CITY OF PASADENA
LOCAL HAZARD MITIGATION PLAN

Final

March 2019

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1 Introduction

Across the United States, natural and manmade disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The impact on families and individuals can be immense and damages to businesses can have catastrophic regional economic effects. The time, money and effort to respond to and recover from these disasters also divert public resources and attention from other important programs and problems. The City of Pasadena recognizes the consequences of disasters and the need to reduce the impacts of hazards. The City's leadership understands that with thorough analysis, mitigation can become a long-term, cost effective means for reducing the impact of these hazards.

Mitigation is commonly defined as any sustained action(s) taken to reduce or, where possible; eliminate risk. Hazard mitigation focuses attention and resources on actions that will reduce or eliminate long-term risks to human life or property from hazards. Hazard mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, it can reduce injuries, protect critical community facilities, reduce exposure to liability, and minimize community disruption.

Federal and State legislation has provided funding for disaster preparedness, response, and recovery. However, history has demonstrated that it is less expensive to mitigate against disaster damage than to repeatedly repair damage in the aftermath. That is why many recognize that the impact of expected, yet often unpredictable natural and manmade events, can be reduced through mitigation planning. A mitigation plan states the aspirations and specific courses of action jurisdictions intend to follow to reduce vulnerability and exposure to future hazard events.

The City of Pasadena Local Hazard Mitigation Plan (LHMP) guides the City of Pasadena towards greater disaster preparedness and resiliency in harmony with the character and needs of the city and its communities. The emphasis of the LHMP is on the assessment of current capabilities and relevant risk, and understanding current and past mitigation efforts, for the purposes of identifying mitigation measures to address existing exposures/vulnerability, thus reducing injuries and ensuring critical infrastructure are functioning after a disaster. Hazard mitigation strategies help to eliminate losses by limiting new exposures in identified hazard areas, diverting the hazard by reducing the impact, and developing an awareness of hazard area location to avoid future development.

Updating of this LHMP demonstrates the city's commitment to mitigation, fulfills regulatory requirements as established by the Federal Emergency Management Agency (FEMA), establishes eligibility for technical assistance and Hazard Mitigation Assistance (HMA) grant programs (Hazard Mitigation Grant Program- *HMGP*, Pre-Disaster Mitigation- *PDM*, and Flood Mitigation Assistance- *FMA*) and, serves as a guide to local decisions makers to implement mitigation programs.

The process to update the LHMP included nearly a year of coordination and was prepared with input from city staff, key committee stakeholders, citizen participation, city officials, and support from the State of California Governor's Office of Emergency Services (Cal OES) and the FEMA.

It is the City's hope that this LHMP continues to be used as a tool for all stakeholders to increase public awareness of local hazards and risks, while at the same time providing information about options and resources available to reduce those risks. Informing and educating the public about potential hazards will help the City, its residents, and visitors protect themselves against their effects.

2 Plan Purpose and Authority

The primary purpose of this LHMP is to identify potential community actions that can be implemented over the short- and long-term that will result in a reduction in risk and potential future losses citywide. This is accomplished by using a systematic process of learning about the hazards that can affect the jurisdiction, setting clear goals and objectives, identifying and implementing appropriate actions, and keeping the plan current.

The LHMP is an integral part of a multi-pronged approach to minimizing personal injury and property damage from natural and manmade hazards. It is designed to complement other planning documents and regulatory authorities governing pre-disaster land use planning and post-disaster response and recovery. It is intended to set the tone for the implementation of hazard mitigation practices that will build a disaster resistant and sustainable community.

The impetus and authority to create this plan is derived from the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000 (DMA 2000). In response to escalating disaster costs, the federal government adopted DMA 2000 which places emphasis on hazard mitigation planning. Under DMA 2000, state and local governments are required to have a FEMA-approved LHMP to be eligible for HMA grants.

The DMA 2000 is legislation designed to improve the delivery of mitigation programs through sound and viable planning. The legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together.

Section 322 of DMA 2000 specifically addresses mitigation planning at the state and local levels. It identifies requirements that allow HMGP funds to be used for planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced State Hazard Mitigation Plan (HMP). LHMPs must be consistent with the State HMP and must demonstrate that their proposed projects are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities. Local governments have certain responsibilities for implementing Section 322 including:

- Preparing and submitting a LHMP
- Reviewing and updating the LHMP every five years, and
- Monitoring mitigation actions included in the LHMP

The requirements and procedures for mitigation plans are found in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 and the associated Interim Final Rule changes.

The federal law and associated rule changes and regulations establish planning and funding criteria for states and local communities. This criterion includes the following:

- *Enhance Public Awareness and Understanding*- to help residents of the City better understand the natural hazards that threaten safety and welfare; economic vitality; and the operational capability of critical infrastructure;

- *Create a Decision Tool for Management*- to provide information that managers and leaders of local government, business and industry, community associations, and other key institutions and organizations need to take action to address vulnerabilities to future disasters;
- *Promote Compliance with State and Federal Program Requirements*- to ensure that the City of Pasadena can take full advantage of state and federal grant programs, policies, and regulations that encourage or mandate that local governments develop comprehensive hazard mitigation plans;
- *Enhance Local Policies for Hazard Mitigation Capability*- to provide the policy basis for mitigation actions that should be promulgated by participating jurisdictions to create a more disaster-resistant future; and
- *Provide Inter-Jurisdictional Coordination of Mitigation-Related Programming*- to ensure that proposals for mitigation initiatives are reviewed and coordinated among the participating jurisdictions within the County.
- *Achieve Regulatory Compliance*- to qualify for certain forms of federal aid for pre- and post-disaster funding, local jurisdictions must comply with the federal DMA 2000 and its implementing regulations (44 CFR Section 201.6). DMA 2000 intends for hazard mitigation plans to remain relevant and current. Therefore, Local plans are updated every five years. This means that the Local Hazard Mitigation Plan for the City of Pasadena uses a "five-year planning horizon". It is designed to carry the City through the next five years, after which its assumptions, goals, and objectives will be revisited and the LHMP resubmitted for approval. Section 7 details specific goals and objectives with regard to implementing mitigation activities over the life of this LHMP. In Section 8, the City of Pasadena has outlined a more aggressive approach to ensuring the LHMP is implemented, evaluated, monitored and updated.

Adoption of this LHMP by the governing body through a signed resolution following formal review and approval by the California OES and FEMA constitutes plan completion. The formal Adoption Resolution is in **Appendix A**.

3 Planning Process

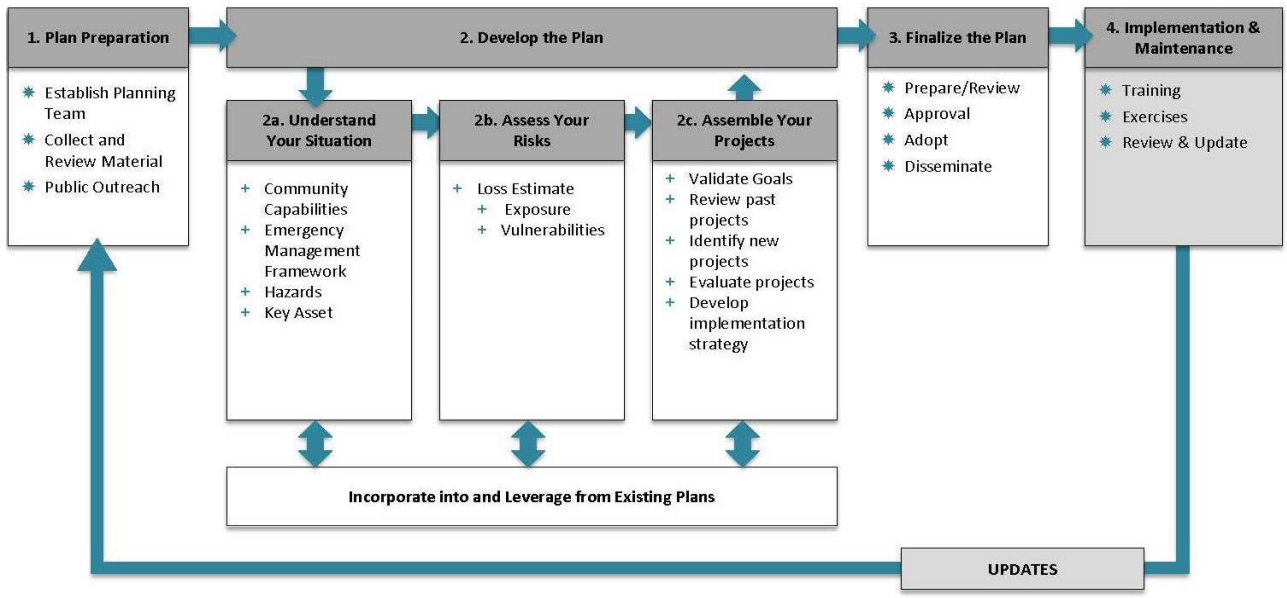
3.1 OVERVIEW

The planning process implemented to update the City of Pasadena's 2013 LHMP followed the concepts and principles outlined in FEMA's Mitigation Guidance, as well as, FEMA's Comprehensive Preparedness Guide (CPG) 101. The planning process for the updating of the LHMP incorporated the following steps:

1. *Plan Preparation*
   - Form/Validate planning team members
   - Establishing common project goals
   - Setting expectations and timelines
2. *Plan Development*
   - Validate and revise the existing conditions/situation within planning area; the Capabilities Assessment and Hazard Assessment Sections in the LHMP
   - Develop and review the risk to hazards (exposure and vulnerability) within the planning area; the Vulnerability Assessment Section in the LHMP
   - Review and identify mitigation actions within the planning area; the Mitigation Strategy in the LHMP
3. *Finalize the Plan*
   - Review and revise the plan
   - Approve the plan
   - Adopt and disseminate the plan

It should be noted that there is a fourth step (*Plan Implementation and Maintenance*); however, that step occurs after adoption and is not part of this update process. To help better understand the planning process, a planning flow chart was also developed (**Figure 3-1**). The flow chart assists in better visualizing the steps and the approach.

Figure 3-1 Local Hazard Mitigation Plan Update Planning Process



In support of the implementation of the planning process, a planning team was established. For this purpose, the planning team is referred to as the Steering Committee. Section 3.2 provides further details on the Steering Committee. Additionally, throughout this process, and complaint with other standard City of Pasadena practices, opportunities for public involvement were offered and encouraged. More details about public engagement are provided under the Public Outreach section of the LHMP (Section 3.3).

3.2 STEERING COMMITTEE

To ensure the update to the LHMP was comprehensive, considerable consideration was given to the selection of Steering Committee members. The intent was to identify members who could represent key segments of the community. In support of this effort, a consultant was hired to facilitate discussions and provide technical assistance to the Steering Committee. The consultant's role was to:

- document the planning process
- facilitate vulnerability assessment discussions
- guide the Steering Committee in the identification of mitigation actions
- review and update material and sections
- coordinate with FEMA and OES

3.2.1 Role and Responsibilities

The Steering Committee was guided through the LHMP planning process; and as decisions were made and material developed, it was the Steering Committee's responsibility to review and accept results.

The Steering Committee focused on the following underlining philosophies:

- **Focus on the mitigation strategy**
  The mitigation strategy is the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.
- **Process is as important as the plan itself**
  In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan should also serve as the written record, or documentation, of the planning process.
- **This is the community's plan**
  To have value; the plan must represent the current needs and values of the community and be useful for local officials and stakeholders. Develop the mitigation plan in a way that best serves your community's purpose and people.
- **Intent is as important as Compliance**
  Plan reviews will focus on whether the mitigation plan meets the intent of the law and regulation; and ultimately that the plan will make the community safer from hazards.

The role of the Steering Committee was to:

- validate the planning approach
- provide information, material and existing plans for incorporation into LHMP
- be the primary liaison with other community members and stakeholders
- promote public participation
- collaborate with other Steering Committee members
- identified the hazards
- develop risk assessment
- update and review material
- address FEMA and the Cal OES comments
- oversee the adoption of the LHMP
- review mitigation actions.

3.2.2 Hazard Mitigation Steering Committee Members

The City of Pasadena Hazard Mitigation Steering Committee was led by the City of Pasadena Fire Department Emergency Services Coordinator Lisa Derderian. This responsibility was later transferred to Chief Deputy Jon Trautwein.

The City's Disaster Coordinators Committee who already met on a monthly basis comprised most of the membership. Representation came from key City Departments and Agencies. A list of Steering Committee Members with position titles and organization is provided in **Table 3-2.**

The Steering Committee meetings were arranged and scheduled to follow the planning process steps outlined in Section 3.1 (Overview). Each meeting was designed to walk the members through sections of the LHMP. In addition to reviewing and validating material, the intent was to also educate members on the planning process and purpose of each section.

By taking this step it helped ensure that each member would bring this knowledge back to their organizations and other stakeholders

Table 3.3 provides a list and the main purpose of each of the meetings. Discussions and results from each meeting were captured and incorporated into the LHMP where appropriate. The attendance logs and presentations of each meeting and can be found in **Appendix B**

Table 3-2 Steering Committee Members

Name	Position/Title	Organization	Department
Adrienne Kung	Program Coordinator II	City of Pasadena	Health
Alex Souto	Human Resources Manager (C)	City of Pasadena	Human Resources
Ana Espanola	Associate Planner	City of Pasadena	Planning
Anita Cerna	Senior Planner	City of Pasadena	Planning
Art Silva	Power Production Superintendent	City of Pasadena	Water & Power

Bertral Washington	Fire Chief	City of Pasadena	Fire
Bob Ridley	Controller	City of Pasadena	Finance
Brad Boman	Engineering Manager	City of Pasadena	Water & Power
Burhan Alshanti	Principal Electrical Engineer	City of Pasadena	Water & Power
Carlos Baffigo	Principal Librarian	City of Pasadena	Library
Carolyn Gordon	Police Sergeant	City of Pasadena	Police
Dan Augustyn	Management Analyst V	City of Pasadena	Information Technology
Denise Guerrero	Operations Assistant	City of Pasadena	Library
Ed Calatayud	Police Commander (C)	City of Pasadena	Police
Erika Estrada	Purchasing Administrator	City of Pasadena	Finance-Purchasing
Hayden Melbourn	Capital Project Manager	City of Pasadena	Public Works
Heather Peron	Event Operations Manager	City of Pasadena	Pasadena Center
Henry Frometa	Management Analyst III	City of Pasadena	Human Resources
Horace Wormerly	NO LONGER W/CITY	City of Pasadena	Human Services and Recreation
Israel Del Toro	Senior Project Manager	City of Pasadena	Planning
James Tong	Engineer	City of Pasadena	Public Works
Jan Hamblen	Principal Electrical Engineer	City of Pasadena	Transportation
Jason Niccoli	Principal Electrical Engineer	City of Pasadena	Water & Power
Jenessa Wendland	Operations Manager	City of Pasadena	Rose Bowl Operating Company
Jennifer Curtis	Director of Human Resources	City of Pasadena	Human Resources
Joaquin Siques	Engineer	City of Pasadena	Transportation
Jon Trautwein	Deputy Fire Chief	City of Pasadena	Fire
Julie Gutierrez	Assistant City Manager	City of Pasadena	City Manager
Kenny James	Senior Community Rel Rep	City of Pasadena	Human Services and Recreation
Kris Markarian	City Engineer	City of Pasadena	Public Works
Lisa Derderian	Public Information Officer	City of Pasadena	Fire
Mandy Templeton	311 Call Center Manager	City of Pasadena	Public Works
Michael Johnson	Director of Public Health	City of Pasadena	Health
Mona Tse	Management Analyst IV	City of Pasadena	Public Works
Norman Lara	Water System Operator	City of Pasadena	Water & Power
Phil Tong	Management Analyst IV	City of Pasadena	Transportation

Richard Yee	Principal Engineer	City of Pasadena	Public Works
Robert Monzon	Management Analyst V	City of Pasadena	City Clerk
Roger Roldan	Police Sergeant	City of Pasadena	Police
Ruben Martinez	Staff Assistant III	City of Pasadena	City Clerk
Sarkis Nazgrian	Building Official	City of Pasadena	Planning
Shari Thomas	Asst Gen Mgr - Water & Power	City of Pasadena	Water & Power
Tim McDonald	Deputy Director	City of Pasadena	Library
Tunji Adedeji	Wholesale Operations Manager	City of Pasadena	Water & Power
Andy Petrow	Facilitator	Consultant	Soteria EM Services
Laura Hernandez	Lead Planner	Consultant	Soteria EM Services

3.2.3 Community Stakeholders

Efforts were made to extend invitations to surrounding cities, counties, and other key stakeholders. A copy of the e-mail invitation is contained in **Appendix C**. While some accepted the invitation, others declined because of workload. Additionally, of those who accepted, some were unable to always participate in meetings. To combat this a separate meeting for key stakeholders was held with city staff. During this meeting the city was able to provide an overview of actions to date and discuss coordination for the identification of mitigation actions. Stakeholders were invited to attend a combined meeting with the Pasadena Steering Committee. The role of the Community Stakeholders was as follows:

- validate hazards and prioritization
- provide information and material and existing plans for incorporation into LHMP
- collaborate with other Steering Committee members
- review and update material
- contribute to mitigation strategies

The following tables provide a list of the key stakeholders (Table 3.2.1).

Table 3.2.1 Key Stakeholder Members

Name	Organization	Title
Catherine Christensen	CalTech	Program Manager
Steve Higginbotham	Disaster Advisory Council	Volunteer
Mary Schander	Disaster Advisory Council	Volunteer
John Penido	LA Co Disaster Management JPA	Area C Coordinator
Jennifer Waldron	Huntington Hospital	Disaster Program Manager
Alex Boekelheide	Pasadena City College	Executive Director
Andrew Oliver	Pasadena Humane Society	Animal Control Officer
Sara Muriello	Pasadena Humane Society	Animal Control Officer
Nelson Cayabyab	Pasadena Unified School District	Chief Facilities Officer
Hilda Ramirez-Horvath	Pasadena Unified School District	Chief of Communications
Steve Miller	Pasadena Unified School District	Chief of Human Resources

Table 3.3 Steering Committee Meetings Summary

Date	Purpose
Oct 2017	Introductions Role of the Steering Committee Overview of planning process and update requirements Restructure/Reorganization of previous LHMP Discuss Collect and Review Existing Plans for Incorporation to LHMP Public Outreach efforts
Nov 2017	Review of the revised Table of Content Review Planning Process Section Discuss the Capability Assessment section Discuss community hazards Identify Public Outreach target dates
Jan 2018	Review of Capabilities Assessment Section Discuss Hazard Assessments Section Review Critical Facilities Prepare for Public Outreach meeting #1- project introduction
Feb 2018	Review of Hazard Assessment Section Present Initial Vulnerability Assessment results Review Goals & Objectives
Jun 2018	Review Vulnerability Results Validate Hazard Ranking Review Revised Goals & Objectives Review previous mitigation strategies Discuss new mitigation strategies
Jul 2018	Review/Adopt Mitigation Actions List Review Draft Mitigation Action Ranking (STAPLEE) Establish Project Priorities Validate Implementation Plan Prepare for Public Outreach Meeting #2 Discuss review and approval process
Aug 2018	Overview of update with Stakeholders Discussion of previous mitigation actions Discussion of new mitigation actions
Sep 2018	Review previous mitigation actions Discuss new mitigation actions Discuss monitoring process

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3.3 PUBLIC OUTREACH

There were two (2) different Public Outreach campaigns used during the City of Pasadena LHMP update process: the first informing the community of LHMP update and the second educating the community of hazards. Community education of hazards is an ongoing campaign that was leveraged during the LHMP update process. Below is a summary of the campaigns:

3.3.1 Informing the Community of the LHMP Update process

In late 2017, the City of Pasadena issued a press release announcing the commencement of the LHMP planning process. This announcement invited the public to notify the city of their interest to participate in the planning process and/or to submit initial thoughts and comments.

In support of this announcement, a Public Outreach meeting was held May 16, 2018 to introduce the community to the LHMP planning process and to inform the community of the hazards the Steering Committee recommended to be included in the LHMP. A second Public Outreach meeting was held September 17, 2018, to inform the community of recommended mitigation actions, provide an opportunity for their input on the mitigation actions, and to invite them to review and submit comments on the draft LHMP update. Both Public Outreach meeting announcements were posted on the city website.

Although well announced, attendance was low at the Public Outreach meetings. Because of this, no public comments were received. The public announcements and presentations for both meetings can be found in **Appendix C**

3.3.2 Ongoing Public Outreach

The City of Pasadena utilizes several platforms to educate the public about hazards in the community, relevant programs to safeguard and protect themselves from the effects of the hazards, and actions they can take to prepare themselves for events. Below is a list of the different platforms used and a summary of the some of the programs:

- Websites
- Social Media (Facebook, Twitter)
- Meetings/Workshops
- Public Service Announcements- radio and television
- Community Emergency Response Team Training (CERT)

Additional City of Pasadena programs can be found in the Capability Assessment Section 4 of the LHMP.

4 Capabilities Assessment

4.1 OVERVIEW

The purpose of the Capability Assessment is to determine the ability of the City of Pasadena to implement a comprehensive mitigation strategy. A Capability Assessment helps understand the existing tools, the administrative structure, and fiscal resources available to implement and support mitigation efforts.

The Capability Assessment serves as a critical first step of the planning process. The *Capability Assessment*, coupled with a *Risk Assessment*, helps to recognize challenges in current capabilities and identify meaningful, needed mitigation actions for incorporation into the *Mitigation Strategy*. In support to achieving a better understanding of current capabilities, this section is structured to present a Community Profile,

4.2 COMMUNITY PROFILE

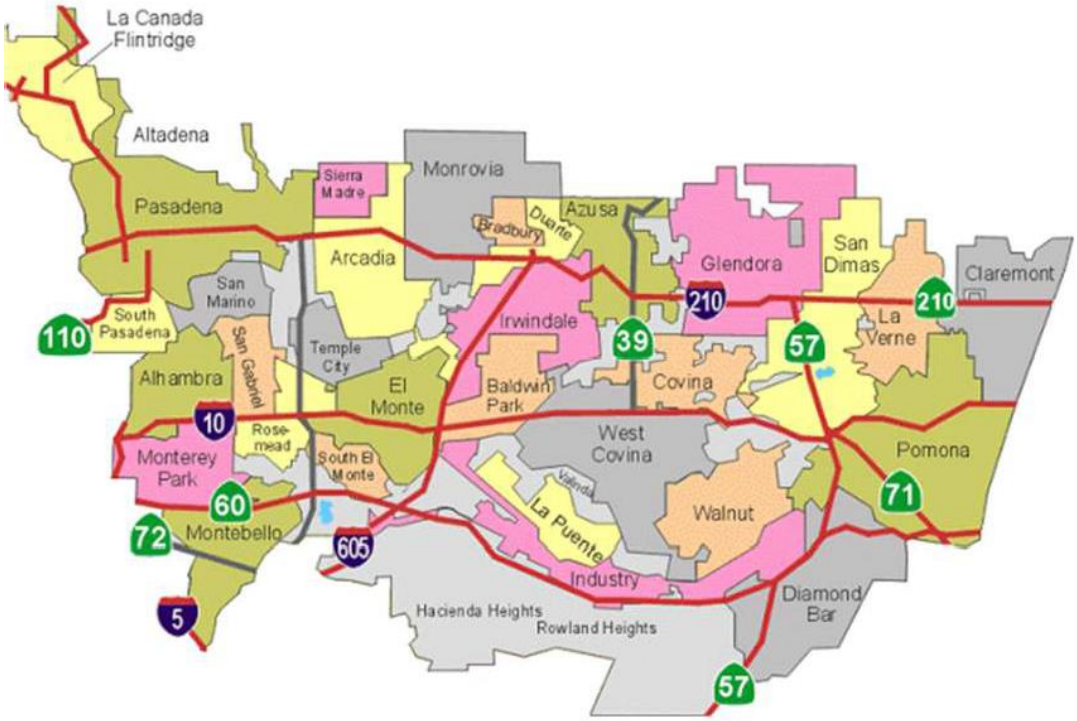
The city of Pasadena is located in the San Gabriel Valley, at the base of the San Gabriel Mountains. The area was part of Rancho el Rincon de San Pasqual, a northeast section of the San Gabriel Mission (1771). The city was founded in 1874 by Thomas B. Elliott as Indiana Colony; the name Pasadena, a Chippewa word meaning "crown of the valley," was adopted in 1875.

The city's growth as a winter resort and citrus center was stimulated by the Santa Fe Railway, and subsequent freeway construction brought it within easy commuting distance to Los Angeles, which lies 12 miles (19 km) southwest.

Pasadena is the home to many recognized businesses including: Pasadena City (community) College (1924), Pacific Oaks College (1945), and Art Center College of Design (1930), California Institute of Technology- *CalTech* (1891), the Pasadena Playhouse, the Norton Simon Museum of Art (formerly Pasadena Art Institute and Pasadena Museum of Modern Art), and the Pacific Asia Museum contains exhibits on the history and art of Asia and the Pacific; its grounds contain a Chinese courtyard garden and koi ponds.

The city is perhaps most famous for its New Year's Day Tournament of Roses, first held in 1890, which features a televised parade attended by several hundred thousand people and the Rose Bowl classic, a contest between two major college gridiron football teams.

Figure 4-1 City of Pasadena Regional Location



The City is served by the California 210 - Foothill Freeway, the California 110 - Pasadena Freeway (Arroyo Seco Parkway), the California 134 - Ventura Freeway, and the California Interstate 710 - Long Beach Freeway. The major arterial highways are Fair Oaks Avenue, Lake Avenue, and Los Robles Avenue, which run north to south. Colorado Boulevard. Walnut Street, Del Mar Boulevard, and Green Street run east to west. (See Figure 4.1)

Pasadena has a residential population of 141,510. Pasadena consists of 23 square miles and is approximately 58% residential, 9% commercial, 2% industrial and 31% open space, parks, institutional or vacant land. (Land Use Element of Revised General Plan, 2015)

4.2.1 Demographics

In 2008, the Southern California Association of Governments (SCAG) initiated the Local Profiles Project as a part of a larger initiative to provide a variety of new services to its member cities and counties. The Local Profiles reports provide a variety of demographic, economic, education, housing, and transportation information about each member jurisdiction including the City of Pasadena. The Local Profile Report was updated and expanded in 2017 to include demographical information on population, housing, transportation, employment, retail sales, and education. The report provides a portrait of the city and its changes from 2000- 2016, using average figures for Los Angeles County as a comparative baseline. In addition, the most current data available for the region is also included in the Statistical Summary (Table 4.1 Population Pasadena vs. LA County)

Figure 4.2- Pasadena Facts

This profile demonstrates current trends occurring in the City of Pasadena. In addition, to City prepared documents and reports, the SCAG report provides the most recent foundational information for developing the City's Community profile as described in this section. (Report by the Southern California Association of Governments, 2017)

4.2.2 Population Trends

Between 2000 and 2016, the total population of the City of Pasadena increased by 7,087 to 141,510 in 2016. During this 16-year period, the city's population growth rate of 5.3% was lower than the Los Angeles County rate of 7.6%. 1.4% of the total population of Los Angeles County is in the City of Pasadena. Between 2000 and 2016:

- The age group 55-64 experienced the largest increase in share, growing from 8 to 12.1%
- The age group that experienced the greatest decline, by share, was age group 21-34, decreasing from 24.2 to 21.3%
- The age group 55-64 added the most population, with an increase of 6,473 people between 2000 and 2016
- The share of Hispanic population in the city remained at 33.4%
- The share of Non-Hispanic White population in the city decreased from 39.1 to 38.5%
- The share of Non-Hispanic Asian population in the city increased from 9.9 to 15.7%
- The share of Non-Hispanic Black population in the city decreased from 14.0 to 8.9%
- The share of Non-Hispanic American Indian population in the city remained at about 0.2%
- The share of All Other Non-Hispanic population group in the city remained at 3.4%

4.2.3 Economy

Pasadena's economic strengths come from its leading scientific institutions, a large international engineering base, a regional health care cluster, and a broad retail sector. Like many other cities across the country, Pasadena has suffered from a struggling economy. Unemployment rates lag near 10% as

businesses delay hiring and decreased retail sales hurt business owners and reduce local public tax revenues. Even with these serious concerns, Pasadena is fortunate to have a relatively diverse business environment.

Although the effects of a slow economy continue, the community has seen growth in a few industries. Both Huntington Hospital and Kaiser Permanente provide many employment opportunities in the medical and professional sectors. Other large professional job gains have been in the engineering, software and financial fields.

In addition, retail sales have regained some of the losses incurred in 2009 with regional tourism helping to support a modest improvement (Pasadena Economic Development Strategic Plan, 2012)

Table 4.1 - Population: Pasadena vs. LA County

Category	Pasadena	Los Angeles County	Pasadena Relative to Los Angeles County*	SCAG Region
2016 Total Population	141,023	10,241,335	[1.4%]	18,954,083
2016 Population Density (Persons per Square Mile)	6,140	2,508	3,632	489
2016 Median Age (Years)	39.0	36.4	2.6	36.0
2016 Hispanic	33.4%	48.7%	-15.3%	46.8%
2016 Non-Hispanic White	38.5%	26.3%	12.2%	31.2%
2016 Non-Hispanic Asian	15.7%	14.1%	1.6%	12.7%
2016 Non-Hispanic Black	8.9%	8.0%	0.9%	6.3%
2016 Non-Hispanic American Indian	0.2%	0.2%	0.0%	0.3%
2016 All Other Non-Hispanic	3.4%	2.7%	0.7%	2.7%
2016 Number of Households	55,608	3,308,022	[1.7%]	6,132,938
2016 Average Household Size	2.5	3.0	-0.5	3.1
2016 Median Household Income	$70,463	$57,864	$12,599	$61,792
2016 Number of Housing Units	60,703	3,504,061	[1.7%]	6,629,879
2016 Homeownership Rate	44.5%	54.3%	-9.8%	54.3%
2016 Median Existing Home Sales Price	$705,000	$520,000	$185,000	$466,000
2015 - 2016 Median Home Sales Price Change	8.5%	7.0%	1.5%	6.6%
2016 Drive Alone to Work	75.6%	76.5%	-0.9%	78.8%
2016 Mean Travel Time to Work (minutes)	30.0	33.0	-3.0	31.0

2015 Number of Jobs	115,444	4,424,056	[2.6%]	7,920,602
2014 - 2015 Total Jobs Change	677	25,840	[3%]	117,499
2015 Average Salary per Job	$64,376	$56,700	$7,676	$53,962
2016 K-12 Public School Student Enrollment	16,240	1,471,103	1%	2,961,726

Sources: U.S. Census Bureau American Community Survey, 2015; Nielsen Co.; California Department of Finance E-5, May 2016; Core Logic/Data Quick; California Department of Education; and SCAG * Numbers with [] represent Pasadena's share of Los Angeles County. The other numbers represent the difference between Pasadena and Los Angeles County.

Mapped jurisdictional boundaries are as of July 1, 2016 and are for visual purposes only. Report data, however, are updated according to their respective sources. (Southern California Association of Governments Community Profile, 2017)

4.2.4 Employment

Total jobs include wage and salary jobs and jobs held by business owners and self-employed persons. The total job count does not include unpaid volunteers or family workers, and private household workers.

- In 2015, total jobs in Pasadena numbered 115,444, a decrease of 5.3% from 2007
- Manufacturing jobs include those employed in various sectors including food; apparel; metal; petroleum and coal; machinery; computer and electronic products; and transportation equipment
- Between 2007 and 2015, the number of manufacturing jobs increased by 51.1%
- Construction jobs include those engaged in both residential and non-residential construction
- Between 2007 and 2015, construction jobs in the city decreased by 16.4%
- Retail trade jobs include those at various retailers including motor vehicle and parts dealers, furniture, electronics and appliances, building materials, food and beverage, clothing, sporting goods, books, and office supplies
- Between 2007 and 2015, the number of retail trade jobs in the city increased by 1.6%
- Jobs in the professional and management sector include those employed in professional and technical services, management of companies, and administration and support
- Between 2007 and 2015, the number of professional and management jobs in the city decreased by 30%
- In 2015, the Education sector was the largest job sector, accounting for 29.8% of total jobs in Pasadena. Other large sectors included Professional (19.8%), Leisure (10.7%), and Retail (9.1%)
- Average salaries for jobs located in the city increased from $44,440 in 2003 to $64,376 in 2015, a 44.9% change. Note: Dollars are not adjusted for annual inflation
- In 2015, the employment sector providing the highest salary per job in the city was Finance-Insurance-Real Estate ($111,896)
- The Leisure-Hospitality sector provided the lowest annual salary per job ($24,370)

4.2.5 Precipitation

The average amount of precipitation for the year in Pasadena is 20.4" (518.2 mm). The month with the most precipitation on average is February with 4.6" (116.8 mm) of precipitation. The month with the least precipitation on average is July with an average of 0.0" (0 mm). There is an average of 43.0 days of precipitation, with the most precipitation occurring in January with 7.0 days and the least precipitation occurring in July with 0.0 days.

- The average temperature for the year is 63.9°F (17.7°C)
- The warmest month on average is August, with an average temperature of 74.7°F (23.7°C)
- The coolest month on average is January, with an average temperature of 54.4°F (12.4°C)
- The highest recorded temperature is 113.0°F (45°C)
- The lowest recorded temperature is 17.0°F (-8.3°C)

4.2.6 Air Quality

The South Coast Air Quality Management District (SCAQMD) reports that in 2007, Pasadena had no unhealthful ozone days, a decrease from 7 unhealthful ozone days in 2003 and 71 in 1992. An unhealthful ozone day occurs when the air has more than 120 parts per billion of ozone in one hour and there is enough ozone in the air for some people to experience headaches, nausea or shortness of breath. The smoggiest month in Southern California is August.

4.2.7 Physical Features

The City of Pasadena (City) is in the northwest portion of the San Gabriel Valley which is situated in the southern half of Los Angeles County. The City is at the foot of the San Gabriel Mountains, approximately 8.5 miles north-northeast of downtown Los Angeles, and encompasses approximately 14,802 acres (23 square miles). The City is bordered by the City of La Cañada-Flintridge to the northwest; the City of Glendale to the west; the Highland Park community of the City of Los Angeles to the southwest; unincorporated Los Angeles County and the cities of South Pasadena and San Marino to the south; unincorporated Los Angeles County and the cities of Arcadia and Sierra Madre to the east; and Altadena (an unincorporated area of Los Angeles County) and the San Gabriel Mountains to the north.

The Arroyo Seco spans eight (8) miles through the western portion of the City of Pasadena. Surrounded by urban development, it supports thriving natural ecosystems that include several native plant communities and provides shelter, food and nesting sites for hundreds of wildlife species.

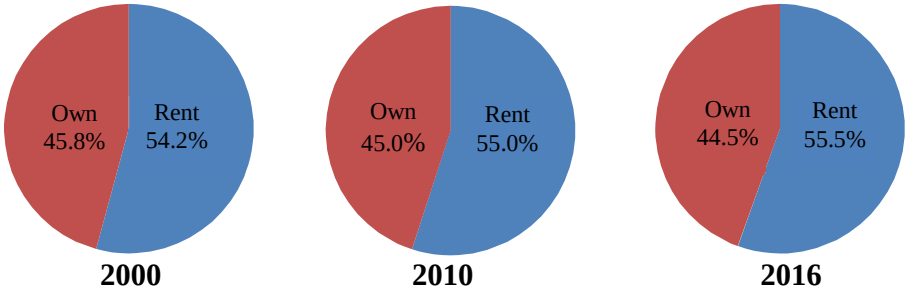
4.2.8 Housing

Between 2000 and 2016, the total number of households in the City of Pasadena increased by 3,764 units, or 7.3%. During this 16-year period, the city's household growth rate of 7.3% was higher than the county growth rate of 5.6%. 1.7% of Los Angeles County's total number of households are in the City of Pasadena.

- In 2016, the city's average household size was 2.5, lower than the county average of 3.0
- In 2016, 79.5% of all city households had 3 people or fewer
- About 34% of the households were single-person households

- Approximately 9% of all households in the city had 5 people or more
- In 2016, about 37% of households earned less than$50,000 annually
- Approximately 36% of households earned $100,000 or more
- From 2000 to 2016, median household income increased by $24,426. Note: Dollars are not adjusted for annual inflation

Figure 4.3 Renters and Homeowners Percentage of Renters and Homeowners



Sources: 2000 and 2010 U.S. Decennial Census; Nielsen Co., 2016. Between 2000 and 2016, homeownership rates decreased, and the share of renters increased.

4.2.9 Schools and Hospitals

The City of Pasadena has 24 elementary schools, 3 middle schools, 4 high schools, 38 private schools, 69 pre-schools or childcare centers and 16 colleges/universities. It has one major hospital: Huntington Memorial, as well as a psychiatric facility: Las Encinas.

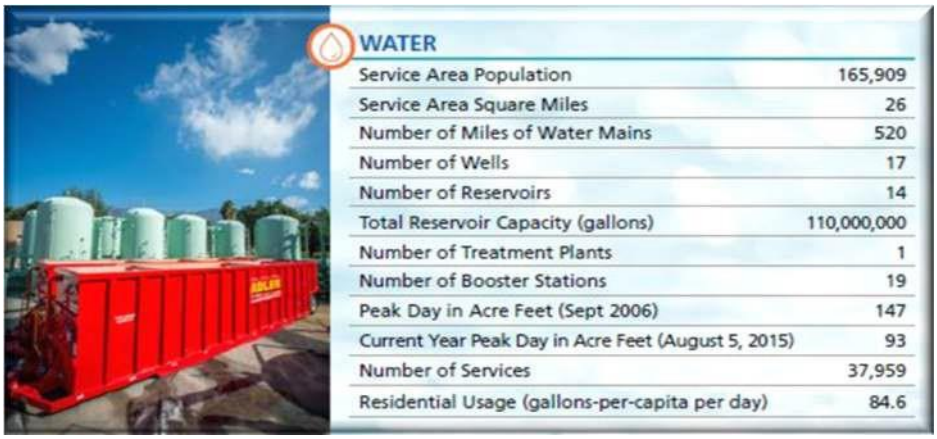
4.2.10 City Parks

Pasadena has twenty-three (23) parks totaling more than one thousand acres of parkland. While operationally distinct, maintenance efforts in the Arroyo Seco as well as those in all other city parks similarly strive to keep parks safe, functional, and attractive for residents and visitors.

4.2.11 Water

Most of the City's water is imported from the Colorado River and Northern California, but a substantial portion of Pasadena's water is acquired from our local aquifer, the Raymond Basin. The Raymond Basin, a 40-square mile natural aquifer underlying Pasadena and neighboring cities, provides over 40% of Pasadena's drinking water supply. The basin water originates as surface water from the San Gabriel Mountains. As the water percolates deep into the ground over many months it is purified through natural filtration processes. The City of Pasadena has sixteen (16) wells that tap into the basin at depths of 300-400 feet, drawing out 13 million gallons of groundwater or more per day, on average**.** The Raymond Basin cannot provide enough water to meet demand, even in wet years, as our population and development has long outpaced local supply.

Figure 4.4 - Water Service Systems and Areas Served



The City of Pasadena's water system begins with "production," which in means pumping local groundwater and the purchased imported water. There are active wells across the city that tap into the Raymond Basin, a vast natural aquifer underlying Pasadena and neighboring cities. Pasadena pumps the groundwater at these well sites, treats it to eliminate microbes or other contaminants, and then either diverts it to a reservoir for short-term storage or pumps it directly into underground water mains for distribution to our customers. Since Pasadena topography is on a gentle gradient, gravity forces do most of the work to distribute water through the system. Pumps near reservoirs and booster stations also build pressure in the system to aid in moving water through the system.

To meet the demand, the City of Pasadena has purchased imported water from the Metropolitan Water District of Southern California (MWD) since 1941. MWD uses aqueducts to transport water from the Colorado River and from the Sacramento-San Joaquin River Delta to 26-member agencies, including PDWP, in dry Southern California. MWD's two primary sources of water are the State Water Project and the Colorado River. The State Water Project is owned by the State of California and operated by the State Department of Water Resources. The State Water Project transports water available from the San Francisco Bay/Sacramento-San Joaquin Delta to Southern California via the California Aqueduct.

Management of the availability of State Water Project supplies through water marketing and groundwater banking plays an important role in meeting California's water needs. To obtain its Colorado River supply, MWD has a permanent service contract with the United States Secretary of the Interior for delivery of water via the Colorado River Aqueduct. Under the priority system that governs the distribution of Colorado River water made available to California, MWD holds the fourth priority right.

4.2.12 Power

Most of the City's power is purchased via contracts from varied sources, both conventional and renewable, or through the wholesale energy market. City of Pasadena-owned generating facilities meet about 10% of its power demand. Power comes from a variety of sources including hydropower, natural-gas-fired generators, renewable energy such as solar and wind power, and power that is purchased on the wholesale market. Pasadena's goal is to achieve a balanced and sustainable mix of sources and becoming 50% green by 2030.

4.2.13 Land Use and Development

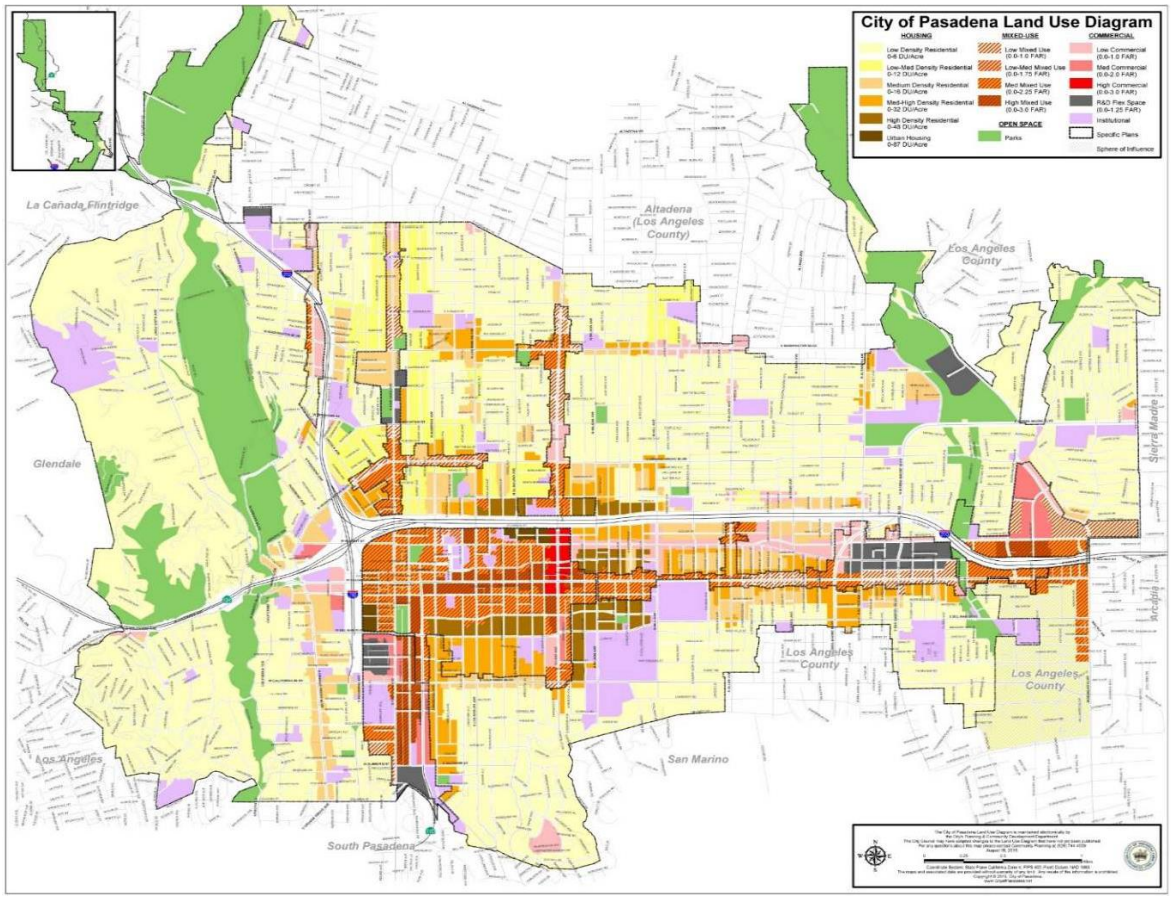
Pasadena's General Plan Land Use Element is grounded by *Guiding Principles* that cumulatively represent the community's vision for the future. The *Guiding Principles* were developed through an extensive program of community outreach and input conducted over a six-year period. The *Guiding Principles* are:

1) Growth will be targeted to serve community needs and enhance the quality of life. Higher density development will be directed away from residential neighborhoods and into the Central District, Transit Villages, and Neighborhood Villages. These areas will have a diverse housing stock, job opportunities, exciting districts with commercial and recreational uses, and transit opportunities. New development will build upon Pasadena's tradition of strong sense of place, great neighborhoods, gardens, plazas, parks, and trees.
2) Pasadena's historic resources will be preserved. Citywide, new development will be in harmony with and enhance Pasadena's unique character and sense of place. New construction that could affect the integrity of historic resources will be compatible with, and differentiated from, the existing resource.
3) Pasadena will be an economically vital city by providing jobs, services, revenues, and opportunities. A diverse economic base with jobs for Pasadena residents will be fostered; existing businesses will be encouraged to stay or expand; affordable housing will be provided for the labor pool; the continued fiscal health of the city will be ensured.
4) Pasadena will be a socially, economically, and environmentally sustainable community. Safe, well-designed, accessible and human-scale residential and commercial areas will be provided where people of all ages can live, work and play.
5) These areas will include neighborhood parks, urban open spaces and the equitable distribution of public and private recreational facilities; new public spaces will be acquired. Human services will be coordinated and made accessible to those who need them.
6) Pasadena will be a city where people can circulate without cars. Specific plans in targeted development areas will emphasize a mix of uses, pedestrian activity, and transit; public and private transit will be made more available; neighborhood villages and transit villages will reduce the need for auto use.
7) Pasadena will be a cultural, scientific, corporate, entertainment and education center for the region. Long-term growth opportunities will be provided for existing institutions; a healthy economy will be fostered to attract new cultural, scientific, corporate, entertainment and educational institutions.
8) Community Participation will be a permanent part of achieving a greater city. Citizens will be provided with timely and understandable information on planning issues and projects; citizens will directly participate in shaping plans and policies for Pasadena's future.
9) Pasadena is committed to public education and a diverse educational system responsive to the broad needs of the community.

