

Mobilehomes
Statewide, the 1996 floods destroyed 156 housing units. Of those units, 61% were mobile homes and trailers. Many older mobilehome parks are located in floodplain areas. Mobilehomes have a lower level of structural stability than stick-built homes, and must be anchored to provide additional structural stability during flood events. Because of confusion in the late 1980s resulting from multiple changes in NFIP regulations, there are some communities that do not actively enforce anchoring requirements. Lack of enforcement of mobilehome construction standards in floodplains can contribute to severe damages from flood events.

The City does not have any Mobile homes.

Business/Industry
Flood events impact businesses by damaging property and by interrupting business. Flood events can cut off customer access to a business as well as close a business for repairs. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

As the City is mostly a residential community, there is limited affect to the business/industry as it relates to flooding. The oil company has provisions in place to pump out the wells when they fill with water. The golf club potentially could suffer ponding or landslides. The City roads can and are affected by flooding such as the 2006 Winter storms.

Public Infrastructure
Publicly owned facilities are a key component of daily life for all citizens of the county. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices can hinder the ability of the government to deliver services. Government can take action to reduce risk to public infrastructure from flood events, as well as craft public policy that reduces risk to private property from flood events.

Roads
During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Roads systems in the City of La Habra Heights are maintained by multiple jurisdictions. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Transportation agencies responsible for road maintenance are typically aware of roads at risk from flooding.

Until the last few years the City had allowed residents to flow their drainage to the City street and use the street as a drainage course. Staff has now determined this is too costly and damaging. The new Municipal Codes addresses this item by no longer allowing run off to flow to the City streets. As development projects come through the City the planning stages address the water run off concern and reroute the water.

Bridges
Bridges are key points of concern during flood events because they are important links in road networks, river crossings, and they can be obstructions in watercourses, inhibiting the flow of water during flood events. The bridges in the City of La Habra Heights are state, county, city, or privately owned. A state-designated inspector must inspect all state, county, and city bridges every two years; but private bridges are not inspected, and can be very dangerous. The inspections are rigorous, looking at everything from seismic capability to erosion and scour.

There are no bridges within La Habra Heights that would be affected by flooding.

Storm Water Systems
Local drainage problems are common in certain portions of the City of La Habra Heights. There is a drainage master plan, maintained by the Community Development Department that addresses the existence of these local drainage threats. The City's General Plan states that the local storm drains are maintained and monitored by the Los Angeles County Public Works Department. The problems are often present where storm water runoff enters culverts or goes underground into storm sewers. Inadequate maintenance

can also contribute to the flood hazard in urban areas.

Water/Wastewater Treatment Facilities
Most residences within the City are served by septic tanks. The City's General Plan notes that there are some instances in the City where these septic systems are failing. This situation could be exacerbated by urban flooding. Potable water is provided by the La Habra Heights County Water District.

Approximately 95% of the City is on septic systems. The City has entered into a Memorandum of Understanding with the County of Los Angeles to identify and track all existing systems. If at some point in the future the City is required to move these residents to sewer connections the City will seek Federal Funding for this purpose, as the cost of sewer connections and pumping stations to the local residents would be too costly.

Water Quality
Environmental quality problems include bacteria, toxins, and pollution. The City's General Plan states that the City participates with the County of Las Angeles in the National Pollutant Discharge Elimination System to reduce pollutants in urban runoff.

Flood Endnotes

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1. http://www.lalc.k12.ca.us/target/units/river/tour/hist.html

2. Gumprecht, Blake, 1999, Johns Hopkins University Press, Baltimore, MD.

3. Ibid

4. http://www.usc.edu/isd/archives/la/scandals/st_francis_dam.html

5. http://www.latimes.com/news/local/surroundings/la-me-surround11dec11,0,1754871.story?coll=la-adelphia-right-rail

6. http://www.fema.gov/rrr/talkdiz/landslide.shtm#what

Appendix A:
Master Resource Directory

City of La Habra Heights

The Resource Directory provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The Development Review Team 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 Review Team 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-Ia.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

City of La Habra Heights

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 City of La Habra Heights Natural Hazards Mitigation Plan integrates a cross-section of public input throughout the planning process. To accomplish this goal, the Planning Team developed a public participation process through five components: (1) developing a Planning Team comprised of knowledgeable individuals representative of several City agencies; (2) conducting a survey of "Levels of Concerns" 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 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.