Below is the City of Pasadena's General Plan proposed Land Use map (**Figure 4.5**). The Land Use map depicts land use designations and depicts the proposed distribution and intensity of uses within the city. Greater detailed information can be found in the City of Pasadena General Plan. The General Plan

Land Use Element established development capacities to regulate building intensity and population density consistently with the designations established by the Land Use Diagram.

Figure 4.5- City of Pasadena Land Use Map



The city is mostly developed, with very few large areas of undeveloped land. Because of that the city has had limited growth in the past 5 years, and it is anticipated this trend will continue over the next 5 years. The majority of growth in the city is centered around increased density in areas. There has been an increase in development around the Gold Line. Much of this development includes replacing single family units or older multi-family units with slightly denser and newer multi-family units.

All development occurring since the adoption of the LHMP was constructed in accordance with all local, state and federal land use, building codes, zoning, and environmental requirements. Because of the limited growth and rigorous project review over the past 5 years, there have been no changes to the community's vulnerability.

All future development proposed within the city will continue to be reviewed to ensure compliance with all relevant land use, zoning, building codes and environmental standards. Additionally, prior to incorporation of information from the updated LHMP into relevant plans and codes, the city will leverage the LHMP during the review of future proposed development projects. In doing so, new projects, whether on vacant land or infill projects will limit and/or reduce expose of structures or population to potential hazards.

4.2.14 Key Assets and Infrastructure

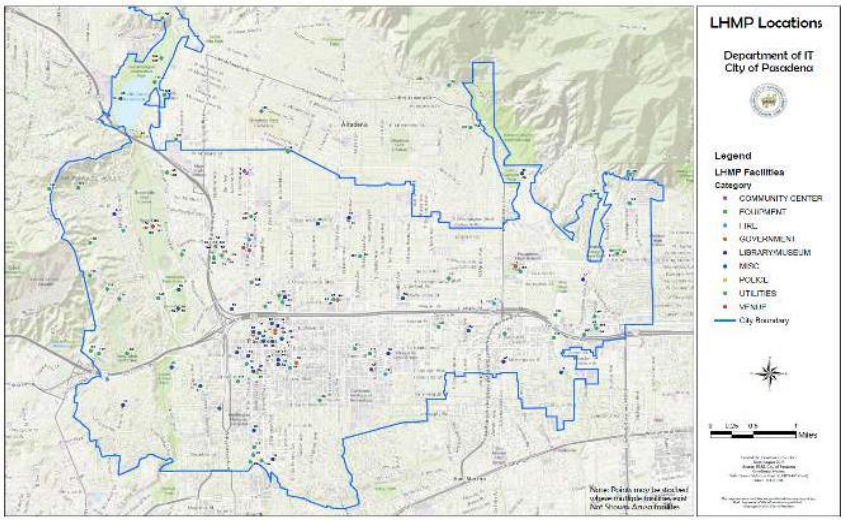
The City of Pasadena has many assets at their disposal. While many are critical and/or essential to day-to-day operations, this section is dedicated to the assets determined by the city to be key in the response and recovery from events/incidents. **Table 4-6** provides a list of the number of each key response and recovery asset by category and **Figure 4-7** depicts the general location of each key response and recovery asset in the city. This list represents the government owned and/or operated assets, as well as, some privately owned and operated assets that are of primary concern for ensuring efficient and effective response and recovery from disaster events. A complete list of the response and recovery key assets is located in **Appendix D**.

It is important to note that as the city refines and adjusts its emergency management practices some assets may be added and/or remove from the list. It is expected that when the City's Emergency Operations Plan (EOP) is updated, and strategies are identified and/or refined, that the city will become more aware of the need for certain assets. As the city goes through the EOP and similar processes, the Steering Committee will review and reevaluate the key assets list.

Table 4-6 Summary of Key Response and Recovery Assets by Category

Category	# of Structures
Community Center	10
Equipment	5
Fire	11
Government	14
Library/Museum	13
Misc.	39
Police	2
Utility- Power	21
Utility- Water	43
Venue	5
TOTAL	**163**

Figure 4-7- Location of Key Response and Recovery Assets



4.3 ADMINISTRATIVE AND TECHNICAL CAPACITY

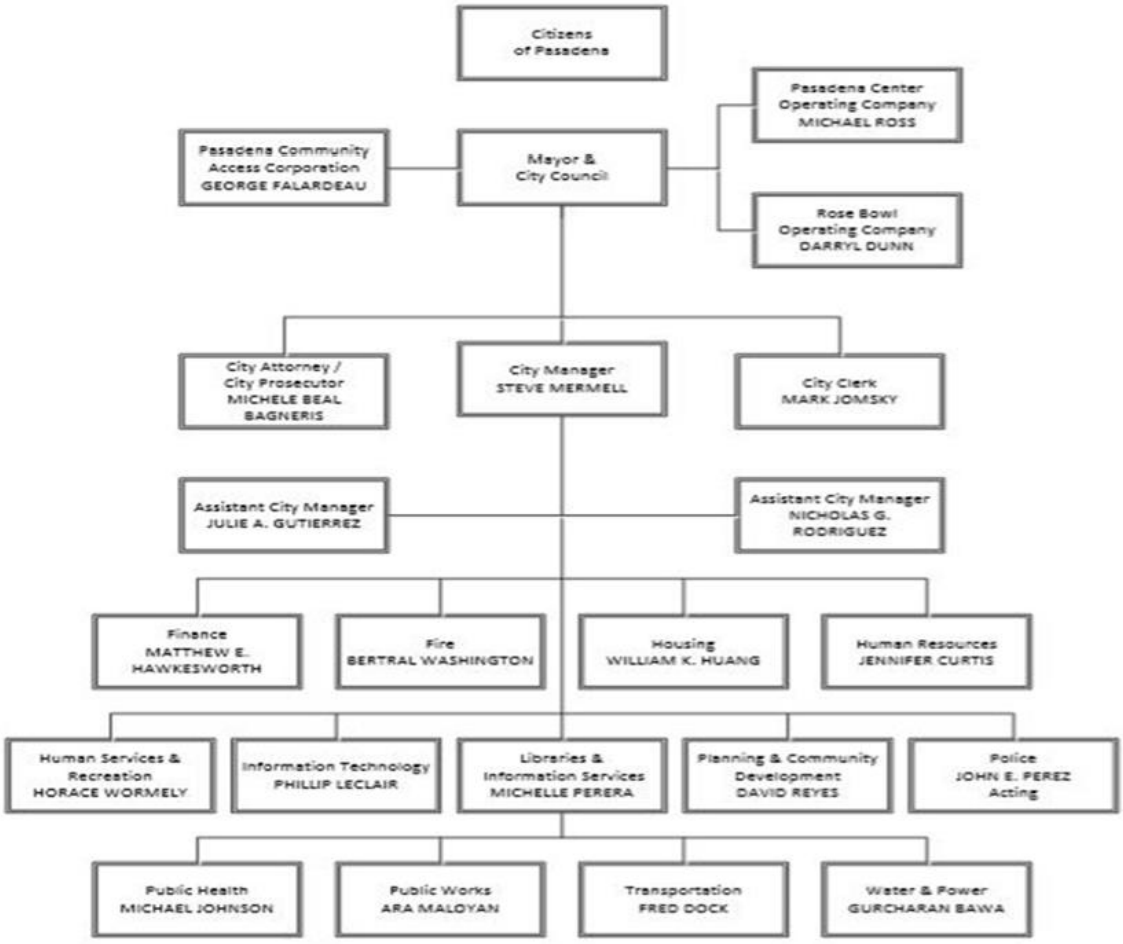
4.3.1 City Government Structure

The City has a Council-Manager form of government with seven (7) City Council districts each electing a Councilmember to a four-year term. The Mayor is an at-large or Citywide elected position serving a four-year term. The City Council is responsible for setting policies, passing ordinances, adopting the budget, appointing committee members, and hiring the City Manager, City Attorney/City Prosecutor, and the City Clerk.

The Mayor acts as the chief executive of the City in performing all acts required to be performed under the laws of the State of California and our City Charter. The Mayor is the official head of the City for all ceremonial purposes, by the Courts for serving civil process and by the Governor of the State for military purposes. The Mayor has a voice and vote in all proceedings of the City Council and presides over City Council meetings.

The City of Pasadena has sixteen (16) departments, three (3) operating companies, the Successor Agency to the Pasadena Community Development Commission (PCOC), and a City Council Office. The City has full range of administrative and technical capabilities for expanding and improving on existing and proposed hazard mitigation measures. Departments have identified opportunities to add or expand a capability through proposed mitigation actions.

4.3.1.1 City Organization Chart



4.3.1.2 City Departments

4.3.1.2.1 City Attorney / City Prosecutor

Civil Division

- Represents the City Council and City officers in all matters of law pertaining to their office
- Represents and appears for the City and its officers in all civil actions and proceedings
- Attends meetings of the City Council, Community Development Commission, Fire and Police Retirement Board, and meetings as required
- Prepares all necessary legal documents
- Performs legal research and prepares opinions
- Assists with updating codes and ordinances including those related to hazard mitigation strategies.

Prosecution Division

- Prosecutes misdemeanor offenses occurring in the City of Pasadena arising out of violations of State or City law
- Drafts and files criminal complaints in Superior court
- Conducts office hearings, pretrial hearings, court and jury trials
- Represents the People of the State in motions, writs and appeals

Liability and Claims

- Makes Risk Management recommendations as relates to the protection of City and its assets
- Recommends the purchase/renewal of Citywide insurance program to include the City's Operating Companies
- Investigates and resolves all pre-litigation claims presented against the City
- Track claims trend

4.3.1.2.2 City Clerk

The City Clerk is the local official for elections, local legislation, the Public Records Act, the Political Reform Act, and the Brown Act (open meeting laws). Before and after the City Council acts, the City Clerk ensures that actions are in compliance with all federal, state, and local statutes and regulations and that all actions are properly executed, recorded, and archived.

The statutes of the State of California prescribe the basic functions and duties of the City Clerk, and the Government Code and Election Code provide precise and specific responsibilities and procedures to follow.

The Office of the City Clerk is a service department within the municipal government upon which the City Council, all City departments, and the general public rely for information regarding the operations and legislative history of the City. The City Clerk serves as the liaison between the public and City Council and provides related municipal services.

As an Elections Official, the City Clerk administers Federal, State, and Local procedures through which local government representatives are selected. The City Clerk assists candidates in meeting their legal responsibilities before, during and after an election. From Election pre-planning to certification of election results and filing of final campaign disclosure documents, the City Clerk manages the process which forms the foundation of our democratic system of government.

As a Legislative Administrator, the City Clerk plays a critical role in the decision-making process of the local legislature. As the key staff for City Council meetings, the City Clerk prepares the legislative Agenda, verifies legal notices have been posted or published, and completes the necessary arrangements to ensure an effective meeting. The City Clerk is entrusted with the responsibility of recording the decisions which constitute the building blocks of our representative government.

As a Records Manager, the City Clerk oversees yet another legislative process; the preservation and protection of the public record. By statute, the City Clerk is required to maintain and index the Minutes, Ordinances, and Resolutions adopted by the legislative body. The City Clerk also ensures that other municipal records are readily accessible to the public. The public record under the conservatorship of the City Clerk provides fundamental integrity to the structure of our democracy.

4.3.1.2.3 City Manager

The Office of the City Manager provides oversight and direction to ensure that all departments are responding to City Council goals, applying policy consistently, identifying key issues that need Council direction, keeping abreast of the changing needs of the community, and planning the services, programs and projects. The Assistant City Manager is a key member of the City's Hazard Mitigation Committee and provides leadership and direction to the hazard mitigation planning process.

4.3.1.2.4 Finance

The City's Finance Department is responsible for preparing and overseeing the City's Operating Budget. The City's budgets are prepared on a fiscal year basis for the period commencing July 1st. The budget represents the City's spending plan and serves as an expenditure guideline for all City operations including general city services as well as city utility enterprise operations. The Finance Department is represented on the Hazard Mitigation Planning Committee and integrally involved in the implementation of the Hazard Mitigation Grant process. The Finance Department when feasible will receive and allocate funds to hazard mitigation projects.

4.3.1.2.5 Fire

The City's Fire Department manages the City's Disaster Preparedness Program and serves as the lead agency for administering the City's Hazard Mitigation Plan and program. The Fire Department provides training for City staff and community outreach to residents. The City's Disaster Preparedness Coordinator conducts monthly meetings of the City's Disaster Coordinator's Committee. The Disaster Coordinator's Committee also serves as the Hazard Mitigation Steering Committee and is responsible for monitoring and coordinating the implementation of the City's LHMP. The Fire Department works closely with City management to expand and develop hazard mitigation strategies.

Housing & Career Services

The City of Pasadena Housing and Career Services Department is responsible for managing City programs that provide affordable housing and community development opportunities for low and moderate-income persons and employment resources. City Housing and Career Services manages the Community Development Block Grant Program (CDBG) and provides a critical role in disaster recovery.

4.3.1.2.6 Human Resources

The role and functions of Human Resources is to ensure the City meets regulatory requirements affecting employers and includes responsibilities such as equal employment opportunity programs, health and safety efforts, labor relations, benefits programs, specialized training and development, and a range of organizational development, and career planning programs. Human resources plays a key role in assisting with Citywide emergency preparedness training for employees.

4.3.1.2.7 Human Services & Recreation

The role of Human Services and Recreation Department is to provide physical, social, and economic health of Pasadena neighborhoods by managing and delivering recreational and human service programs to City residents.

Representatives from the Human Services and Recreation Department participate on the Hazard Mitigation Planning Committee. Facilities managed by Human Services and Recreation Department are identified as critical facilities and therefore potentially eligible for hazard mitigation funding assistance.

4.3.1.2.8 Information Technology

The Department of Information Technology (DoIT) is responsible for providing the City's information technology services and support. DoIT provides 24/7 services citywide in areas utilizing networks, desktops, application development, radios, telephones, and related program and project management. DoIT is also responsible for managing the City's Open Data Portal and a collection of GIS services and maps.

The City also owns and operates approximately 50 miles of fiber network within Pasadena. The fiber infrastructure supports City business and transportation operations and provides the foundation for a variety of business-oriented services that the City offers currently and plans to expand in the future. Currently the City does not provide service in residential areas. DoIT continues to assess threats and vulnerabilities to the City's fiber infrastructure and has recommended several hazard mitigation strategies for protecting the City's ability to support information and technology services.

4.3.1.2.9 Library

The Library has more than 100 full-time employees and an annual budget of about $14.5 million. The department includes Central Library and nine branch libraries, serving 1.3 million people per year in person, online or via social media. With more than 3,000 on-site programs, free Wi-Fi services and an extensive collection of printed books, periodicals, media and cloud-based eBooks, the Pasadena Public Library serves as a life-long learning center and cultural center for the greater Pasadena community.

The Pasadena Library maintains representation on the City's Hazard Mitigation Steering Committee and continues seek out opportunities for expanding and improving on policies and procedures related to hazard mitigation strategies and emergency preparedness.

4.3.1.2.10 Planning & Community Development

The Planning & Community Development Department is responsible for providing economic vitality and safe livable neighborhoods, which reflect, preserve, and enhance Pasadena's unique cultural and historic character. The department also promotes informed decision-making, which facilitates sustainable development, affordable housing and reinvestment in the community.

The City's Planning Department is represented on the Hazard Mitigation Steering Committee and is a key player in ensuring that the LHMP is linked to the City's General Plan. City Planning staff also assist with planning updates and identifying opportunities for improving and expanding on existing policies, codes and ordinances.

4.3.1.2.11 Police

The Pasadena Police Department serves as the lead public safety agency for the City of Pasadena. There are more than 400 civilian and non-civilian members of the Department.

The Chief of Police has ultimate responsibility of the Pasadena Police Department for the protection of life and property, preservation of law and order, investigation and suppression of all crimes, including organized crime and vice, and the enforcement of State Laws and City Ordinances. There are four divisions in the Police Department: Administration Services Division; Criminal Investigations Division; Field Operations Division; and, the Strategic Services Division. Representatives from the Police Department sit on the City's Hazard Mitigation Planning Committee and participate in the planning process.

4.3.1.2.12 Public Health

The Pasadena Public Health Department (PPHD) is responsible for a variety of health-related programs.

- The City's Public Health agency is responsible for maintaining the Vital Records Office which handles birth and death records for events occurring in Pasadena.
- Environmental Health is an enforcement agency operating as part of the Pasadena Public Health Department by performing routine inspections of permitted facilities and investigating complaints. Technically trained staff are commonly known as "Health Inspectors" but their official title is "Environmental Health Specialist".
- The Public Health Emergency Preparedness Program promotes disaster preparedness and response by planning with the entire Pasadena community. By understanding the needs of everyone in the City, the role of the Public Health Department is to reduce the health impacts that may be created as a result of an emergency. The PPHD works with the Pasadena Fire and Police Departments, Huntington Memorial Hospital, the Pasadena Unified School District, and other agencies to increase safety for all residents by conducting drills, exercises, trainings, and outreaches.
- City of Pasadena provides free to low-cost healthcare services. Clinical services offered at the Pasadena Public Health Department include child and travel immunizations, screening and treatment of tuberculosis, and HIV testing.
- The Living Well Pasadena Program has two components: 1) The Nutrition and Physical Activity Program aims to reduce the prevalence of obesity and other chronic diseases by providing nutrition education and obesity prevention services in Pasadena; and, 2) The Tobacco Control Program's mission is to protect and preserve the health and well-being of the Pasadena Community from the harmful effects of tobacco and tobacco smoke, especially among youth.
- The Pasadena Public Health Department maintains a close relationship with its health professional partners within the community by providing timely and accurate health information and facilitating mandated disease reporting requirements.
- Reporting is crucial for disease surveillance and detection of disease outbreaks. Under the California Code of Regulations, Title 17 (Section 2500), public health professionals, medical

providers and others are mandated to report more than 80 diseases or conditions to the Pasadena Public Health Department. In addition, persons in charge of any type of school are also required to report these diseases (Section 2508), as are laboratories (Section 2505).

- Physicians, surgeons, veterinarians, podiatrists, nurse practitioners, physician assistants, nurses, nurse midwives, infection control practitioners, medical examiners, coroners, dentists, and administrators of health facilities and clinics knowing of a case or suspected case of a communicable disease are required to report to the local health department (CCR, Title 17, Section 2500).
- In addition, anyone in charge of a public or private school, kindergarten, boarding school, or preschool is also required to report these diseases (Section 2508).

4.3.1.2.13 Public Works

The Pasadena Department of Public Works (PDPW) preserves, maintains, and enhances the City's infrastructure and natural resources and provides environmental stewardship for the benefit of residents, businesses, and visitors. Public Works Divisions include Parks and Natural Resources; Street Maintenance and Integrated Waste Management; Building Systems and Fleet Maintenance; Finance and Management Services; and Engineering. Representative from the City's Public Works Department are active participants in the City's Hazard Mitigation Planning process and the Hazard Mitigation Grant Program. Staff from all divisions actively seek opportunities to expand and improve on policies, procedures and methods for securing City facilities and infrastructure. In 2018, PDPW submitted three hazard mitigation applications to retrofit some of the City's fire stations and the City's Public Work's Yard.

Transportation

The Department of Transportation provides for the movement of people and goods within Pasadena, while concurrently ensuring a balance between land use and transportation to maintain a livable community in which cars are not necessary to travel within the city.

4.3.1.2.14 Water & Power

Pasadena Department of Water and Power (PDWP) is responsible for providing water and power to all City residents and businesses. The PDWP General Manager reports to the City Manager and is governed by the City Council with oversight from the Municipal Services Committee of the City Council. PDWP is under the management of the General Manager and organized into five separate business units: Water Delivery, Power Supply, Power Delivery, Finance, Administration, and Customer Service, and Customer Relations and Legislative.

Pasadena's City Council determines how PDWP's services are provided within the community, including setting rates and approving services. Council members are residents of Pasadena who are customers of the utility. In addition to local accountability, PDWP is subject to requirements established by numerous state and federal regulatory bodies.

4.3.1.3 City Operating Companies

4.3.1.3.1 Rose Bowl Operating Company

The mission of the Rose Bowl Operating Company (RBOC) is to improve the quality of life in Pasadena by providing top quality entertainment and by generating revenue through the operation of a world-class stadium and a professional quality golf course complex.

The RBOC is a California non- profit, public benefit corporation, founded in 1995 by an act of the Pasadena City Council. The RBOC has an independent board that governs its operations and adopts its annual budget.

4.3.1.3.2 Pasadena Center Operating Company

The Pasadena Center Operating Company (PCOC) is a private, non-profit corporation (401 C 4) formed in 1973 to manage the Pasadena Convention & Visitors Bureau, Pasadena Convention Center, Pasadena Civic Auditorium and the Pasadena Ice Skating Center and such other City facilities as may be assigned by the City Council.

The PCOC has responsibility to ensure that Pasadena's facilities are effectively and efficiently managed while improving the local economy, adding value for our customers, residents, workers and businesses within the City of Pasadena. The Pasadena Convention & Visitors Bureau (CVB) is the official destination marketing organization for the City of Pasadena. The CVB stimulates the local economy though sales and marketing efforts by increasing visits from tourist, business travelers and conventions who generate overnight lodging, restaurant and shopping revenues.

4.3.1.3.3 Pasadena Community Access Corporation

The Pasadena Community Access Corporation (PCAC) is a component unit, nonprofit public benefit corporation recognized under Nonprofit Benefit Corporation Law for charitable purposes. The specific purposes of this corporation are to promote, coordinate, facilitate, produce and assist public service community programming on behalf of all residents of the City of Pasadena, California ('Pasadena") for all public, community and government access channels of Pasadena's cable telecommunications system; to inform Pasadena residents of the potential services and benefits of the cable telecommunications systems and to provide training opportunities for the public to have their voice heard through the public access channels. It serves as a production company and provides equipment, instruction, hands on training, resources and facilities to individuals and groups in order that they may produce and cable cast TV programs and productions; to provide a structure in which the public can learn and develop media skills.

- KPAS - Government Channel- Government Channel
- The Arroyo Channel
- KLRN - PUSD Channel- K-12 Education Channel
- PCC TV - Pasadena City College Channel- Pasadena City College Education Channel

4.3.1.4 Affiliate Agencies

4.3.1.4.1 Burbank Glendale Pasadena Airport Authority

The Burbank-Glendale-Pasadena Airport Authority is a separate government agency created under a Joint Powers Agreement between the three (3) cities of Burbank, Glendale, and Pasadena in 1977 for the sole purpose of owning and operating Hollywood Burbank Airport. The mission of the Airport Authority is to provide state-of-the-art regional airport facilities and related services which are efficient, safe, convenient, and user-friendly, while being a good neighbor. The Authority consists of nine (9) Commissioners, three (3) from each city. The Commissioners from each city are appointed by their city council.

In 2012, the Burbank-Glendale-Pasadena Authority commenced construction of the Regional Intermodal Transportation Center (RITC), housing consolidated rental car facilities and connecting passengers and visitors to local passenger transit services.

The RITC is to date the largest capital project undertaken. In December 2017, the airport officially rebranded itself the Hollywood Burbank Airport, putting an end to the former title that paid tribute to the comedian and showman Bob Hope. The airport adopted the Bob Hope name in 2003 after being named the Burbank-Glendale-Pasadena Airport for 25 years.

4.3.1.4.2 Metro Gold Line

Metro (the Los Angeles County Metropolitan Transportation Authority) is unique among the nation's transportation agencies. We serve as transportation planner and coordinator, designer, builder and operator for one of the country's largest, most populous counties. More than 9.6 million people – nearly one-third of California's residents – live, work, and play within our 1,433-square-mile service area. Six (6) Gold Line Stations are located in the City of Pasadena. The Gold Line travels north to the Fillmore Station which sits in the heart of Pasadena's up and coming biotechnology corridor and is two blocks from Huntington Memorial Hospital. The line continues to Del Mar Station and Memorial Park Station. Both stations are two blocks from Old Town Pasadena's shopping, theaters, restaurants and the annual Tournament of Roses Parade route. Memorial Park Station is walking distance to the city's landmark City Hall. The final three stations are located in the median of the I-210 Freeway. The line annexes the San Gabriel by way of Azusa, traveling 11 miles to the line (or from) the San Gabriel Valley.

4.3.1.4.3 Pasadena Unified School District

The schools of the Pasadena Unified School District (PUSD) enroll more than 16,700 students in Transitional Kindergarten-12th grade in a 76-square mile area that includes Altadena, Pasadena, Sierra Madre and unincorporated areas of Los Angeles County. PUSD was formed in 1874 and unified in 1961.The District currently operates twenty-eight (28) schools and programs:

- Seventeen (17) elementary schools (grades K-5)
- Four (4) middle schools (grades 6-8)
- One (1) K-8 school
- Two (2) 6-12th grade schools
- Two (2) high schools (grades 9-12)
- One (1) continuation high school
- One (1) alternative education program

PUSD also operates four (4) Early Childhood Education Centers, one (1) Transitional Kindergarten programs, one (1) Focus Point Academy, and one (1) Twilight Adult Education.

4.3.1.5 Disaster Emergency Services Council

The Disaster Emergency Services Council (DESC) was established by ordinance which provides input on the preparation of plans forth protection of persons and property within the city in the event of an emergency. Membership to the DESC is established in accordance with Section 2.370.030 of the Pasadena Municipal Code. The purpose of the DESC is to:

- Provide for the preparation and carrying out of plans for the protection of persons and property within the city in the event of an emergency;
- Direct an emergency services organization;
- Coordinate the emergency functions of the city with all other public agencies, corporations, organizations and affected private persons.

The DESC consists of the following members:

- The mayor of the city, who shall be chair of the council
- The director of disaster emergency services, who shall be the vice chair of the council
- The assistant director of disaster emergency services
- Such chiefs of emergency services as are provided for in a current emergency plan of this city, adopted pursuant to this chapter
- Such representatives of civic, business, labor, veterans, professional or other organizations having an official emergency responsibility, as may be appointed by the director with the advice and consent of the city council

4.4 FISCAL RESOURCES

4.4.1 City Budget

The annual budget for the City of Pasadena makes it possible to provide many services and facilities that contribute to the high quality of life for City residents. The budget seeks to maintain essential services that protect resident's quality of life such as neighborhood police patrols, keep roads and parks in good condition, support youth and senior programs and other ways that make the City a desirable place to live. In the 2019 Adopted Budget the City shows appropriations made for City Departments, Affiliated Agencies and the Capital Improvement Program (CIP).

Figure 4.4 - 2019 Total Budget Appropriations

in millions

	FY 2017 Actuals	FY 2018 Adopted	FY 2019 Adopted
General Fund	$235.1	$236.7	$246.1
All Funds	$789.9	$782.9	$816.7

Full-Time Equivalent Positions
(including Affiliated Agencies)

	FY 2017 Actuals	FY 2018 Adopted	FY 2019 Adopted
General Fund	1,002.55	983.75	974.91
All Funds	2,218.60	2,171.26	2,181.57

Over the past five (5) years, the city has not received any Hazard Mitigation Assistance (HMA) funds to implement projects from the LHMP; general funds have been used to implement needed projects within the jurisdiction. Administration of the projects were carried out in accordance with current city policies and requirements. A sample of some of the completed projects is included in Section 7 of the LHMP. With a better understanding of their risk, possible actions, and potential HMA funding sources, the city is hoping to obtain grants to help implement future projects.

4.4.2 Grants that Support Mitigation Efforts

In addition to FEMA's Hazard Mitigation Assistance (HMA) grants, the City of Pasadena has access to other grant and grant programs that can assist in developing and expanding hazard mitigation strategies. These grants include:

- Pasadena Capital Grants Program
- Planning and Community Development Department
- Assistance to Firefighters Grants (AFG)
- The Alisa Ann Ruch Burn Foundation
- The Community Development Block Grant (CDBG) Program Police Department
- Police Foundation
- Department of Justice (DOJ) Body-Worn Camera Policy and Implementation Program
- U.S. Department of Justice Assistance Grant
- Supplemental Nutrition Assistance Program (SNAP) Additional Funding
- Non-Potable Water Project - Phase I
- Supplemental Food Program for Women, Infants and Children (WIC)
- Supplemental Nutrition Assistance Program (SNAP)
- Shelter Plus Care
- Home Opportunities for Persons with AIDS
- Continuum of Care Program
- Water Conservation Field Services (WCFS)
- Bullet Proof Vest Grant
- Edward Byrne Memorial Justice Assistance Grant - Body-Worn Camera Initiative
- Asset Forfeiture
- WIOA - Foster Youth
- WIOA - Adult
- WIOA - High Performing Board
- WIOA - VEAP
- WIOA - Touch Screen Technology
- WIOA - Youth
- WIOA - Dislocated Worker
- WIOA - Rapid Response
- WIOA - Rapid Response Layoff Aversion
- WIOA - Rapid Response Special - Hire Path
- Purchase of Replace Transit Vehicle and Large Capacity Fixed Route Transit Vehicles
- Dial-A-Ride Expansion for Accessibility Enhancement - FTA5310
- Dial-A-Ride Aging Vehicle Replacement - FTA5310
- Increase Local Transit Capacity for Improved Jobs Access-FTA5316 JARC Operation
- Public Health Emergency Preparedness (formerly Bio-Terrorism)
- Substance Abuse and Mental Health (SAMHSA)
- Centers for Disease Control and Prevention - TB Local Assistance
- Child Lead Poison Prevention
- Substance Abuse and Mental Health (SAMHSA) - GBHI

- Immunization Subvention Funds
- CDC REACH
- Temporary Assistance for Needy Families (TANF)
- Transitional Subsidized Employment (TSE)
- Child Health and Disability Prevention Program - Gateway
- Special Projects of National Significance (HRSA)
- Special Projects of National Significance (HRSA)
- MCH County and Comprehensive Prenatal Outreach
- MCH Black Infant (federal share only)
- Homeland Security Grant Program (SHGP)
- Urban Areas Security Initiative (UASI)
- CDBG Entitlement
- Emergency Shelter Grant Program
- HOME - Investment in Affordable Housing
- Home Opportunities for Persons with AIDS
- Section 108 Loan - Robinson Park
- Section 8 Low Income Housing - Voucher Program
- Laundry to Landscape Greywater Recycling Program Expansion
- La Loma Bridge
- Holly Street Bridge Seismic Retrofit
- Detect Bicycle at Intersection by Traffic Signal
- Left Turn Signal Phasing at Colorado/Orange Grove/Holly
- Light Rail Train Tracking
- Intelligent Transportation System - Phase 1
- OTS Safer Streets Pasadena - School Area Safety
- Safer Streets Pasadena - Bicycle Safety Outreach Project
- Selective Traffic Enforcement Program (STEP)
- Asset Forfeiture
- HIV Prevention Activities Health Department Based
- Alcohol & Drug Abuse/Mental Health Services Block Grant - AODPS
- State Homeland Security Program (SHSP)

5 Hazard Assessment

5.1 OVERVIEW

The purpose of this section is to review, validate, and/or update the profiled hazards in 2013 City of Pasadena LHMP. The intent is to confirm, and if necessary, expand the list of hazards facing the city and determine if the information is current and accurate. The importance of this is to ensure that decisions (mitigation actions) are based on a comprehensive understanding of all hazards and that the most up-to-date information on hazards is being considered. Another purpose of this section is to prioritize (or rank) the hazards. This ranking will provide an understanding of the significance of each hazard in the community.

During this effort to assess the hazard information and ranked the hazards, the Steering Committee considered the following questions:

- Is this hazard still present and significant within the jurisdiction?
- Has the potential for the hazard within the jurisdiction changed including the location, severity, and/or frequency?
    - Including climate change considerations
- Are there other hazards affecting the jurisdiction?

As part of process, the Steering Committee leveraged other planning efforts and documents, including the State of California Multi-Hazard Mitigation Plan, the City of Pasadena General Plan, the City of Pasadena 2013 LHMP, and other agency documents containing updated information and best practices for hazards (i.e., FEMA, USGS, NOAA, USC). Utilizing the information and material, the Steering Committee assessed and profiled hazards in the geographic area. The following is a summary of the work.

5.2 HAZARD IDENTIFICATION

Using the City of Pasadena 2013 LHMP as the basis, the Steering Committee leveraged information from other documents (i.e., California State Multi-Hazard Mitigation Plan, City of Pasadena General Plan, City of Pasadena Climate Action Plan) and utilized local experience and knowledge to identify and document the hazards relevant to the city (**Table 5.1**).

Table 5.1 Relevant Hazards in the City of Pasadena

	Hazards
1	Earthquake
2	Wildfire
3	Flood
4	Landslide and other Earth Movement
6	Extreme Heat
7	Hailstorm
8	Windstorm
9	Energy Shortage/Outage
10	Air Pollution
11	Oil Spill
12	Dam Failure
13	Agricultural Pests and Disease
14	Infectious Disease
15	Hazardous Material Release
16	Radiological Incident
17	Terrorism
18	Cyber Attack
19	Aircraft Crash
20	Train Accident; Explosion and/or Chemical Release
21	Natural Gas Pipeline/Storage Failure
22	Civil Disturbance

5.3 HAZARD PRIORITIZATION

The intent of prioritizing hazards is to help evaluate which hazard is the greatest concern in the community. The City of Pasadena 2013 LHMP did not document its prioritization process so there was little to review and validate. For the 2018 update of the LHMP, the Steering Committee decided to adopt and document their approach. A summary of the process (methodology) and the results are presented below:

5.3.1 Methodology

Evaluate hazards on two (2) factors:

- Probability of the hazard affecting the community
- Potential impacts of the hazard on the community

To assist with rankings, terms of "*High*", "*Medium*", and "*Low*" were utilized to define probability of occurrence and potential impact. The following are definitions of each term:

Probability of Occurrence

High- Highly Likely/Likely (significant chance will happen every year)
Medium- Possible (75% chance will happen every 5 years)
Low- Unlikely (50% chance will happen every 10 years)

Potential Impact

High- Catastrophic/Critical: Major loss of function, downtime, and/or evacuations

Medium- Limited: Some loss of function, downtime, and/or evacuations
Low- Negligible: Minimal loss of function, downtime, and/or evacuations

5.3.2 Results

Utilizing the methodology, the Steering Committee evaluated the list of hazards. The results of the assessment are presented in **Table 5-2**. Based on LHMP update requirements and previous discussions with Cal OES and FEMA, it has been suggested that the list of hazards be divided into "*higher priority*" and "*lower priority*" hazards. The shading of the boxes above indicates the priority level: the "*higher priority*" hazards are indicated in the Red boxes and the "*lower priority*" hazards are reflective in the Green and Gray boxes. It should be noted that while some mitigation actions will be identified for "*lower priority*" hazards, the focus will be on the "*higher priority*" hazards.

Table 5-2 Hazard Screening and Ranking

	High Impact	Medium Impact	Low Impact
High Probability	• Earthquake • Wildfire • Terrorism • Cyber Attack • Drought/Water Shortage • Civil Disturbance • Windstorm • Infectious Disease	• Agricultural Pest and Disease	
Medium Probability	• Energy Shortage/Outage	• Flood • Extreme Heat • Train Accident • Hazardous Material Release	• Landslide and other Earth Movement
Low Probability	• Aircraft Crash	• Dam Failure • Radiological Incident • Air Pollution • Natural Gas Pipeline/ Storage Failure	• Hailstorm • Oil Spill

5.4 HAZARD PROFILES

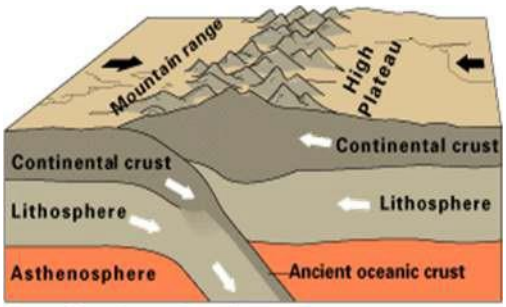
To ensure each hazard was given proper consideration, a standardized format was used. Each hazard presented on the LHMP will contain: 1) a brief description of the hazard; 2) an overview of the location and extent of the hazard within the city; 3) the history of the hazard within the city; 4) the probability of occurrence within the city; and, 5) the climate change considerations for the hazard. The Steering Committee considered this information when they ranked each hazard. The following information is intended to be an overview of the relevant hazards; more information may be found in the State of California Multi-Hazard Mitigation Plan, the City of Pasadena General Plan, and/or other documents.

5.4.1 Higher Priority Hazards

5.4.1.1 Earthquake

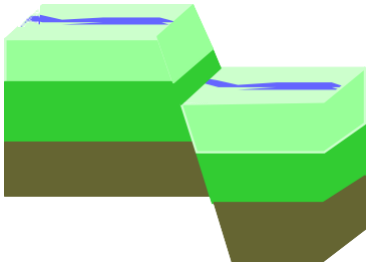
5.4.1.1.1 Description of Hazard

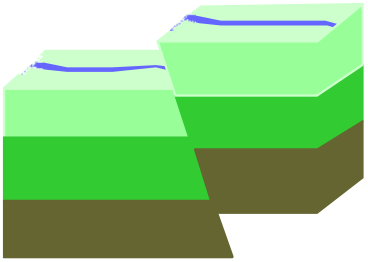
An earthquake is caused by a release of strain within or along the edge of the Earth's tectonic plates, producing ground motion, surface fault rupture, and secondary hazards such as ground failure. The severity of the shaking increases with the amount of energy released, decreases with distance from the causative fault or epicenter, and is amplified by soft soils. After just a few seconds, earthquakes can cause massive damage and extensive casualties. A fault is a fracture between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.



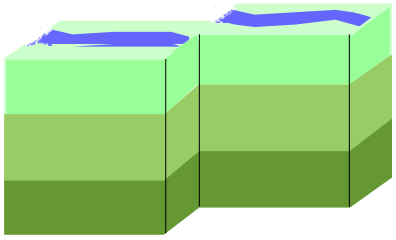
Continental-continental convergence

There are three (3) different types of earthquake faults: 1) Normal, 2) Thrust; and, 3) Strike-slip. Normal fault and Thrust faults are examples of dip-slip faults. 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 (or trust) fault. Thrust faults have a reverse fault with a dip of 45° or less.


Normal Fault


Thrust Fault

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.


Strike-slip Fault

The effect of an earthquake on various locations throughout the felt area is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of

furniture, damage to chimneys, and total destruction of property. The scale currently used in the United States is the Modified Mercalli Intensity (MMI) Scale (**Table 5.3**). It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale is composed of increasing levels of intensity designated by Roman numerals that range from imperceptible shaking (MMI I) to catastrophic destruction (MMI X). It does not have a mathematical basis; instead, it is an empirical scale based on observed effects.

Table 5.3 Modified Mercalli Intensity (MMI) Scale

Intensity	Shaking	Description
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent

However, most people are familiar with the Richter scale, a method of rating earthquakes based on the amplitude of seismic waves - an indirect measure of energy released (Error! Not a valid bookmark self-reference.). The Richter scale is logarithmic. Each one-point increase corresponds to a 10-fold increase in the amplitude of the seismic shock waves and a 32-fold increase in energy released. For example, an earthquake registering magnitude 7.0 on the Richter scale releases over 1,000 times more energy than an earthquake registering magnitude 5.0. It should be noted that while an earthquake may have many intensity values across the impacted area, there is just one Richter magnitude associated with each event.

Table 5.4 Richter Scale

Magnitude	Earthquake Effects
0-1.9	*Micro*- Not felt by people
2.0-2.9	*Minor*- Felt by few people
3.0-3.9	*Minor*- Felt by some people, inside objective can be seen shaking
4.0-4.9	*Light*- Felt by most people, inside object shake and fall
5.0-5.9	*Moderate*- Felt by everyone, damage and possible collapse of unreinforced buildings
6.0-6.9	*Strong*- Felt by everyone, widespread shaking/damage, some buildings collapse
7.0-7.9	*Major*- Felt by everyone, widespread shaking/damage, many buildings collapse
8.0 or greater	*Great*- Felt by everyone, widespread shaking/damage, most buildings collapse

Ground shaking, surface fault rupture, landslides, and liquefaction 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, distance from the epicenter (where the earthquake originates), and local soil conditions. Soils and soft sedimentary rocks near the earth's surface can amplify earthquake ground shaking. 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. Amplification can also occur in areas with deep sediment filled basins and on ridge tops. Peak ground acceleration (PGA) is a measure of the strength of ground shaking. Larger PGAs result in greater damage to structures. PGA is used to depict the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5%, or 2%) of being exceeded in 50 years return period. These values are often used for reference in construction design, and in assessing relative hazards when making economic and safety decisions.

Surface Fault Rupture- As previously mentioned, the sudden sliding of one part of the earth’s crust past another releases the vast store of elastic energy in the rocks as an earthquake. The resulting fracture is known as a fault, while the sliding movement of earth on either side of a fault is called fault rupture. Fault rupture generally begins below the ground surface at the earthquake hypocenter, typically between three and ten miles below the ground surface in California. If an earthquake is large enough, the fault rupture will reach the ground surface (referred to as “surface fault rupture”), wreaking havoc on structures built across its path. Structures built across the fault are a risk of significant damage from surface fault rupture. In California, the 1972 Alquist-Priola Earthquake Fault Zoning Act prohibits the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting.

Recent large earthquakes in Turkey and Taiwan have shown that few structures built across the surface traces of faults can withstand the large displacements that may occur during an earthquake.

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.

Liquefaction- Liquefaction is the phenomenon that occurs when ground shaking causes loose, saturated soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength occurs when the soil supporting structures liquefy, causing the structures to settle, resulting in damage and, in some cases, collapse.

5.4.1.1.2 Location and Extent of Hazard in Pasadena

As noted by the California Geological Survey, California is divided into eleven (11) geomorphic provinces. California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform. Each region displays unique, defining features based on geology, faults, topographic relief and climate. These geomorphic provinces are remarkably diverse. They provide spectacular vistas and unique opportunities to learn about earth's geologic processes and history. These geomorphic provinces each have the potential to create significant earthquakes and associated hazards.

The City of Pasadena is located in a high seismic activity zone in the Transverse Range geologic province. The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is oblique to the normal northwest trend of coastal California, hence the name "Transverse." The province extends offshore to include San Miguel, Santa Rosa, and Santa Cruz islands. Its eastern extension, the San Bernardino Mountains, has been displaced to the south along the San Andreas Fault. Intense north-south compression is squeezing the Transverse Ranges. As a result, this is one of the most rapidly rising regions on earth. Great thicknesses of Cenozoic petroleum-rich sedimentary rocks have folded and faulted, making this one of the important oil producing areas in the United States. **Figure 5.1** maps the more significant faults within the region.

Figure 5.1 Earthquake Faults in Southern California Region

Historical and geological records show that California has a long history of seismic events. In California, movement between the North American and the Pacific tectonic plates manifest primarily along a region known as the San Andreas Fault system. Experts believe the San Andreas Fault is capable of producing an earthquake of magnitude 8.0+ over the next few years. The San Andreas Fault is considered the "Master Fault" because it has frequent (geologically speaking), large earthquakes, and it controls the seismic hazard in southern California. Faults in the San Andreas Fault zone that passes through Los Angeles County are part of the very active southern segment. This segment includes historically active, active, potentially active, and inactive faults.

The San Andreas Fault is ten (10) miles deep and runs 800-miles from the Salton Sea in Imperial County in the south to Cape Mendocino in Humboldt County in the north. 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 segment. The last large earthquake on the southern San Andreas Fault segment occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades. The closets points of the San Andreas Fault are situated approximately 20-50 miles to the north and east of the City of Pasadena. Below is an overview of the San Andreas Fault Zone.

San Andreas Fault Zone- Large faults, such as the San Andreas Fault, are generally divided into segments in order to evaluate their future earthquake potential. The segments are generally defined at discontinuities along the fault that may affect the rupture length. The southern segment of the San Andreas Fault zone is divided into three (3) segments named, from north to south: 1) Mojave; 2) San Bernardino Mountains; and, 3) Coachella Valley segments.

Each segment is assumed to have a characteristic slip rate (rate of movement averaged over time), recurrence interval (time between moderate to large earthquakes), and displacement (amount of offset during an earthquake). While this methodology has some value in predicting earthquakes, historical records and studies of prehistoric earthquakes show that it is possible for more than one segment to rupture during a large quake or for ruptures to overlap into adjacent segments.

Mojave Segment- This segment of the San Andreas Fault is 83 miles long, extending from approximately Three Points southward to just northwest of Cajon Creek, at the southern limit of the 1857 rupture. Scientists estimate a recurrence interval of 150 years for this segment. The Mojave segment is estimated to be capable of producing a magnitude 7.1 earthquake.

San Bernardino Mountains Segment- This segment extends approximately 49 miles from Cajon Creek to the San Gorgonio Pass. This segment is a structurally complex zone that is poorly understood, and for which there are scant data on fault behavior. It has been estimated there is a probable recurrence interval on this fault of approximately 146 years. This fault segment is estimated capable of producing a magnitude 7.3 earthquake. If this fault segment ruptures together with the Mojave and Coachella Valley segments, higher ground motions would be expected.

Coachella Valley Segment- This segment is about 71 miles long and extends from San Gorgonio Pass to the Salton Sea. This segment has not produced any large surface-rupturing earthquakes in historic times (Sieh and Williams, 1990). Paleo seismic studies suggest that the last surface-rupturing earthquake on this segment occurred around 1680. The data also suggest that during the 1680 earthquake, and the one prior to that, in 1450, both the Coachella Valley and San Bernardino Mountain segments ruptured simultaneously. This segment is thought capable of producing a magnitude 7.4 earthquake.

While the San Andreas Fault system is capable of producing an earthquake with a magnitude of 8.0+ on the Richter scale; some of the "lesser" known faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Experts believe that a magnitude 6.0 earthquake on the Newport-Inglewood area 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.

The two largest faults in the Pasadena area are the Sierra Madre Fault, a reverse fault on the north boundary of the City, and the Raymond Fault, a left lateral strike-slip fault that extends into the southern and eastern areas of the City. A rupture of either fault would result in major damage to the city. Other nearby faults include the Verdugo, Hollywood, Whittier, and Elysian Park fault zones. Any of these faults have the potential to cause serious damage to Pasadena. Below is an overview of the Sierra Madre Fault, Verdugo Fault, and the Raymond Fault.

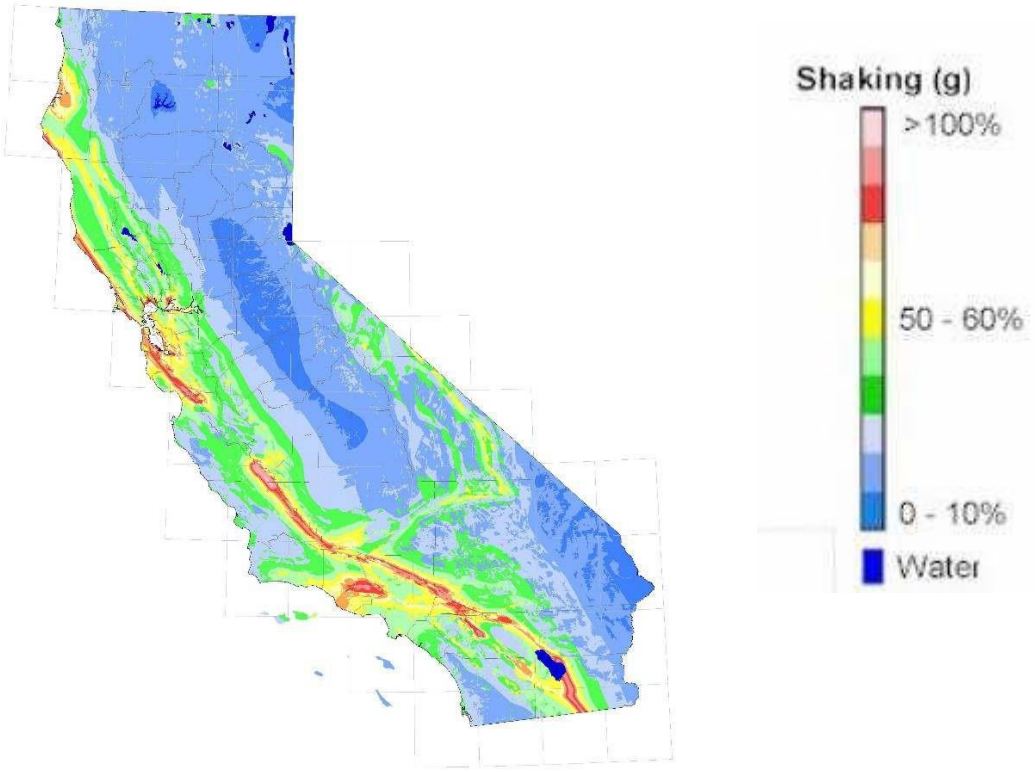
Sierra Madre Fault- The Sierra Madre fault zone is a north-dipping reverse fault zone approximately 47 miles long that extends along the southern flank of the San Gabriel Mountains from San Fernando to San Antonio Canyon, where it continues southeastward as the Cucamonga fault. The Sierra Madre fault has been divided into five segments, and each segment has a different rate of activity. The northwestern-most segment of the Sierra Madre fault (the San Fernando segment) ruptured in 1971, causing the magnitude 6.7 San Fernando (or Sylmar) earthquake. As a result of this earthquake, the Sierra Madre fault has been known to be active. In the 1980s, Crook and others (1987) studied the Transverse Ranges using general geologic and geomorphic mapping, coupled with a few trenching locations, and suggested that the segments of the Sierra Madre fault east of the San Fernando segment have not generated major earthquakes in several thousands of years, and possibly as long as 11,000 years. By California's definitions of active faulting, most of the Sierra Madre fault would therefore be classified as not active. The segment in Los Angeles County is active and may generate an earthquake in the future.

Verdugo Fault- the Verdugo fault is a 13-mile long, southeast-striking fault that lies along the southern flank of the Verdugo Mountains, near Burbank. Earthquake researchers have interpreted this fault as both a reverse fault and a left-lateral strike-slip fault. Results of these studies suggest that the Verdugo fault changes in character from a reverse fault adjacent to the Pacoima Hills, to a normal fault at the southwest edge of the Verdugo Mountains. Vertical separation on the fault is at least 1,000 meters. The fault's recurrence interval is unknown.

Raymond Fault- The Raymond fault is a left-lateral, strike-slip fault about 13 miles long that extends across the San Gabriel Valley, including southern Pasadena. The fault is arcuate in shape, trending east- west in its western section, and east-northeast in its eastern section. The fault produces a very obvious south-facing scarp along much of its length, which led many geologists to favor reverse-slip as the predominant sense of fault motion. However, left-deflected channels, shutter-ridges, sag ponds, and pressure ridges indicate that the Raymond fault is predominantly a left-lateral strike slip fault. Research indicates that the Raymond fault may rupture alone or together with other nearby faults, such as the Hollywood fault. The recurrence rate is uncertain. The Raymond fault appears to transfer slip southward from the Sierra Madre fault zone to other fault systems. This sense of motion is confirmed by the seismological record, especially the main shock and aftershock sequence to the 1988 Pasadena earthquake of local magnitude 5.0 that probably occurred on this fault (Jones et al., 1990; Hauksson and Jones, 1991).

As indicted previously, earthquakes create associated hazards (i.e., ground shaking, liquefaction). To help understand the potential of some of these hazards, the United States Geologic Survey (USGS) illustrated the range of potential ground shaking throughout the state of California (**Figure 5.2**). Earthquake ground shaking estimates are calculated considering earthquake magnitudes and rates, the decrease in earthquake shaking with distance, and amplification of shaking by soils. The result is expressed as the level of ground shaking (as a percentage of gravity). The figure below shows the level of ground motion with a one (1) chance in 475 of being exceeded each year, which is equal to having a 10% probability of being exceeded in 50 years.

Figure 5.2 Peak Ground Acceleration with a 10% Probability of being exceeded in 50 Years



As noted above, some areas of sandy soil may be prone to liquefaction. On sloping ground, liquefaction will usually result in slope failure. On level ground, liquefaction results in water rising to the ground surface. The National Earthquake Hazards Reduction Program (NEHRP) rates soils from hard to soft, and gives the soils ratings from Type A through Type E. The hardest soils are rated Type A, and the softest soils are rated Type

E. Liquefaction risk is considered high if there are soft sandy soils (some Types D or Type E) and shallow ground water present. The California Geologic Survey conducted a study to document the potential earthquake-induced landslides and liquefaction potential for the San Gabriel Mountain foothill areas. **Figure 5.**3 and **Figure 5.4** illustrate the potential in the Pasadena area. The areas in green are liquefaction potential and the areas in light blue are earthquake-induced landslide potential.

Figure 5.3 Earthquake-induced Landslide and Liquefaction Potential- Pasadena Quadrangle

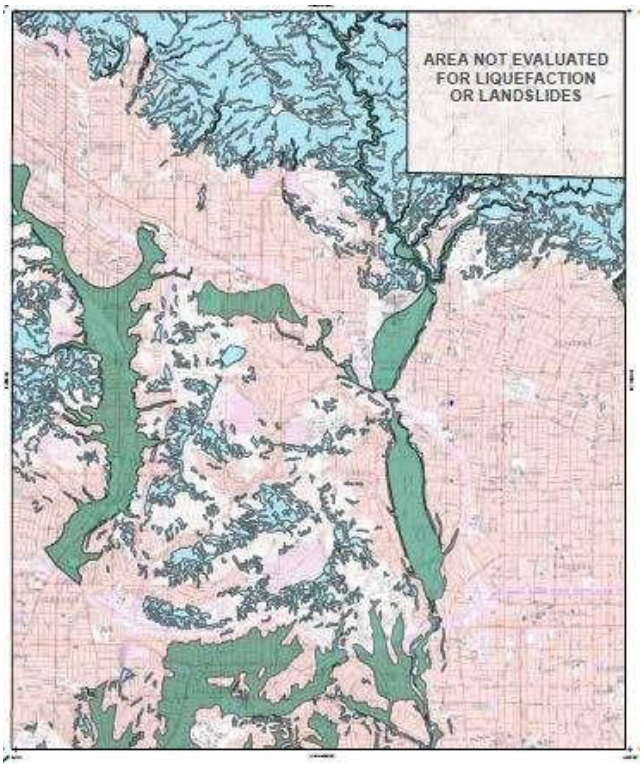
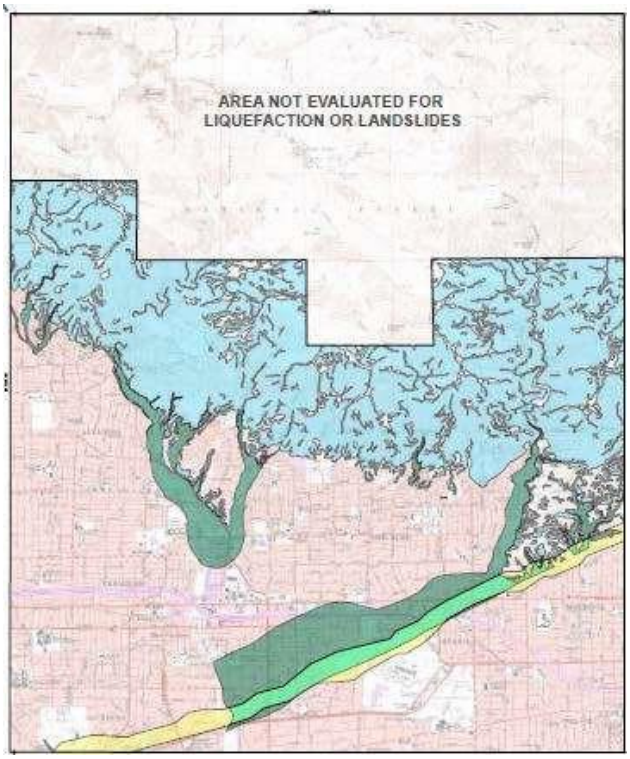


Figure 5.4 Earthquake-induced Landslide and Liquefaction Potential-Mount Wilson Quadrangle



5.4.1.1.3 History of Hazard in Pasadena

The most recent significant earthquake event affecting the Los Angeles area was the Northridge Earthquake. At 4:31 A.M. on Monday, January 17, 1994, a 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.

Fifty-seven (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, leaving thousands of people temporarily homeless. Some 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.

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

Two very large earthquakes, the Fort Tejon in 1857 (magnitude 7.9) and the Owens Valley in 1872 (magnitude 7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. The Fort Tejon earthquake surface rupture broke the portions of the central and southern segments of the San Andreas Fault system (Cholame, Carrizo, and Mojave segments), resulting in displacements of as much as 27 feet (9 meters) along the rupture zone. These fault segments are thought to have an incident recurrence interval of between 104 and 296 years.

In more recent times, two (2) magnitude 7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). However, the damage from these large earthquakes was limited because they 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. Other significant earthquake events in the region included:

- Newport-Inglewood Earthquake- Magnitude 6.4, March of 1933. 120 deaths, over $50 million in damage.
- San Fernando (Sylmar) Earthquake- Magnitude 6.5, February 1971. 65 deaths, over $500 million in damage
- Whittier Narrows Earthquake- Magnitude 5.9, October 1987. 8 deaths, over $358 million in damage
- Sierra Madre Earthquake - Magnitude 5.8, June 1991. 2 deaths, over $40 million in damage

Figure 5.5 displays historical epicenters of earthquakes located in southern California since 1568 and **Table 5.5** presents a list of significant earthquakes, magnitude 6.0 or greater since 1700 in the State of California.

Figure 5.5 Significant Earthquakes in Southern California since 1568

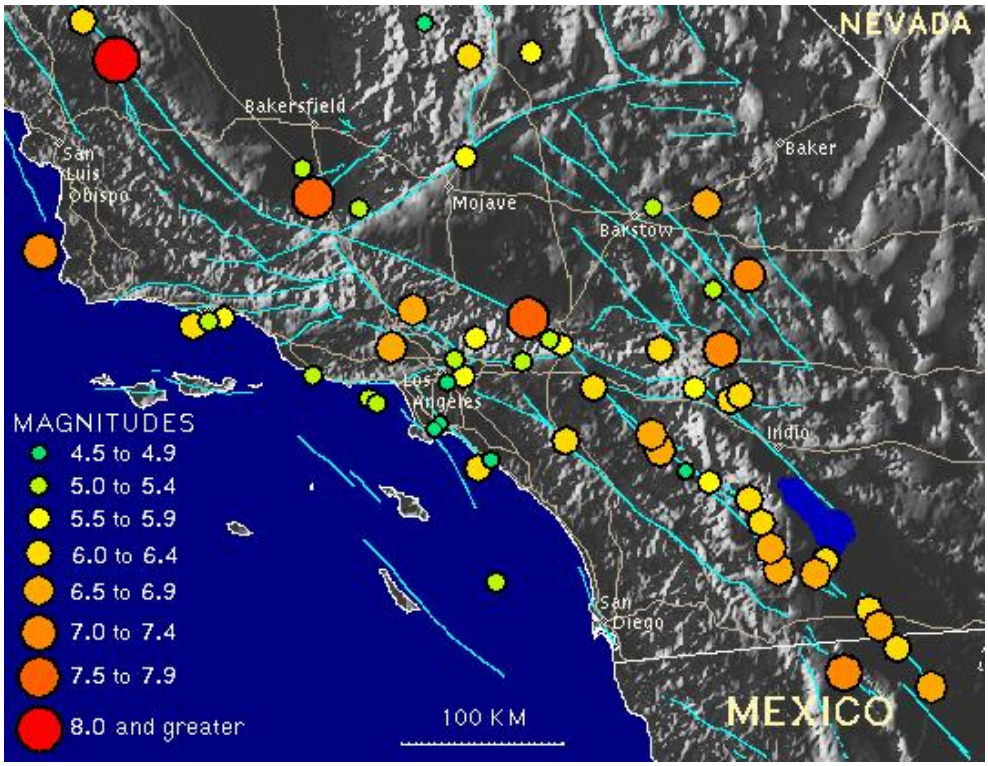


Table 5.5 List of Significant Earthquakes in California Since 1700

Date	Magnitude	Name, Location, or Region Affected	Loss of Life and Property
1700, Jan. 26	9.0	Offshore, somewhere between Cape Mendocino and Canada	Limited data available, magnitude is an estimate. Shook northern California, Oregon, Washington, and southern British Columbia; caused tsunami damage to villages in Japan and western US
1857, Jan 9	7.9	Great Fort Tejon earthquake	1 dead; damage from Monterey to San Bernardino County
1906, Apr 18	7.8	Great 1906 San Francisco Earthquake and Fire	3,000 dead; $524 million in property damage (includes damage from fire)
1838, Jun	7.4	San Francisco to San Juan Bautista	Limited data available, magnitude is an estimate. Damage to San Francisco and Santa Clara
1872, Mar 26	7.4	Owens Valley	27 dead; 56 injured; $250,000 in property damage
1980, Nov 8	7.4	West of Eureka	6 injured; $2 million in property damage

1812, Dec 8	7.3	Wrightwood	Limited data available, magnitude is an estimate. 40 dead at San Juan Capistrano
1892, Feb 24	7.3	Laguna Salida, Baja California	Damage to San Diego and Imperial Valley
1922, Jan 31	7.3	Offshore, about 70 mi W of Eureka	
1952, Jul 21	7.3	Kern County earthquake	12 dead; $60 million in property damage
1954, Dec 16	7.3	Fairview Peak, near Fallon, NV	
1992, Jun 28	7.3	Landers	1 dead; 402 injured; $91.1 million in property damage
1923, Jan 22	7.2	Off Cape Mendocino	Destructive in Humboldt County; strongly felt in Reno
1932, Dec 21	7.2	Cedar Mountain, near Gabbs, NV	
1992, Apr 25	7.2	Petrolia	356 injured; $48.3 million in property damage
1812, Dec 21	7.1	Los Angeles, Ventura, Santa Barbara	Limited data available, magnitude is an estimate. 1 dead
1927, Nov 4	7.1	40 km west of Lompoc	Damage in Santa Barbara and San Luis Obispo counties
1954, Dec 16	7.1	Dixie Valley, near Fallon, NV	
1868, Oct 21	7.0	Hayward Fault	30 dead; $350,000 in property damage
1899, Apr 16	7.0	Offshore, about 80 miles west of Eureka	
1934, Dec 31	7.0	In Mexico, about 100 miles SE of El Centro	
1940, May 19	7.0	Imperial Valley	9 dead; $6 million in property damage
1991, Aug 17	7.0	Offshore, about 100 miles NW of Eureka	Preceded by two quakes (M 6.3 and 6.2) on Aug. 16 and 17
1994, Sep 1	7.0	Offshore, about 70 miles W of Cape Mendocino	
1873, Nov 23	6.9	Crescent City region	Damage in California-Oregon border area
1989, Oct 17	6.9	Loma Prieta	63 dead; 3,737 injured; $6 billion in property damage
1872, Mar 26	6.8	Owens Valley	Aftershock of previous entry
1872, Apr 11	6.8	Owens Valley	Aftershock of March 26, 1872 quake
1890, Feb 9	6.8	San Jacinto fault?	Little damage

1918, Apr 21	6.8	San Jacinto	1 dead; several injuries; $200,000 in property damage
1925, Jun 29	6.8	Santa Barbara	13 dead; $8 million in property damage
1954, Jul 6	6.8	Rainbow Mountain, near Fallon, NV	
1999, Oct 16	7.1	Bullion Mountains (Hector Mine)	Minimal injuries and damage due to sparse population in affected area
1954, Aug 24	6.8	Rainbow Mountain, near Fallon, NV	
1976, Nov 26	6.8	Offshore, about 100 mi WNW of Eureka	
1898, Apr 15	6.7	Fort Bragg - Mendocino	Limited data available, magnitude is an estimate. Damage from Fort Bragg to Mendocino; 3 houses collapsed; landslides reported
1899, Dec 25	6.7	San Jacinto and Hemet	6 dead; $50,000 in property damage
1994, Jan 17	6.7	Northridge	57 dead; more than 9,000 injured; about $40 billion in property damage
1892, Apr 19	6.6	Vacaville	1 dead; $225,000 in property damage
1915, Nov 21	6.6	In Mexico, about 60 miles S of El Centro	
1941, Feb 9	6.6	Offshore, about 65 miles W of Eureka	
1954, Dec 21	6.6	East of Arcata	1 dead; several injured; $2.1 million in property damage
1968, Apr 8	6.6	Borrego Mountain	
1971, Feb 9	6.6	San Fernando	65 dead; more than 2,000 injured; $505 million in losses
1987, Nov 24	6.6	Superstition Hills	part of above damage
1992, Apr 26	6.6	Petrolia	Aftershock of the Apr. 25 quake
1992, Apr 26	6.6	Petrolia	Another aftershock of Apr. 25 quake
1852, Nov 29	6.5	Near Fort Yuma, Arizona	Limited data available, magnitude is an estimate.
1860, Mar 15	6.5	Carson City	Limited data available, magnitude is an estimate.
1865, Oct 8	6.5	Santa Cruz Mountains	$0.5 million in property damage
1918, Jul 15	6.5	Offshore, about 40 W of Eureka	
1934, Jul 6	6.5	Offshore, about 100 mi WNW of Eureka	
1934, Dec 30	6.5	In Mexico, about 40 miles S of El Centro	
1947, Apr 10	6.5	East of Yermo	
1956, Feb 9	6.5	In Mexico, about 80 miles SW of El Centro	
1979, Oct 15	6.5	Imperial Valley	9 injured; $30 million in property

			damage
1992, June 28	6.5	Big Bear	Included with Landers losses, above
2003, Dec 22	6.5	San Simeon	
1836, Jun 10	6.4	Near San Juan Bautista	Limited data available, magnitude is estimate. Older reports reported quake as possibly larger and centered near Oakland
1898, Mar 31	6.4	Mare Island	$350,000 in property damage
1991, Jul 12	6.6	Offshore west of Crescent City	
1899, Jul 22	6.4	Wrightwood	Chimneys knocked down; landslides reported
1911, Jul 1	6.4	Morgan Hill area	
1933, Mar 11	6.4	Long Beach	115 dead; $40 million in property damage
1942, Oct 21	6.4	About 25 miles W of Westmoreland	
1983, May 2	6.4	Coalinga	
1986, Jul 21	6.4	Chalfant Valley	
1800, Nov 22	6.3	San Diego/San Juan Capistrano region	Limited data available, magnitude is an estimate. Damaged adobe walls of missions in San Diego and San Juan Capistrano
1922, Mar 10	6.3	Parkfield	
1995, Feb 19	6.3	Offshore, about 70 miles W of Cape Mendocino	
1980, May 25	6.2	Mammoth Lakes	
1984, Apr 24	6.2	Morgan Hill	$8 million in property damage
1908, Nov 4	6.0	SW of Death Valley	
1948, Dec 4	6.0	East of Yermo	
1980, May 25	6.0	Mammoth Lakes	
1987, Oct 1	6.0	Whittier Narrows	8 dead; $358 million in property damage to 10,500 homes and businesses

Some of the more local earthquake events to impacts the Pasadena areas include the Pasadena Earthquake (1988, magnitude 5.0) and the Sierra Madre Earthquake (1991, magnitude 5.8). The Pasadena Earthquake did not create significant damage, but it was widely felt within the area. The earthquake did provide a clear example of the left-lateral movement of the Raymond fault. The Sierra Madre Earthquake occurred on the Clamshell-Sawpit Canyon fault, an offshoot of the Sierra Madre fault zone. Because of its depth and moderate size, it caused no surface rupture, though it triggered rockslides that blocked some mountain roads. Roughly $40 million in property damage occurred in the San Gabriel Valley. Unreinforced masonry buildings were the hardest hit. Two deaths resulted from this earthquake and, at least 100 others were injured.

5.4.1.1.4 Probability of Occurrence

The United States Geological Survey (USGS) and their partners, as part of the latest Uniform California Earthquake Rupture Forecast Version 3 (UCERF3; 2015), have estimated the chances of having large earthquakes throughout California over the next 30 years (**Figure 5.6**). **Figure 5.7** provides a zoom in of the Los Angeles area of the UCERF3 work.

Figure 5.6 Likelihood of Earthquakes of M6.7 or Larger in the Next 30 years- Statewide

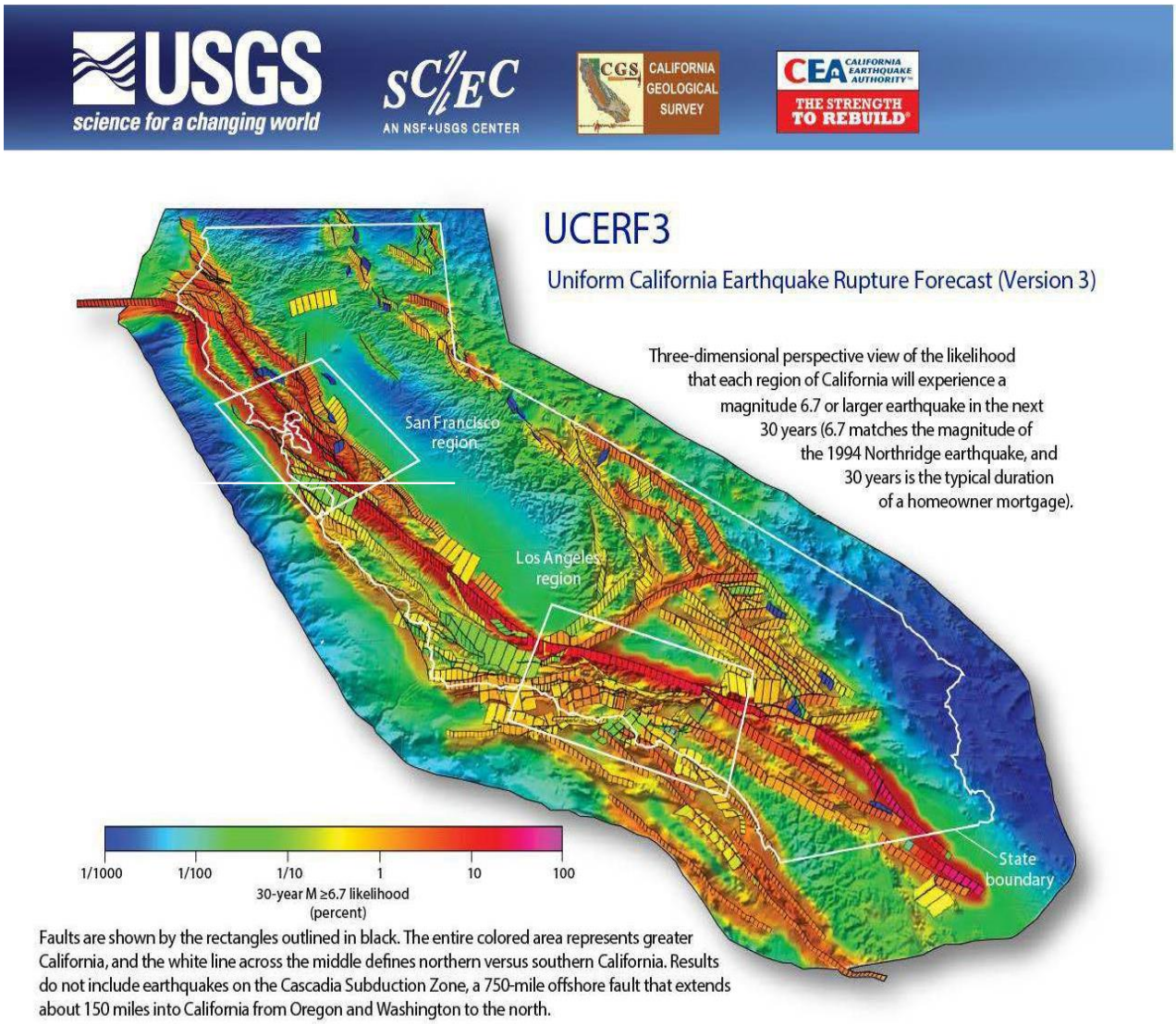
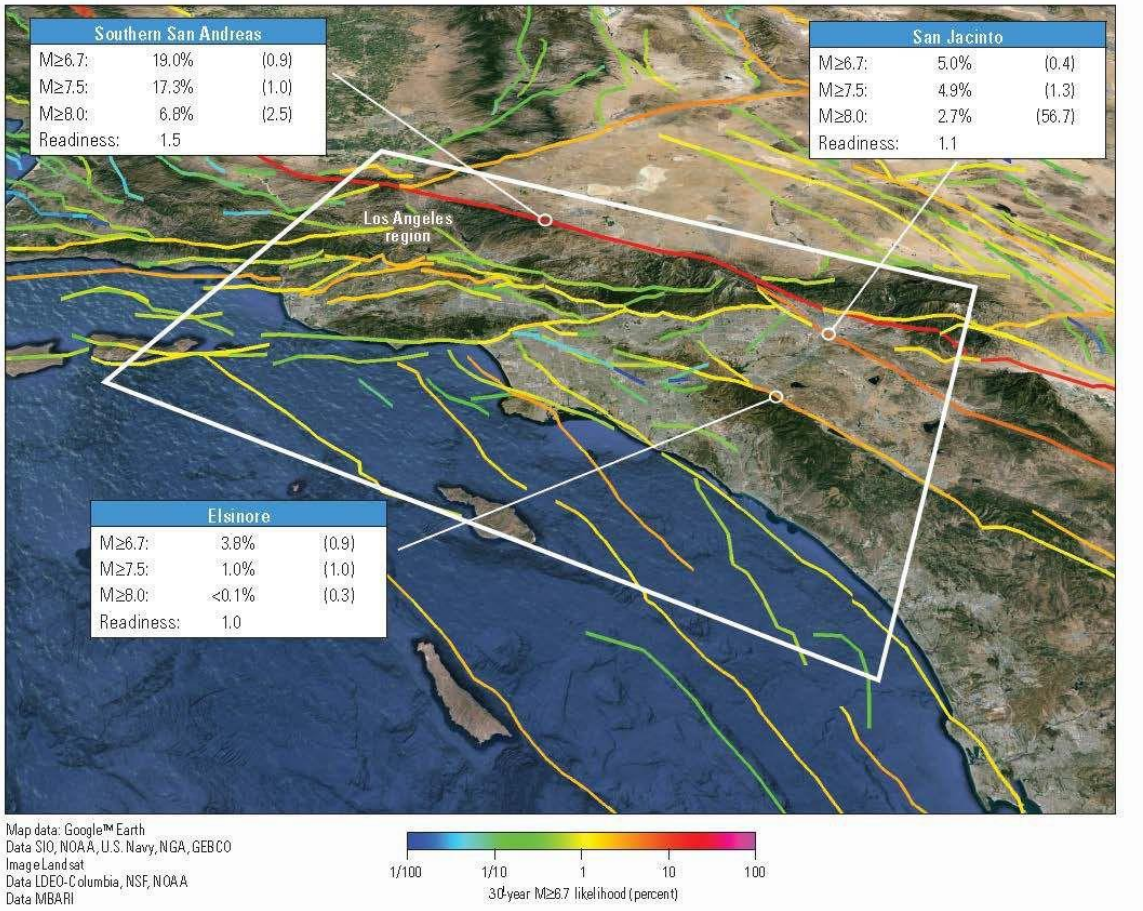


Figure 5.7 Likelihood of M6.7 or greater earthquakes in the Next 30 years- Los Angeles Area



Statewide, the rate of earthquakes around Magnitude 6.7 (the size of the 1994 Northridge earthquake) has been estimated to be 1 per 6.3 years (more than 99% likelihood in the next 30 years); in southern California, the rate is 1 per 12 years (93% likelihood in the next 30 years). Southern California's rates are given in **Table 5.6**.

Table 5.6 Southern California Region Earthquake Likelihoods (UCERF3, 2015)

Magnitude (greater than or equal to)	Average Repeat Time (years)	30-year likelihood of one or more events
5.0	0.24	100%
6.0	2.3	100%
6.7	12	93%
7.0	25	75%
7.5	87	36%
8.0	522	7%

5.4.1.1.5 Climate Change Considerations

To date, no credible evidence has been provided that links climate to earthquakes; however, climate and weather does play a significant role in the response and recovery from earthquakes. Effects from climate change could create cascading complications and impacts.

5.4.1.2 Wildfire

5.4.1.2.1 Description of Hazard

Wildfires can be classified as either a wildland fire or a wildland-urban interface (WUI) fire. Wildland fires involve situations where a fire occurs in an area that is relatively undeveloped except for the possible existence of basic infrastructure such as roads and power lines. A WUI fire includes situations in which a wildland fire enters an area that is developed with structures and other human developments. In WUI fires, the fire is fueled by both naturally occurring vegetation and the urban structural elements themselves. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the wildland-urban interface is defined as "*…the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.*"

The WUI fire can be subdivided into three (3) categories (NWUIFPP, 1998): 1) classic wildland-urban interface; 2) the mixed wildland-urban interface; and, 3) the occluded wildland-urban interface. 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. The *occluded wildland- urban interface* exists where islands of wildland vegetation occur inside a largely urbanized area. Generally, many of the areas at risk within the City of Pasadena fall into the classic wildland-urban interface category.

Certain conditions must be present for a wildfire hazard to occur; a large source of fuel must be present, the weather must be conducive (generally hot, dry, and windy), and fire suppression sources must not be able to easily suppress and control the fire. The cause of a majority of wildfires is human-induced or lightning; however, once burning, wildfire behavior is based on three (3) primary factors: 1) fuel; 2) topography; and, weather. Fuel will affect the potential size and behavior of a wildfire depending on the amount present, its burning qualities (e.g. level of moisture), and its horizontal and vertical continuity. Topography affects the movement of air, and thus the fire, over the ground surface. The terrain can also change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire. Weather as manifested in temperature, humidity and wind (both short and long term) affect the probability, severity, and duration of wildfires. Other factors that create concern are drought conditions and development (the build environment). Drought conditions bring on contributing concerns in that it can lead to relatively drier conditions and leave reservoirs and water tables lower; thus, creating hotter fires and less water to fight the fires. The expansion of the built environment into previously unoccupied areas introduces more people to the hazard and in some cases make response actions more challenging.

5.4.1.2.2 Location and Extent of Hazard in Pasadena

The climate, topography, and vegetation in Pasadena is conducive to annual wildfire events. California Department of Forestry and Fire Protection, Fire and Resource Assessment Program (CDF-FRAP) was established and mandated to map areas of significant fire hazards based on fuels (vegetation), terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones, define the application of various mitigation strategies to reduce risk associated with wildland fires. CDF-FRAP developed data that displays the relative risk to areas of significant population density from wildfire.

This data is created by intersecting residential housing unit density with proximate fire threat, to give a relative measure of potential loss of structures and threats to public safety from wildfire. The most current mapping efforts by CDF-FRAP were conducted in 2007. The maps below show the "very high" Fire Hazard Severity Zones (VHFHSZ) located in Los Angeles County for state and local responsibility areas (**Figure 5.8**).

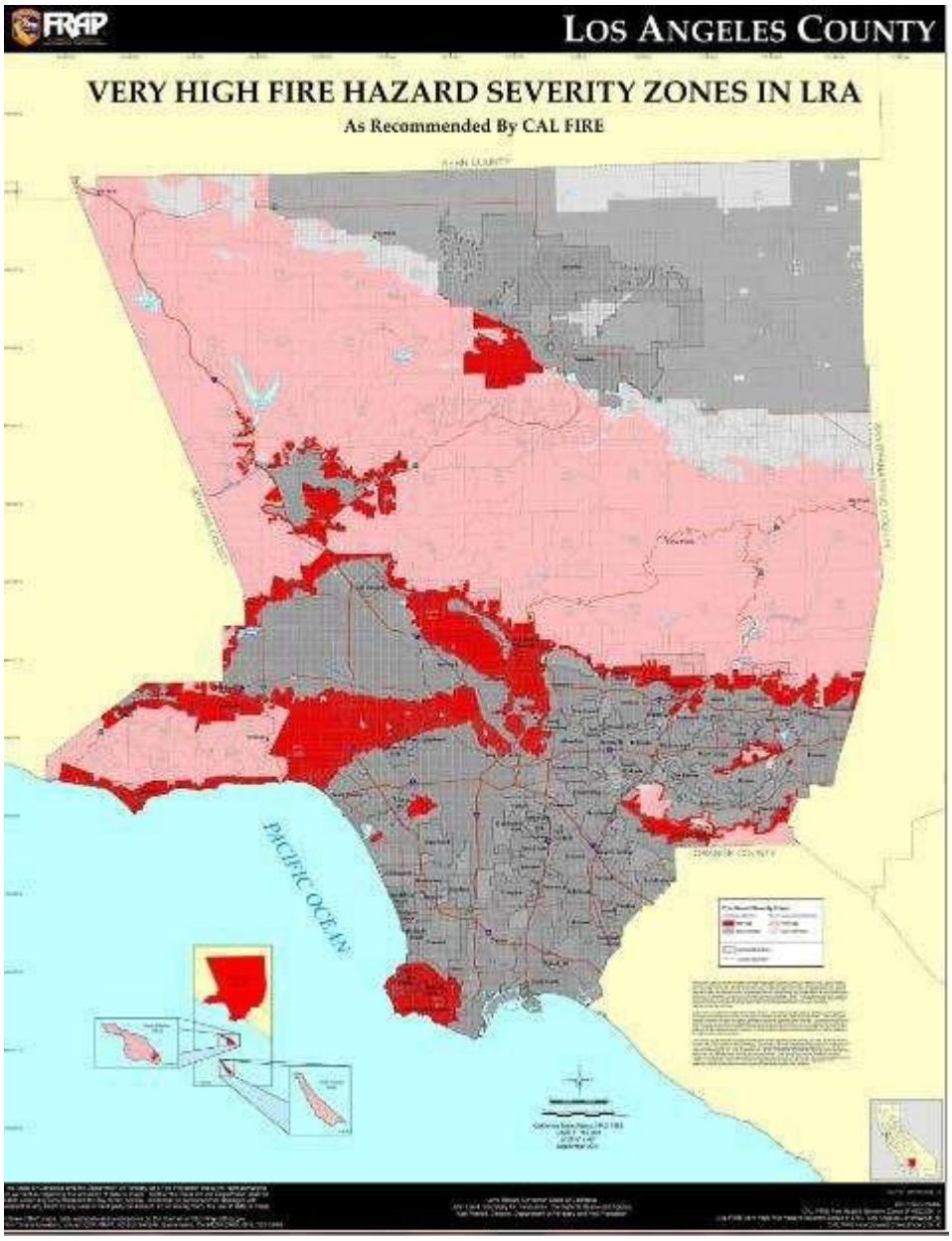
Extent is the strength or magnitude of the hazard. Wildfire measurement of extent is described in ***Table 5-7.*** Fire Hazard Severity Zones for Pasadena can be found in ***Figure 5.9.***

Table 5-7 Wildfire Measurement of Extent

Wildfire (http://www.southernwildfirerisk.com/map/index/public)

	1	Lowest Intensity	Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
	1.5		
	2	Lowest Intensity	Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
	2.5		
	3	Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
	3.5		
	4	High	Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
	4.5		
	5	Highest	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

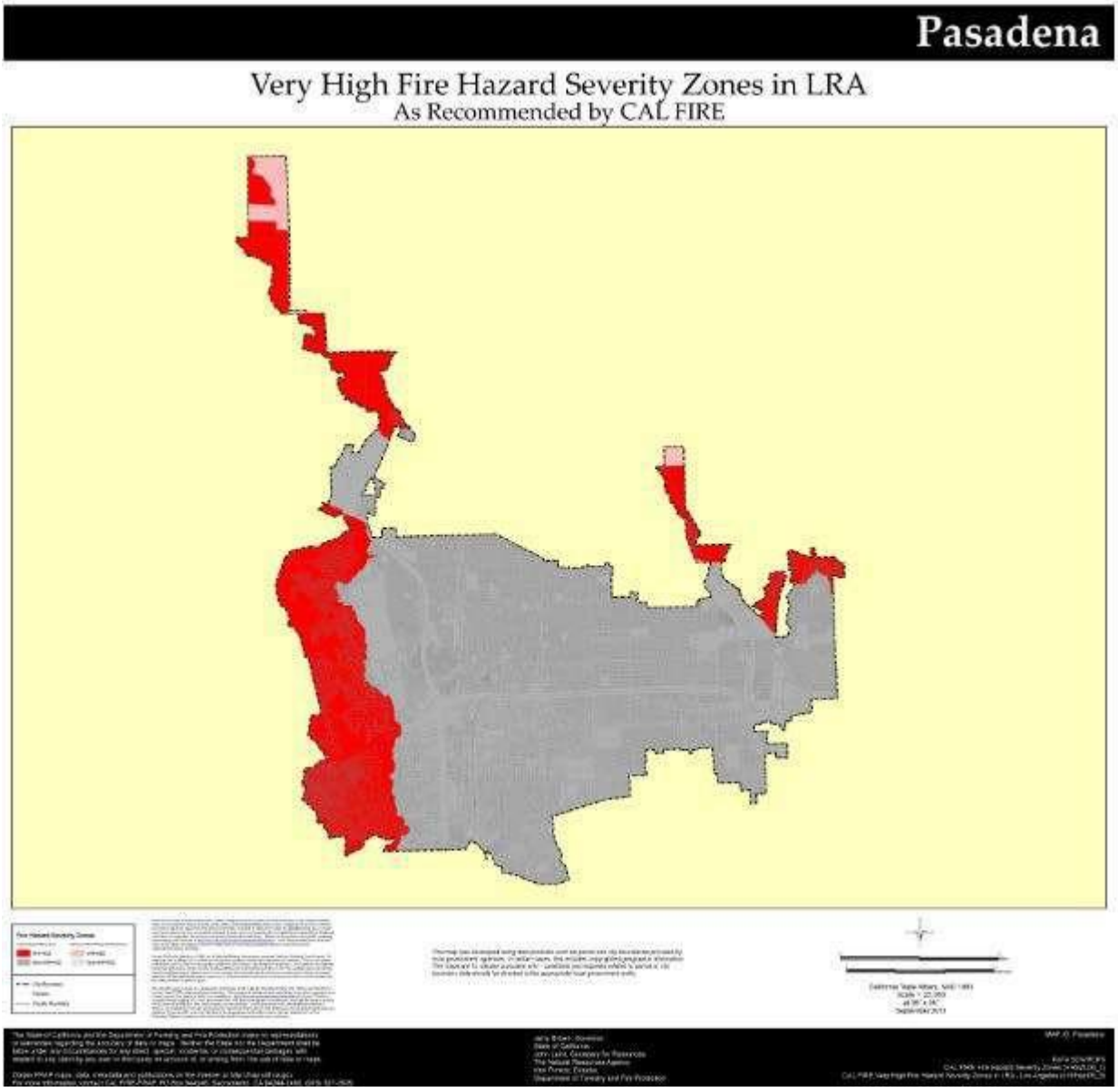
Figure 5.8 Fire Hazard Severity Zones- Los Angeles County



The City of Pasadena is located along the foothills of the San Gabriel Mountains. These mountains are known for steep topography and extensive vegetation. The extended droughts characteristic of California's Mediterranean climate often results in large areas of dry vegetation. Furthermore, the native vegetation typically has a high oil content that makes it highly flammable.