Planning Team

Hazard mitigation in the City of La Habra Heights was overseen by the City's Hazard Mitigation Planning Team, which consisted of representatives from various City and County 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 Planning Team 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 #1: Pre-Training April 21, 2004

The meeting was held at La Habra Heights City Hall. Emergency Planning Consultants (EPC) delivered pre-training to the Planning Team. 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 1.5 hours.

Meeting #2: Kick-Off Meeting April 21, 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 Planning Team prepared a draft media release and discussed a public opinion survey provided by EPC. EPC committed to revising the media release and survey and distributing electronic copies to each of the Planning Team entities. The Kick-Off Meeting lasted approximately 6 hours.

Meeting #3 Pre-Training: Mitigation July 6, 2004
The meeting was held at La Habra Heights City Hall. EPC delivered pre-training to the Planning Team. 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 July 6, 2004
EPC delivered the Draft Hazard Analysis and the Planning Team 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 La Habra Heights, as well as identifying future mitigation actions.

A brainstorming process was then conducted to develop the goals for the Plan. The Planning Team established goals for the Mitigation Plan. Following a discussion of alternative ranking techniques, the Team agreed to cluster the rankings of the Mitigation Actions by type of actions as follows: #1 Multi-Hazard, #2 Earthquakes, and #3 Wildfire.

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 Planning Team 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.

Throughout the planning process, the consultant reminded the Planning Team of the importance of considering Benefit/Cost issues including: social issues, political realities, economic benefits, and environmental concerns. During Meeting #4, the consultant introduced the Planning Team to the STAPLEE Tool (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) as one of many means available to prioritize mitigation actions. Following a discussion of a range of benefit/cost issues, the Planning Team voted to cluster the action items by hazard as follows: #1 Multi-Hazard, #2 Earthquake, #3 Wildfire, and #4 Urban Flooding. The Team was unanimous in its belief that the “Multi-Hazard” actions would yield the greatest benefit to the jurisdiction.

During February 2007, the Mitigation Team met to complete the STAPLEE Prioritization Tool. The results of this effort can be found in Plan Maintenance – Attachment 1.

Public Meetings

City of La Habra Heights conducted a public meeting where the Final Draft Natural Hazards Mitigation Plan was presented and discussed. At the City Council meeting (October 14, 2004) the Council was pleased 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 Planning Team to become a Disaster Resistant Community. The results of the resident survey were discussed and the Council commended the Planning Team for its expeditious efforts to satisfy the DMA 2000 requirements.

Invitation Process

The Planning Team worked with the City Clerk to identify possible public notice sources. A press release was submitted to the local media. A notice was also placed in the quarterly city newsletter that is mailed to all residents.

Results

The Planning Team Chairperson began the presentation by providing an overview of the project to the participants. The participants were encouraged to present their views and make suggestions on possible mitigation actions. The Planning Team Chairperson 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 and the results of the resident survey. The Chairperson then fielded questions from the City Council. The meeting lasted approximately 1 hour and was aired on City of La Habra Heights cable access for approximately one month.

The City Council was unanimous in their approval of the City of La Habra Heights Natural Hazards Mitigation Plan.

Once the Plan is approved by FEMA the Planning Team will take the document back to the City Council for formal adoption.

Appendix B: Attachment 1

Survey Results

The City of La Habra Heights distributed a survey at the City Council and the City's Newsletter to residents. The survey asked participants to rank their concerns about the following hazards: earthquakes and wildfire. Approximately 5% (107 surveys received) of the community's 2000 residents responded to the survey which yielded the following results:

	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned	Average
Earthquake	11.20%	26.10%	39.30%	18.70%	4.67%	20.00%
Wildfire	55.00%	23.30%	15.90%	1.90%	1.90%	19.60%
Other	19.60%	7.50%	23.30%	11.20%	7.50%	13.82%

Note: See Survey Sample attached to Appendix B: 10

Appendix B: Attachment 2

CITY OF LA HABRA HEIGHTS

MINUTES OF A REGULAR MEETING OF

THE LA HABRA HEIGHTS CITY COUNCIL

OCTOBER 14, 2004

16. LOCAL HAZARD MITIGATION PLAN (LHMP).

This item was taken out of order.

To comply with FEMA requirement the City of La Habra Heights must submit a Local Hazard Mitigation Plan in order to receive FEMA assistance when needed. The filing date must be prior to November 1, 2004.

RECOMMENDATION: Approve submittal of the Local Hazard Mitigation Plan.