The area is also intermittently impacted by Santa Ana winds, the hot, dry winds that blow across southern California in the spring and late fall. Because of these characteristics, wildfire is a significant threat to the city. As part of CDF's efforts under the FRAP, it produced a series of local "very high" Fire Hazard Severity Zone maps. **Figure 5.9** below depicts the mapping within the city of Pasadena city limits.

Figure 5.9 Fire Hazard Severity Zones- City of Pasadena



In addition to the VHFHSZ maps, Cal Fire has also developed a State Fire Threat map showing the ratings of wildland fire threat based on the combination of potential fire behavior (fuel rank) and expected fire frequency (how often an area burns) under severe conditions. These factors combine to create four (4) threat classes ranging from moderate to extreme. Fire frequency is derived from 50 years of fire history data, and fire behavior is derived from fuels and terrain data.

5.4.1.2.3 History of Hazard in Pasadena

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. During this period, large crown fires covering tens of thousands of acres were not uncommon. One of the largest fires in Los Angeles County occurred in 1878 (60,000 acres), and the largest fire in Orange County's history was over half a million acres (1889).

According to the 2013 State of California Multi-Hazard Mitigation Plan, there have been 44 state- and/or federally declared wildfire disasters in Los Angeles County between 1950 and December 2012. Of the 20 most disastrous wildfires in the state (based on the number of structures destroyed), three have occurred in Los Angeles County, including the Bel Air Fire in November 1961, Topanga Fire in November 1993, and Sayre Fire in November 2008.

In recent Los Angeles County history, the worst fire was the Station Fire, which burned from August to October of 2009. This was an arson fire that burned 160,500 acres, destroyed over 200 structures, and killed two firefighters. The fire started in the La Canada Flintridge area, burned northwest, and then turned east. It was the 10th largest fire in California history.

Over the last five (5) years, Pasadena has not experienced a major wildfire. In 2016 and 2018, there were three vegetation fires along the freeways and urban interface that escalated into a brush fire response. The size and scope of the fires involved less than one half acre of brush, and the fires were extinguished with no loss of structures, and no injuries to civilian or firefighter personnel. A complete list of the significant previous and recent wildfires in the Pasadena area is provided in **Table 5.8** and a map depicting the location of past wildfire events in California is provided in **Figure 5.10**.

Table 5.8 Significant Wildfires in the Pasadena Area

Date	Name	Acres	Structures Lost/ Deaths
1878	Unnamed	60,000	
1961	Bel Air Fire	6,090	484/0
1970	Clampitt Fire	100,000	80/4
1993	Topanga Fire	18,000	323/0
1993	Kinneloa Fire	5,500	121/0
2008	Sayre Fire	11,262	604/0
2009	Station Fire	160,500	200/2

Figure 5.10 Recent, Significant Wildfire Perimeters in California

5.4.1.2.4 Probability of Occurrence

The majority of work done to estimate the probability of wildfire occurrence has been around identifying the potential areas for wildfire to occur. As previously mentioned, vegetation and topography were the significant elements in wildfire threat. The area north and west of the city of Pasadena is marked by steep terrain. These mountains and canyons are covered in susceptible vegetation. A large amount of the native vegetation in the Pasadena area is commonly called chaparral, it is a dense and scrubby bush that has evolved to persist in a fire-prone habitat. Chaparral plants will eventually age and die; however, they will not be replaced by new growth until a fire rejuvenates the area. Chamise, manzanita and ceanothus are all examples of chaparral which are quite common in the Pasadena area.

This knowledge and understanding are a key driver in the methodology of the CDF-FRAP program. According the CDF, the FRAP "very high" Fire Hazard Severity Zone maps are based on data and models of, potential fuels over a 30- to 50-year time horizon and their associated expected fire behavior

and expected burn probabilities to quantify the likelihood and nature of vegetation fore exposure to buildings. This indicates a very high likelihood of wildfire occurrence in the area. As such, Pasadena is susceptible to annual wildfire risk.

5.4.1.2.5 Climate Change Considerations

Climate change plays a significant role in wildfire hazards. The changing conditions from wet to dry can create more fuel; the increased possibility of high winds increase risk and present a challenge, and drought conditions could hinder ability to contain fires. Large wildfires also have several indirect effects beyond those of a smaller, local fire. These may include air quality and health issues, road closures, business closures, and other forms of losses. Furthermore, large wildfires increase the threat of other disasters such as landslide and flooding.

Climate change presents Pasadena with both complex challenges and tremendous opportunities. In the fall of 2015, the City of Pasadena embarked on a process to develop a Climate Action Plan (CAP) to reduce community-wide GHG emissions and combat climate change. The Pasadena CAP is the latest initiative in the City's on-going commitment to confronting the issue of climate change.

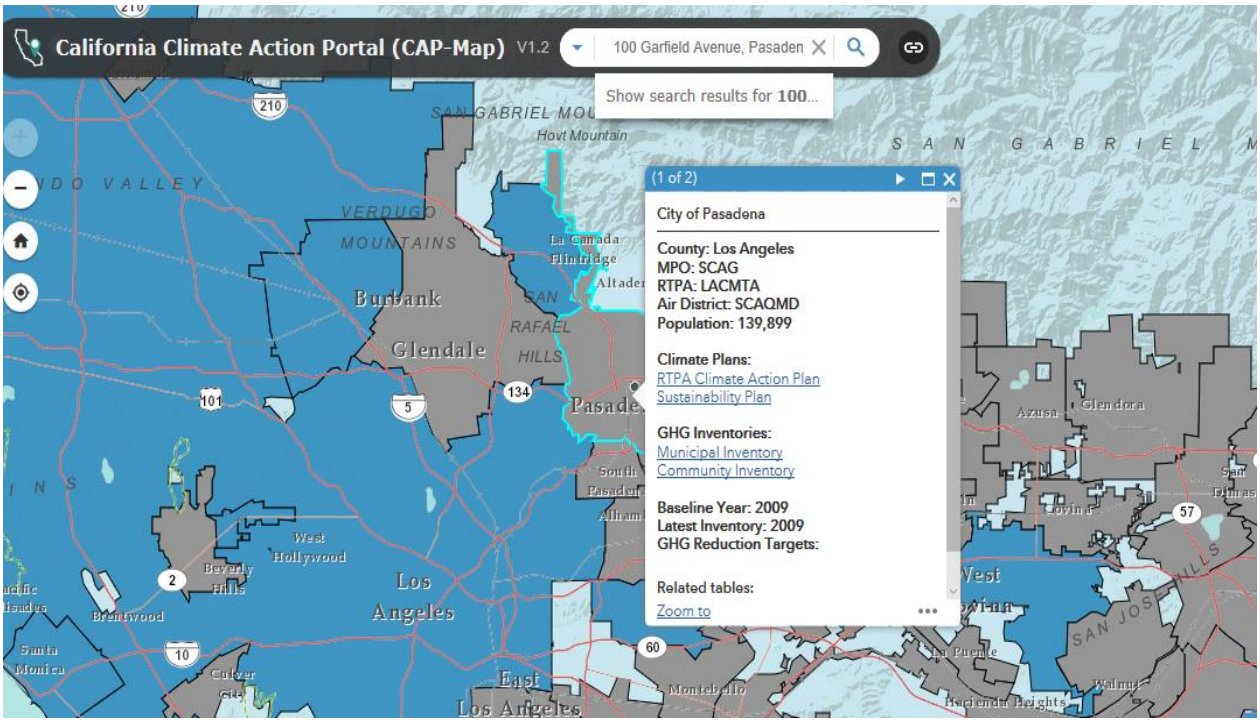


Figure 5-I - California Climate Change Program - Pasadena

The California Climate Action Plan does not currently reflect climate action planning efforts by the City of Pasadena. More information about the City's CAP can be found at https://ww5.cityofpasadena.net/planning/planning-division/community-planning/pasadena-climate-action-plan/

5.4.1.3 Drought and Water Shortage

5.4.1.3.1 Description of Hazard

Drought can best be thought of as a condition of water shortage for a particular user in a particular location. Drought is a condition when a region receives below-average precipitation, which results in prolonged shortages in its water supply, whether the region's water supply is provided by atmospheric, surface, or ground water means. Adding to this hazard is the lack (or limits) of infrastructure in support of the water resource network (storage, transmission, distribution).

There is no universal definition of when a drought begins. A drought can last for months or years; or may be declared after as few as 15 days. Drought and water shortages are a gradual phenomenon and generally are not signified by one or two dry years. In California, this is largely due its extensive system of water supply infrastructure (reservoirs, groundwater basins, and interregional conveyance facilities) that generally mitigates the effects of short- term dry periods for most water users. The map below depicts the water supply infrastructure (Figure 5.11), as tracked by the California Department of Water Resources in the state of California. According to the U.S. Drought Monitor Map for California (Figure 5-10a), the City of Pasadena is in Area 2; a severe drought area. This information is dated December 25, 2018.

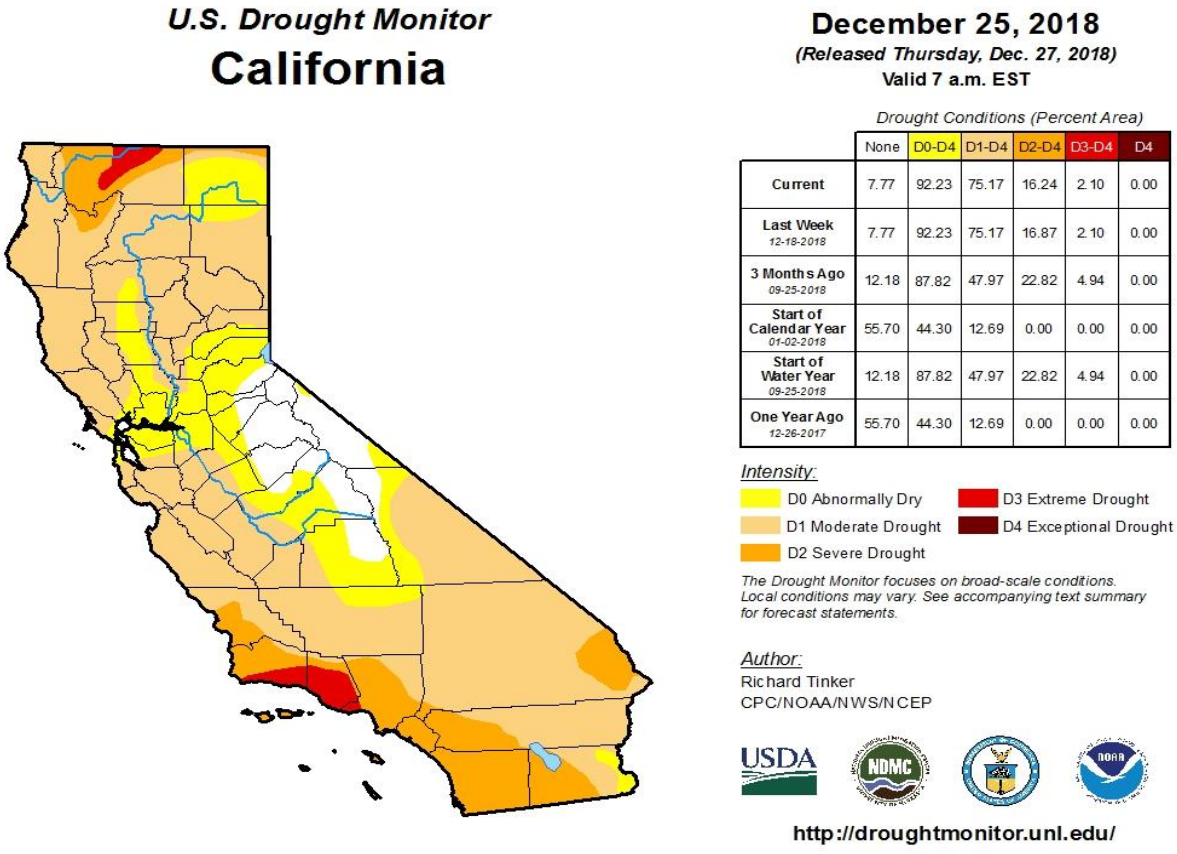


Figure 5-10a U.S. Drought Map for California

Figure 5.11 Water Supply Infrastructure in California

The U.S. Drought Monitor, established in 1999, is a weekly map of drought conditions produced jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center at the University of Nebraska-Lincoln. The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country. Droughts are generally categorized into five (5) categories: 1) Abnormally Dry, 2) Moderate Drought; 3) Severe Drought; 4) Extreme Drought; and, 5) Exceptional Drought. There are many considerations that are factored into the determining the drought status; these include consideration of status on the Palmer Drought Severity Index; CPC Soil Moisture Model; USGS Weekly Streamflow; Standardized Precipitation Index; and Objective Drought Indicator Blends.

5.4.1.3.2 Location and Extent of Hazard in Pasadena

The entire city is subject to drought conditions and water shortages. This is largely due to the limited number of local water resources and reliance on heavily fought over outside water resources. Pasadena receives the majority of its water supply by importing water from the Colorado River and Northern California (State Water Project); but also relies on water from a local aquifer, the Raymond Basin. The Raymond Basin, a 40 square mile natural aquifer underlying Pasadena and neighboring cities, provides over 40% of Pasadena's drinking water supply. The basin water originates as surface water from the San Gabriel Mountains. As the water percolates deep into the ground over many months it is purified through natural filtration processes. The city has 16 wells that tap into the basin at depths of 300-400 feet, drawing out 13 million gallons of groundwater or more per day, on average. This water is treated and then either diverted it to a reservoir for short-term storage or pumped directly into underground water mains for distribution to customers. However, the Raymond Basin cannot provide enough water to meet demand, even in wet years, as the population and development has long outpaced local supply. Efforts are underway to extend local water resources through recycling and expanding the ability to recharge the groundwater basins.

5.4.1.3.3 History of Hazard in Pasadena

The state of California and Pasadena have been in drought conditions since December 2011; with the Governor declaring a drought State of Emergency in 2015. However, in April 2017, the state, with a few exceptions declared the Drought State of Emergency over. Ending the State of Emergency declaration does not mean the drought is over; just that the drought category dropped to a category not deemed critical.

California has experienced statewide droughts in 1841, 1864, 1924, 1928-1935, 1947-1950, 1959-1960, 1976-1977, 1987-1992, 2006-2010, and 2012-2017. Of these, the 2006-2010 drought was the only other drought to receive a statewide declaration under California's Emergency Services Act. The last significant regional drought occurred in parts of Southern California in 1999-2002.

5.4.1.3.4 Probability of Occurrence

In any given year, the City of Pasadena can be subject to drought conditions and water shortages. This is especially true since much of the water is provided by outside resources, resources that a shared with others. It is also important to note the droughts do not happened over night, they are a slow buildup of conditions. On average, seventy-five percent (75%) of the state's annual precipitation occurs in the "wet season"- *November thru March*. December, January, and February generally see the most precipitation but there have been many early and late season storms that bring in a substantial amount of precipitation. One of the best ways to predict drought conditions is to study the status of the El Niño Southern Oscillation (ENSO) patterns. In California. ENSO is a periodic shifting of ocean atmosphere conditions in the tropical Pacific that ranges from El Niño (warm phase) to neutral to La Niña (cold phase). La Niña conditions tend to favor a drier outlook for Southern California; while the El Niño conditions favor stronger, and wetter storms.

5.4.1.3.5 Climate Change Considerations

Climate change has the potential to make drought events more common in the West, including California. Extreme heat creates conditions more conducive for evaporation of moisture from the

ground, thereby increasing the possibility of drought. A warming planet could lead to earlier melting of winter snow packs, leaving lower stream flows and drier conditions in the late spring and summer. Snow packs are important in terms of providing water storage and ensuring adequate supply in the summer, when water is most needed. Changing precipitation distribution and intensity have the potential to cause more of the precipitation that does fall to run-off rather than be stored. The result of these processes is an increased potential for more frequent and more severe periods of drought.

5.4.1.4 Windstorm

5.4.1.4.1 Description of Hazard

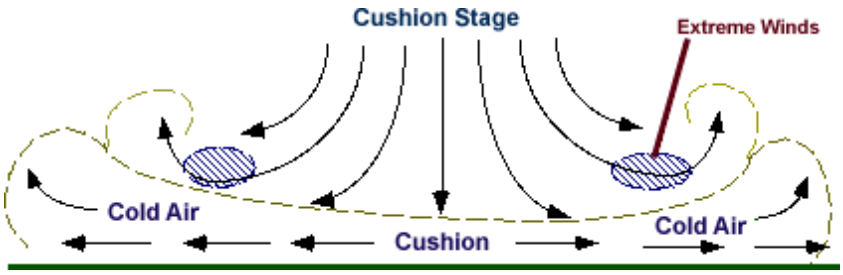
Winds are often referred to according to their strength, and the direction from which they are blowing. Wind is caused by the difference in pressure from one point on the earth's surface to another. Wind is created by air moving from the area of "*higher*" pressure to the area of "*lower*" pressure; the difference in pressure over a certain distance, determines the strength of the wind. Air does not move directly from the point of highest pressure to the point of lowest pressure. The earth's rotation affects the air flow by deflecting it to the right. This effect is called the Coriolis Effect. In the Northern Hemisphere, this causes air to flow clockwise around high-pressure areas and counter-clockwise around low-pressure areas. Winds are categorized by types and each type is associated with wind speeds: breeze (<0-31 mph), gale (32-65 mph), storm (66-72 mph), and hurricane (73-139> mph). Within each category are sub classifications with differential names depending on geographic location (i.e., tropical depression, tropical storm/cyclone) and/or categories (i.e., category 3 hurricane). Damage from winds account for half of all severe reports in the lower 48 states and is more common than damage from tornadoes.

For the purposes of the LHMP, windstorms are defined as events with significant winds, with little-to-no precipitation. These storms have wind speeds capable of reaching up to 100 mph, capable of producing a path of damage extending for hundreds of miles. Terms and characteristics of damaging windstorm events include:

> *Straight-line winds*- Straight-line winds are common with the gust front of a thunderstorm or originate with a downburst from a thunderstorm. The winds can gust to 130 mph and winds of 58 mph or more and can last for more than twenty minutes. Straight-line wind events are most common during the spring when instability is highest and weather fronts routinely cross the country.
>
> *Derecho*- Derechos, Spanish for "straight", are a widespread, long-lived, straight-line windstorm event that is associated with a land-based, fast-moving group of severe thunderstorms. Derechos can cause hurricane-force winds, tornadoes, heavy rains, and flash floods. A warm-weather phenomenon, derechos occur mostly in summer, especially during June, July, and August.
>
> *Updrafts/Downdraft*- Localized regions of warm or cool air will exhibit vertical movement (updrafts/downdrafts). Updrafts are small- scale current of rising air, often within a cloud. A mass of warm air will typically be less dense than the surrounding region, and so will rise until it reaches air that is either warmer or less dense than itself. The converse will occur for a mass of cool air and is known as subsidence. This movement of large volumes

of air, especially when regions of hot, wet air rise, can create large clouds, and is the central source of thunderstorms. Drafts can also be conceived by low or high-pressure regions. A low-pressure region will attract air from the surrounding area, which will move towards the center and then rise, creating an updraft. A high-pressure region will then attract air from the surrounding area, which will move towards the center and sink, spawning a downdraft.

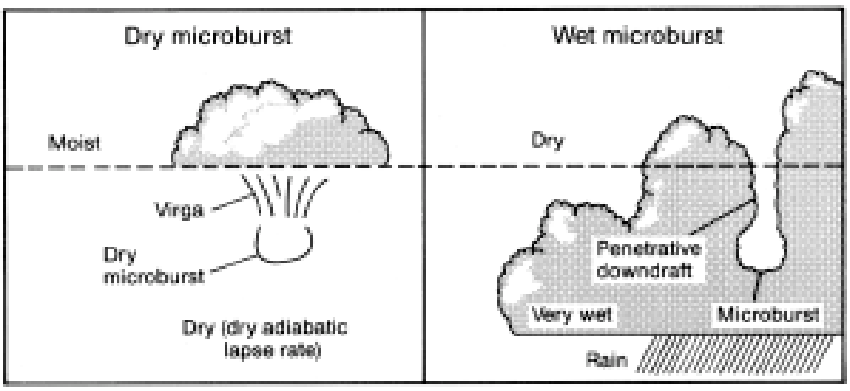
Downburst-Strong, downdraft winds flowing out of a thunderstorm cell. A downburst is a straight- direction surface wind in excess of 39 miles per hour caused by a small-scale, strong downdraft from the base of convective thundershowers and thunderstorms. Downbursts of all sizes descend from the upper regions of severe thunderstorms when the air accelerates downward through either exceptionally strong evaporative cooling or by very heavy rain, which drags dry air down with it. When the rapidly descending air strikes the ground, it spreads outward in all directions, like a fast-running faucet stream hitting the bottom of the sink.



There are two (2) sub-categories of downbursts: the larger macrobursts and small microbursts.

Macroburst- Macrobursts are downbursts with winds up to 117 miles per hour which spread across a path greater than 2.5 miles wide at the surface and which last from 5 to 30 minutes.

Microburst- Microbursts are strong, damaging winds which strike the ground and often give the impression a tornado has struck. They frequently occur during intense thunderstorms. The origin of a microburst is downward moving air from a thunderstorm's core. But unlike a tornado, they affect only a rather small area, less than 2.5 miles in diameter from the initial point of downdraft impact. An intense microburst can result in damaging winds near 170 miles per hour and often lasts for less than five minutes. There are two (2) types of microburst windstorms: dry and wet.



Gust Front- A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.

Tornado- A tornado is a rapidly rotating column of air that is in contact with both the surface of the Earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. Tornadoes come in many shapes and sizes, and are often visible in the form of a condensation funnel originating from the base of a cumulonimbus cloud, with a cloud of rotating debris and dust beneath it. Most tornadoes have wind speeds less than 110 miles per hour, are about 250 feet across, and travel a few miles before dissipating. The Fujita scale rates tornadoes by damage. An F0 tornado, the weakest category, damages trees, but not substantial structures. An F5 tornado, the strongest category, rips buildings off their foundations and can deform large skyscrapers.

Haboob- Haboobs, Arabic for *blasting/drifting*, is a type of intense dust storm carried on an atmospheric gravity current (i.e., thunderstorm), also known as a weather front. When a thunderstorm collapses, and begins to release precipitation, wind directions reverse, gusting outward from the storm and generally gusting the strongest in the direction of the storm's travel. Haboobs occur regularly in arid regions throughout the world.

In Southern California, Santa Ana winds are considered a windstorm event. Santa Ana winds are katabatic winds- Greek for *"flowing downhill"*. These winds occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles basin. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which it derives its name). Santa Ana winds are strong, extremely dry (low humidity) down-slope winds that originate from cool, dry high-pressure air masses in the Great Basin region (the high plateau east of the Sierra Mountains and west of the Rocky Mountains, including most of Nevada and Utah) and affect Southern California. These winds come up, over, and are pulled southward down the eastern side of the Sierra Nevadas and into the Southern California region. The air warms as it descends toward the California coast at the rate of 5 degrees Fahrenheit per 1000 feet due to compressional heating. Thus, compressional heating provides the primary source of warming. The air is dry since it originated in the desert, and it dries out even more as it is heated.

Forecasters at the National Weather Service offices in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "*Santa Ana*" for winds greater than 25 knots. These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots. Santa Ana winds can happen anytime during the year but are most prevalent in the autumn and winter months.

5.4.1.4.2 Location and Extent of Hazard in Pasadena

The entire City of Pasadena is susceptible to various types of windstorms.

5.4.1.4.3 History of Hazard in Pasadena

Los Angeles County has a history with windstorm events. These types of events include tornadoes, funnel clouds, waterspouts, and strong winds. Below is a list of the significant wind events as reported by Los Angeles County Department of Public Works:

- November 25, 1918: A strong windstorm produced a wind gust of 96 miles per hour in Mt. Wilson area.
- September 24-25, 1939: A tropical storm lost hurricane status shortly before moving on shore at San Pedro generating sustained winds at 50 miles per hour. 48 people died due to sinking boats.
- March 16, 1952: Tornado in Santa Monica. Three people died in storm.
- November 19-29, 1956: A strong and prolonged Santa Ana wind event started on November 19 and ended on November 29. On November 20, 100 mile per hour wind gust was recorded at a forest lookout in Saugus. A fire north of Descanso started on November 19 and burned 44,000 acres. Two wooden bridges and a power plant were destroyed.
- November 5-6, 1961: Strong Santa Ana winds fanned fires in Bel Air and Brentwood. There was also a fire in Topanga Canyon where 103 firefighters were injured. The fire brought $100 million economic losses including 484 buildings, mostly residential, and 6,090 acres destroyed.
- November 7, 1966: Tornado hits the City of Hawthorne.
- February 4-10, 1976: Strong storm winds hit 64 miles per hour in Palmdale.
- February 10, 1978: Tornado hits El Segundo as trees were hurled onto parked cars. Power poles knocked down.
- October 9, 1982: Santa Ana wind gust at 64 miles per hour as a major wildfire roared across the Santa Monica Mountains. November 23, 1986: Strong Santa Ana winds hits Los Angeles area and mountain foothills. Wind gust up to 54 miles per hour were recorded, but the estimated gusts reached as high as 70 miles per hour in some areas. An unfinished house in Glendale was blown to bits. Numerous beach rescues were needed for sailors and windsurfers. Two sailboat masts were snapped in a boat race off Channel Islands.
- November 9, 1982: Seven tornadoes touched down in the Los Angeles basin. Three began as waterspouts at Pt. Mugu, Malibu and Long Beach. The Long Beach waterspout moved 10 miles inland and became an F2 Tornado. Another tornado reached F2 strength in Van Nuys. Property damage was sustained especially in Long Beach.
- March 1, 1983: Two tornadoes categorized as F2 and F0 touched down in the Los

Angeles basin. In all 30 people were injured and 100 homes were damaged. At 8 p.m., an F2 tornado damaged seven businesses and 50 homes in South Central Los Angeles. The tornado caused 30 injuries and stopped just about one mile before reaching the Los Angeles civic center area. F0 tornado injured a motorist when his Cadillac vehicle was lifted 15 feet off the ground and carried across a highway in San Marino.

- August 20, 1987: The remnants of Tropical Storm Ignacio tracked northward moved inland in central California with gale force winds over portions of the Southern California coastal waters. This occurred during the strong El Nino of 1997-1998.
- December 12-13, 1987: Strong Santa Ana winds with gusts registering at 60-80 miles per hour caused a parked helicopter to be blown down a hillside in Altadena. Power poles and freeway signs were downed and damaged.
- December 15, 1987: Strong storm wind gust measuring up to 60 miles per hour were clocked in the San Gabriel Mountains.
- February 16-19, 1988: Strong Santa Ana winds with gusts up to 70 miles per hour in the San Gabriel Mountains and foothill areas on February 17. Numerous trees and power lines were downed as there were power outages in the foothill communities of the San Gabriel Mountain areas. The power outages impacted 200,000 customers in Los Angeles and Orange counties. Roof damage was widespread in communities around Glendale and Pasadena. Airplanes were flipped at Burbank Airport.

While Pasadena has experience various windstorm events, the most prevalent wind events are the Santa Ana winds. The City of Pasadena has had several strong Santa Ana wind events which resulted in local damages and power outages. Two of the most notable were the windstorms in 2006, 2010, and 2011. January 2006, a windstorm struck the City with winds up to 70 mph. Over 30 trees were toppled, and power was disrupted to many residents. April 2010, a windstorm struck the Pasadena area. Trees and power lines were knocked down. December 2011, the San Gabriel Valley was struck by a freak windstorm which caused over $40 million in damage. The City of Pasadena had nearly $25 million in damage. Portions of the City were without power for days, and debris clean up lasted for over a month. Over 6,300 customers lost electricity and 1450 customers lost water. Over 1,000 trees were damaged or fallen, impacting over 325 miles of roads and causing the evacuation of 37 residents. City Public Works staff received over 1,300 reports of damage and the Fire Department logged over 94 calls.

5.4.1.4.4 Probability of Occurrence

The City of Pasadena is at risk of windstorms at any given time during the calendar year. However, as previously mentioned they are more prevalent in the autumn and winter months.

5.4.1.4.5 Climate Change Considerations

Climate change, although still being studied, could have an effect on high- and low-pressure zones. High- and low-pressure zones are created by many factors, but many are related to uneven heating of the earth's surface by the sun. Many of the factors that go into the heating of the earth's surface, but many may be impacted by Climate change (i.e., type of vegetation in areas impact ability to absorb heat, amount of snow cover which reflects heat). In addition to altering and possibly increasing frequency of winds, it can also increase the likelihood of thunderstorms in the area. This indicates that the City of Pasadena could experience a greater number of windstorm events in the future.

5.4.1.5 Energy Shortage/Outage

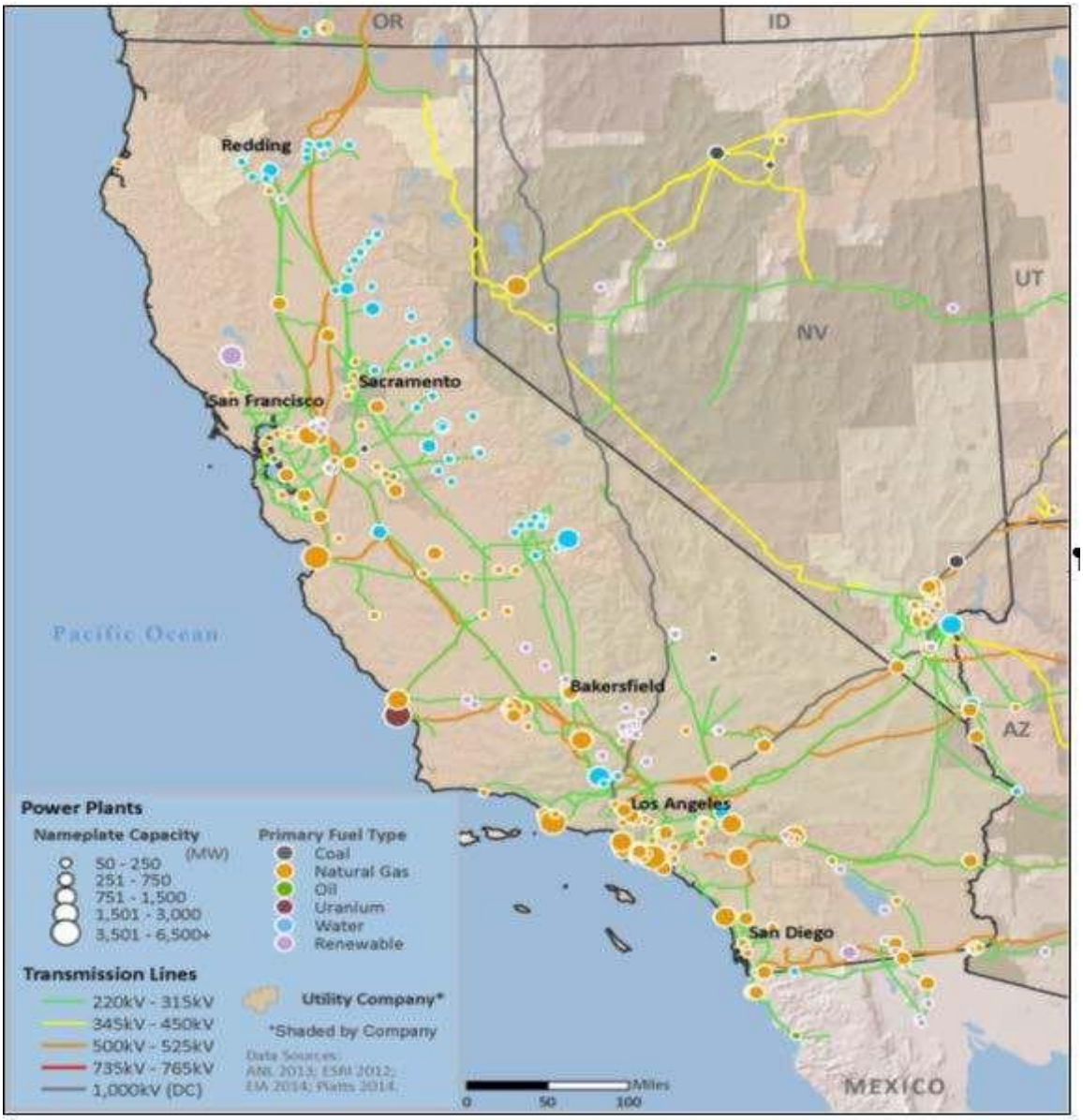
5.4.1.5.1 Description of Hazard

Energy shortages/outages are considered a form of lifeline system failure. These disruptions (shortages and outages) can be the consequence of another hazard (earthquakes, floods, and landslides), or can be a primary hazard, absent of an outside trigger. A failure could involve one, or a combination of other lifelines systems (potable water, power, natural gas, wastewater, communication, or transportation). Additionally, energy shortages/outages can create cascading impacts on the other lifeline and operational systems. Most power shortages/outages are the result of situations involving unintended events, such as an overwhelming need for power due to weather conditions, equipment failure, or accidents. These shortages/outages can last anywhere from a few minutes to several weeks. There are three (3) different power shortage/outage phenomena, all categorized to the duration and effect of the shortage/outage: 1) permanent; 2) brownout; and, 3) blackout. Below is summary of the power outage categories:

- Permanent is a massive loss of power typically caused by a fault on a power line. Power is automatically restored once the fault is cleared.
- Brownout is a drop (or sag) in voltage in an electrical power supply. Brownouts can cause poor performance of equipment or operational systems.
- Blackout a total loss of power in an area and is the most severe form of power outage that can occur. Blackouts may last from a few minutes to a few weeks depending on the nature and the configuration of the electrical network.

The significant electrical energy infrastructure, as tracked by the US Department of Energy for the state California is depicted in **Figure 5.12**.

Figure 5.12 Significant Electrical Infrastructure in California



5.4.1.5.2 Location and Extent of Hazard in Pasadena

The entire city is subject to energy shortages. The City of Pasadena Water and Power (PWP) manages the energy resources within the city. While city purchases most of its needed power through outside sources, it owns and operates a generating facility that meets about 10% of the city's energy needs. This leaves the city vulnerability to outside influences and competing demands.

Today, there are several mechanisms in place to monitor, manage and adapt to changing conditions and demands to help reduce and/or eliminate energy shortages. California and regional departments (California Independent System Operator- *Cal ISO*, Federal Energy Regulatory Commission- *FERC*, Western Electricity Coordinating Council- *WECC*, North American Electric Reliability Corporation- *NERC*, California Public Utilities Commission- *CPUC*, California Energy Commission- *CEC*) are in

place and play a significant role in planning, coordinating, and managing the allocation of energy within the state.

5.4.1.5.3 History of Hazard in Pasadena

Energy disruptions on a small scale have occurred on a regular basis in the city. Energy shortages are usually on a larger scale and more regional in nature. Because the City of Pasadena relies heavily on outside resources, impacts the region ripple to the city as well. Significant state and regional energy shortages include:

- December 1982 (near Tracy California) - Loss of a transmission tower, two (2) 500-kV lines, and a pair of 230-kV lines. Five (5) million people impacted
- October 1989 (Loma Prieta Earthquake)- Loss of substations; 1.4 million people impacted
- August 1996 (region)- Cascading impacts from loss of power from 1996 North American Blackouts
- December 1998 (San Francisco)- Loss of substations; impacting 350,000 buildings and 940,000 people
- 2000 (statewide)- Power outages due to electricity crisis
- 2011 (Southwest Blackout)- Cascading impacts from the loss of power from the 23 distinct events that occurred on 5 separate power grids; impacted 1.4 million people
- July 2017 (Los Angeles)- Explosion at power plant; causes widespread outages in San Fernando Valley

5.4.1.5.4 Probability of Occurrence

In any given year, Pasadena can be subject to energy shortages. However, as previously mentioned, programs, processes, and procedures have been put into place to help reduce and/or eliminate probability.

5.4.1.5.5 Climate Change Considerations

With increased changes in weather and climate, the demands on energy will shift too. This shift in demand could have significant impacts on energy supply and demand.

5.4.1.6 Agricultural Pests and Disease

5.4.1.6.1 Description of Hazard

Agricultural pests and disease infestation occur when an undesirable organism inhabits an area in a manner that causes serious harm to agriculture crops/plants, livestock or poultry, and wildland vegetation or animals. Countless insects and diseases live on, in, and around plants and animals in all environments. Most are harmless, while some can cause significant damage and loss. Under some conditions, insects and diseases that have been relatively harmless can become hazardous. For example, severe drought conditions can weaken trees and make them more susceptible to destruction from insect attacks than they would be under normal conditions.

5.4.1.6.2 History of Hazard in Pasadena

The City of Pasadena has very little agriculture crops or commercial livestock or poultry. However, the city has a demonstrated vulnerability to insect infestation. Infestations of Mediterranean Fruit Fly,

Oriental Fruit Fly, Gypsy Moth, Glassy-winged Sharpshooter, Asian Citrus Psyllid, and Light-Brown Apple Moth have all occurred in the last 30 years; however, there are not detailed records to list each event. Diseases such as Chrysanthemum White Rust and Pierce's Disease of Grapes have caused significant losses to local plants and impacts on wildland vegetation or animals.

5.4.1.6.3 Location and Extent of Hazard in Pasadena

Impacts to local plants happen throughout the entire city. Impacts on wildland vegetation or animals generally happened in interface areas along edges of the community (i.e., San Gabriel Mountain foothills, Arroyo Seco, Eaton Canyon).

5.4.1.6.4 Probability of Occurrence

Due to its interaction with the global economy, its mild Mediterranean climate, and its diversified agricultural and native landscape, the City of Pasadena can experience impacts from agricultural pests and diseases annually.

5.4.1.6.5 Climate Change Consideration

Continued climate change is likely to alter the abundance and types of many pests, lengthen pests' breeding season, and increase pathogen growth rates. For example, the pink bollworm, a common pest of cotton crops, is currently a problem only in southern desert valleys because it cannot survive winter frosts elsewhere in the state. However, if winter temperatures rise 3 to 4.5°F, the pink bollworm's range would likely expand northward, which could lead to substantial economic and ecological consequences for the state.

Temperature is not the only climatic influence on pests. For example, some insects are unable to cope in extreme drought, while others cannot survive in extremely wet conditions. Furthermore, while warming speeds up the lifecycles of many insects, suggesting that pest problems could increase, some insects may grow more slowly as elevated carbon dioxide levels decrease the protein content of the leaves on which they feed (California Climate Change Center 2006).

5.4.1.7 Infectious Disease

5.4.1.7.1 Description of Hazard

Infectious disease is caused by biological agents, including organisms such as bacteria, viruses or toxins, with the potential for significant illness or death in the population. Outbreaks, Epidemics, and Pandemics are terms used to describe the spread of an infectious disease. Outbreaks, epidemics, or pandemics can occur when a new virus emerges to which the population has little immunity. The 20th century saw three such pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 20 million deaths throughout the world. Secondary impacts include significant economic disruption to a community's infrastructure due to loss of employee work time, essential services and products, and costs of treating or preventing spread of the disease.

An outbreak of an infectious disease is when there are more cases than would be normally expected, often suddenly, in a community or facility. An epidemic is when there are more cases than would be normally expected of an infectious disease, often suddenly, in a population of a large geographic area.

A pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people. Infectious disease emergencies may be caused or spread by:

- Naturally occurring spread person to person (e.g., measles, mumps, meningococcal disease, tuberculosis)
- Food-borne (e.g., salmonella, E. coli, botulinum toxin)
- Vector-borne such as a mosquito that spread disease (e.g., West Nile virus, Dengue, Zika, Malaria)
- Intentionally caused spread of disease or toxins (e.g., bioterrorism)

Public health measures are used to control outbreaks, epidemics, or pandemics of infectious diseases, and are especially important for diseases with high morbidity or mortality and limited medical prophylaxis and/or rapid treatment. The impact of infectious disease emergencies on the local community will depend on:

- The type of biological agent and availability of treatment for victims
- The availability of prophylaxis for responders and the public
- The scale of exposure and ongoing exposure
- The mode of transmission and whether transmission can be interrupted
- Whether the event is affecting staffing for critical infrastructure within and outside of the county such as transportation, law enforcement, health care, and the medical and food supply chains

Measures to control disease include legal measure such as isolation and quarantine of persons, products and/or closure of food establishments; and control of contaminated food or water through recall of product or, for water, "Do Not Use", "Do Not Drink" or "Boil Water" orders.

5.4.1.7.2 Location and Extent of Hazard in Pasadena

An infectious disease hazard can occur throughout the entire city any time during year.

5.4.1.7.3 History of Hazard in Pasadena

The Communicable Disease Control and Prevention Program at the Pasadena Public Health Department monitors disease reporting mandated by law. For more information, view the 2017 Annual Report of Communicable Diseases in Pasadena.

5.4.1.7.4 Probability of Occurrence

There is an annual risk of experiencing an infectious disease outbreak in Pasadena. There is a continued threat from a novel influenza virus or other emerging epidemic or pandemic disease; however, the potential threat of outbreaks and epidemics have been increased due expanding global trade and accessible national and international travel. Infectious disease outbreaks and epidemics occur on an ongoing basis.

5.4.1.7.5 Climate Change Consideration

While many vector-borne diseases, such as malaria, yellow fever, dengue, and murine typhus, are rarely seen in the United States, the United States are susceptible to these vector-borne diseases. Many vector-borne diseases are climate sensitive and ecological shifts associated with climate change are expected to impact the distribution and incidences of these diseases. Changes in temperature and

precipitation directly affect vector born disease transmission through pathogen-host interaction, and indirectly through ecosystem changes and species composition. As temperatures increases vectors can spread into new areas that were previously too cold. For example, two mosquito vectors that carry malaria are now found at the U.S.-Mexico border.

5.4.1.8 Terrorism

5.4.1.8.1 Description of Hazard

There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. The term terrorism usually refers to intentional, criminal malicious acts. Terrorism is defined in the Code of Federal Regulations (CFR) as "*...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.*" (28 CFR, Section 0.85). For the purposes of this plan, terrorism refers to the use of weapons of mass destruction, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; and, industrial sabotage and intentional hazardous materials releases. Many of these incidents can be well-planned, coordinated attacks with multiple suspects, or the result of a lone individual on a rampage.

5.4.1.8.2 Location and Extent of Hazard in Pasadena

Terrorism can occur throughout the entire city but due to terrorisms' intended purpose it would most likely happened in more populous areas where more devastation, fear, and chaos will ensue.

5.4.1.8.3 History of Hazard in Pasadena

The city has little to any experienced of terrorist events.

5.4.1.8.4 Probability of Occurrence

A terrorist event could occur throughout the city on any given day. With its annual events (i.e., Rose Bowl Parade, Rose Bowl Game), large concert venues (i.e., Arroyo Seco, Rose Bowl), acclaimed local businesses (i.e., Norton Simon Museum, Huntington Library), and overall international name recognition, Pasadena could be a prime target for terrorism. While some of these facilities are perceived as a soft target, many have taken preventative measures to become more resilient again terrorism.

5.4.1.8.5 Climate Change Consideration

While there is little evidence to link climate change increasing occurrences of terrorism, depending on the type of attack, it could intensify the incident (i.e., Improvised Explosive Device- *IED* during high wind event), and hinder the response and recovery efforts (i.e., evacuation during flooding).

5.4.1.9 Cyber-Attack

5.4.1.9.1 Description of Hazard

A cyber security threat is a circumstance or event that has or indicates the potential to exploit vulnerabilities and to adversely impact organizational operations, organizational assets (including information and information systems), individuals, other organizations, or society. Critical infrastructure, such as utilities and telecommunications, are also potential targets. Cyber security threats are most easily described as either external threats (where attacks originate outside of

established networks) or internal/insider threats (where attacks originate from users who have existing access to an internal network). Examples of cyber threats include: malware and hacking, phishing, denial of service attacks, ransomware, and state-sponsored hacking. Any one of these threats, if initiated, and successful, can produce a cyber-attack that has major implications throughout the organization.

5.4.1.9.2 Location and Extent of Hazard in Pasadena

A cyber security incident can happen anywhere within the City but will generally be targeted towards larger corporations or government organizations. In fact, according to the California Department of Justice, California Data Breach Report from February 2016, the retail sector is most affected by cyber threats, accounting for 25% of those for the four-year reporting period, while the government sector accounted for 5%.

5.4.1.9.3 History of Hazard in Pasadena

While the City of Pasadena has not experienced a severe incident related to a cyber-attack, the frequency of cyber-attacks on public and private sector organizations in general, continues to rise.

5.4.1.9.4 Probability of Occurrence

The probability of occurrence of cyber-attacks is daily and is rapidly increasing, especially with increased reliance on the internet and cloud-based computing. Local governments are increasingly being targeted by cyber criminals on the basis that they have fewer resources to defend themselves. Unlike natural hazards, where there is historical data, and some predictive modeling can occur, cyber-attacks are an emerging hazard, which are more challenging to anticipate.

5.4.1.9.5 Climate Change Consideration

While there is little evidence to link climate change to an increase in occurrences of cyber-attacks, the target could be related to persons/groups with issues with individuals or companies they perceive to have effect on the climate (i.e., greenhouse gas producers). And much like terrorism, depending on the consequence of the cyber-attack, it could hinder the response and recovery efforts.

5.4.1.10 Civil Disturbance

5.4.1.10.1 Description of Hazards

Civil Disturbance is a term generally used to describe disorderly conduct or a breakdown of orderly society by a large group of people. Civil Disturbance can range from a form protest against major socio-political problems to riots.

5.4.1.10.2 Location and Extent of Hazard in Pasadena

Civil Disturbance can occur in any part of the city; however, it will generally be located within larger, more urbanized areas.

5.4.1.10.3 History of Hazard in Pasadena

No significant historical events to report to date.

5.4.1.10.4 Probability of Occurrence

There are no studies that predict the probability of civil disturbance occurrences, but the City is susceptible to experiencing civil disturbance annually.

5.4.1.10.5 Climate Change Consideration

While there is no direct linkage between climate change and occurrences of civil disturbances, there could be indirect linkages. As climate change impacts are either felt or perceived to be felt it could ignite passions within people to demonstrate against possible causes or enablers.

5.4.2 Lower Priority Hazards

5.4.2.1 Flood

5.4.2.1.1 Description of Hazard

A flood is a temporary condition (short-duration or long-duration) of partial or complete inundation on land that is normally dry. This condition is generally caused by precipitation (i.e., rainfall). Several factors determine the severity of floods, including rainfall intensity and duration, antecedent moisture conditions, surface permeability, and geographic characteristics of the watershed such as shape and slope. Other causes of flooding can include rapid ice or snow melting in the mountains, dam or levee failure, and/or under- engineered infrastructure.

According to FEMA, there are several different types of floods and under some there are subtypes. The flooding types and subtypes include:

- Riverine Flooding
    - Overbank (River/Stream) Flooding
    - Flash Floods
    - Dam and Levee Failure
    - Alluvia Fans
    - Ice Jam Flooding
    - Moveable Bed Streams
- Urban Drainage
- Ground Failures
    - Mudflood and Mudflows
    - Subsidence
    - Liquefaction
- Fluctuating lake levels
- Coastal flooding and erosion
    - Storm Surge

In California, some of the more common types of flooding fall under Riverine Flooding (i.e., flash flooding), Urban Flooding, and Coastal Flooding (i.e., storm surge). A flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours. Coastal flooding occurs when storms produce large ocean waves that sweep across coastlines making landfall.

This "storm surge" inundates coastal areas, destroys dunes, and causes flooding. If a storm surge occurs at the same time as high tide, the water height will be even greater. Urban Flooding is caused by communities converting permeable surfaces (i.e., soils, plants) to more impervious surfaces (i.e., concrete, asphalt), losing its ability to absorb rainfall. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas (impervious) than in fields or woodlands (permeable).

Some of these events are also associated with Ground Failures (i.e., mudflow, mudflows). Rain moves rapidly downstream, often with severe consequences for anything in its path. These typically occur in mountain canyons and foothills; however, any hilly or mountainous area with intense rainfall and the proper geologic conditions may experience one of these sudden and devastating events. This problem can be exacerbated when hillsides are bare following brush fires. As the slide continues, it can increase in speed and begin carrying items like boulders, trees, and cars. In extreme cases, flood-generated mudflows (aka debris flows) will roar down a canyon at speeds near forty miles per hour (40 mph) with a wall of mud, debris, and water tens of feet high. Furthermore, the oils in the plants native to Southern California, when burned, react with the soils, making them water-repellant. As a result, less rainwater than usual infiltrates the ground, and instead makes its way down-slope as runoff, carrying ashes and other burned debris with it.

Floods can take several hours to days to develop; the following flood characterization designates the amount of time for response:

- **Flood Watch** – a flood is possible in the area
- **Flood Warning** – flooding is already occurring or will occur soon in the area
- **Flash Flood Watch** – a flash flood is possible in the area. Seek immediate shelter or higher ground
- **Flash Flood Warning** – flooding is already occurring or will occur soon in the area. Flash floods can occur without warning, during heavy rain in mountainous regions ensure that precautions and flash flood warnings are adhered to.

To assist better understand flooding, the following terms are being offered:

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 floodwater. The floodplain is made up of two sections: the floodway and the flood fringe.

Floodway- Floodways are defined for regulatory purposes, and unlike floodplains, do not reflect a recognizable geologic feature. The National Flood Insurance Program (NIPA) defines floodways as the channel of a river or other watercourse areas 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. The floodway carries the bulk of the floodwater 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.

Flood Fringe- The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. Generally, the

flood fringe is defined as "the land area which is outside of the stream flood way but is subject to periodic inundation by regular flooding." This is the area where development is most likely to occur, and where precautions to protect life and property need to be taken.

100-Year Flood- The 100-year flooding event is the flood having a one percent (1%) 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.

5.4.2.1.2 Location and Extent of Hazard in Pasadena

The geographical location, climate, and topography of Pasadena make the city prone to flooding. In Pasadena, floods usually occur during the winter "wet" season, the time of year with the highest precipitation totals or heavy rainfalls. During significant rainfall years, the season is characterized by high intensity rainfalls and rapid runoffs or discharge. These storm events have: inundate streams; flooded areas; create debris flows (i.e., sediment, rock, dead trees) that have plug culverts and damage bridges/overpasses; and/or, eroded or scared the landscape.

While the City of Pasadena is 6 miles east of Los Angeles, it is not so far away as to not be affected by the heavy rains that brought flooding to Los Angeles. In addition, the towering mountains that give the Los Angeles region its spectacular views also bring 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 (3) sides of the valley seldom reach heights above three thousand feet (3,000 ft.). The western San Gabriel Mountains, in contrast, have elevations of more than seven thousand feet (6,000 ft.). These higher ridges often trap eastern moving winter storms. Although downtown Los Angeles averages just fifteen (15) inches of rain a year, some mountain peaks in the San Gabriel Mountains receive more than forty (40) inches of precipitation annually.

Two (2) types of flooding primarily affect the City of Pasadena: Riverine Flooding and Urban Flooding. While the entire city is subjective to Urban Flooding, the northern and western parts of the city are the most prone to riverine flooding due to its proximity to the San Gabriel Mountains. Two (2) main north-to-south flowing stream systems drain in the Pasadena area: Arroyo Seco and Eaton Wash. The Arroyo Seco runs along the western edge of the City of Pasadena, while Eaton Wash drain the eastern side of the city. A dam and reservoir system protect both of these streams, but they are still prone to flooding during significant events. Discussion of the dams (and reservoirs) are presented under the Dam Failure hazard.

As mentioned previously, Urban Flooding can happen throughout the city. Over fifty percent (50%) of the area in Pasadena has a high concentration of impermeable surfaces that either collect water or concentrate the flow of water in unnatural channels. During periods of heavy rainfall, controlled rainfall runoff from the San Gabriel Mountains merges with city runoff from impervious surface (i.e., houses, asphalt) in the city's storm water infrastructure. Times the city's storm water infrastructure can become overwhelmed, while in other instances, the infrastructure is inadequate to handle the volume. Additionally, storm drains often back up with debris causing additional localized flooding. This has led to streets becoming swift moving rivers and/or turning intersections into ponds.

5.4.2.1.3 History of Hazard in Pasadena

Pasadena has had serious floods throughout its history. Several canyons near the Pasadena area, including Eaton, Zachau, Rubio, and Shields canyons, have flooded in recent recorded history. The historic and continued threat for flooding led the County of Los Angeles and the City of Pasadena to begin developing a flood management strategy for the area in the early 1920s. While dams and other flood infrastructure has helped address flooding, it has not eliminated flooding. The history of flooding in Pasadena is closely linked to the flooding in Los Angeles County. Los Angeles County has experienced 14 significant flooding events that have received a federal disaster declaration. **Table 5.9** lists these floods, as well as information concerning the nature of the flooding and the extent of the damages.

Table 5.9 Historical Records of Floods in Los Angeles County

Date	Federal Disaster Number	Name
Jan 1969	DR-253	Severe Storms & Flooding
Feb 1978	DR-547	Coastal Storm, Mudslides & Flooding
Feb 1980	DR-615	Severe Storms, Mudslides & Flooding
Feb 1983	DR-677	Coastal Storms, Floods, Slides & Tornadoes
Feb 1988	DR-812	Severe Storms, High Tides & Flooding
Feb 1992	DR-935	Rain/Snow Storms, Flooding, Mudslides
Feb 1993	DR-979	Severe Winter Storm, Mud & Land Slides, & Flooding
Jan 1995	DR-1044	Severe Winter Storms, Flooding, Landslides, Mud Flows
Mar 1995	DR-1046	Severe Winter Storms, Flooding, Landslides, Mud Flows
Feb 1998	DR-1203	Severe Winter Storms and Flooding
Feb 2005	DR-1577	Severe Storms, Flooding, Mudslides, And Landslides
Apr 2005	DR-1585	Severe Storms, Flooding, Landslides, and Mudslides
Mar 2010	DR-1884	Severe Winter Storms, Flooding, and Debris and Mud Flows
Mar 2017	DR-4305	Severe Storms, Flooding, and Mudslides

5.4.2.1.4 Probability of Occurrence

FEMA National Flood Insurance Program (NFIP) produces Flood Insurance Rate Maps (FIRM). The FIRM identifies potential flood risk in geographic areas. The FIRMs are the official map of a community on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to the community. Historically, FIRMs were produced on paper; however, over recent years FEMA has begun the process of creating digital versions- *DFIRM*. Because of the volume of area, not all FIRMs have been digitized. Due to the limited detail and large scale of the base maps used for most FIRMs, much interpolation between contour lines is done in mapping the floodplain boundaries. This is why you may find discrepancies when actual ground elevations are surveyed: the maps are just the best available graphic representations of the BFEs.

The flood hazard zones on the FIRMs include: Zone A, Zone AE, Zone AE Floodway, Zone AH, Zone AO, and Zone Shaded X. Complete definitions of flood zone designations are provided in **Table 5-10**.

Table 5-10 FEMA Flood Zone Designations

Risk Level	Flood Zone	Description
High	A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30- year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
	AE	The base floodplain where base flood elevations are provided.
	AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
	AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
Moderate to Low	X (Shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods.
	X (Unshaded)	Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.
Undetermined	D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

As part of FEMA's practice, it processes a Letter of Map Revision (LOMR) when changes are needed to the FIRMs. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). In short, the LOMR officially revises the FIRM.

Because the FIRMs are not updated on a regular basis, approximately once every 10 years, FEMA has developed National Flood Hazard Layer (NFHL) maps. The NFHL maps are simplified digital maps that enable FEMA to produce a map that incorporates the LOMR data with the FIRM data. In essence, the NFHL maps are considered the most up-to-date data available on the probability of flooding in an area. Because FIRMs for the City of Pasadena do not have any LOMRs, there is not a NFHL for the area.

There are two (2) FEMA FIRMs for the city of Pasadena (**Figure 5.13** and **Figure 5.14**). While difficult to view, the FIRMs indicate that majority of the City of Pasadena is within Zone D (Other Areas which flood hazards are undetermined, but possible) and Zone X (Other Areas determined to be outside the 0.2% annual chance floodplain); and a small portion of the city within the Arroyo Seco in the shaded

Zone X (Other Flood Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot/draining areas less than 1 square mile).

Figure 5.13 Flood Insurance Rate Map- Panel 1400F

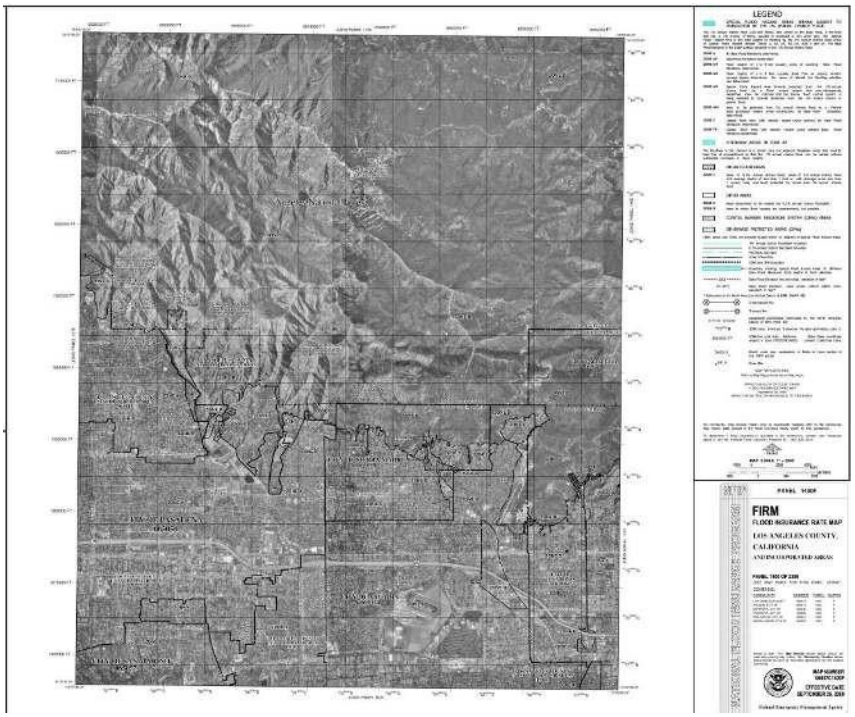
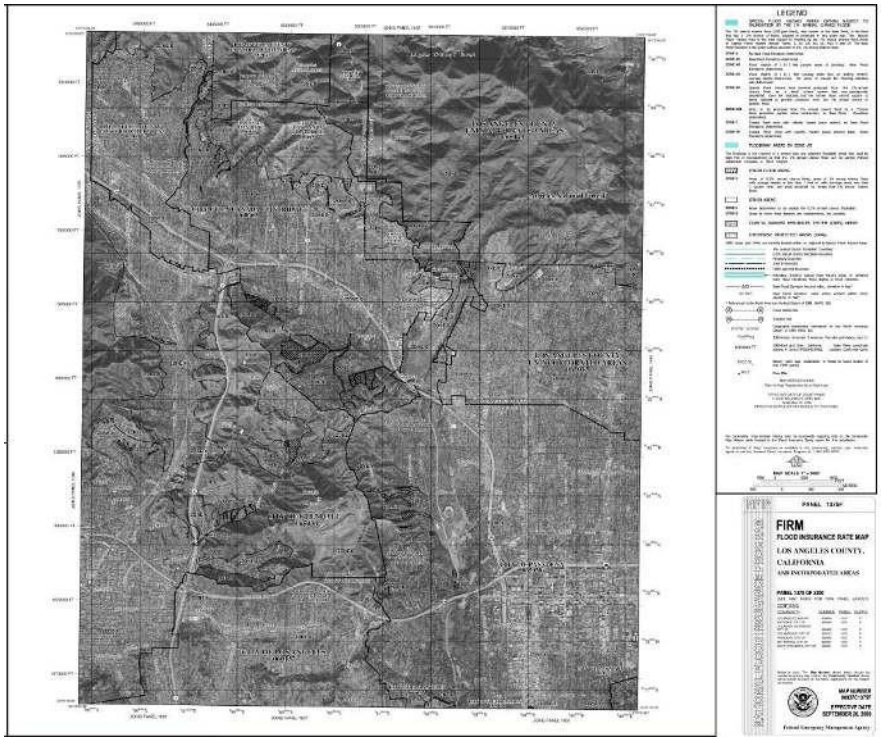


Figure 5.14 Flood Insurance Rate Map- Panel 1375F



5.4.2.1.5 Climate Change Consideration

Climate change is acts as an amplifier of existing flood hazards. Extreme weather events have become more frequent over the past 40 to 50 years and this trend is projected to continue. Rising sea levels and shifting weather patterns (temperate, winds) are expected to have a significant impact on rainfall frequency, intensity and distribution; which in turn will have a significant impact on the frequency of flood occurrences.

Climate Change can also increase the frequency and/or intensity of mudflows. Changes in precipitation, specifically the increased frequency of intense precipitation, can result in a water content the ground cannot tolerate, and may cause mudflows. These mudflows may happen more frequently due to the increased number of heavy rainfall events.

5.4.2.2 Landslide and other Earth Movements

5.4.2.2.1 Description of Hazard

A landslide is defined as the movement of a mass of rock, debris, or earth down an incline. The most common cause of a landslide is an increase in the down slope gravitational stress that exceeds the strength of the earth materials that compose the slope, also known as over-steepening. Over-steepening can be caused by natural processes or by man-made activities. Undercutting of a valley wall by stream erosion or of a sea cliff by wave erosion are ways in which over-steeping may occur naturally. Landslides can be broken down into: large, deep, slow moving slides (i.e., rockslides, earth flow), and/or small, shallow, fast-moving slides (rock falls, debris slides, debris flows).

Fast-moving (or rapidly moving) landslides present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides are at increased risk of serious injury. Debris- flows can travel down a hillside with speeds up to 200 miles per hour (though more commonly, 30-50 miles per hour), depending on the slope angle and type of earth and debris in the flow.

Slow-moving landslides can occur on relatively gentle slopes and can cause significant property damage but are less likely to result in serious human injuries. Slow-moving slides include rotational slides, where sliding material moves along a curved surface, and translational slides, where movement occurs along a flat surface. These slides are generally slow moving and can be deep. Slumps are small rotational slides that are generally shallow.

The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil; the length, width, and depth of the area affected; frequency of occurrence; and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure and their composition and characteristics.

NOTE: This hazard does not include earthquake-induced movements (i.e., landslides, liquefaction) or flood- induced movements (i.e., mudflows). Those hazards can be found under the relevant hazard section.

5.4.2.2.2 Location and Extent of Hazard in Pasadena

Landslides are a common hazard in California. Weathering and the decomposition of geologic materials produce conditions conducive to landslides, and human activity further exacerbates many

landslide problems. Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying soils as they, along with climate, create landslide hazards. Proper planning cannot eliminate the threat of landslides to the safety of people, property, and infrastructure; however, without proper planning, landslide hazards will be even more common and more destructive.

Locations at risk from landslides or debris flows include areas with one or more of the following conditions:

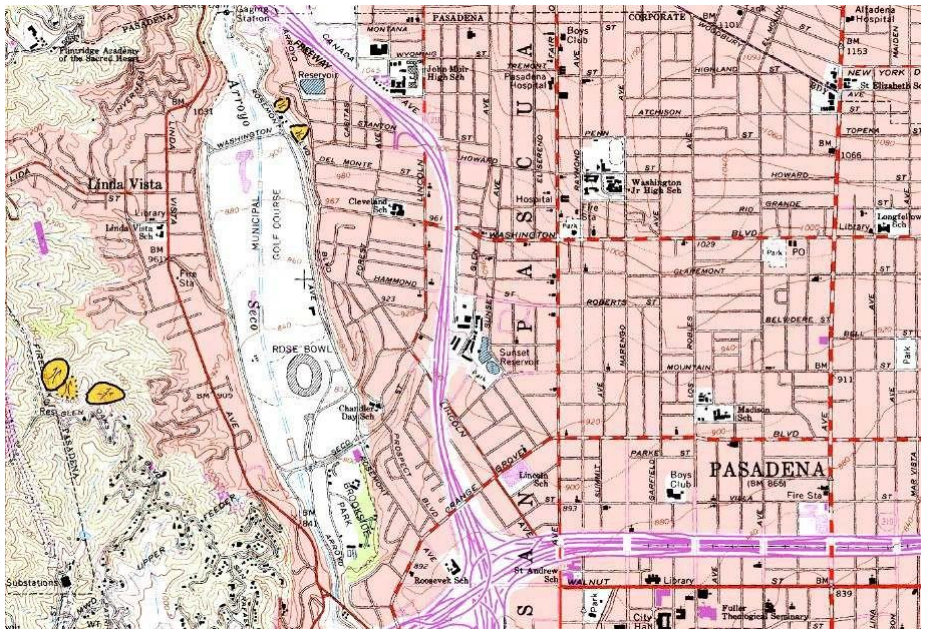
- On or close to steep hills;
- Steep road-cuts or excavations;
- Existing landslides or places of known historic landslides (such sites often have tilted power lines, trees tilted in various directions, cracks in the ground, and irregular-surfaced ground);
- Steep areas where surface runoff is channeled, such as below culverts, V -shaped valleys, canyon bottoms, and steep stream channels;
- Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons; and
- Canyon areas below hillside and mountains that have recently (within 1-6 years) been subjected to a wildland fire.

5.4.2.2.3 History of Hazard in Pasadena

The City's mountain and foothill areas are vulnerable to slope instability. Steep-sided slopes along the Arroyo Seco and other incised drainages may also be locally susceptible to slope instability. Further, most of the residential construction in the foothills of Pasadena occurred prior to the development and enforcement of stronger grading codes in the 1970s, as well as before the heightened awareness of slope stability issues that has resulted from the periodic intense rainstorms of the last 30 years. Consequently, there are older residences built in or near natural drainage courses and steep slopes that may be at risk from slope failures. Older developments along the top of the Arroyo Seco bluffs may also be locally susceptible.

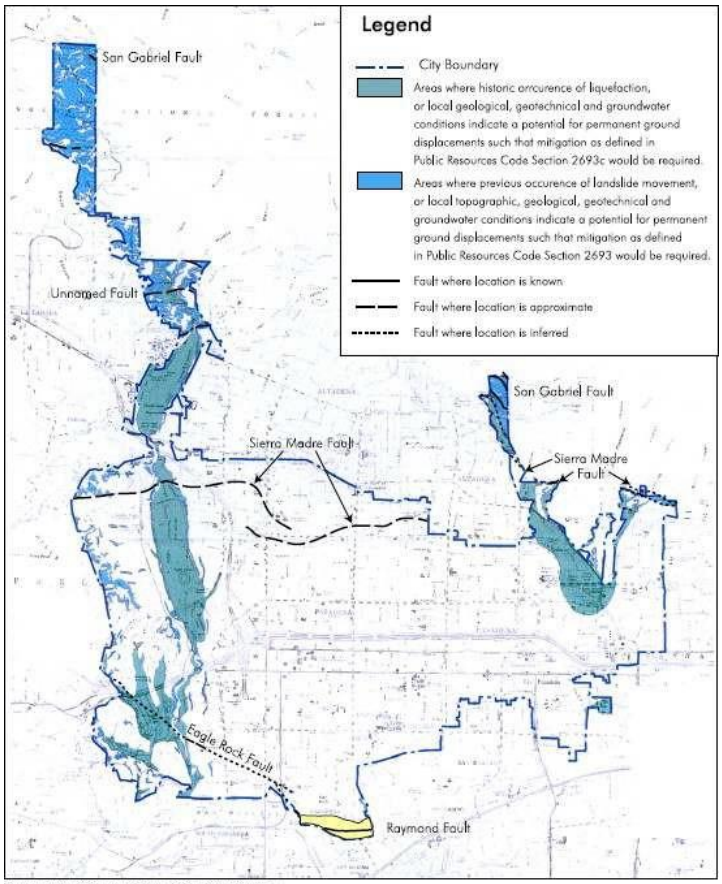
The City of Pasadena has had a number of landslides in the past. The U.S. and State of California Geological Survey organizations have identified landslide areas they have evaluated as dormant (**Figure 5.15**). These are areas with a history of landslide activity but have been inactive in the recent past. These dormant areas are in the hills directly west of the Rose Bowl and can be seen below as yellow marks in a close-up snapshot of a 2007 California Geological Survey map.

Figure 5.15 Pasadena Landslide Areas



The City's 2002 General Plan includes a figure showing areas where either previous occurrences of landslide movement, or local topographic, geological, geotechnical, or groundwater conditions indicate a potential for permanent ground displacements requiring mitigation (**Figure 5.16**). These areas are shown in blue in the following figure:

Figure 5.16 Pasadena Areas Susceptible to Landslides



Source: City of Pasadena General Plan Safety Element.
Prepared by Earth Consultants International, August 2002.

Some of the more recent events include the following:

- 1958- Pasadena Freeway landslide
- 2005- Landslide on Mount Wilson Toll Road in Eaton Canyon – destroyed 50 yards of road
- 2010- Landslide on Avenue 64

5.4.2.2.4 Probability of Occurrence

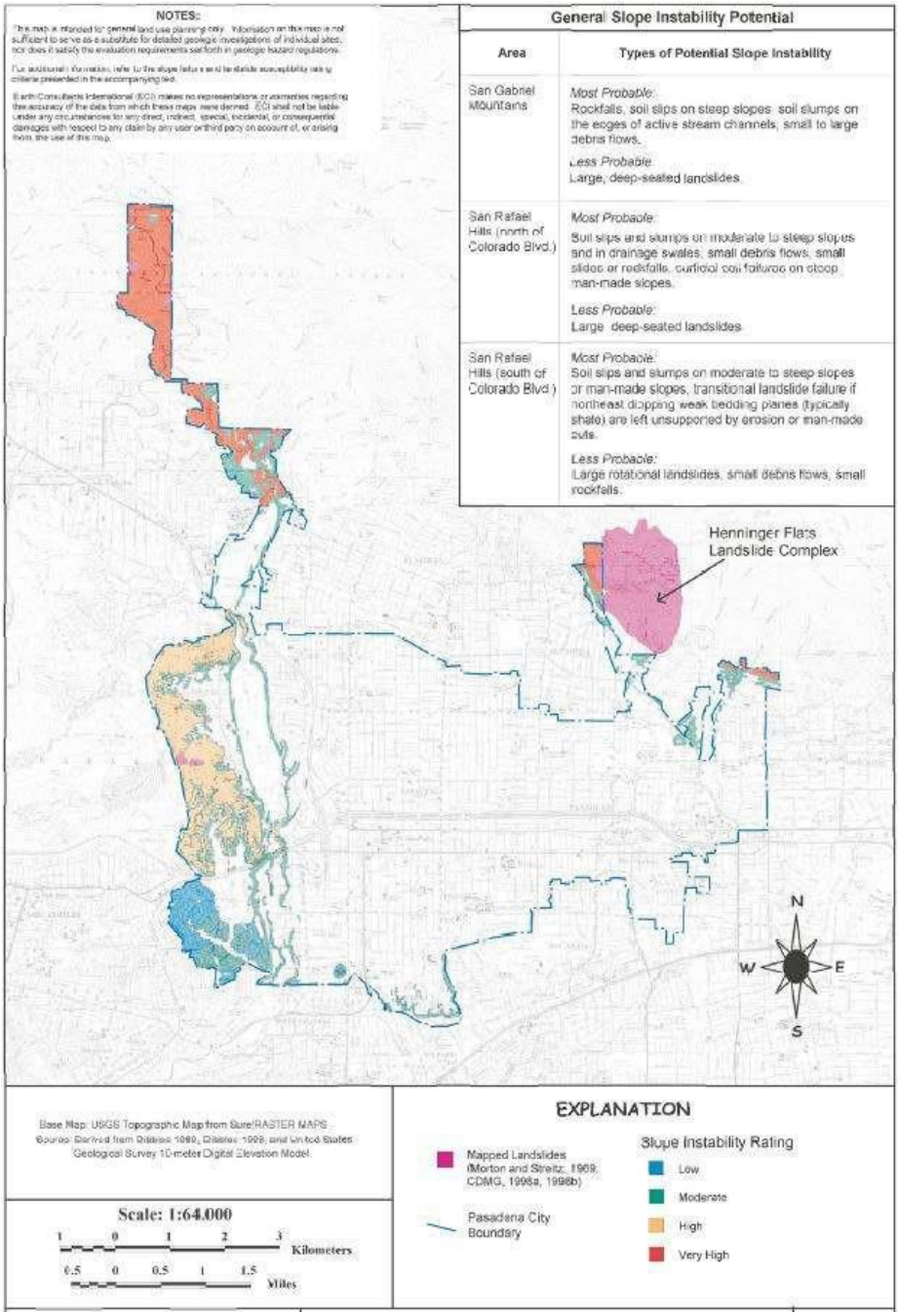
Landslides are common throughout the San Gabriel Mountains, particularly near the range front, where rock weakened by fracturing, shearing, and crushing along the numerous fault zones is present. Because of this, the city of Pasadena can experience landslides on a daily basis. This weakness in the rock fabric, combined with the moderate to extremely steep slopes that have resulted from rapid uplift of the mountains, are important elements that create the setting for the development of slope failures. Similar conditions are present in the San Rafael Hills, where rocks are highly weathered and slope gradients of 30 degrees or steeper are common.

The City's hillsides are vulnerable to slope instability due primarily to the fractured, crushed, and weathered condition of the bedrock, as well as the steep terrain. Over-steepened slopes along the large drainage channels are also locally susceptible. The probability of large bedrock landslides occurring is relatively low; therefore, the source of potential losses due to slope instability arises primarily from

the occurrence of smaller slope failures in the form of small slides, slumps, soil slips, debris flows, and rock falls.

The Technical Background Report developed for the 2002 General Plan Safety Element included a figure showing slope instability (**Figure 5.17**). This map identified provided information about potential slope instability types for three areas: San Gabriel Mountains, San Rafael Hills (north of Colorado Boulevard), and San Rafael Hills (south of Colorado Boulevard).

Figure 5.17 Slope Instability and Past Landslides in Pasadena



5.4.2.2.5 Climate Change Consideration

Based on the definition of the under this LHMP, climate change will not have little impact on Landslides and other earth movements. However, the increase in heavy precipitation may cause instability in areas where landslides are likely; therefore, resulting in more and larger widespread landslides.

5.4.2.3 Extreme Heat

5.4.2.3.1 Description of Hazard

Extreme Heat is a function of heat and relative humidity. A Heat Index describes how hot the heat-humidity combination makes the air feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the Heat Index rises, so do health risks such as heat exhaustion, sunstroke, and heatstroke. Some Heat Index Program Alert procedures are implemented when the high temperature is expected to exceed 105° to 110° (depending on local climate) for at least two consecutive days.

5.4.2.3.2 Location and Extent of Hazard in Pasadena

The entire city is subject to extreme heat conditions.

5.4.2.3.3 History of Hazard in Pasadena

The county of Los Angeles has experienced several extreme heat events. Below is a list of extreme heat events tracked by the County of Los Angeles:

- June 11, 1877: The Los Angeles temperature hit 112 degrees, at the time it was an all-time record, but official recording keeping did not begin until 20 days later.
- March 28-29, 1879: Temperatures reached 99 degrees in Los Angeles on March 29.
- July 25, 1891: The Los Angeles temperature registered at 109 degrees.
- April 23, 1900: Temperatures reached 100 degrees in Los Angeles, a record for the month of April.
- February 25, 1921: The Los Angeles temperature measured at 92 degrees, a record for the month of February.
- September 18-22, 1939: Temperatures reached 100 degrees for seven consecutive days in Los Angeles, peaking at 107 degrees on September 20. Two days later, the low temperature in Los Angeles was 84 degrees, the highest minimum on record.
- August 31-September 7, 1955: Los Angeles hits 110 degrees on September 1, an all-time record.
- October 14, 1961: Hot Santa Ana winds drove temperatures to 110 degrees in Long Beach, recorded as the hottest spot in the nation, Los Angeles registered at 100 degrees in many coastal and inland locations.
- October 20-29, 1965: Los Angeles experienced 10 consecutive days with afternoon highs reaching over 100 degrees.
- November 1, 1966: Temperatures reached 101 degrees at Los Angeles International Airport and 100 degrees in Los Angeles, record highs for the month of November. Also, Santa Ana winds fan fires that killed 16 firefighters.
- September 25-30, 1970: Drought in Southern California came to a climax. Hot Santa Ana winds sent temperatures soaring to 105 degrees in Los Angeles.

- September 12, 1971: Temperatures reached 103 degrees in Los Angeles.
- October 3-4, 1987: For two straight days Los Angeles temperatures registered 108 degrees.
- February 10-11, 1988: Record heat from Santa Ana wind conditions caused temperatures to reach 88 degrees in Los Angeles.
- March 25-26, 1988: Santa Ana conditions brought temperatures in the 90 degrees range. On March 25, temperatures reached 95 degrees in Los Angeles. Several brush fires resulted due to the hot temperature conditions.
- April 6-7, 1989: Temperatures reached 106 degrees in Los Angeles, setting record high for the month of April.
- March 5, 1990: Downtown Los Angeles temperatures registered at 101 degrees, eight degrees higher than the previous record for the date.
- August 17, 1992: Tropical air brought high temperatures and heat index values to Los Angeles where the temperature reached 99 degrees with a heat index of 110 degrees.
- February 20, 1995: 95-degree temperatures set a record for the month of February in Los Angeles.

While Pasadena was impacted by the Los Angeles County events, exact past extreme heat events in the city; have not been well documented.

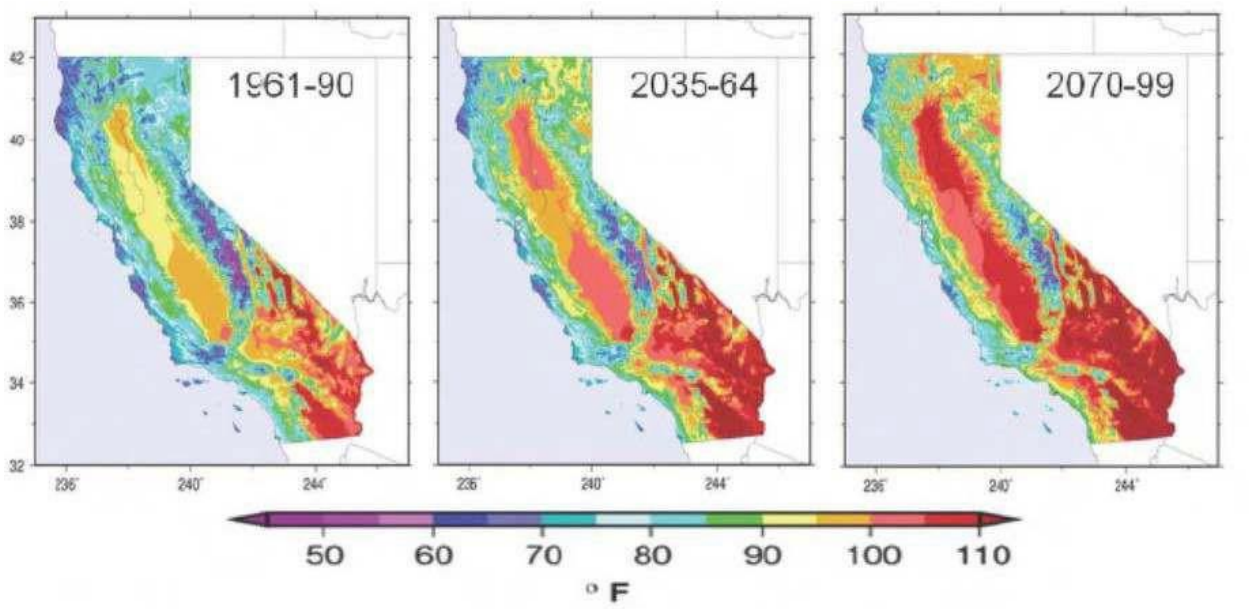
5.4.2.3.4 Probability of Occurrence

In any given year, Pasadena can be subject to extreme heat conditions.

5.4.2.3.5 Climate Change Considerations

As temperatures rise due to climate change, Californians will face greater risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. By mid-century, extreme heat events in urban centers could cause two to three times more heat-related deaths than occur today. By 2100, hotter temperatures are expected throughout the state, with an increase of 3 to 5.5°F under the lower emissions scenario and 8 to 10.5°F under the higher emissions scenario (**Figure 5.18)**.

Figure 5.18 Comparison between Historic and Projected Temperature



5.4.2.4 Hailstorm

5.4.2.4.1 Description of Hazard

Hail is a type of precipitation in the form of pellets or balls of ice more than 0.19 inches in diameter. Hail is possible within most thunderstorms as it is produced by cumulonimbus, and within 2 nautical miles of the parent storm. Hail formation requires environments of strong, upward motion of air with the parent thunderstorm (similar to tornadoes) and lowered heights of the freezing level. In the mid-latitudes, hail forms near the interiors of continents, while in the tropics, it tends to be confined to high elevations.

There are methods available to detect hail-producing thunderstorms using weather satellites and weather radar imagery. Hailstones generally fall at higher speeds as they grow in size, though complicating factors such as melting, friction with air, wind, and interaction with rain and other hailstones can slow their descent through Earth's atmosphere. Severe weather warnings are issued for hail when the stones reach a damaging size, as it can cause serious damage to human-made structures.

5.4.2.4.2 Location and Extent of Hazard in Pasadena

The entire city is subject to hailstorms.

5.4.2.4.3 History of Hazard in Pasadena

There is no current record of a hailstorm in the city.

5.4.2.4.4 Probability of Occurrence

In any given year, Pasadena can be subject to hailstorm condition.

5.4.2.4.5 Climate Change Considerations

Hailstorms have the possibility of becoming more frequent with the climate temperatures increasing, and the atmosphere becomes more convective.

5.4.2.5 Air Pollution

5.4.2.5.1 Description of Hazard

Air pollution is much more hazardous to the health of large numbers of Californians than some other significant hazards (i.e., earthquakes, floods, fires). Air pollution is a continuing problem, with the largest concentration of pollution in the highest populated air basins: the San Francisco Bay Area, San Joaquin Valley, Sacramento Valley, San Diego, and the South Coast. Pollutants include smog, soot, and toxic air contaminants (TACs). Air pollution is generally measured by particles.

As stated by the US Environmental Protection Agency (EPA), particle pollution is a mixture of microscopic solids and liquid droplets suspended in air. This pollution, known as particle matter, is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen and mold spores). The size of the particles is directly linked to their potential for causing health problems. Small particles pose the greatest risk because they can get deep into the lungs, and even the bloodstream. Larger particle are less of a concern but can cause issues with eyes, nose, and throat.

The South Coast Air Quality Management District (SCAQMD) is the air pollution control agency for all of Orange County and the urban portion of San Bernardino, Riverside, and Los Angeles (including Pasadena). SCAQMD has adopted the US EPA's Air Quality Index (AQI) which establishes six (6) health categories:

- Hazardous 301-500 parts per million
- Very Unhealthy 201 to 300 parts per million
- Unhealthy 151 to 200 parts per million
- Unhealthy for Sensitive Groups 101 to 150 parts per million
- Moderate 51 to 100 parts per million
- Good 0 to 50 parts per million

Based on air monitoring systems, community considerations (i.e., traffic, fires), and expected weather conditions (i.e., temperature, winds), SCAQMD will forecast the air health category.

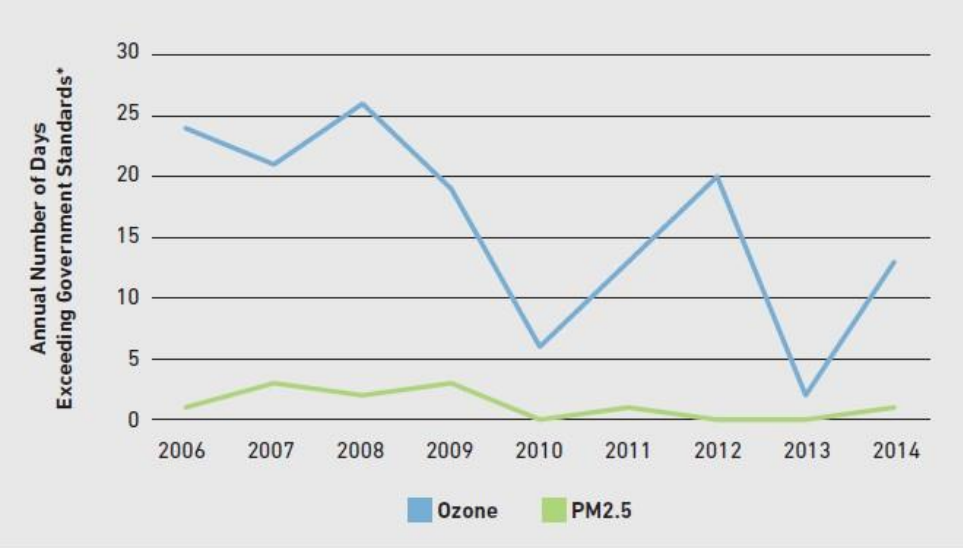
5.4.2.5.2 Location and Extent of Hazard in Pasadena

Air pollution, while on the decline since 1970, is still an issue throughout the city. Air pollution in the city intensified when there are onshore breezes or still air conditions. Under these conditions, air pollution is trapped along foothills and mountains. In addition, in the summer months, the thinner warmer air can strengthen air pollutants.

5.4.2.5.3 History of Hazard in Pasadena

In Pasadena, the number of days per year that pollution levels due to fine particles (PM2.5) exceed government standards has remained relatively steady over the past several years (under 5 days). The number of days per year that ozone levels exceed government standards varied over the past several years but had a generally decreasing trend (**Figure X**).

Figure X Days/Year Ozone Quality and Particles Pollution Exceeded Government Standards



** State ozone standards are >0.070 ppm over 8-hr. Fine Particles (PM2.5) include % samples exceeding Federal Std. of >35 µg/m³ over 24-hr.*

5.4.2.5.4 Probability of Occurrence

At any given time, the city can experience concentrations of air pollution; however, the smoggiest month in Southern California is August.

5.4.2.5.5 Climate Change Considerations

Oddly, climate change does not have an impact on air pollution as much as air pollution has an impact on climate change. In clear air, air pollution and particles interact with solar beams. Particles containing little or no carbon reflect solar radiation, making the air and Earth surface below a bit cooler than they would otherwise be. In contrast, particles containing substantial amounts of carbon warm their surroundings by absorbing solar radiation before it reaches the ground. A secondary effect from carbon-based pollutants is that it reflects the incoming sunlight; casting shade and the ground surface below making it cooler.

5.4.2.6 Oil Spills

5.4.2.6.1 Description of Hazard

An oil spill is a release of liquid petroleum hydrocarbon into the environment due to human activity or technological error that results in pollution of land, water, and air. Oil releases also occur naturally through oil seeps either on land or under water. Marine oil spills, whether accidental or intentional, can result from the release of crude oil from offshore oil platforms, drilling rigs, wells, pipelines, tank trucks, and marine tank vessels (tankers). Refined petroleum products such as gasoline, diesel, and heavier fuels such as bunker fuel used by cargo ships are also sources of potential oil spill releases. Depending on the origin, size, and duration of the release, an oil spill can have serious impacts on air and water quality, public health, plant and animal habitat, and biological resources. Clean up and recovery is time and cost consuming, and dependent on weather conditions such as wind and rain. Tidal and Current conditions may also make the spill more dynamic.

5.4.2.6.2 Location and Extent of Hazard in Pasadena

Most sources of liquid petroleum hydrocarbon storage and use in Pasadena can be found at motor vehicle fueling stations and emergency generators. These sources, although may be large in quantity, are properly stored, secondarily contained and monitored. Therefore, release of petroleum hydrocarbons will gen pose an insignificant hazard to the community.

5.4.2.6.3 History of Hazard in Pasadena

There have been no significant historical events to report to date.

5.4.2.6.4 Probability of Occurrence

There is a small probability that a major release can occur anytime of the year.