Senior Management Analyst Orchanian reported that the City was required to submit a Local Hazard Mitigation Plan (LHMP) to FEMA by November 1, 2004. La Habra Heights held their kickoff meeting on Wednesday, April 21, 2004 with Carolyn Harshman of Emergency Management Agency (FEMA).

Ms. Orchanian noted that during the meeting they discussed the potential hazards that could affect the City of La Habra Heights. Two of these hazards are *wildfire and earthquakes.* The planning team was comprised of the City Manager, Senior Management Analyst, Fire Chief, Community Development Director, Planning Technician, Fire Marshal, Deputy City Engineer, L.A. County Public Works, and a County Sheriff Deputy. A survey was mailed out in our summer Newsletter with a 5% response from residents indicating that Fire and Earthquake were a definite threat. Other hazards were identified as well. We are concerned that if something happens and they are not approved it might affect whether we get assistance from FEMA.

Ms. Orchanian stated that the City has made an effort to comply with FEMA, although some of their document does not apply to our City. Until further notice, our document will be a work in progress that City Staff will review and revise every two years as needed.

We are requesting that the City Council approve the Local Hazard Mitigation Plan document.

No additional costs were incurred besides the Consultant fees. The Consultant fees totaled $10,000. This was paid in $2,000 increments for five months.

City Manager Hendrickson explained that if the Council does not adopt the Local Hazard Mitigation Plan, we would not be eligible for FEMA assistance. We are concerned that the Water District did not participate in this Hazard Mitigation Plan, although they did something similar.

Senior Management Analyst Orchanian thanked Mayor Pro Tem Douglas for his help in putting the finishing touches on the document.

Carolyn Harshman stated that a good definition for Mitigation is, "to lessen or eliminate threats associated with a hazard". She stated that the City is already doing many things to lessen earthquake hazards, such as building codes. She also noted that the City is already doing about half of the mitigation actions that are on their list.

Ms. Harshman noted that 55% of the concerns expressed by the residents were about wildfires. That needs to be taken into consideration in planning mitigation of such risks.

Mayor Borrowe asked the Senior Management Analyst if she had figured Staff time in with the cost of this plan.

Ms. Orchanian answered in the negative.

City Manager Hendrickson explained that they did not count Staff time as they get paid no matter what they are working on and he just wanted to show what the additional cost is. He stated that the next time he would try to estimate the cost.

Mayor Borrowe stated that he would like to see what the total cost of such mandated requirements are.

Mayor Borrowe noted that he had heard comments that this Plan was not really required to receive aid from FEMA. Is this correct or not?

Ms. Harshman stated that this was not correct. What would be cut off would be the Hazard Mitigation Plan Grants.

Mayor Borrowe asked Ms. Orchanian if she had any idea why there was such a low response from the residents on the survey.

Ms. Orchanian stated that it was sent out in the summer and could have been affected by vacations. We did have a deadline that we had to reach.

Mayor Pro Tem Douglas noted that the residents are very aware of these hazards and hear about them and how we can mitigate them.

Ms. Harshman noted that even if the response was low, the 55% who expressed their concern with wildfires, shows where the concerns lie.

Mayor Borrowe stated that he liked the glossary with the Hazard Mitigation Plan which has 93 definitions in it.

Councilmember Carroll offered a motion to submit the Local Hazard Mitigation Plan to FEMA. The motion was seconded by **Mayor Pro Tem Douglas** and approved as follows:

AYES: Borrowe, Carroll, Douglas, Klein and Millsap
NOES: None
ABSENT: None

Appendix B: Attachment 3

List of Plan Reviewers

Los Angeles County Sheriff'
Los Angeles County Public Works
John Hendrickson, City Manager
Bruce Douglas, Mayor Pro-Tem
Lara Orchanian, Senior Management Analyst
Sandra Massa-Lavitt, Community Development Director
Barbara Doppieri, Planning Technician
Patrick Lang, Deputy City Engineer
John Nielsen, Fire Chief
Jim Powderly, Fire Marshal

LOCAL HAZARD MITIGATION SURVEY RESULTS

NOTE: SCALE 1-5 (5 being the highest & 1 being the lowest)

	EXTREMELY CONCERNED	VERY CONCERNED	CONCERNED	SOMEWHAT CONCERNED	NOT CONCERNED
Natural Disaster	*5*	*4*	*3*	*2*	*1*
EARTHQUAKE					
WILDFIRE					
OTHER					

Appendix C:
Benefit Cost Analysis

City of La Habra Heights

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.

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

> 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.

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

City of La Habra Heights

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

City of La Habra Heights

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.