5.4.2.6.5 Climate Change Considerations

With increased changes in climate, the demands for oil and oil byproducts will also increase. This shift in demand could increase production, distribution, and transportation of oil products; thus, increasing the potential oil spill occurrences.

5.4.2.7 Dam Failure

5.4.2.7.1 Description of Hazard

Dams fail due to old age, poor design, structural damage, improper siting, landslides flowing into a reservoir, or terrorist actions. Structural damage is often a result of a flood, erosion, or earthquake. A catastrophic dam failure could inundate the area downstream. The force of the water is large enough to carry boulders, trees, automobiles, and even houses along a destructive path downstream. The potential for casualties, environmental damage, and economic loss is great. Damage to electric generating facilities and transmission lines could impact life support systems in communities outside the immediate hazard area.

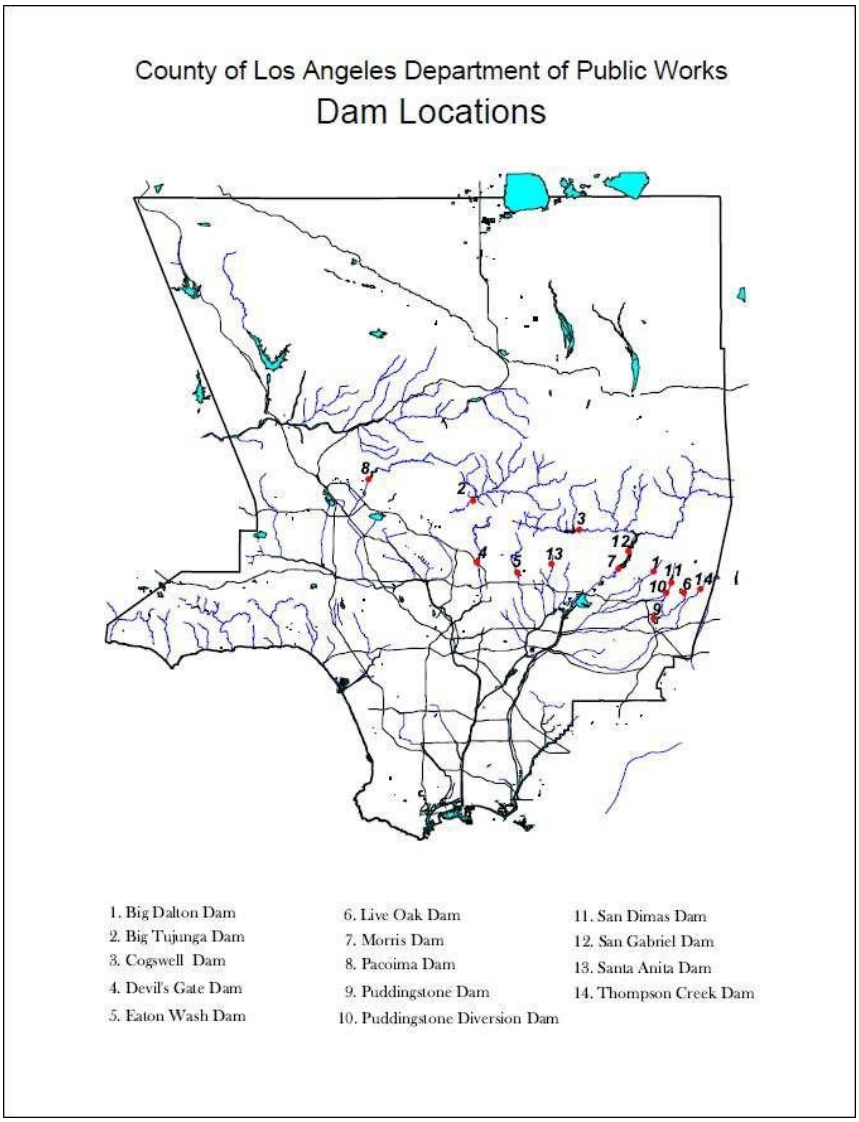
5.4.2.7.2 History of Hazard in Pasadena

The State of California and the federal government have a rigorous Dam Safety Program. This is a proactive program that ensure proper planning in the event of failure but also sets standards for dam design and maintenance. Because of this, many potential issues have been addressed and/or resolved. However, prior to the construction of the dams, the area experienced several events.

5.4.2.7.3 Location and Extent of Hazard in Pasadena

There are fifteen (15) dams in Los Angeles County (**Figure 5.19**). These dams range in purpose from water supply to flood control. Dam failure inundation zones, mapped by the State of California, indicate areas that would be inundated should a dam fail catastrophically. Efforts were made to obtain these maps but locating available and practical maps was difficult. In the case of the dams in question it is further complicated by the fact that the reservoirs behind the dams can be dry; only filling up after significant storms.

Figure 5.19 Dam Locations- Los Angeles County



Of the 15 dams, there are two (2) major flood infrastructure structures located in or upstream from the Pasadena area to manage the Riverine Flooding potential: the Devil's Gate Dam and Reservoir and the Eaton Wash (Creek) Dam and Reservoir. These structures are owned by the Los Angeles County Department of Public Works and are located along the Arroyo Seco and Eaton Wash (Creek) tributary stream systems, respectively.

The *Devil's Gate Dam* flood inundation path shows that the floodway of the Arroyo Seco would contain most of the water. Since this area is largely undeveloped and used primarily for recreation purposes, the risk posed by this hazard could be considered low.

The *Eaton Wash Dam* inundation path shows that, on its southern reaches, some developed areas would be impacted. The risk posed by this hazard could be considered low.

5.4.2.7.4 Probability of Occurrence

Dam failure events are infrequent and usually coincide with the events that cause them, such as earthquakes, landslides and excessive rainfall and snowmelt. There is a "residual risk" associated with dams; residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of occurrence of any type of dam failure event is considered to be low in today's regulatory and dam safety oversight environment.

5.4.2.7.5 Climate Change Considerations

Increased rainfall from changing climate conditions could present a risk to dams if volume of runoff is greater than the dam's capacity. This could cause the County to release stored water into the downstream watercourses in order to ensure the integrity of the dam.

5.4.2.8 Hazardous Materials Release

5.4.2.8.1 Description of Hazard

Hazardous waste/materials are widely used at and/or created by facilities such as hospitals, wastewater treatments plants, universities and industrial/manufacturing warehouses. Several household products such as cleaning supplies and paint are also considered hazardous materials. Hazardous materials include:

- Explosives;
- Flammable, non-flammable, and poisonous gases;
- Flammable liquids;
- Flammable, spontaneously combustible, and dangerous when wet solids;
- Oxidizers and organic peroxides;
- Poisons and infectious substances;
- Radioactive materials; and
- Corrosive materials.

Both mobile and external hazardous materials releases can spread and affect a wide area, through the release of plumes of chemical, biological, or radiological elements or leaks or spills. Conversely, internal releases are more likely to be confined to the structure the material is stored in.

Chemical may be corrosive or otherwise damaging over time. A hazardous materials release could also result in fire or explosion. Contamination may be carried out of the immediate area of the incident by people, vehicles, wind, and water. Weather conditions can increase the size and intensity of the Hazardous Materials Release. Typography, such as hills and canyons, can increase the size of the release or make it more difficult to contain.

5.4.2.8.2 Location and Extent of Hazard in Pasadena

The locations and identity of facilities that store hazardous materials are reported to local and federal governments. Many facilities have their own hazardous materials guides and response plans, including transportation companies who transport hazardous materials.

The release of hazardous materials into the environment can cause a multitude of problems. Although these incidents can happen almost anywhere, certain areas of the city are at higher risk, such as near

roadways and railways, that are frequently used to transport hazardous materials and locations with industrial facilities that use, store, and/or dispose of such materials.

5.4.2.8.3 History of Hazard in Pasadena

Most releases that have occurred in Pasadena, have been minor releases and easily mitigated in compliance with industry standards in accordance with State and Federal regulations. There have been no significant historical events to report to date.

5.4.2.8.4 Probability of Occurrence

The release of hazardous materials can occur throughout the entire city on any given day. Incidences can occur during production, storage, transportation, use or disposal of hazardous materials. Communities can be at risk if a chemical is used unsafely or released in harmful amounts into the environment. Hazardous materials can cause death, serious injury, long lasting health effects, and damage to buildings, the environment, homes, and other property.

5.4.2.8.5 Climate Change Consideration

As mentioned above, weather can play a significant factor in hazardous material releases. While there is little evidence to link climate change increase occurrences of hazardous material releases, it could impact the response and recovery efforts.

5.4.2.9 Radiological Incident

5.4.2.9.1 Description of Hazard

Radioactive materials are routinely transported in California. These materials include the medical and industrial sources described below, as well as wastes that have radioactive components. Many of the radioactive waste shipments come from research and cleanup efforts at national laboratories and nuclear power plants. Radiological incidents that result in the release of radioactive materials may result in long-term health risks and contamination of the state resources, including air, water supply, groundwater, and agricultural lands.

Four (4) Emergency Classification Levels (ECLs) have been established in federal regulations to characterize the severity of the emergency and the response actions required. The ECLs must be used as the foundation for emergency response planning, training and exercises.

5.4.2.9.2 Location and Extent of Hazard in Pasadena

There are a few medical, industrial and research/educational sources within the city that generate, store or utilize radioactive material; and because of the transport of the material this hazard can occur throughout most of the city.

5.4.2.9.3 History of Hazard in Pasadena

No significant radiological incidents have occurred to date in Pasadena.

5.4.2.9.4 Probability of Occurrence

A major radiological incident can occur anytime during the year.

5.4.2.9.5 Climate Change Consideration

While there is little evidence to link climate change increase occurrences of radiological incidents (i.e., material releases), it could impact the response and recovery efforts.

5.4.2.10 Aircraft Crashes

5.4.2.10.1 Description of Hazard

Airline crashes are defined as any accident of private, commercial, or military aircraft on land or over sea. Airline crashes, like other transportation accidents, are less likely to lead to a state or federal disaster declaration, than other hazards previously and afore mentioned.

5.4.2.10.2 Location and Extent of Hazard in Pasadena

Only small aircraft typically fly over the City of Pasadena including Pasadena Police Department's helicopters.

5.4.2.10.3 History of Hazard in Pasadena

No significant historical events to report to date. Although within the last 25 years, two small fixed wing aircraft have crashed in Pasadena and the Pasadena Police helicopter has had emergency landings in a handful of situations. No significant injury or damage was sustained as a result of these incidents.

5.4.2.10.4 Probability of Occurrence

Aircraft crashes have a low probability of occurrences but can occur anytime during the year.

5.4.2.10.5 Climate Change Consideration

There is no none linkage between climate change and airline crashes. Although bad weather does play a factor in some airline crashes, current technology does a good job of forecasting potential conditions.

5.4.2.11 Train Accidents

5.4.2.11.1 Description of Hazard

Train accidents are defined as any accidents involving public or private trains carrying passengers or cargo along the rail corridor. Train accidents, like other transportation accidents, are less likely to lead to a state or federal disaster declaration, than other hazards previously and afore mentioned.

5.4.2.11.2 Location and Extent of Hazard in Pasadena

Trains running through Pasadena carry both commuters and commodities. Such commodities include hazardous materials, fuel (including oil), agriculture, meats, and non-consumables. A hazardous materials incident on the rails or roadway has the potential to shut down both rail and highway transportation routes where the two are within close proximity to another. Train accidents are generally localized, and the incidents result in limited impacts at the community level. However, if there are volatile or flammable substances on the train and the train is in a highly populated or densely forested area, death, injuries, and damage to homes, infrastructure, and the environment, including forest fires can occur.

5.4.2.11.3 History of Hazard in Pasadena

The only significant train accidents in Pasadena in the last 10 years would be related to the light rail Metro Gold Line commuter train. There have been several auto verses train accidents at the Del Mar crossing and there have been a handful of big rig trucks that have come off the 210 Freeway and ended up on the train tracks and in the Metro Gold Line right-of-way as a result of traffic collisions.

5.4.2.11.4 Probability of Occurrence

Train accidents can occur anytime during the year.

5.4.2.11.5 Climate Change Consideration

There is no none linkage between climate change and train accidents.

5.4.2.12 Natural Gas Pipeline/Storage Failure

5.4.2.12.1 Description of Hazard

The United States is heavily dependent on transmission pipelines to distribute energy and fuel sources. Virtually all-natural gas, which accounts for about 28% of energy consumed annually, is transported by transmission pipelines. Energy demand in the United States continues to increase. Although California is a leader in exploring and implementing alternative energy sources such as wind and solar, the expansion of traditional energy sources, such as natural gas, continues.

Most of the natural gas used in California comes from out-of-state natural gas basins. It is delivered to California via the interstate natural gas pipeline system. In 2012, California customers received 42% of their natural gas supply from basins in the Southwest, 22% from Canada, 23% from the Rocky Mountains, and 12% from California.

Generally speaking, transmission lines are large-diameter steel pipes carrying natural gas at high pressure and compressed to provide higher carrying capacity. Transmission lines are both interstate and intrastate, with the latter connecting to smaller distribution lines delivering gas directly to homes and businesses.

5.4.2.12.2 Location and Extent of Hazard in Pasadena

Natural gas transported via the interstate pipelines, and some of the California-produced natural gas, is delivered into the Pacific Gas & Electric (PG&E) and Southern California Gas (SoCal Gas) intrastate natural gas transmission pipeline systems (commonly referred to as California's "backbone" natural gas pipeline system). Natural gas on the utilities' backbone pipeline systems is then delivered into the local transmission and distribution pipeline systems, or to natural gas storage fields. SoCal Gas own and operate several natural gas storage fields that are located in Northern and Southern California. SoCal Gas operates a natural gas storage field, Aliso Canyon, located in the north end of the San Fernando Valley area.

Data compiled by the Pipeline and Hazardous Materials Safety Administration (PHMSA) report a total of 115,292 miles of gas pipelines in California, of which 12,414 miles are classified as gas transmission lines, 403 miles are gas-gathering lines, and the majority, 102,475 miles, are for gas distribution. Nearly 40% of gas transmission lines are located in Los Angeles, Kern, and San Bernardino counties. **Figure**

5.20 shows the location and ownership of the natural gas pipeline system. Many of the pipelines are located in areas with high seismic activity, crossing the San Andreas and other active faults.

Figure 5.20 Natural Gas Pipeline and Service Providers in California

5.4.2.12.3 History of Hazard in Pasadena

No significant historical events to report to date.

5.4.2.12.4 Probability of Occurrence

Increased urbanization is resulting in more people living and working closer to existing gas transmission pipelines that were placed prior to government agencies adopting and implementing land use and other pipeline safety regulations. Compounding the potential risk is the age and gradual deterioration of the gas transmission system due to natural causes. Significant failure, including pipe

breaks and explosions, can result in loss of life, injury, property damage, and environmental impacts. Causes of and contributors to pipeline failures include construction errors, material defects, internal and external corrosion, operational errors, control system malfunctions, outside force damage, subsidence, and seismicity. Growth in population, urbanization, and land development near transmission pipelines, together with addition of new facilities to meet new demands, may increase the likelihood of pipeline damage due to human activity and the exposure of people and property to pipeline failures. Because of this, natural gas pipeline/storage facility failure can occur anytime during the year.

5.4.2.12.5 Climate Change Consideration

Climate change will not have a direct effect on natural gas pipelines; however, climate change could increase the demand for natural gas. This increase in demand may require the development of new pipelines; which could increase potential complications.

6 Vulnerability Assessment

6.1 OVERVIEW

The purpose of this section is to estimate the potential vulnerability (impacts) of the priority hazards within the city on the population and built environment (residential, non-residential, critical facilities, etc.). To accomplish this three (3) different approaches have been used: 1) application of scientific loss estimation models; 2) analysis of exposure of key assets to hazards; and, 3) a qualitative estimate of potential impacts from hazards. It is important to note that the first two approaches can only be applied to hazards that have an exposure area (footprint). For those priority hazards where an exposure layer does not exist or where the hazard exposure area is the entire planning area (i.e., City of Pasadena), a brief analysis of the potential vulnerability is presented. The vulnerability assessment was only done for the hazards within the city that have been categorized as "high priority" in Section 5 of this LHMP.

6.1.1 Scientific Loss Estimation Models

The approach used to complete this effort involves the utilization of the Federal Emergency Management Agency's (FEMA) Hazes model. Hazes is a nationally applicable standardized methodology that estimates potential losses from earthquakes, hurricane winds and floods. Hazes uses state-of-the-art Geographic Information Systems (GIS) software to map and present data results of damage and economic loss estimates for buildings and infrastructure from earthquake, hurricane winds and flood hazard. It also allows users to estimate the impacts of the hazards on populations. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation plans/policies and emergency preparedness, response, and recovery plans/planning.

Hazes' standard configuration allows for "out-of-the-box" regional or community-wide loss assessment using default ("Level 1") population and building inventory databases, aggregated to the census tract level for earthquakes or census block level for flood and hurricane. Additionally, there is a default essential facilities and lifeline systems database; however, these data sets are incomplete and usually need augmentation and/or adjustments.

Hazes default building inventory data can be presented by general occupancy and by general building type. The distribution of buildings across the various construction classes given in Table 6-0-7 is estimated using Hazes default relationships (e.g., X% of offices may be built of concrete frame, Y% of offices may be built of reinforced masonry, etc.). The actual distribution of building across these construction types may be different.

The Hazes essential facilities default data is also used for the analysis. Potential impacts are estimated using the construction type and design level assumed for the essential facilities considered in the Hazes risk assessment. A more accurate risk assessment could be conducted if additional facility information was collected, such as structural system, number of stories, year of construction/seismic code used for design, building square footage, building replacement value, and content replacement value. It should also be noted that the Hazes default database represents each school campus with a single building record of an assumed construction type.

Most public schools are multi-building campuses, built over a period of years (i.e., buildings may be designed to different seismic codes). To improve the risk assessment for public schools, information on each individual building would need to be collected.

The lifeline inventory within HAZUS is divided between transportation and utility lifeline systems. There are seven (7) transportation systems in Hazes that include 1) highways, 2) railways, 3) light rail, 4) buses, 5) ports, 6) ferries and 7) airports; while the six (6) utility systems include 1) potable water, 2) wastewater, 3) natural gas, 4) crude & refined oil, 5) electric power, and 6) communications.

6.1.2 Analysis of Exposure of Key Assets to Hazards

The approach used to complete this effort involves using GIS software to geolocation each key asset to identify which fall within the hazard exposure area (footprint). The results provide an overview of the total number of exposed key assets and if possible, the estimate cost of building replacement and content. Section 4.2.14 provides a summary of the categories of key assets identified by the City of Pasadena. While similar, this list is different than the Hazes list which was developed to estimate damage (loss) from hazards. Information for government-owned or -operated facilities (building replacement cost and building content costs) were reviewed and updated as needed; where available the same information was reviewed and updated for the privately owned or operated facilities. As mentioned previously, a complete list of the key assets can be found in **Appendix D**.

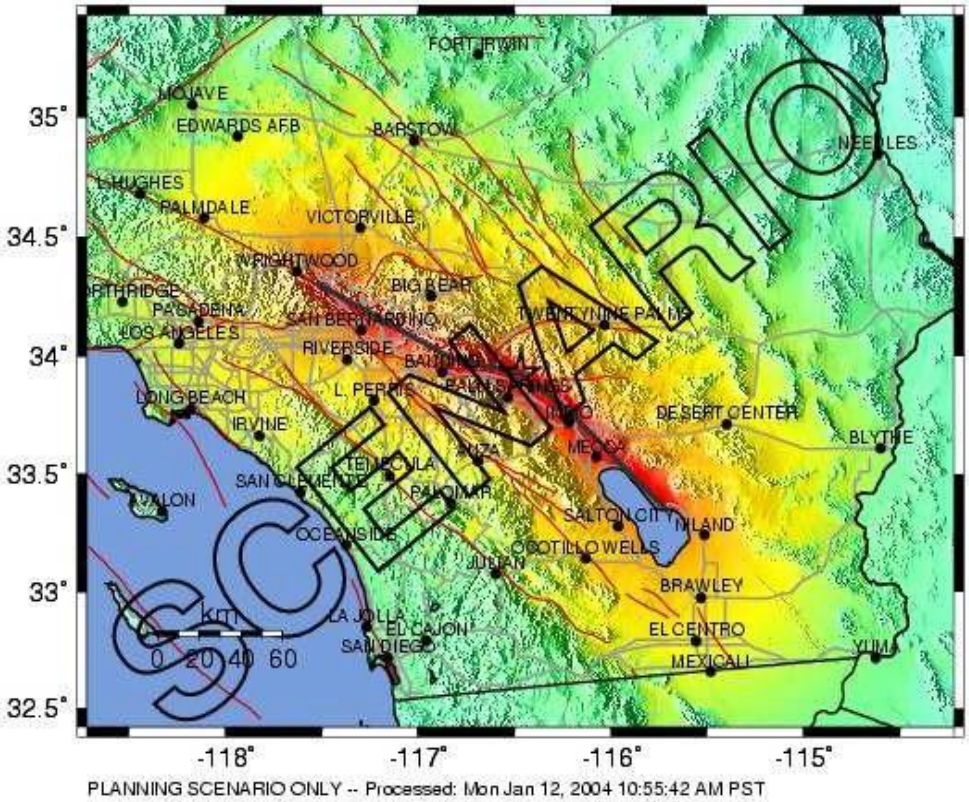
6.1.3 Qualitative Estimate of Impacts from Hazards

The approach used to complete this effort involves utilizing readily available data (i.e., historical and recent events), After Action Reports, and census data to extrapolate and estimate potential vulnerability. In some cases, the estimation built upon historic events but projected worst-case potentials.

6.2 SCIENTIFIC LOSS ESTIMATION ANALYSIS

There have been several earthquake risk assessments completed using the Hazes model done for the Pasadena area. These assessments were done as part of other projects but can be leveraged for this plan. While there are several earthquakes scenarios that are in closer proximity to Pasadena (i.e., M6.5 along the Raymond fault, M6.7 along the Verdugo Fault, M7.1 along the Puente Hills fault, M6.8 along the Whittier fault, and the M6.9 along the Newport-Inglewood fault), the Planning Committee focused on the earthquake scenario developed by the United States Geological Survey (USGS), commonly referred to as the Southern California ShakeOut scenario, to assess potential impacts in the region. The "ShakeOut" scenario is the simulation of the magnitude 7.8 scenario on the San Andreas fault in Southern California (**Figure 6-5**).

Figure 6-5 M7.8 Earthquake on the San Andreas Fault- Southern California



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+

The M7.8 earthquake scenario ruptures 186 miles of the San Andreas fault from Bombay Beach at the edge of the Salton Sea in the south to Lake Hughes northwest of Palmdale in the north. The final slip (offset across the fault) ranges from 6-23 ft. This scenario also had the most readily available information which presented estimates for the region and the city.

An overview of the Hazes results the City of Pasadena and Los Angeles County for the M7.8 earthquake scenario is provided in **Table 6-0-6**. **Table 6-0-7** and **Table 6-0-8** provides a breakdown of estimated building damage by general building type and general occupancy (use) type**.**

Table 6-0-6 M7.8 Earthquake Scenario Impacts

Direct Economic Losses for Buildings ($1,000)			*Los Angeles Co.*
Capital Stock	Cost of Structural Damage	$ 75,052	*$ 2,644,589*
	Cost of Non-Structural Damage	$ 219,081	*$ 10,162,098*
	Cost of Contents Damage	$ 88,724	*$ 4,548,931*
	Inventory Loss	$ 1,125	*$ 127,886*
Income	Relocation Loss	$ 1,132	*$ 35,799*
	Capital-Related Loss	$ 12,224	*$ 305,052*
	Rental Income Loss	$ 20,842	*$ 683,136*
	Wage Losses	$ 16,244	*$ 466,476*
	Total Direct Economic Loss	**$ 434,424**	***$ 18,973,967***
Casualties			
	Level 1 - minor injuries, basic first aid	290	*12,254*
	Level 2 - hospital treat & release	2	*98*
	Level 3 - injuries requiring hospitalization	0	*15*
	Level 4 - fatalities	1	*69*
	Total Casualties	**293**	***12,436***
Shelter			
	Displaced Households	623	*27,941*
	People Requiring Short-term Shelter	200	*12,069*
Debris (in 1,000 tons)			
	Brick, Wood & Other (Light) Debris	25	*1,101*
	Concrete & Steel (Heavy) Debris	65	*2,368*
	Total Debris	**90**	***3,469***

Table 6-0-7 Estimated Damage by Building Type- M7.8 Earthquake Scenario

General Building Type	Damage State				
	None	Slight	Moderate	Extensive	Complete
Concrete					
Pasadena	397	190	144	51	10
LA Co	29,806	6,862	4,483	1,145	364
Manufactured Housing					
Pasadena	0	0	1	0	0
LA Co	329	202	497	575	512
Precast Concrete					
Pasadena	93	20	6	1	0
LA Co	8,825	1,312	465	52	5
Reinforced Masonry					
Pasadena	535	84	41	17	1
LA Co	35,979	3,565	1,709	402	88
Steel					
Pasadena	163	93	73	15	2
LA Co	8,138	2,623	1,910	412	78
Unreinforced Masonry					

Pasadena	224	69	24	4	1
LA Co	9,201	1,386	446	95	53
Wood Frame (other)					
Pasadena	2,161	924	294	17	1
LA Co	131,036	21,046	6,885	1,922	553
Wood Frame (single family)					
Pasadena	20,924	4,223	287	1	0
LA Co	1,452,616	188,618	31,841	2,077	178

Table 6-0-8 Estimated Building Damage by Occupational Use- M7.8 Earthquake Scenario

General Building Type	Damage State				
	None	Slight	Moderate	Extensive	Complete
Agriculture					
Pasadena	8	3	2	0	0
LA Co	487	122	62	11	1
Commercial					
Pasadena	1,582	528	274	59	10
LA Co	93,798	15,645	7,678	1,618	417
Education					
Pasadena	148	26	10	2	0
LA Co	2,676	330	167	44	9
Government					
Pasadena	3	1	0	0	0
LA Co	142	25	13	3	1
Industrial					
Pasadena	189	58	56	28	3
LA Co	27,075	3,815	2,019	591	173
Other Residential					
Pasadena	5,689	1,589	283	15	1
LA Co	348,679	40,394	8,123	2,344	1,042
Religion					
Pasadena	202	52	18	2	0
LA Co	7,464	1.062	374	70	15
Single Family					
Pasadena	16,676	3,348	228	1	0
LA Co	1,195,609	164,221	29,799	2,001	172

6.3 CRITICAL FACILITIES ANALYSIS

The only "*priority*" hazard, other than Earthquake to have a hazard footprint is Wildfire. However, there are no models available that can estimate potential damage from wildfire scenarios. Because of this, the Wildfire hazard is analyzed by estimating the potential exposure of key assets to California Department of Forestry and Fire Protection, Fire Resource Assessment Program (CDF-FRAP) Fire Hazard Severity Zones. ***Table 6-0-9*** represents the number of key assets exposed to CDF-FRAP Fire Hazard Severity Zones within the City of Pasadena.

Table 6-0-9 Key asset Wildfire Exposure

Category	Number of Assets
Fire	2
Library/Museum	2
Misc.	3
Police	1
Utilities- Water	15
TOTAL	**23**

6.4 QUALITATIVE ESTIMATE OF IMPACTS ANALYSIS

This section assesses the risk for the other "priority" hazards that do not have a hazard footprint or hazard area. In most cases, the hazard footprint is the entire city.

6.4.1 Terrorism

A significant terrorism event could have considerable impact on the population, built environment, lifeline infrastructure, environment, and the economy. Because of its international recognition and significant annual events, Pasadena could be targeted by terrorist groups. It is also possible that local individuals/organizations (commonly referred to as homegrown) could be targeted individuals, businesses, and events in Pasadena.

6.4.2 Cyber Threats

A significant cyber event could have considerable impact on the population, built environment, lifeline infrastructure, environment, and the economy. Most jurisdictions have several levels of security in place, dependent upon security levels of individuals and the geographical locations (onsite or remote). Many also have redundant dispatch centers with separate systems that can function if the primary center isn't functioning.

A cyber-attack can infiltrate many institutions including banking, medical, education, government, military, and communication and infrastructure systems. The majority of effective malicious cyber-activity has become web-based. Recent trends indicate that hackers are targeting users to steal personal information and targeting computers to cause system failures. The duration of a cyber-attack is dependent on the complexity of the attack, how widespread it is, how quickly the attack is detected, and the resources available to aid in restoring the system. A cyber-attack could be geared toward one organization, one type of infrastructure and/or a specific geographical area. The affected area could range from small to large scale. Cyber-attacks generated toward large corporations can negatively affect the economy. A 2014 report from the MacAfee Corporation stated that the annual global loss to the global economy is between $375B and $500B. Attacks geared toward critical infrastructure and hospitals can result in the loss of life and the loss of basic needs, such as power and water, to the general public. Cyber-attacks can lead to the loss of operational capacity.

6.4.3 Drought/Water Shortage

Past experience with droughts indicates that impacts are felt first by those most dependent on or affected by annual rainfall – fire departments, ranchers engaged in dryland grazing, rural residents relying on wells in low-yield rock formations, or other small water systems lacking a reliable water source.

However, drought and water shortage can happen citywide; and have significant impacts on the populations and the economy. In some cases, droughts can also cause significant increases in food prices to the consumer due to shortages.

Drought can have secondary impacts too. For example, drought is a major determinant of wildfire hazard, in that it creates greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes.

Climate change has the potential to make drought events more common in California. Extreme heat creates conditions more conducive for evaporation of moisture from the ground, increasing the possibility of drought. A warming planet could lead to earlier melting of winter snow packs, leaving lower stream flows and drier conditions in the late spring and summer. Snow packs in northern California are important for water storage and ensuring adequate supply in the summer months when water is most needed. Changing precipitation distribution and intensity have the potential to cause more of the fallen precipitation run-off rather than be stored. The result is an increased potential for more frequent and more severe periods of drought.

6.4.4 Civil Disturbance

A civil disturbance, depending on the cause and effect, could have a considerable impact on the population, built environment, lifeline infrastructure, economy, and the environment. Downtown Los Angeles is a frequent site of demonstrations due to its high profile and presence of government buildings. It is conceivable that a demonstration could turn to violence and begin spreading into neighboring communities. While the City of Pasadena does not have a history of riots, it also has a high profile and has several events which attract large crowds. This coupled with increased causes creating disharmony within society may provide opportunities for some individuals.

6.4.5 Windstorm

Windstorms have the capability of being of long or short duration. While longer duration events can have significant impact on the population, built environment, lifeline infrastructure, or the economy, shorter duration events can be just as damaging if the winds are powerful. As can be expected, these events will only become more frequent and severe when factoring in climate change considerations. This could include both the increase of frequency, as well as, the increase in intensity. A case could also be made that the increase of windstorm events could trigger the increase of other hazards. For example, prolonged periods of high winds, whether short or long, could create issues with trees and power lines; combining to create prolonged power outages.

Other impacts from windstorms include:

Life and Property

Based on the history of the region, windstorm events can be expected, perhaps annually, across widespread areas of the region. Obviously, the city and surrounding region can be adversely impacted during a windstorm event. This can result in the involvement in the City of Pasadena's emergency response personnel during a wide-ranging windstorm or microburst tornadic activity.

Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building components and surfaces outward.

With extreme wind forces, the roof or entire building can fail, causing considerable damage. Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike a community, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

Utilities

Historically, falling trees and other flying debris have been the major cause of power outages in the region. Windstorms such as strong microbursts and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock. Rising population growth and new infrastructure in the region creates a higher probability for damage to occur from windstorms as more life and property are exposed to risk.

Infrastructure

Windstorms can result in direct damage and indirect consequences (interrupted services) to the local economy. Direct impacts include damages to buildings, personnel, and other vital equipment; while secondary (indirect) impacts include economic losses. Windstorms can collapse or damage buildings, roads, bridges, traffic signals, streetlights, parks, and other facilities. Windstorms can damage buildings/properties and infrastructure due to falling trees and flying debris. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted.

Increased Fire Threat

Perhaps the greatest danger from windstorm activity in Southern California comes from the combination of windstorms and wildfires. With the Santa Ana winds driving the flames, the speed and reach of the flames are greater than in times of calm wind conditions.

Transportation

Windstorm activity can have an impact on local transportation infrastructure. During periods of extremely strong winds, major roads and highways can be temporarily closed to personal, commercial (high profile trucks), and recreational vehicle traffic. However, typically these disruptions are not long lasting, nor do they carry a severe long-term economic impact on the region.

6.4.6 Infectious Disease

The city, as well as the state and country, are vulnerable to infectious disease (epidemics or pandemics) caused by either newly emerging or existing diseases spread person to person, through a vector such as a mosquito, or both. The Centers for Disease Control and Prevention (CDC) and the Los Angeles County Department of Public Health have considered the impact of disease outbreaks on urban areas in the United States.

For example, the rapid transmission of influenza could result in the closure of local schools, surge in hospital visits, and a reduced ability to provide basic City services including public safety.

A significant epidemic or pandemic disease event can have considerable impact on the population, the economy, and essential public services. Pasadena is one of three cities in California that maintains a city-based health department, and therefore has local capacity to develop and exercise response plans related to infectious disease outbreaks. Plans are developed through the coordination efforts of partner agencies to establish a solid foundation for improved coordination and intervention by all participants. Implementation of plans would enable the city to fulfill their significant roles and responsibilities through a coordinated strategy aimed at protecting the public's health and minimizing the impact on the economy and essential public services.

6.4.7 Agricultural Pest and Disease

A significant agricultural pest and/or disease event will have an impact on the environment and the community, but since there is limited agriculture and/or crops, it will not impact the local economy. While nurseries and home improvement store garden sections may be impacted the greatest effects will be felt by property owners. Another impact will be to the overall community as tree lined streets may be effect causing a permeant alteration to the community's character and feel.

6.4.8 Energy Shortage/Outage

Energy shortage/outages (disruptions) are considered a form of lifeline system failure and could have a significant impact on the population, built environment, infrastructure, and the economy. Disruptions can be the consequence of another hazard, or can be the primary hazard, absent of an outside trigger. Pasadena and Southern California as a whole, has experienced a population growth, this coupled with changes to daily life styles and weather have contributed to a heavy demand for power over recent years.

There are two (2) factors to consider: 1) increased demand within the city; and, 2) increased demand elsewhere. Because Pasadena is connected to the Southern Californian Edison (Edison) power grid, increases in other parts of the state could curtail the energy available to Pasadena. This vulnerability is compounded by the reality that our communities have become more reliant on power for gadgets and appliances to perform basic daily activities. This loss of power will not only be an inconvenience but could become a life-threatening experience. Many citizens rely on power to operate medical machinery to survive (i.e., oxygen tanks, dialysis machines).

Climate change considerations indicate that as the weather conditions change, there could be an increase in energy needs. This could be from both potential increase in heat and cold. These predicted increases will put ever-greater strain on Pasadena's energy supply.

6.4.9 Flood

Although not a "priority" hazard, it is worth to note aspects of the Flood hazard. As previously mentioned, flooding in the City of Pasadena is generally related to urban flooding; not riverine flooding. In addition, although the city is not a participating member of the NFIP and has gone through several flood events in which properties have experienced repetitive loss, there are no properties that fall under the NFIP definition of Repetitive Loss Properties.

Repetitive loss properties are defined as property that is insured under the NFIP that has filed two or more claims in excess of $1,000 each within any consecutive 10-year period since 1978.

The City of Pasadena has two repetitive loss properties, both residential properties. One property has two (2) claims and is located on the southern boundary of Eaton Canyon Park; the other property has three (3) claims and is located just west of the Rose Bowl.

7 Mitigation Strategies

7.1 Overview

The City of Pasadena's Mitigation Strategy is derived from an in-depth review of the revised hazards, vulnerabilities, and capabilities sections of this plan coupled with the Steering Committee's vision for creating a disaster resistant and sustainable community for the future. The Steering Committee's vision is expressed in terms of Goals and Objectives. A focused set of Goals and Objectives helped assist the Steering Committee identify needed mitigation actions. The Goals and Objectives should consider both mitigation challenges and opportunities.

To begin, the Steering Committee reviewed the Goals and Objectives and the mitigation actions identified in the City of Pasadena 2013 Local Hazard Mitigation Plan (LHMP). The Goals and Objectives were reviewed to ensure that they still reflect the intended vision. Then the previous mitigation actions were reviewed to determine the current status of action (complete, underway/planned, or not started). With a validation (or revision) of the Goals and Objectives and an understanding of the status of the previous mitigation actions the Steering Committee could evaluate whether any of the unfinished mitigation action were still needed. This process also helped identify new mitigation actions that may be needed. Lastly, with a new list of recommended mitigation actions an implementation plan for each of the mitigation actions was prepared, providing a roadmap forward.

7.2 Mitigation Goals and Objectives

The Goals and Objectives in the existing LHMP were reviewed by the Steering Committee. Based on current hazard profiles and knowledge of existing vulnerabilities and capabilities, appropriate revisions were made to the Goals and Objectives. The City of Pasadena LHMP Steering Committee has reviewed the goals and objectives for adoption as of August 2018. The revised set of Goals and Objectives are outlined below:

GOAL 1 Protect Life and Property

Objective 1.1 Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.

Objective 1.2 Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.

Objective 1.3 discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

GOAL 2 Public Awareness:

Objective 2.1 Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.

Objective 2.2 Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

GOAL 3 NATURAL SYSTEMS:

Objective 3.1 Balance natural resource management and land use planning with natural hazard mitigation to protect life, property, and the environment.

Objective 3.2 Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

GOAL 4 PARTNERSHIPS AND IMPLEMENTATION:

Objective 4.1 Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, businesses, and industry to gain a vested interest in implementation.

Objective 4.2 Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

GOAL 5 EMERGENCY SERVICES:

Objective 5.1 Establish policy to ensure mitigation actions for critical facilities, services, and infrastructure.

Objective 5.2 Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, businesses, and industry.

Objective 5.3 Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

7.3 PREVIOUS MITIGATION ACTION PROGRESS

As part of the LHMP update process, FEMA requires that the Mitigation Strategy section describe the status of mitigation actions included in the previous plan. A meeting was held with the Steering Committee to review the mitigation actions included in the 2013 City of Pasadena LHMP. For convenience, a numbering system was incorporated which was not part of the 2013 LHMP. During the Steering Committee meeting members identified whether the mitigation action was completed, ongoing, underway/planned, or not completed. Results were used when discussing recommended mitigation actions (Section 7.5). **Table 7-10** indicates the status of each of the 2013 mitigation actions.

Table 7-10 Status of 2013 Mitigation Actions

Mitigation Action	Mitigation Sub Action	Status
Multi-hazard- Short-term #1 *Integrate the goals and action items from the City of Pasadena Multi-Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate*	1 Use the Mitigation Plan to help the City's General Plan institutionalize guidelines for sustainable development in all new construction and development projects according to the hazards that impact the City of Pasadena	**Ongoing**
	2 Integrate the City's Mitigation Plan into current capital improvement plans to ensure that development plans include specific strategies for mitigation requirements	**Ongoing**
Multi-hazard- Short-term #2	3 Develop public and private partnerships for hazard mitigation activities	**Ongoing**

Identify and pursue funding opportunities to develop and implement local and City mitigation activities	4 Track state and federal grant programs which support location mitigation programs	**Ongoing**
Multi-hazard- Short-term #3 *Develop public and private partnerships to foster hazard mitigation program coordination and collaboration in City of Pasadena*	5 Identify organizations within City of Pasadena that have programs or interests in hazards mitigation	**Complete**
	6 Involve private businesses throughout the City in hazard mitigation awareness and planning	**Ongoing**
	7 Encourage continuity planning for local businesses as part of community wide hazard mitigation efforts	**Ongoing**
Multi-hazard- Long-term #1 *Strengthen emergency services preparedness and response by linking emergency services with hazard mitigation programs*	8 Ensure on-going operational planning for emergencies includes recognition and inclusion of hazard mitigation requirements	**Ongoing**
	9 Coordinate with neighboring jurisdictions regarding their specific hazard mitigation challenges and plans	**Ongoing**
	10 Coordinate the maintenance of emergency transportation routes through communication with the County Department of Public Works, neighboring jurisdictions, Metrolink and the California Department of Transportation	**Ongoing**
Multi-hazard- Long-term #2 *Establish a formal role for the City of Pasadena Hazard Mitigation Advisory Committee to develop a sustainable process for implementing, monitoring, and evaluating citywide mitigation activities*	11 Establish clear roles for participants, meeting regularly to pursue and evaluate implementation of mitigation strategies through the disaster coordinators meeting	**Ongoing**
	12 Oversee implementation of the Multi-Hazard Mitigation Plan	**Ongoing**
	13 Monitor hazard mitigation implementations by jurisdictions and participating organizations through surveys and other reporting methods	**Complete**
	14 Develop updates for the Multi-Hazards Mitigation Action Plan based on new information	**Complete**
	15 Conduct a full review of the Multi-Hazards Mitigation Action Plan every 5 years by evaluating mitigation successes, failures, and areas that were not addressed	**Complete**
	16 Provide training for Committee members to remain current on developing issues in the natural hazard loss reduction field	**Complete**
Multi-hazard- Long-term #3 *Develop and implement outreach programs designed to educate the public about hazard mitigation*	17 Make the City of Pasadena Multi-Hazard Mitigation Plan available to the public by publishing the Plan electronically on the City websites	**Ongoing**

	18 Provide information regarding mitigation hazards and planning at events promoted by the City	**Ongoing**
	19 Include emergency preparedness information related to hazard mitigation in public safety information and training programs (e.g. Citizen's Academy, Community Emergency Response Team Program)	**Ongoing**
Multi-hazard- Long-term #4 *Use technical knowledge of natural ecosystems and events to link natural resource management and land use organizations to mitigation activities and technical assistance*	20 Review ordinances that protect natural systems and resources to mitigate for natural hazards for possible enhancements	**Ongoing**
	21 Pursue vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the watershed	**Ongoing**
Multi-hazard- Long-term #5 *Develop a long-term approach to monitoring hazard mitigation planning by conducting meetings of the Hazard Mitigation Advisory Committee annually*	22 Review mitigation efforts from the past six months for effectiveness	**Complete**
	23 Identify changes in regulations, regional planning, or technology which may impact ongoing mitigation plans or programs	**Complete**
	24 Prepare an annual report to the City Manager regarding Multi-Hazard mitigation efforts in the City of Pasadena	**Complete**
Earthquake- Short-term #1 *Partner with the California Institute of Technology and other institutions (located in Pasadena) to identify advances in earthquake effects modeling*	25 Use the latest advances in understanding the effects of earthquakes in urban areas to improve local standards and requirements for earthquake resistant private construction	**Ongoing**
	26 Use CalTech's or other institutions latest advances in understanding of the impact of earthquake's on municipal infrastructure to harden critical systems necessary for earthquake recovery efforts	**Ongoing**
Earthquake- Short-term #2 *Incorporate all earthquake evacuation planning developed by the Los Angeles County Emergency Alliance, Sheriff's Department, and Mutual Aid Area C into the City of Pasadena Emergency Operations Plan.*	27 Conduct a review to determine if any changes have been made to area-wide evacuation plans	**Ongoing**
	28 Integrate any Los Angeles County evacuation routes data into the City of Pasadena Emergency Operations Plan	**Ongoing**
Earthquake- Long-term #1 *Encourage purchase of earthquake hazard insurance*	29 Provide earthquake insurance information to the City of Pasadena residents	**Complete**
	30 Coordinate with the State of California program to produce and distribute earthquake insurance information	**Complete**

Earthquake- Long-term #2 *Conduct seismic evaluations of critical facilities in the City of Pasadena to identify vulnerabilities of buildings and infrastructure*	31 Coordinate with California Institute of Technology (Cal Tech) staff or other institutions to identify structures based on their use, construction type, and potential risk to failure during earthquakes	**Complete**
	32 Provide information to private building owners on potential risks from earthquake damage and options for mitigating these affects	**Complete**
Earthquake- Long-term #3 *Evaluate, repair or replace rubble walls in the Arroyo Seco Park Area*	33 Evaluate all rubble walls in the Arroyo Seco Park Area	**Complete**
	34 Repair or replace the walls to make them resistant to earthquake and floods	**Complete**
Flood-Short-term #1 *Analyze potential flood properties or locations within the City of Pasadena and identify appropriate and feasible mitigation options*	35 Identify appropriate and feasible mitigation activities for potential flood properties.	**Complete**
	36 Encourage and assist property owners to engage in mitigation activities.	**Complete**
Flood-Short-term #2 *Recommend revisions to requirements for development within potential flood areas. Include private property owners and developers in reviewing development standards*	37 Evaluate elevation requirements for new residential and nonresidential structures in the unincorporated floodplain area	**Ongoing**
	38 Provide opportunities for private property owners and developers to offer suggestions and feedback on standards for development in potential flood areas.	**Ongoing**
Flood-Long-term #1 *Encourage development of strategies to preserve open space for flood mitigation, fish habitat, and water quality in the localized floodplain*	39 Conduct biannual reviews of existing flood and water use management projects.	**Ongoing**
	40 Promote regional partnerships between flood mitigation, fish habitat, and water quality enhancement organizations and programs.	**Ongoing**
	41 Identify sites where environmental restoration work can benefit flood mitigation, fish habitat, and water quality and supply.	**Ongoing**
Flood-Long-term #2 *Identify surface water drainage obstructions within the City of Pasadena*	42 Prepare an inventory of major urban drainage problems and identify causes and potential mitigation actions for urban drainage problem areas.	**Ongoing**
	43 Use this list to establish priorities for maintenance and removal of mud and debris.	**Ongoing**
Flood-Long-term #3 *Improve water management and flood control efforts in the Hahamongna Watershed and Arroyo Seco park areas. Protect and restore natural habitats where practical*	44 Replace aging storm drains.	**Ongoing**
	45 Monitor sediment buildup and remove as necessary.	**Ongoing**
	46 Restore natural habitats near flood basins	**Ongoing**
	47 Raise park roadways where necessary to improve the flow of water downstream.	**Ongoing**

Flood-Long-term #4 *Upgrade the City storm drain system. The City of Pasadena has many miles of storm drains, some of which are over 80 years old. Normal use combined with frequent seismic events can gradually weaken the system and result in failures during periods of heavy water flow*	48 Continue annual Storm Drain inspections.	**Ongoing**
	49 Restore/replace any damaged section of the Storm Drain system	**Ongoing**
Flood-Long-term #5 *Repair and replace the raised concrete gutters and curbs in the City. The gutters and curbs are critical for directing runoff during flooding conditions. They protect vehicles and pedestrians as well as structures during flooding events. Gutters and curbs are often damaged or displaced by tree root*	50 Continue annual inspections	**Ongoing**
	51 Restore/replace any damaged portions of the curb or gutter system	**Ongoing**
Landslide- Short-term #1 *Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas. Increase coordination between City Departments regarding landslide risk areas.*	52 Conduct an annual review of potential landslide areas in the City of Pasadena	**Ongoing**
	53 Provide private property owners maps of possible risk areas	**Ongoing**
Landslide- Short-term #2 *Identify safe evacuation routes in high-risk debris flow and landslide areas*	54 Identify potential debris removal resources	**Ongoing**
	55 Increase participation in regional committee planning for emergency transportation routes	**Ongoing**
	56 Identify and publicize information regarding emergency transportation routes	**Complete**
Landslide- Long-term #1 *Review local ordinances regarding building and development in landslide prone areas*	57 Review local ordinances for building in potential landslide areas based on proposed development plans and current environmental conditions	**Ongoing**
	58 Create committee of local stakeholders to study the issues and make recommendations to staff	**Ongoing**
Windstorm-Short-term #1 *Provide public warning during periods when high winds are forecast for the area*	59 Provide warnings on the City website	**Ongoing**
	60 Provide public service announcements to the media	**Ongoing**
Windstorm-Long-term #1 *Assist private property owners regarding windstorm mitigation activities*	61 Provide information on the City website about annual tree maintenance programs to limit damage from falling debris including tree trimming and debris removal	**Ongoing**

	62 Provide information on the City website regarding property protection strategies to limit damage from windstorms	**Complete**
Windstorm-Long-term #2 *Upgrade the current utility pole system in the City. The City of Pasadena is gradually moving electrical utilities underground. Pasadena has 14,000 wooden utility poles, many of which are over 30 years old*	63 Continue annual inspections	**Ongoing**
	64 Restore/replace any worn or damaged power poles.	**Ongoing**
Human Threat- Short-term #1 *Develop contingency plans for responding to a light rail accident in the downtown area*	65 Develop and coordinate planning with Mutual Aid Area C for light rail accident involving mass casualties	**Ongoing**
Human Threat- Short-term #2 *Develop contingency plans for responding to a terrorist incident in Pasadena*	66 Develop and coordinate planning with Mutual Aid Area C for terrorist events involving mass casualties	**Ongoing**
Human Threat- Short-term #3 *Develop contingency plans for responding to a terrorist incident in Pasadena*	67 Develop and coordinate planning with Mutual Aid Area C for civil unrest events involving mass arrests	**Ongoing**
	68 Provide mobile field force training for Pasadena police officer	**Complete**
Human Threat- Short-term #4 *Develop contingency plans for responding to a pandemic outbreak involving Pasadena*	69 Develop and coordinate planning with LA County Department of Health for distribution of medicines	**Ongoing**
	70 Prepare a plan for reducing City services due to sickness	**Ongoing**
	71 Prepare an operational plan for coordination of efforts with the local school district	**Ongoing**
Human Threat- Long-term #1 *Develop contingency plans for responding to a mass casualty event involving Pasadena*	72 Develop and coordinate planning with LA County Mutual Aid Area C	**Ongoing**
	73 Prepare a plan with local hospitals and the Los Angeles Coroner's office	**Ongoing**
	74 Prepare an operational plan for coordination of efforts with the local school district	**Ongoing**

It is worth to mention that although not included as part of the 2013 City of Pasadena LHMP, the City of Pasadena has completed several projects that have been beneficial to the City's mitigation efforts. Below is a sample of some of those mitigation actions:

Monk Hill Treatment Plant- the Monk Hill Treatment Plant located in Northwest Pasadena near NASA's Jet Propulsion Lab (JPL), is a state-of-the-art water treatment plant that is part of an ongoing effort to remove perchlorate and volatile organic compounds (VOCs) from the groundwater. The plant is funded by NASA and backed by the U.S. EPA, California Department of Toxic Substances Control and the Los Angeles Regional Water Quality Board.

Glenarm Repowering Project- the Pasadena Department Water and Power completed the Glenarm Repowering Project, an extensive power plant upgrade that includes the replacement of a 51-year-old steam-generating unit, with a more efficient combined cycle turbine unit

known as Gas Turbine 5 (GT-5). Now fully operational, GT-5 provides Pasadena with clean, natural-gas fueled power that is the most efficient and environmentally "clean" unit in its class.

7.4 MITIGATION PRIORITIZATION

FEMA requests that all proposed mitigation actions be prioritized. The Steering Committee decided to use an evaluation process to prioritize the proposed mitigation actions. The STAPLEE Criteria process was used to evaluate the feasibility of each of the mitigation actions being considered for inclusion in the 2018 LHMP. STAPLEE is an acronym with each letter standing for a subject area which should be considering when implementing a project/action. STAPLEE stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Each of these areas can pose a threat (or challenge) for a project/action. The questions considered under the STAPLEE criteria, included the following:

Social

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the general plan, or must the general plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?

- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential sources (public, non-profit, and private)?
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide?

Environmental

- How will the action affect the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

A scale of 1 – 5 where 5 is favorable/beneficial or NO major issues/opposition; 3 is middle of the road, and 1 is unfavorable/not beneficial or major issues/opposition was used to score each STAPLEE criteria. Each STAPLEE criteria score was totaled to achieve one relative score for each mitigation action.

This evaluation is intended to assist the city to focus their efforts on those actions with the greatest potential for implementation. However, it is recognized that the criteria is not weighted; some criteria may be considered more important than others in determining the final prioritization of individual mitigation actions. For example, the urgency of implementing a mitigation action to address a high priority hazard, or the current availability of funding to initiate a mitigation action affected the final priority assigned to each mitigation action. The Steering Committee engaged in an interactive consensus building exercise to assign a priority rating of High, Medium or Low to each of the mitigation actions under consideration. The final list of mitigation actions, the STAPLEE score assigned and the final priority ranking are presented in the next section. The highest possible score any mitigation action could receive, based on the scoring criteria is 35. The scores assigned range from a low of 20 to a high of 31.

7.5 PROPOSED MITIGATION ACTIONS

The table below (**Table 7-11**) represents the proposed mitigation actions and ranking (or scoring) as identified by the Steering Committee. The list of proposed mitigation actions is a combined effort of reviewing and evaluating previous mitigation actions (Section 7.3), understanding current hazards (Section 5), assessing current vulnerabilities against current capabilities (Section 6 and Section 4), and incorporating new, best practices.

As part of the assessment of current capabilities, emphasis was placed on evaluating current plans, programs, policies, regulations, and codes to determine if there are any deficiencies or if new plans, programs, policies, regulations, and codes were needed. The findings of this evaluation are captured in the form of new mitigation actions. As mentioned earlier, the focus of the mitigation actions was focused on the "high priority" hazards; however, some mitigation actions also address lower priority hazards.

Previous mitigation actions that have been "*completed*" were deleted from the list. Mitigation actions identified as "*ongoing*", "*underway/planned*", or "*not completed*" were reevaluated to determine if they were still relevant and should be carried forward. Mitigation actions that were carried forward were also reviewed for wording; and in several instances existing mitigation actions were changed to reflect more appropriate needs.

Table 7-11 Proposed Mitigation Actions

Mitigation Action	STAPLEE Score
Design water delivery systems to accommodate drought events and develop new or upgrade existing water delivery systems to eliminate breaks and leaks.	**33**
Develop a program to retrofit at-risk structures in wildfire hazard areas with non-combustible materials and technologies.	**31**
Develop a comprehensive plan to understand and assess local vulnerability to drought by gathering and analyzing local water and climate data, identifying factors effecting severity of the drought and determining how the community has been impacted in the past	**31**
Make the City of Pasadena Multi-Hazard Mitigation Plan available on the City website	**30**
Develop a comprehensive plan that recognizes wildfire hazards identifying areas of risk and describing policies and recommendations for addressing the risk including land use and public safety.	**30**
Establish and provide annual cyber-security risk briefings to City officials. Possibly leverage the Department of Homeland Security's State, Local, Tribal, and Territorial Cyber security engagement programs.	**28**
Improve regulations for safer construction in wildfire very high hazard areas addressing access, signage, fire hydrants, water availability, vegetation management and special building construction standards.	**28**
Implement a fuels management program to reduce hazardous vegetation fuels on public lands, near essential infrastructure and on private lands by working with landowners.	**28**
Retrofit existing residential buildings, public buildings and critical facilities with modifications to reduce future wind damage including improving roof coverings, anchoring roof-mounted utilities, and adding load-path connectors to strengthen structural frames.	**28**
Establish and conduct annual employee training on privacy and security policies and incident response procedures.	**28**
Develop a policy to ensure the City's LHMP is reviewed during the development of capital improvement plans	**28**
Upgrade Traffic Signal, Street Lighting Poles, and Systems citywide to meet or exceed modern loading requirements	**26**
Seismic Retrofit of City-owned Essential Buildings, including Fire Stations and Evacuation Centers.	**26**
Develop a policy to ensure the annual review of potential landslide areas in the City of Pasadena	**26**
Develop a Public Outreach Plan geared towards providing hazard education, emergency management, and mitigation action activities.	**26**
Review and revise the Emergency Operations Plan (EOP) to reflect response and recovery Concept of Operations best practices	**26**
Purchase supplies, equipment, and other resources to enable critical facilities identified in the EOP to be able to function as needed	**26**
Review area-wide evacuation plans/routes to identify changes and determine if changes need to be incorporated in the City Emergency Operations Plan (EOP) and/or Evacuation Plan	**25**

Develop a Disaster Communications Plan	**25**
Develop an EOP scenario-based Annex light rail accident	**25**
Develop an EOP scenario-based Annex for active shooter events	**25**
Develop a planning team to work with local school districts and universities to prepare both scenario-based and functional-based plans	**25**
Utilize drought tolerant landscape design for all new public buildings and develop a plan to retrofit all existing public buildings with drought tolerant landscape.	**25**
Develop a plan to move all power lines in severe wind vulnerable areas underground.	**25**
Develop and adopt a soft-story retrofit ordinance; possibly administer an implementation program for the ordinance.	**24**
Evaluate and take necessary actions to ensure robust cyber-security of utility infrastructure and protection of critical information systems from cyber-attacks/incidents.	**24**
Partner with the (Cal OES) California Office of Emergency Services and the (Cal-CSIC) California Cybersecurity Integration Center to assess the risks to Pasadena's critical infrastructure and information technology networks. Enable cross-sector coordination and sharing of recommended best practices and security measures. Support cybersecurity assessments, audits, and accountability programs that help to protect the information technology networks of California's agencies and departments.	**24**
Develop a policy and/or possibly a Memorandum of Understanding (MOU) with the County Department of Public Works, neighboring jurisdictions, Metrolink, and the California	**24**
Department of Transportation to ensure coordination and maintenance of the emergency transportation routes	**24**
Establish a Disaster Coordination group and establish a regular meeting schedule; include both public and private members; and federal, state, county, and local partners. Part of the duties will include the review, evaluation, and monitoring of the LHMP	**24**
Provide information to the public regarding hazard mitigation and emergency planning at events promoted by the City	**24**
Develop a policy that encourages incorporation or consideration of vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the watershed when mitigation against hazards	**24**
Develop a policy to ensure the City's Building Codes are reviewed annually to reflect changes and best practices in hazard science (flood, earthquake).	**24**
Develop a Debris Removal Plan.	**24**
Develop a landslide area-building ordinance. Review local ordinances for building in potential landslide areas based on proposed development plans and current environmental conditions	**24**
Develop an EOP functional-based Annex for evacuations	**24**
Identify City-service, mission critical tasks and develop Business Continuity Plans for each service	**24**
Utility infrastructure improvements against earthquake and other hazards including seismic upgrade of power and water facilities, Sunset reservoir improvements, and upgrades and replacements of local generating units.	**23**
Ensure training protocols reflect current and industry best practices in the fields of cyber, information, and critical infrastructure security. Where necessary or applicable, integrate cyber-security training in staff's professional annual training/development goals and/or performance reviews.	**23**
Integrate the LHMP into the City's General Plan	**23**
Integrate hazard mitigation material into public safety information and training programs (e.g. Citizen's Academy, Community Emergency Response Team Program)	**23**
Prepare an inventory of major urban drainage problems and identify causes and potential mitigation actions for urban drainage problem areas.	**23**

Assess and evaluate critical facilities identified in the EOP	**23**
Evaluate and retrofit critical facilities identified in the EOP	**23**
Develop an EOP scenario-based Annex for terrorist events	**23**
Implement measures to bolster local water supply to meet demand, create a sustainable water supply, while meeting environmental mandates.	**23**
Develop a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the public.	**23**
Develop and maintain a database to track community vulnerability to severe wind including GIS mapping of vulnerable areas.	**22**
Seismic Retrofit of City-owned Bridges	**22**
Restoration of habitat, improvements to the watershed, and enhancement of spreading activities of water runoff to enhance the flood protection systems and preserve the natural systems	**22**
Evaluate and implement protective measures of critical utility buildings, plants and facilities against natural hazards (fire, flood, windstorm)	**22**
Develop and implement a program to develop Business Continuity Plans of utility mission critical tasks. Potentially purchase of equipment, mobile electrical sub-stations, and emergency backup generators for utility facilities; emergency transmission and distribution system replacements to ensure continuous functionality after disaster events	**22**
Support enhanced cyber-security training for IT staff to maintain expertise and foster operational readiness	**22**
Develop a Floodplain Management/Flood Plan.	**22**
Develop an EOP functional-based Annex for mass casualties	**22**

Develop an EOP functional-based Annex for Mass Shelter	**22**
Develop an EOP scenario-based Annex for civil unrest events	**22**
Develop a Dam Mitigation Plan.	**21**
Develop a Vegetation Management Plan.	**21**
In accordance with the 2011 Water Integrated Resources Plan, develop alternative sources of water to meet Pasadena's annual water demands (non-potable water project)	**21**
Upgrade the Arroyo Seco stream water intake structure to improve our ability to capture more stream water and to recharge the groundwater basin (Arroyo Seco Project)	**21**
Develop and coordinate planning with partners for dispensing of medications or vaccines	**21**
Coordinate infection control planning with partners	**21**
Vegetation management on City lands in the watershed for water supply enhancement and fire reduction; Improvements to the Arroyo Seco Canyon; Azusa Hydro upgrades and replacements; and rainwater capture and recycling	**20**
Develop a program to encourage and support business continuity planning for local businesses	**20**
Evaluate and implement necessary retrofits and upgrades to the diversion facilities in Arroyo Canyon	**20**
Upgrade and replace local generating units	**20**
Replace emergency transmission and distribution systems	**20**
Increase wildfire risk awareness by developing education and outreach programs that target citizens, businesses, developers, landscapers, and insurers with strategies to protect homes and infrastructure.	**19**
Evaluate and implement security and protective measures of critical utility buildings, plants and facilities from man-made hazards (terrorist)	**19**

Identity the libraries role as a critical facility during response and recovery efforts. Assess the current facilities and retrofit as needed (i.e., fire systems, seismic upgrades) to ensure the integrity of library buildings for use as critical facilities during multi-hazard events. Purchase equipment, supplies, and other resources necessary to carry out the intended role.	**19**
Develop a Landslide Management Plan.	**19**
Raise park roadways where necessary to improve the flow of water downstream.	**19**
Purchase emergency generators at facilities	**19**
Azusa Hydro upgrades and replacements	**17**
Develop requirements for wind engineering measures and construction techniques in wind vulnerable areas including structural bracing, straps and clips, anchor bolts, impact resistant glass, reinforced garage doors, window shutters, waterproof adhesive sealing strips or interlocking roof shingles.	**15**

7.6 IMPLEMENTATION PLAN

The following table (**Table 7-12**) reflects the implementation plan for each proposed mitigation action. The implementation plan is the key to a successful LHMP effort. In addition to the proposed mitigation action, the implementation plan identifies the relevant hazard, responsible department, estimated cost, potential funding source, and the proposed timeframe for completion. Where cost is concerned, FEMA's Hazard Mitigation Assistance (HMA) grant programs will be pursued to pay up to 75% of eligible costs, while the remaining 25% will be acquired from non-Federal sources. It should be noted, in developing a complete and comprehensive implementation plan for FEMA as envisioned by their requirements, the projects below are proposed (only) as potential projects that may or may not be identified in the City of Pasadena Capital Improvement Plan (CIP).

Table 7-12 Proposed Mitigation Actions- Implementation Plan

Mitigation Action Sub Action(s)	Relevant Hazard	Staplee Score	Responsible Departments	Cost/ Funding Source	Action Timeframe
Develop and adopt a soft-story retrofit ordinance; possibly administer an implementation program for the ordinance.	Earthquake	24	Building & Safety	$67.2 million HMA, non-Federal sources, building owners	1 to 7 years
Upgrade Traffic Signal, Street Lighting Poles, and Systems citywide to meet or exceed modern loading requirements.	Multi-hazard	26	Public Works	$5.5 million HMA, non-Federal sources	3 to 7 years
Seismic Retrofit of City-owned Essential Buildings, including Fire Stations and Evacuation Centers.	Earthquake	26	Public Works	$50 million HMA	1 to 10 years
Seismic Retrofit of City-owned Bridges.	Earthquake	22	Public Works	$40 million HMA	1 to 10 years

Utility infrastructure improvements against earthquake and other hazards including seismic upgrade of power and water facilities, Sunset reservoir improvements, and upgrades and replacements of local generating units.	Earthquake	23	Water & Power	$60-$75 million HMA, non-Federal sources	4 to 5 years
Restoration of habitat, improvements to the watershed, and enhancement of spreading activities of water runoff to enhance the flood protection systems and preserve the natural systems.	Flood	22	Water & Power	$12-$15 million HMA. non-Federal sources, Water & Power Fund	3 to 5 years
Vegetation management on City lands in the watershed for water supply enhancement and fire reduction; improvements to the Arroyo Seco Canyon; Azusa Hydro upgrades and replacements; and rainwater capture and recycling.	Multi-hazard	20	Water & Power	$12-$15 million HMA, Water & Power Fund	3 to 5 years
Evaluate and implement protective measures of critical utility buildings, plants and facilities against natural hazards (fire, flood, windstorm).	Multi-hazard	22	Water & Power	$5-$7 million HMA, Water & Power Fund	2 to 3 years
Evaluate and take necessary actions to ensure robust cyber-security of utility infrastructure and protection of critical information systems from cyber-attacks/incidents.	Cyber-Attack	24	Water & Power	$5-$7 million Water & Power Fund, HMA	2 to 3 years
Evaluate and implement security and protective measures of critical utility buildings, plants and facilities from man-made hazards (terrorist).	Terrorism	19	Water & Power	$25-$30 million Water & Power Fund, HMA	4 to 5 years

Develop and implement a program to develop Business Continuity Plans of utility mission critical tasks. Potential purchase of equipment, mobile electrical sub- stations, and emergency backup generators for utility facilities; emergency transmission and distribution system replacements to ensure continuous functionality after disaster events.	Multi-hazard	22	Water & Power	$5-$7 million Water & Power Fund, HMA	2 to 3 years
Identify the Library's role as a critical facility during response and recovery efforts. Assess the current facilities and retrofit as needed (i.e., fire systems, seismic upgrades) to ensure the integrity of library buildings for use as critical facilities during multi-hazard events. Purchase equipment, supplies, and other resources necessary to carry out the intended role.	Multi-hazard	19	Library	$8-$12 million HMA, non-Federal sources	2 to 7 years
Partner with the California Office of Emergency Services (Cal OES) and the California Cybersecurity Integration Center (Cal-CSIC) to assess the risks to Pasadena's critical infrastructure and information technology networks. Enable cross-sector coordination and sharing of recommended best practices and security measures. Support cybersecurity assessments, audits, and accountability programs that help to protect the information technology networks of California's agencies and departments.	Cyber-Attack	24	Dept. of Information Technology (DoIT)	$75,000 non-Federal sources, Computing and Communications Fund	2 to 3 years
Ensure training protocols reflect current and industry best practices in the fields of cyber, information, and critical infrastructure security. Where necessary or applicable, integrate cyber-security training in staff's professional annual training/development goals and/or performance reviews.	Cyber-Attack	23	Dept. of Information Technology (DoIT)	$5,000 Computing and Communications Fund	1 year

Support enhanced cyber-security training for IT staff to maintain expertise and foster operational readiness.	Cyber-Attack	22	Dept. of Information Technology (DoIT)	$10,000 non-Federal sources, Computing and Communications Fund	1 year
Establish and provide annual cyber- security risk briefings to City officials. Possibly leverage the Department of Homeland Security's State, Local, Tribal, and Territorial Cyber security engagement programs.	Cyber-Attack	28	Dept. of Information Technology (DoIT)	$5,000 non-Federal sources, Computing and Communications Fund	1 year
Establish and conduct annual employee training on privacy and security policies and incident response procedures.	Cyber-Attack	28	Dept. of Information Technology (DoIT)	$5,000 non-Federal sources, Computing and Communications Fund	1 year
Integrate the LHMP into the City's General Plan.	Multi-hazard	23	Planning	No Cost	2 to 3 years
Develop a policy and/or possibly a Memorandum of Understanding (MOU) with the County Department of Public Works, neighboring jurisdictions, Metrolink, and the California Department of Transportation to ensure coordination and maintenance of the emergency transportation routes.	Multi-hazard	24	Fire	No Cost	1 year
Establish a Disaster Coordination group and establish a regular meeting schedule; include both public and private members; and federal, state, county, and local partners. Part of the duties will include the review, evaluation, and monitoring of the LHMP.	Multi-hazard	24	Fire	No Cost	1 year
Make the City of Pasadena Multi- Hazard Mitigation Plan available on the City website.	Multi-hazard	30	PIO	No Cost	1 year
Provide information to the public regarding hazard mitigation and emergency planning at events promoted by the City.	Multi-hazard	24	PIO	$5,000 HMA, grants, non-Federal sources	1 year

Integrate hazard mitigation material into public safety information and training programs (e.g. Citizen's Academy, Community Emergency Response Team Program).	Multi-hazard	23	Fire	$5,000 HMA, grants, other sources	1 year
Develop a policy to ensure the City's LHMP is reviewed during the development of capital improvement plans.	Multi-hazard	28	City Manager	No Cost	1 year
Develop a policy that encourages incorporation or consideration of vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the watershed when mitigation against hazards.	Multi-hazard	24	Planning	$150,000 HMA, non-Federal sources	1 to 2 years
Develop a policy to ensure the City's Building Codes are reviewed to reflect changes and best practices in hazard science (flood, earthquake).	Multi-hazard	24	Planning	No Cost	3 years
Review area-wide evacuation plans/routes to identify changes and determine if changes need to be incorporated in the City Emergency Operations Plan (EOP) and/or Evacuation Plan.	Multi-hazard	25	Fire	$5,000 HMA and non-Federal sources	1 year
Prepare an inventory of major urban drainage problems and identify causes and potential mitigation actions for urban drainage problem areas.	Flood	23	Public Works	$300,000 HMA, non-Federal sources	2 to 3 years
Develop a Debris Removal Plan.	Multi-hazard	24	Public Works, County Flood Control District	$300,000 HMA, non-Federal sources	2 to 3 years
Develop a Dam Mitigation Plan.	Flood	21	County Flood Control District	$300,000 HMA, non-Federal sources	2 to 3 years

Develop a Vegetation Management Plan.	Multi-hazard	21	Public Works	$300,000 HMA, non-Federal sources	2 to 3 years
Develop a Floodplain Management/Flood Plan.	Flood	22	County Flood Control District	$300,000 HMA, non-Federal sources	2 to 3 years
Develop a Landslide Management Plan.	Landslide	19	County Public Works	$300,000 HMA, non-Federal sources	2 to 3 years
Raise park roadways where necessary to improve the flow of water downstream.	Flood	19	Public Works	$3 million HMA, non-Federal sources	4 to 5 years
Develop a policy to ensure the annual review of potential landslide areas in the City of Pasadena.	Landslide	26	County Public Works	$70,000 HMA, non-Federal sources	1 year
Develop a landslide area building ordinance. Review local ordinances for building in potential landslide areas based on proposed development plans and current environmental conditions.	Landslide	24	County Public Works	$200,000 County Fund	2 to 3 years
Develop a Public Outreach Plan geared towards providing hazard education, emergency management, and mitigation action activities.	Multi-hazard	26	PIO	$5,000 HMA, non-Federal sources	1 to 2 years
Develop a Disaster Communications Plan.	Multi-hazard	25	Fire	No Cost	1 to 2 years
Review and revise the Emergency Operations Plan (EOP) to reflect response and recovery Concept of Operations best practices.	Multi-hazard	26	Fire	$30,000 HMA, non-Federal sources	1 to 2 years

Assess and evaluate critical facilities identified in the EOP.	Multi-hazard	23	Public Works	$2-$3 million HMA, non-Federal sources	3 to 4 years
Evaluate and retrofit critical facilities identified in the EOP.	Multi-hazard	23	Public Works	$12-$13 million HMA, non-Federal sources	5 to 10 years
Purchase supplies, equipment, and other resources to enable critical facilities identified in the EOP to be able to function as needed.	Multi-hazard	26	Fire	$100,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP functional-based Annex for mass casualties.	Multi-hazard	22	Fire	$200,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP functional-based Annex for evacuations.	Multi-hazard	24	Fire	$200,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP functional-based Annex for Mass Shelter.	Multi-hazard	22	Human Services and Recreation	$200,000 HMA, other non-Federal sources	1 to 2 years
Develop an EOP scenario-based Annex for terrorist events.	Terrorist	23	Police	$200,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP scenario-based Annex light rail accident.	Train Accident	25	Fire	$200,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP scenario-based Annex for civil unrest events.	Civil Unrest	22	Fire	$200,000 HMA, non-Federal sources	1 to 2 years
Develop an EOP scenario-based Annex for active shooter events.	Terrorist	25	Police	$200,000 General Fund, HMA	1 to 2 years

Develop a program to encourage and support business continuity planning for local businesses.	Multi-hazard	20	City Manager	$75,000 HMA, non-Federal sources	2 to 3 years
Identify City-service, mission critical tasks and develop Business Continuity Plans for each service.	Multi-hazard	24	City Manager	$75,000 HMA, non-Federal sources	2 to 3 years
Develop a planning team to work with local school districts and universities to prepare both scenario-based and functional-based plans.	Multi-hazard	25	Fire	$50,000 HMA, non-Federal sources	2 to 3 years
In accordance with the 2011 Water Integrated Resources Plan, develop alternative sources of water to meet Pasadena's annual water demands (non-potable water project).	Multi-hazard	21	Water & Power	$1 million Water & Power Fund, HMA	2 to 3 years
Upgrade the Arroyo Seco stream water intake structure to improve our ability to capture more stream water and to recharge the groundwater basin (Arroyo Seco Project).	Multi-hazard	21	Water & Power	$10 million Water & Power Fund, HMA	2 to 3 years
Implement measures to bolster local water supply to meet demand, create a sustainable water supply, while meeting environmental mandates.	Multi-hazard	23	Water & Power	$10 million Water & Power Fund, HMA	2 to 3 years
Evaluate and implement necessary retrofits and upgrades to the diversion facilities in Arroyo Canyon.	Multi-hazard	20	Water & Power	$10 million Water & Power Fund, HMA	2 to 3 years
Develop and coordinate planning with partners for dispensing of medications or vaccines.	Infectious Disease	21	Health	$250,000 State and Federal Grant Funds, HMA	2 years
Coordinate infection control planning with partners.	Infectious Disease	21	Health	$250,000 State and Federal Grant Funds, HMA	2 years
Upgrade and replace local generator units.	Multi-hazard	20	Water & Power	$20-$25 million Water & Power Fund, HMA	2 to 4 years

Purchase emergency generators at facilities.	Multi-hazard	19	Water & Power	$2 million Water & Power Fund, HMA	1 year
Replace emergency transmission and distribution systems.	Multi-hazard	20	Water & Power	$3 million Water & Power Fund, HMA	5 years
Azusa Hydro upgrades and replacements.	Multi-hazard	17	Water & Power	$10 million Water & Power Fund, HMA	2 to 4 years
Develop a comprehensive plan that recognizes wildfire hazards identifying areas of risk and describing policies and recommendations for addressing the risk including land use and public safety.	Fire	30	Fire Department	$50,000 HMA, other non-Federal sources	1 to 2 years
Improve regulations for safer construction in wildfire very high hazard areas addressing access, signage, fire hydrants, water availability, vegetation management and special building construction standards.	Fire	28	Fire Department	$5,000 HMA, other non-Federal sources	1 year
Develop a program to retrofit at-risk structures in wildfire hazard areas with non-combustible materials and technologies.	Fire	31	Fire Department	$25,000 HMA, other non-Federal sources	1 to 2 years
Implement a fuels management program to reduce hazardous vegetation fuels on public lands, near essential infrastructure and on private lands by working with landowners.	Fire	28	Fire Department	$500,000 HMA, other non-Federal sources	3 to 5 years
Increase wildfire risk awareness by developing education and outreach programs that target citizens, businesses, developers, landscapers, and insurers with strategies to protect homes and infrastructure.	Fire	19	Fire Department	$25,000 HMA, non-Federal sources	1 to 2 years
Develop a comprehensive plan to understand and assess local vulnerability to drought by gathering and analyzing local	Drought	31	Water & Power	$200,000 Water & Power Fund, HMA	1 to 2 years

water and climate data, identifying factors effecting severity of the drought and determining how the community has been impacted in the past.					
Develop a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the public.	Drought	23	Water & Power	$50,000 Water & Power Fund, HMA	1 to 2 years
Design water delivery systems to accommodate drought events and develop new or upgrade existing water delivery systems to eliminate breaks and leaks.	Drought	33	Water & Power	$10 Million Water & Power Fund, HMA	7 to 10 years
Utilize drought tolerant landscape design for all new public buildings and develop a plan to retrofit all existing public buildings with drought tolerant landscape.	Drought	25	Water & Power	$100,000 Water & Power Fund, HMA	1 to 2 years
Develop requirements for wind engineering measures and construction techniques in wind vulnerable areas including structural bracing, straps and clips, anchor bolts, impact resistant glass, reinforced garage doors, window shutters, waterproof adhesive sealing strips or interlocking roof shingles.	Windstorm	15	Water & Power, Public Works	$200,000 Water & Power Fund, HMA	1 to 3 years
Develop data to identify community vulnerability to severe wind.	Windstorm	22	Fire	$5,000 HMA, non-Federal sources	1 to 2 years
Develop a plan to move all power lines in severe wind vulnerable areas underground.	Windstorm	25	Water & Power	$500,000 Water & Power Fund, HMA	3 to 5 years

Retrofit existing residential buildings, public buildings and critical facilities with modifications to reduce future wind damage including improving roof coverings, anchoring roof-mounted utilities, and adding load-path connectors to strengthen structural frames.	Windstorm	28	Water & Power, Public Works	$5 Million Water & Power Fund, HMA	5 to 7 years

7.7 Relevant Governance

The City of Pasadena has many plans, programs and regulations that address disaster management. Some of them (or elements of them) directly relate to hazards, such as the Safety Element of the General Plan, while others focus on different aspects of disaster management such as emergency response (Emergency Operations Plan- EOP). Still others do not focus directly on disaster issues but have implications that are relevant to hazard mitigation, such as plans related to spending on public facilities.

As part of the LHMP planning process, each of these plans, programs, and regulations were reviewed to identify relevant information to be incorporated into the LHMP Update, to identify deficiencies with plans, programs, and regulations, or to understand needed plans, programs, and regulations. The review for deficiencies also included actions to leverage information and findings from the LHMP update into the plans, programs, and regulations. These plans, policies and codes were used to help inform the risk assessment and mitigation actions in the plan.

The City can expand and improve on their plans, programs, and regulations but may have little control over other's plans, programs, and regulations (i.e., NFIP). Whether they have the ability or not to expand/improve, relevant plan, program, or regulation, each was assessed for deficiencies.
Recommended changes or needed plans, programs, and regulations are reflected in the mitigation actions section (Section 7). Below is a list of the relevant plans, programs, and regulations:

7.8 Plans

These plans were used to inform sections of the City's LHMP related to the City's Community Profile, Hazard Assessment, Hazard Profiles and Mitigation Strategies.

- Arroyo Seco Flood Hazard Warning and Contingency Plan (Draft)
- Water Integrated Resources Plan (2011)
- Pasadena Adopted Budget (2018-19)
- Pasadena Adopted Capital Improvement Plan (2018-19)
- Pasadena Climate Action Plan (2017)
- Pasadena Community Access Corporation (Section 26)
- Pasadena Economic Development Task Force Report (2012)
- Pasadena Economic Strategic Plan (2012)
- Pasadena General Plan Land Use Element (2015)

- Pasadena General Plan Safety Element (2002)
- Public Safety Committee Meeting Report of Soft Story Structures (12/4/2017)
- Southern California Association of Governments Profile of City of Pasadena (2017)

7.9 Policies

These policies were used to inform the section of the City's LHMP related to City's capabilities.

- Citywide Media Policy on Emergency Media Relations
- Disaster Service Worker
- Injury and Illness Prevention Program
- Worker's Compensation
- Disaster Emergency Services Council

7.10 Programs

These programs were used to inform sections of the City's LHMP related to hazard mitigation strategies.

- Hazardous Materials Disclosure Program
- Earthquake Hazard Reduction in Existing Unreinforced Masonry
- Excavation and Grading in Hillside Areas
- Fire and Life Safety Protection Systems
- Urban Forestry Program
- Undergrounding Utility Program
- Electric System Conversion Program

NOTE: The City of Pasadena is not a participating member of the NFIP

7.11 Regulations

These programs were used to inform sections of the City's LHMP related to the City's hazard mitigation strategies.

- Regulatory Environment
- California Alquist-Priolo Earthquake Fault Zoning Act (2017)
- California Seismic Hazards Mapping Act (2007)
- Real Estate Disclosure Requirements (2005)
- California Environmental Quality Act (2016)
- California Building Code (2016)
- National Pollutant Discharge Elimination System (NPDES)
- Emergency Planning and Community Right-To-Know Act (EPCRA)
- Comprehensive Environmental Response, Compensation and Liability Act
- Resources Conservation and Recovery Act
- Pasadena Code of Ordinances

7.12 LHMP Integration

The Pasadena Local Hazard Mitigation Plan (LHMP) will be integrated into other city plans such as the City's Capital Improvement Plan (CIP), the General Plan (GP), the Climate Action Plan (CAP) and the Emergency Operations Plan (EOP). In general, the City's Hazard Mitigation Steering Committee should work collaboratively and across disciplines to ensure that, when possible, the development of City plans, policies and regulations integrate hazard mitigation strategies contained in the LHMP. This can be accomplished through monthly meetings and close monitoring of the City's adopted LHMP.

The LHMP will help the City achieve efficiencies, avoid duplication of effort, enhance problem solving and realize cost savings by ensuring that mitigation-planning activities are developed collaboratively with other City plans. The City's CIP, CAP, GP and the LHMP are among some of the plans that contain mitigation actions. Mitigations actions should be discussed and shared among Hazard Mitigation Steering Committee members and community stakeholders. Developing successful hazard mitigation strategies requires a comprehensive approach, inclusiveness among all players and collaboration of all planning efforts.

There are many benefits to the integration of LHMP with City plans the. Some of these include:

- LHMP Hazard Maps can be used in the City's Emergency Operations Plan and assist with EOP hazard analysis, evacuation planning and public education;
- The LHMP Hazard Analysis can be integrated with the Safety Element of the City's General Plan.
- The LHMP may be integrated into the CIP, CAP and GP to help identify other mitigation planning efforts and future trends;
- The LHMP may be integrated the CAP, CIP and the City's Budget to help identify alternate funding sources that are aligned with proposed hazard mitigation actions;

- The LHMP can help the City achieve a favorable rating under the FEMA's Community Rating System (CRS) leading to lower flood insurance premiums for residents.

8 Plan Maintenance

8.1 Review, Evaluation, and Monitoring

As part of the 2013 LHMP Plan Maintenance, the City of Pasadena committed to leveraging, and where possible, incorporating the LHMP information into other plans. Since adoption, the City of Pasadena has leveraged LHMP information to review projects, support permits, substantiate comments on draft plans, and prepare public education outreach information/material. Additionally, while some actions have been taken to incorporate the LHMP into the City's General Plan Safety Element, the information in the 2011 LHMP was not fully incorporated.

The City of Pasadena is committed to review, monitor, and evaluate this plan on a regular basis. The City of Pasadena Fire Department will lead the effort and will be responsible for ensuring that this plan is being monitored over the next five (5) years. The City of Pasadena will leverage existing meetings to review, evaluate, and to discuss progress on the mitigation actions set forth in this plan. While there is not a confirmed meeting schedule, the City of Pasadena Fire Department will ensure that at a minimum there is an annual meeting of the Steering Committee and other interested stakeholders to discuss the LHMP. The first annual meeting will occur one (1) year from the date of FEMA approval. Information obtained from these meetings will be captured by the City of Pasadena Fire Department and made available for the next LHMP update.

In addition to the annual meeting and leveraging other meetings, the City of Pasadena will also ensure that the LHMP is an agenda item during any preparation of any After Action Report for a disaster event occurring within the city. This will provide the city with an opportunity to evaluate the value of any implemented mitigation actions and validate the needs for others.

Similar to the efforts done after approval of the 2013 LHMP, upon adoption, the LHMP will be leveraged and possibly incorporated into the other City of Pasadena plans (i.e., General Plan) and other materials (i.e., building codes/ordinances), and relevant plans and ordinances maintained by the City of Pasadena. This has ensured that past and will ensure that future planning efforts and capital projects are influenced by the findings of this Plan. The LHMP will also be utilized and referenced for the City of Pasadena Emergency Operations Plan update.

The City of Pasadena is also committed to evaluating and updating this plan at least once every five (5) years, as required by the Disaster Mitigation Act of 2000. To ensure that this update occurs in a timely fashion, after completion of the third year following plan adoption, the primary contact for the City of Pasadena will engage the Steering Committee to undertake the following activities:

- Thoroughly analyze and update the risk of natural and human-caused hazards in the Planning Area
- Provide a detailed review and revision of the mitigation strategy
- Prepare a new mitigation action plan
- Prepare an updated draft LHMP and submit it to Cal OES and FEMA for preliminary review
- Submit the updated draft LHMP to the City Council for adoption
- Submit the updated LHMP to FEMA for final approval

The City of Pasadena will ensure the public will continue to be involved whenever the plan is updated and as appropriate during the monitoring and evaluation process. Prior to adoption of updates, the City of Pasadena will provide multiple opportunities for the public to comment on the plan and revisions, as was done during the preparation of this update. A public notice will be published announcing the start of the update process, outlining the public comment period, and identifying meeting locations.

8.2 POINT OF CONTACT

Comments or suggestions regarding this plan may be submitted to:

Jon Trautwein, Deputy Fire Chief
City of Pasadena Fire Department
100 North Garfield, Pasadena, CA 91101

jtrautwein@cityofpasadena.net (email)

(626) 744-4745 (telephone)

APPENDIX A

Adoption forms

- Letter from California State Office of Emergency Services
- Letter from Federal Emergency Management Agency
- FEMA Review Tool
- Pasadena City Council Letter of Adoption

GAVIN NEWSOM
GOVERNOR

MARK S. GHILARDUCCI
DIRECTOR

March 15, 2019

Ms. Juliette Hayes, Mitigation Division Director
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, California 94607

Subject: City of Pasadena Local Hazard Mitigation Plan

Dear Ms. Hayes:

The California Governor's Office of Emergency Services (Cal OES) is forwarding the Local Hazard Mitigation Plan for City of Pasadena for formal review. Enclosed are the plan and CD containing the electronic documents.

If you have any questions, please contact me at (916) 845-8187, or Victoria LaMar-Haas, Senior Emergency Services Coordinator, Mitigation Planning Division, at (916) 845-8135.

Sincerely,

ADAM SUTKUS, Chief
Mitigation Planning Division

Enclosures

c: Jon Trautwein, Deputy Fire Chief, City of Pasadena Fire Department

3650 SCHRIEVER AVENUE, MATHER, CA 95655
(916) 845-8506 TELEPHONE (916) 845-8511 FAX
www.CalOES.ca.gov

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

March 20, 2019

Jon Trautwein
Deputy Fire Chief
Pasadena Fire Department
100 North Garfield Avenue
Pasadena, California 91101

Dear Mr. Trautwein:

We have completed our review of the *City of Pasadena Local Hazard Mitigation Plan* and have determined that this plan is eligible for final approval pending its adoption by the City of Pasadena.

Formal adoption documentation must be submitted to the FEMA Region IX office by the jurisdiction within one calendar year of the date of this letter, or the entire plan must be updated and resubmitted for review. We will approve the plan upon receipt of the documentation of formal adoption.

If you have any questions regarding the planning or review processes, please contact the FEMA Region IX Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

Juliette Hayes
Director
Mitigation Division
FEMA, Region IX

Enclosure

cc: Julie Norris, Mitigation and Dam Safety Branch Chief, California Governor's Office of Emergency Services
Jennifer Hogan, State Hazard Mitigation Officer, California Governor's Office of Emergency Services

REGION IX LOCAL HAZARD MITIGATION PLAN REVIEW TOOL

The *Local Hazard Mitigation Plan Review Tool* demonstrates how the Local Hazard Mitigation Plan meets the regulation in 44 CFR §201.6 and offers State and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The **Regulation Checklist** provides a summary of FEMA's evaluation of whether the plan has addressed all requirements.
- The **Plan Assessment** identifies the plan's strengths as well as documents areas for future improvement. This section also includes a list of resources for implementation of the plan.
- The **Multi-Jurisdiction Summary Sheet** is a mandatory worksheet for multi-jurisdictional plans that is used to document which jurisdictions are eligible to adopt the plan.
- The **Hazard Identification and Risk Assessment Matrix** is a tool for plan reviewers to identify if all components of Element B are met.

Jurisdiction: City of Pasadena	**Title of Plan:** City of Pasadena Local Hazard Mitigation Plan	**Date of Plan:** September 2018 March 2019 (Resubmission)
Local Point of Contact: Jon Trautwein	**Address:** 100 North Garfield Avenue Pasadena, California 91101	
Title: Deputy Fire Chief		
Agency: Pasadena Fire Department		
Phone Number: 626-744-4745	**E-Mail:** jtrautwein@cityofpasadena.net	

State Reviewer:	**Title:**	**Date:**
Wendy Boemecke Wendy.bomecke@caloes.ca.gov 916-926-9878	Emergency Services Coordinator	October 2018
Victoria LaMar-Haas Victoria.lamar-haas@caloes.ca.gov	Senior Emergency Services Coordinator	January 2019
Date Received at State Agency		
Date Sent to FEMA	March 15, 2019	

FEMA Reviewer:	**Title:**	**Date:**
Jesse Carpentier	Community Planner	March 18, 2019
Date Received in FEMA Region IX	March 15, 2019	
Date Not Approved		
Date Approvable Pending Adoption	March 20, 2019	
Date Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in the *Local Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS				
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	a. Does the plan provide documentation of how the plan was prepared? This documentation must include the schedule or timeframe and activities that made up the plan's development as well as who was involved.	Section 3 Appendix B	**X**	
	b. Does the plan list the jurisdiction(s) participating in the plan that are seeking approval?	Section 1	X	
	c. Does the plan identify who represented each jurisdiction? (At a minimum, it must identify the jurisdiction represented and the person's position or title and agency within the jurisdiction.)	Section 3.2.2	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	a. Does the plan document an opportunity for neighboring communities, local, and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, as well as other interested parties to be involved in the planning process?	Section 3 Appendix C	X	
	b. Does the plan identify how the stakeholders were invited to participate in the process?	Appendix C	X	
A3. Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	a. Does the plan document how the public was given the opportunity to be involved in the planning process?	Section 3.3	X	
	b. Does the plan document how the public's feedback was incorporated into the plan?	None received	N/A	
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))		Section 7.7-7.11	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))		Section 3.3.2, 8.1	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	a. Does the plan identify how, when, and by whom the plan will be **monitored** (how will implementation be tracked) over time?	Section 8	X	
	b. Does the plan identify how, when, and by whom the plan will be **evaluated** (assessing the effectiveness of the plan at achieving stated purpose and goals) over time?	Section 8	X	
	c. Does the plan identify how, when, and by whom the plan will be **updated** during the 5-year cycle?	Section 8	X	
ELEMENT A: REQUIRED REVISIONS				
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT (Reviewer: See Section 4 for assistance with Element B)				
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect each	a. Does the plan include a general description of all natural hazards that can affect each jurisdiction?	Section 5	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
jurisdiction(s)? (Requirement §201.6(c)(2)(i))	b. Does the plan provide rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	Section 5	X	
	c. Does the plan include a description of the **type** of all natural hazards that can affect each jurisdiction?	Section 5.4	X	
	d. Does the plan include a description of the **location** for all natural hazards that can affect each jurisdiction?	Section 5.4	X	
	e. Does the plan include a description of the **extent** for all natural hazards that can affect each jurisdiction?	Section 5.4	X	
B2. Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	a. Does the plan include information on **previous occurrences** of hazard events for each jurisdiction?	Section 5.4	X	
	b. Does the plan include information on the **probability** of future hazard events for each jurisdiction?	Section 5.4	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	a. Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)?	Section 6	X	
	b. Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction?	Section 6	X	
B4. Does the plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))		Section 6.4.9	X	
ELEMENT B: REQUIRED REVISIONS				

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
ELEMENT C. MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	a. Does the plan document each jurisdiction's existing authorities, policies, programs and resources?	Section 4.3, 7.7-7.12	X	
	b. Does the plan document each jurisdiction's ability to expand on and improve these existing policies and programs?	Section 4.3, 7.7-7.12	X	
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))		Section 6.4.9	X	
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))		Section 7.2	X	
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	a. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts from hazards?	Section 7.3, 7.6	X	
	b. Does the plan identify mitigation actions for every hazard posing a threat to each participating jurisdiction?	Section 7.3, 7.6	X	
	c. Do the identified mitigation actions and projects have an emphasis on new and existing buildings and infrastructure?	Section 7.6	X	
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	a. Does the plan explain how the mitigation actions will be prioritized (including cost benefit review)?	Section 7.4	X	
	b. Does the plan identify the position, office, department, or agency responsible for implementing and administering the action, potential funding sources and expected timeframes for completion?	Section 7.6	X	
C6. Does the plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement	a. Does the plan identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated?	Section 3.1, 4.4.2, 7.1, 7.5, 7.12	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
plans, when appropriate? (Requirement §201.6(c)(4)(ii))	b. Does the plan describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms?	Section 3.1, 4.3.2, 7.1, 7.5, 7.12	X	
	c. The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts.	Section 7.3, 8	~~X~~	
ELEMENT C: REQUIRED REVISIONS				
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (Applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))		Section 4.2.13	~~X~~	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))		Section 7.3	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))		Section 7.2	X	
ELEMENT D: REQUIRED REVISIONS				
ELEMENT E. PLAN ADOPTION				
E1. Does the plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))		Pending APA status		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))		NA		
ELEMENT E: REQUIRED REVISIONS				
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (Optional for State Reviewers only; not to be completed by FEMA)				
F1.				
F2.				
ELEMENT F: REQUIRED REVISIONS				

SECTION 2:
PLAN ASSESSMENT

Element A: Planning Process

Strengths:

1) Issuing a press release about the LHMP to the community and holding multiple public meetings.

2) The planning process is well-documented.

3) The steering committee represents a wide variety of interests and expertise.

Opportunities for Improvement:
1) Although it is entirely up to the City, we do not encourage including the addresses of every critical facility for the publicly accessible version of the LHMP.

2) Attendance might have been low at the meetings because there was not enough targeted outreach. We encourage reaching out to community organizations who represent vulnerable communities and related interests, so they can share information about upcoming meetings or opportunities for input with their constituents.

Element B: Hazard Identification and Risk Assessment

Strengths:
1) The hazard assessment is clear and consistently organized throughout.

2) The plan does a really good job of capturing the history of most of the identified hazards.

3) The climate change discussion in each hazard profile is excellent and will help the community understand how risk will evolve in the future.

Opportunities for Improvement:
1) While it is useful to understand exposure of assets, it is also important to assess and consider the characteristics of structures and people that make them vulnerable to the identified hazards.

2) Similarly, we encourage doing a social vulnerability assessment in future updates. What sectors of the population are more vulnerable to each hazard, and why? How can the mitigation strategy support the resilience of those specific communities?

3) Although it makes sense to do an initial hazard ranking so that resources can be attributed appropriately to the analysis and writing that goes into each section, I recommend doing a hazard priority ranking that considers the risk and vulnerability assessment as well. In other words, the community's ranking of hazards might be more accurate if supported by the research and analysis done for the risk and vulnerability assessments.

4) I would like to see more detail on the impacts of drought on the City of Pasadena. Are there specific demographics or economic sectors affected by drought conditions?

Element C: Mitigation Strategy

Strengths:

1) It is great that the plan uses the STAPLEE evaluation criteria to prioritize mitigation actions.

2) It is good to see that effort was made into estimating costs of the actions.

3) The plan has a wide variety of mitigation measures that leverage existing capabilities.

4) Detailed capabilities assessment and discussion of plan integration. This is very important for a successful plan, as it helps the planning team identify the tools it can use, as well as the gaps that can be addressed by the mitigation strategy.

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

Strengths:

1) Detailed discussion of population and land use trends that may impact vulnerability.

2) Clear and useful table illustrating progress in mitigation actions from the previous plan.

Opportunities for Improvement:

1) Table 7-10 lists all but one action as "ongoing" – it would be helpful if this was defined better. Does ongoing mean partially complete, or does it indicate a continued process that does not have an end? If the latter, indicate whether the identified process has been established or not.

2) It would also be useful to see more evaluation of the existing actions. Has implementation been successful? Why or why not? Have any of these projects or processes been tested by a hazard event? Did they succeed in reducing impacts to the community?

B. Resources for Implementing and Updating Your Approved Plan ic

This resource section is organized into three categories:

1) Guidance and Resources
2) Training Topics and Courses
3) Funding Sources

Guidance and Resources

Local Mitigation Planning Handbook
https://www.fema.gov/media-library/assets/documents/31598
Beyond the Basics
http://mitigationguide.org/
Mitigation Ideas
https://www.fema.gov/media-library/assets/documents/30627
Plan Integration: Linking Local Planning Efforts
https://www.fema.gov/media-library/assets/documents/108893
Integrating Disaster Data into Hazard Mitigation Planning
https://www.fema.gov/media-library/assets/documents/103486
Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning
https://www.fema.gov/ar/media-library/assets/documents/4317
Community Rating System User Manual
https://www.fema.gov/media-library/assets/documents/8768
U.S. Climate Resilient Toolkit
https://toolkit.climate.gov/
2014 National Climate Assessment
http://nca2014.globalchange.gov/
Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
http://ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf
FY15 Hazard Mitigation Assistance Unified Guidance
https://www.fema.gov/media-library/assets/documents/103279
Climate Resilient Mitigation Activities for Hazard Mitigation Assistance
https://www.fema.gov/media-library/assets/documents/110202

Training

More information at https://training.fema.gov/emi.aspx or through your State Training Officer

Mitigation Planning
IS-318 Mitigation Planning for Local and Tribal Communities
https://training.fema.gov/is/courseoverview.aspx?code=is-318
IS-393 Introduction to Hazard Mitigation
https://training.fema.gov/is/courseoverview.aspx?code=is-393.a
G-318 Preparing and Reviewing Local Plans
G-393 Mitigation for Emergency Managers
Hazard Mitigation Assistance (HMA) Grant Programs

IS-212.b Introduction to Unified HMA
http://www.training.fema.gov/is/courseoverview.aspx?code=IS-212.b
IS-277 Benefit Cost Analysis Entry Level
http://www.training.fema.gov/is/courseoverview.aspx?code=IS-277
E-212 HMA: Developing Quality Application Elements
E-213 HMA: Application Review and Evaluation
E-214 HMA: Project Implementation and Programmatic Closeout
E-276 Benefit-Cost Analysis Entry Level

GIS and Hazus-MH

IS-922 Application of GIS for Emergency Management
http://www.training.fema.gov/is/courseoverview.aspx?code=IS-922
E-190 ArcGIS for Emergency Managers
E-296 Application of Hazus-MH for Risk Assessment
E-313 Basic Hazus-MH

Floodplain Management

E-273 Managing Floodplain Development through the NFIP
E-278 National Flood Insurance Program/ Community Rating System

Potential Funding Sources

Hazard Mitigation Grant Program

POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/hazard-mitigation-grant-program

Pre-Disaster Mitigation Grant Program

POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/pre-disaster-mitigation-grant-program

Flood Mitigation Assistance Grant Program

POC: FEMA Region IX and State Hazard Mitigation Officer
Website: https://www.fema.gov/flood-mitigation-assistance-grant-program

Emergency Management Performance Grant Program

POC: FEMA Region IX
Website: https://www.fema.gov/emergency-management-performance-grant-program

SECTION 3:
MULTI-JURISDICTIONAL SUMMARY SHEET

INSTRUCTIONS: For multi-jurisdictional plans, this summary sheet must be completed by listing each participating jurisdiction that is eligible to adopt the plan.

MULTI-JURISDICTION SUMMARY SHEET					
#	**Jurisdiction Name**	**Jurisdiction Type**	**Eligible to Adopt the Plan?**	**Plan POC**	**Email**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

SECTION 4:
HAZARD IDENTIFICATION AND RISK ASSESSMENT MATRIX (OPTIONAL)

INSTRUCTIONS: This matrix can be used by the plan reviewer to help identify if all of the components of Element B have been met. List out natural hazard names that are identified in the plan in the column labeled "Hazards" and put a "Y" or "N" for each component of Element B.

HAZARD IDENTIFICATION AND RISK ASSESSMENT MATRIX								
Hazard	**Requirement Met? (Y/N)**							
	Type	**Location**	**Extent**	**Previous Occurrences**	**Probability**	**Impacts**	**Vulnerability**	**Mitigation Action**
Earthquake*	Y	Y	Y	Y	Y	Y	Y	Y
Wildfire*	Y	Y	Y	Y	Y	Y	Y	Y
Drought*	Y	Y	Y	Y	Y	N	Y	Y
Windstorm*	Y	Y	Y	Y	Y	Y	Y	Y
Flood	Y	Y	Y	Y	Y	Y	N	
Landslide and other Earth Movement	Y	Y	N	Y	Y	Y	Y	
Extreme Heat	Y	Y	Y	Y	Y	Y	N	
Hailstorm	Y	Y	Y	Y	Y	Y	N	
*Top hazards; require mitigation measure								

Placeholder: Insert Pasadena City Council Letter of Adoption

APPENDIX B

Steering Committee Presentations

NAME	ORGANIZATION	DEPARTMENT							
									AUG 2018
Adrienne Kung	City of Pasadena	Health		X		X		X	X
Alex Souto	City of Pasadena	HR		X	X		X		
Ana Espanola	City of Pasadena	Planning	X						
Anita Cerna	City of Pasadena	Planning	X		X				
Art Silva	City of Pasadena	Water & Power	X						
Bertral Washington	City of Pasadena	Fire			X				
Bob Ridley	City of Pasadena	Finance	X	X	X		X		X
Brad Boman	City of Pasadena	Water & Power			X	X			
Burhan Ashanti	City of Pasadena	Water & Power							
Carlos Baffigo	City of Pasadena	Library	X						X
Carolyn Gordon	City of Pasadena	Police		X	X				
Dan Augustyn	City of Pasadena	DOIT		X			X	X	X
Denise Guerrero	City of Pasadena	Library	X	X	X	X			X
Ed Calatayud	City of Pasadena	Police	X						
Erika Estrada	City of Pasadena	Finance-Purchasing	X	X	X				
Hayden Melbourn	City of Pasadena	Public Works							
Heather Peron	City of Pasadena	Pasadena Center		X	X	X		X	
Henry Frometa	City of Pasadena	HR		X					X
Horace Wormerly	City of Pasadena	HSRD		X	X		X		
Israel Del Toro	City of Pasadena	Planning	X						
James Tong	City of Pasadena	Public Works, Engineering				X	X	X	
Jan Hamblen	City of Pasadena	DOT							
Jason Niccoli	City of Pasadena	PWP				X			
Jenessa Wendland	City of Pasadena	RBOC				X			
Jennifer Curtis	City of Pasadena	Human Resources	X			X			
Joaquin Siques	City of Pasadena	Transportation	X		X		X		
Jon Trautwein	City of Pasadena	Fire					X	X	
Julie Gutierrez	City of Pasadena	City Manager	X	X	X			X	
Kenny James	City of Pasadena	HSRD			X			X	
Kris Markarian	City of Pasadena	PW			X				
Lisa Derderian	City of Pasadena	Fire	X	X	X	X			
Mandy Templeton	City of Pasadena	PW			X				
Michael Johnson	City of Pasadena	Health	X						
Mona Tse	City of Pasadena	Public Works Engineering						X	
Norman Lara	City of Pasadena	Water & Power			X	X			
Phil Tong	City of Pasadena	Transportation		X					
Richard Yee	City of Pasadena	Public Works, Engineering							
Robert Monzon	City of Pasadena	City Clerk	X	X					
Roger Roldan	City of Pasadena	Police			X				
Ruben Martinez	City of Pasadena	City Clerk			X				
Sarkis Nazgrian	City of Pasadena	Planning				X			
Shari Thomas	City of Pasadena	PWP			X			X	
Tim McDonald	City of Pasadena	Library							
Tunji Adedeji	City of Pasadena	PWP		X			X		

City of Pasadena

Hazard Mitigation Plan Update

3.4 Steering Committee Kickoff Meeting

October 2017

Agenda

- Introductions
- Purpose of the Meeting
- Goal of the Project
- Objective of Hazard Mitigation Plans (HMPs)
- Update Requirements
- Available Resources
- Role of the Steering Committee
  - *Role of Consultant*
- Proposed HMP Update Methodology
- Initial Review of the Pasadena HMP
- Next Steps
- Questions

Introductions

- Steering Committee
  - *Lead*
  - *Others*
- Consultant team

Purpose of the Meeting

- Gain understanding of HMP effort
  - What needs to be done
  - Why it needs to be done
  - When it needs to be done
- Agree on HMP update process
  - How will it be done
  - Who is responsible
- Start the review/update process
- Set expectations for next meeting

Goals of the Project

- Update the HMP
  - Updated every 5 years to remain eligible to receive Hazard Mitigation Assistance grants
  - Last approved in 2013
- Ensure regional coordination
- Encourage regional mitigation strategies
- Provide technical assistance
- Provide a catalyst for implementation

Objective of HMPs

- Utilize a comprehensive approach
  - Multi hazards
  - Engage the public and others
- Understand capabilities and vulnerabilities
- Identify projects and actions
- Integrated with other planning efforts
- Meet eligibility requirements to receive HMA grants

Update Requirements

- OES reviews
- FEMA approves
- Locals adopts

What are they looking for……

- Proper documentation of planning process (Element A)
- Current community, hazard, and impact information (Element B)
- Validation/Identification of projects and actions (Element C)
- Method for plan review (updating) and implementation (Element D)
- Verification plan was adopted (Element E)

Handout FEMA Review Tool

Available Resources

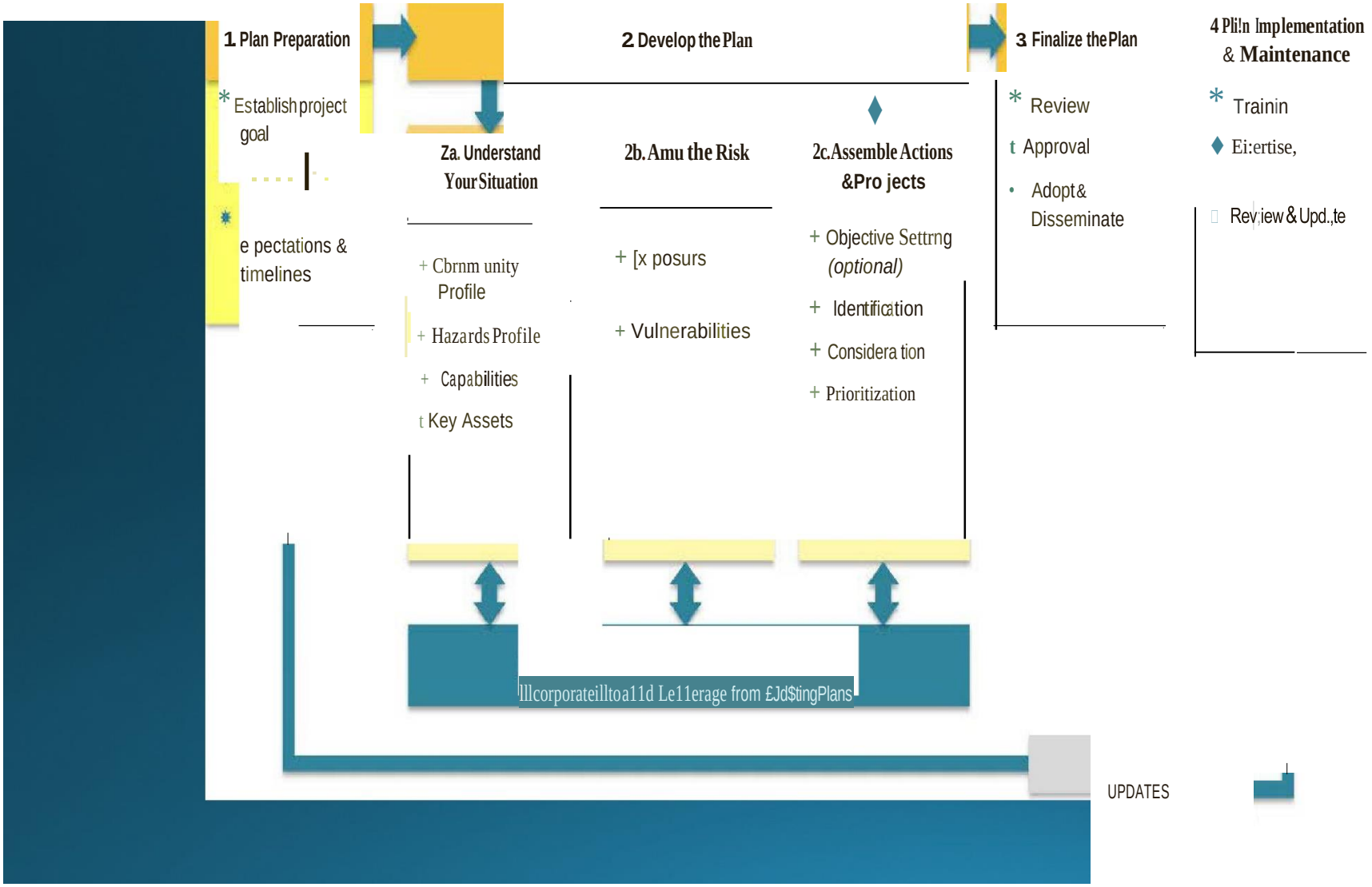
- Guides
  - Local Mitigation Plan Review Guide
  - Multi Hazard Mitigation Planning Guides (Blue Books)
    - Local Mitigation Handbook
    - Mitigation Ideas
  - Comprehensive Preparedness Guide (CPG) 101
  - General Plan Guidelines
  - Climate Adaptation
- Plans
  - Local General Plan and specific plans
  - Other Local plans
  - California State HMP
  - Los Angeles County HMP
  - Surrounding cities HMP
  - Safeguarding California Plan
- Websites

Role of the Steering Committee

- Validate approach
- Provide information
- Primary liaison with community and stakeholders
  - Promote public participation
- Collaborate with other Steering Committee members
- Update and review sections
- Address Federal/State comments
- Oversee the adoption of the plan

- Consultant focused on:
  - Documentation of planning process
  - Hazard profiles and vulnerabilities
  - Mitigation projects and actions
  - Technical support/reviewing updates
  - Working with Federal and State counterparts

Proposed Update Methodology



Proposed Update Methodology (*cont*)

- Steering Committee meetings to update HMP
  - Kickoff (1 meeting)
  - Capabilities (1 meeting)
  - Risk Assessment (1 2 meetings)
  - Actions and Projects (1 2 meetings)
  - Review final draft plan (1 meeting)
- Public Outreach Efforts
  - Project kickoff (1 meeting)
  - Draft plan (1 meeting)

Handout Draft timeline

Initial Review of the Pasadena HMP

HMP structure

- Reduce size; make more user-friendly
- Possibly create Annexes or Volumes
- Slight reorganize the plan
  - Reduce and/or eliminate Executive Summary
  - Expand Community Profile to include other aspects
  - Divide Risk Assessment into two (2) chapters Hazard Assessments and Vulnerability Assessment (Loss Estimation)
  - Move Asset Inventory from Risk Assessment
  - Move Capability Assessment from Hazard Goals and Action Items

Handout draft TOC

Initial Review of the Pasadena HMP (cont)

Planning Process

- Agreement on proposed process
- Validate target dates
- Identify missing team members
- Need to reach out to public
  - Press Release of update process

Initial Review of the Pasadena HMP (cont)

Community Profile

- Restructure section
  - Increase area profile to include other areas economy, climate, physical features
  - New section on Administrative and Technical Capacity government structure, role of departments
  - Move Capability Assessment into this section
  - Move Asset Inventory into this section
  - New section on Fiscal Resources
- Need to update/validate Asset Inventory list
- Need information on:
  - governmental structure/role of departments in mitigation
  - fiscal resources
- Need maps and/or graphics

Next Steps

- Start collecting list of hazard event information since 2013
- Submit relevant material and plans
  - Planning Process
  - Community Profile
- Engage the public
- Prepare for next Steering Committee meeting
  - Review Draft sections
  - Initial Discussion of Hazards

Questions

- Lisa Derderian
  - (818) 744 7276
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294 5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844 1720
  - Laurah@soteriaem.com

City of Pasadena

Hazard Mitigation Plan Update

3.5 Steering Committee Meeting

Planning Meeting #2

Thursday, November 16, 2017

Agenda

- Roll Call
- Call for Questions or Additional Agenda Items
- Recap of Meeting #1
- Discussion Topics for Meeting #2
- Next Steps
- Questions

Recap of Meeting #1

- Goal of the project
- HMPs and Update requirements
- Available resources
- Role of the Steering Committee
- Proposed HMP update planning process (phases)
- HMP format reorganization

Discussion Topics for Meeting #2

- Draft Section 1 and 2 (*distributed via email*)
- Draft Section 3- Planning Process (*distributed via email*)
- Section 4- Capability Assessment
- State hazards (*distributed via email*)
- Confirm target date for Public Outreach meeting #1

Section 1 and 2
Introduction / Authority

- General Information
- Provides background on rationale behind mitigation planning

Section 3
Planning Process

- Plan update process we will follow
- Who was involved
- How was it accomplished
- What was achieved
- Must meet Element A requirements

Section 4
Capability Assessment

- Reorganizing; new structure
- Purpose
  - Provide overview of area
  - Provide summary of resources
- Information gaps
  - Sources
  - Economic
  - Key Assets/Infrastructure
  - Committee Recommendations

State Hazards

- California 2013 SHMP identified 31 hazards
- Must include all hazards existing in city or may have significant impact on city
- Focus should be on natural hazards
- May include manmade and technological hazards

Public Outreach Objectives

- Introduce the HMP update process
- Get feedback on hazards in the community
- Encourage participation
- Must meet requirements of Element A

Next Steps

- Provide comments and revisions to consultant
  - Draft Table of Content
  - Draft Section 3 Planning Process
- Provide Input for draft Section 4 Capabilities Assessment
  - Review Draft Section 4 prior to Meeting #3
- Provide updated hazard events/impacts
- Start planning for Public Outreach meeting #1

Questions

- Lisa Derderian
  - (818) 744-7276
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

CITY OF PASADENA

Hazard Mitigation Plan Update

Steering Committee Meeting

Planning Meeting #3

Thursday, January 18, 2018

Agenda - Meeting #3

- Roll Call
- Call for Questions or Additional Agenda Items
- Recap of Meeting #2
- Discussion Topics for Meeting #3
- Next Steps
- Questions

Recap of Meeting #2

- Draft Section 1 and 2 (*distributed via email*)
- Draft Section 3- Planning Process (*distributed via email*)
- Section 4- Capability Assessment (Introduced)
- State hazards (*distributed via email*)
- Confirm target date for Public Outreach meeting #1 (Public Safety Meeting – L. Derderian)

Discussion Topics for Today

- Overview of Capabilities Assessment – Remaining Gaps
- Hazard Assessment and Prioritization
- Public Outreach Objectives
  - Newspaper
  - Public Safety Meeting
  - Information Sheet for City Council Offices

Overview of Capabilities Assessment and Gaps

Objective:

Document authorities, policies, programs, staff, funding and other resources to accomplish mitigation strategies that reduce long term vulnerability.

May include existing plans, reports, programs, resources, regulations, City procedures and practices

Primary Types of Capabilities (Current):

- Planning and Regulatory – Need Current
- Administrative and Technical – General Description of City Functions
- Financial – Budget, Capital Improvement Plan, Economic Strategic Plan
- Education and Outreach – Programs

Must relate to the reduction of disaster losses and or used to reduce future losses.

Screening and Priority of Hazards

- Identified approximately 23 of 31 California hazards
- See Hand-Out of revised list of hazards
- Determining probability and potential for impact

Public Outreach Objectives

- Public Safety Meeting
- Newspaper
- Website
- Introduce the HMP update process
  - Get feedback on hazards in the community
  - Encourage participation
  - Must meet requirements of Element A

Next Steps

- Provide comments and revisions to consultant
  - Draft Section 4 - Capabilities Assessment
- Set date and venue for Public Outreach meeting #1
- Next Meeting February 15, 2018

Questions

- Lisa Derderian
  - (818) *744-7276*
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

CITY OF PASADENA

Hazard Mitigation Plan Update

Steering Committee Meeting
Planning Meeting #4
Thursday, February 22, 2018

Agenda - Meeting #4

- Sign- In
- Call for Questions or Additional Agenda Items
- Recap of Meeting #3
- Discussion Topics for Meeting #4
- Next Steps
- Questions

Recap of Meeting #3

- Draft Section 1 and 2 (*distributed via email*)
- Draft Section 3- Planning Process (*distributed via email*)
- Section 4- Capability Assessment (Introduced)
- Prioritization of hazards (*distributed via email*)
- Hazard Assessment (*distributed via email*)

Discussion Topics for Today

- Hazard Assessment and Prioritization
- Gaps and Needs
- Public Outreach Objectives
  - Newspaper
  - Public Safety Meeting
  - Information Sheet for City Council Offices
- Next Steps

Hazard Assessment & Prioritization

- Discussion on Draft Section 5 – Hazard Assessment
- Review Hazards
- Review Prioritization
- Discussion on Vulnerability Assessment

	High Impact	Medium Impact	Low Impact
High Probability	• Earthquake • Wildfire • Terrorism • Cyber Threat • Drought/Water Shortage • Civil Disturbance • Windstorm • Infectious Disease	• Agricultural Pest and Disease	
Medium Probability	• Energy Shortage/Outage	• Flood • Extreme Heat • Train Accident • Hazardous Material Release	• Landslide and other Earth Movement
Low Probability	• Aircraft Crash	• Dam Failure • Radiological Incident • Air Pollution • Natural Gas Pipeline/Storage Failure	• Hailstorm • Oil Spill

Gaps and Needs

1. Graphic Support
2. Budget Information
3. City Policies and Programs for Section 4
4. Other?

Next Steps

Public Outreach meeting #1 – March 21, 2018 at 6 pm.

Meeting Location:

100 N. Garfield Avenue
Pasadena City Hall
Council Chamber S249

- Next Meeting 0830 Hours March 22, 2018

Virtual Meeting

Questions

- Lisa Derderian
  - (818) *744-7276*
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

CITY OF PASADENA

Hazard Mitigation Plan Update

Steering Committee Meeting
Planning Meeting #5
Thursday, June 21, 2018

1

Agenda - Meeting #5

- Sign- In
- Call for Questions or Additional Agenda Items
- LHMP Status
- Discussion Topics for Meeting #5
- Next Steps
- Questions

2

LHMP Status

- Section 1 Introduction – Distributed via email
- Section 2 Plan Purpose and Authority- Distributed via email
- Section 3 Planning Process - Distributed via email
- Section 4 Capability Assessment -Introduced
- Section 5 Hazards Assessment - Distributed via email
- Section 6 Vulnerability Assessment – Today's Hand-Out
- Section 7 Mitigation Strategy – Today's Handout
- Section 8 Plan Maintenance - Next Step

3

Discussion Topics for Today

1. Comments on Section 6 - Vulnerability Assessment (emailed)
2. Section 7- Mitigation Strategy Discussion (See HandOut)
3. Gaps and Needs

Gaps and Needs

1. Critical Facilities List – Content Value

   Fire HQ - Content Value
2. Critical Asset Wildfire Exposure
3. City's pandemic influenza disease response plan (See 6.4.6 and 6.4.7 Page 6-9)
4. History of past events (Northridge and Fires?)

5

Next Steps

Public Outreach meeting #1 – TBD

Meeting Location:

100 N. Garfield Avenue
Pasadena City Hall
Council Chamber S249

- Next Meeting 0830 Hours July 19, 2018

Virtual Meeting

Questions

- Lisa Derderian
  - (818) 744-7276
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

CITY OF PASADENA

Hazard Mitigation Plan Update

Steering Committee Meeting

Planning Meeting #6

Thursday, July 19, 2018

Agenda - Meeting #6

- Sign- In/Roll Call
- Call for Additional Agenda Items or Questions
- LHMP Update Status
- Discussion Topics for Today
- Next Steps
- Questions

LHMP Update Status

- Section 1 Introduction – Distributed
- Section 2 Plan Purpose and Authority- Distributed
- Section 3 Planning Process - Distributed
- Section 4 Capability Assessment -Introduced
- Section 5 Hazards Assessment - Distributed
- Section 6 Vulnerability Assessment – Distributed
- Section 7 Mitigation Strategy – Distributed
- Section 8 Plan Maintenance - Next Step
  - *First Public Outreach meeting was conducted last night*

Discussion Topics for Today

1. Gaps and Needs
2. Projects

Section Review: Gaps and Needs

1. Section 4 – Capability Assessment (Sent via e-mail)
   a) Are we missing any Critical Facilities? See excel doc.
   b) Roles in Mitigation. Do you agree?
   c) Policies – Are the policies for each department listed accurately?
   d) Grants – Are all grants identified and listed accurately?
2. Section 5 - Hazard Assessment (Sent via-email)
   a) Do you agree with prioritization? Page 5-3
   b) Do you agree with description of hazard? Pages 5-3
   c) Are we missing any historic past events? See Pages 5-24, 28, 37, 43, 55, 56, 59, 60, 61
3. Section 6 – Vulnerability Assessment (sent via e-mail)
   a) Do you have Content Value and Replacement Costs of Critical Facilities? See excel doc.
   b) Do you have damage estimates from past historic events? Page 6-2,6-6, 6-9
4. Section 7 – Status on Projects (sent via e-mail)
   a) Do you have an information on past projects?
   b) What is current status?

Projects

Next Steps

- **Data and Comment Collection**
  - Need input from team
  - Revise LHMP sections
  - Projects
- Next Meeting 0830 Hours August 19, 2018
  - May be virtual meeting

Questions

- Lisa Derderian
  - (818) *744-7276*
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

CITY OF PASADENA

Hazard Mitigation Plan Update

Steering Committee Meeting

Planning Meeting #7

Thursday, August 23, 2018

Agenda

- Sign- In/Roll Call
- Call for Questions or Additional Agenda Items
- Comments on Sections 1-6
- Discuss Section 7- Mitigation Strategies
- Next Steps
- Questions

Comments on LHMP Sections

- Section 1 Introduction
- Section 2 Plan Purpose and Authority
- Section 3 Planning Process
- Section 4 Capability Assessment
- Section 5 Hazards Assessment
- Section 6 Vulnerability Assessment

Validate: Plans, Disaster History and Impact, Critical Facilities

Section 7- Mitigation Strategies

A. Review Previous Projects

B. Review Capabilities and Vulnerabilities

C. Identify New Projects

D. Prioritize New Projects

E. Project Implementation Plan

Section 7A- Previous Projects

- List of Previous Projects Previously Disseminated- *Section 7*
- Need to Know Projects that are:
  - complete
  - underway/planned
  - no longer needed
- Any Project NOT in an Above Category Assumed Needed
  - "underway/planned" and "needed" projects will carry over into the LHMP update

Section 7B- Capabilities and Vulnerabilities

- Look at Capabilities/Vulnerabilities for each Priority Hazard

- Earthquake
  - 290 injuries; 2 with hospital stay, 1 death
  - 623 displaced households; 200 requiring shelter
- Wildfire
- Terrorism
- Cyber
- Drought/Water Shortage Threat

Section 7B- Capabilities and Vulnerabilities

- Civil Disturbance
- Windstorm
- Infectious Disease
- Energy Shortage/Outage
- Agricultural Pest/Disease

Section 7C- New Projects

- Must look at previous projects
- Consideration should be given to:
  - Vulnerability to/ impacts from “high priority” hazards
  - Current capabilities (staffing, resources, plans, policies, programs)
- Must have project for every priority hazard
- Can reference /leverage:
  - Surrounding area LHMPs (LA City, San Marino, South Pasadena)
  - Reference State HMP
  - FEMA Mitigation Idea Guide
  - CFR 44
- *New*: Fire Station/PW Building Retrofit(s)

Section 7D- Prioritize New Projects

- No set method
  - FEMA introduces STAPLEE in guidance material
- Uses STAPLEE last time but did not prioritize
- Suggest applying 1-5 scoring
  - 5 favorable/beneficial - 1 unfavorable/not beneficial
  - Higher score; easier to implement/fewer challenges
  - Use equal weighting; unless otherwise
- STAPLEE questions in Section 7

Section 7E- Project Implementation Plan

- Identify the Goal, Objective, and Hazard project addresses
- Identify Participating Jurisdiction
- Identify Responsible Agencies/Departments
- Estimate Cost
- Potential Funding Source
- Projected Timeframe for Completion Plan

Next Steps

- Create List of New Projects
  - Prioritize
  - Implementation Plan
- Create Administrative Draft of LHMP
- Prepare for 2nd Public Outreach meeting

Questions

- Chief Jon Trautwein
  - (626) 744-4745
  - jtrautwein@cityofpasadena.net
- Lisa Derderian
  - (626) 744-7276
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

APPENDIX C

Public Outreach Efforts

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AGENDA
PUBLIC SAFETY COMMITTEE
MAY 16, 2018

MEMBERS
John J. Kennedy, Vice Mayor, District 3
Terry Tornek, Mayor
Tyron Hampton, District 1
Steve Madison, District 6

STAFF
Steve Mermell, City Manager
Valerie Flores, Recording Secretary

MISSION STATEMENT
The City of Pasadena is dedicated to delivering exemplary municipal services, responsive to our entire community and consistent with our history, culture and unique character.

In compliance with the Americans with Disabilities Act of 1990, Assistive Listening Devices are available from the City Clerk's Office with a 24-hour advance notice. Please call (626) 744-4124 to request use of a listening device.

Language translation services are available for this meeting by calling (626) 744-4124 at least 24 hours in advance. Habrá servicio de interpretación disponible para éstas juntas llamando al (626) 744-4124 por lo menos con 24 horas de anticipación.

Public meeting begins at 6:00 p.m.
Items on the agenda may not be called in order listed.

Agendas and supporting documents are available on the Internet at http://ww5.cityofpasadena.net/commissions/city-council-public-safety-committee/

*Materials related to an item on this Agenda submitted to the Public Safety Committee **after** distribution of the agenda packet are available for public inspection in the City Clerk's Office at 100 N. Garfield Avenue, Room S-228, Pasadena, during normal business hours.*

CITY OF PASADENA
NOTICE OF REGULAR MEETING
OF THE PUBLIC SAFETY COMMITTEE
WEDNESDAY, MAY 16, 2018
PASADENA CITY HALL
100 NORTH GARFIELD AVENUE
CITY HALL COUNCIL CHAMBER – S249

NOTICE IS HEREBY GIVEN that the regular meeting of the Public Safety Committee will be held on Wednesday, May 16, 2018, at 6:00 p.m. in the Pasadena City Hall Council Chamber – S249. The agenda for the meeting is as follows:

1. **CALL TO ORDER/ROLL CALL**

2. **PUBLIC COMMENT ON MATTERS NOT ON THE AGENDA** (Public comment will be limited to a total of **20 minutes** at the beginning of the meeting and will continue at the conclusion of the meeting, if necessary. Please limit comments to **3 minutes** each.)

3. **APPROVAL OF MINUTES**

   February 5, 2018 – Regular Meeting*
   February 21, 2018 – Cancellation of Regular Meeting*
   March 5, 2018 – Regular Meeting*
   March 21, 2018 – Cancellation of Regular Meeting*
   April 2, 2018 – Cancellation of Regular Meeting*

4. **NEW BUSINESS**

   A. Contract Award to Public Works Group to Perform Evaluation of Proposition 47 Board of State and Community Corrections (BSCC) Grant Funded Activities for the Pasadena Police Department*

5. **INFORMATION ITEMS**

   A. Seismic Retrofitting of Soft-Story Buildings*
   B. Local Hazard Mitigation Plan (HMP) Update* (Powerpoint Presentation)
   C. Urban Search and Rescue (US&R) Regional Task Force 4 (RTF-4)* (Powerpoint Presentation)
   D. Police Chief's Monthly Report*

6. ADJOURNMENT

JOHN J. KENNEDY, Chair
Public Safety Committee

I HEREBY CERTIFY that this agenda in its entirety, was posted on the City of Pasadena Chamber bulletin board, room S249, and the bulletin board in the rotunda area of City Hall, and a copy was distributed to the Central Library for posting this 10th day of May 2018, by 5:30 p.m.

LAARNI DAZA
City Manager's Office

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Pasadena Unified School District
Board of Education
Superintendent
Deputy Superintendent
Assistant Superintendent

PASADENA
Fire Department

Public Safety Committee – Item # Local Hazard Mitigation Plan (HMP) Update

Deputy Chief Jon Trautwein

May 16, 2018

Goals of the Project

Fire Department

- Update the Hazard Mitigation Plan (HMP)
  - Updated every 5 years to remain eligible to receive Hazard Mitigation Assistance grants
  - Last approved in 2013
- Ensure regional coordination
- Encourage regional mitigation strategies
- Provide technical assistance
- Provide a catalyst for implementation

2

Objective of HMPs

Fire Department

- Utilize a comprehensive approach
  - Multi-hazards
  - Engage the public and others
- Understand capabilities and vulnerabilities
- Identify projects and actions
- Integrated with other planning efforts
- Meet eligibility requirements to receive HMA grants

3

Update Requirements

Fire Department

- Office of Emergency Service (OES) reviews
- Federal Emergency Management Agency (FEMA) approves
- Locals adopt
- What are they looking for……
  - Proper documentation of planning process (Element A)
  - Current community, hazard, and impact information (Element B)
  - Validation/Identification of projects and actions (Element C)
  - Method for plan review (updating) and implementation (Element D)

4

Proposed Update Methodology

Fire Department

- Steering Committee
- Public Outreach

Role of the Steering Committee

Fire Department

- Validate approach
- Provide information
- Primary liaison with community and stakeholders
  - Promote public participation
- Collaborate with other Steering Committee members
- Update and review sections
- Address Federal/State comments
- Oversee the adoption of the plan

6

Hazard Mitigation Plan Outline

Fire Department

1. Introduction
2. Authority
3. Planning Process
4. Capabilities Assessment
5. Hazard Assessment
6. Vulnerability Assessment
7. Mitigation Strategy
8. Plan Maintenance

7

Community Hazards

Fire Department

1. Earthquake
2. Wildfire
3. Flood
4. Landslides
5. Drought/Water Shortage
6. Extreme Heat
7. Hailstorm
8. Windstorm
9. Energy Shortage
10. Air Pollution
11. Oil Spill
12. Dam Failure
13. Agricultural Pest/Disease
14. Infectious Disease
15. Hazardous Material
16. Radiological Incident
17. Terrorism
18. Cyber Threat
19. Aircraft Crash
20. Train Accident
21. Natural Gas Pipeline / Storage Failure
22. Civil Disturbance

8

Next Steps

Fire Department

- Steering Committee meetings
  - Review Current Plan
  - Revise, Update, Incorporate information
  - Review draft Plan
- Engage the public

9

Eligible Types of Hazard Mitigation Projects

Fire Department

1. Mitigation Projects
   - Property Acquisition and Structure Demolition
   - Property Acquisition and Structure Relocation Structure Elevation
   - Mitigation Reconstruction
   - Dry Floodproofing of Historic Residential Structures
   - Dry Floodproofing of Non-residential Structures
   - Generators
   - Localized Flood Risk Reduction Projects
   - Non-localized Flood Risk Reduction Projects
   - Structural Retrofitting of Existing Buildings
   - Non-structural Retrofitting of Existing Buildings and Facilities
   - Safe Room Construction
   - Wind Retrofit for One- and Two-Family Residences
   - Infrastructure Retrofit
   - Soil Stabilization
   - Wildfire Mitigation
   - Post-Disaster Code Enforcement
   - Advance Assistance
   - 5 Percent Initiative Projects
   - Miscellaneous/Other(1)
2. Hazard Mitigation Planning
   - Planning Related Activities
3. Technical Assistance
4. Management Cost

Ineligible HMGP Projects

Fire Department

The following activities cannot be funded as mitigation planning–related activities:

- Hazard identification or mapping and related equipment for the implementation of mitigation activities (eligible under 5 Percent Initiative)
- Geographic Information System (GIS) software, hardware, and data acquisition whose primary aim is mitigation activity (eligible under 5 Percent Initiative)
- Public awareness or education campaigns about mitigation (eligible under 5 Percent Initiative)
- Project scoping or development (also referred to as "project planning"), such as BCA, engineering feasibility studies, application development, construction design, or EHP data collection
- Activities not resulting in a clearly defined product or products

City of Pasadena Proposed Projects

Fire Department

Below are the four projects that the City will be applying for the HMGP funding. The Notice of Interest sub applications have already been submitted. The full application is due on July 2 and a decision is expected six to nine months following. If approved, FEMA would fund 75% of the project cost along with a 25% required local match. Currently, the engineer's estimates of these projects are $3 to $4 Million each.

- Seismic Retrofit of Fire Station #31
- Seismic Retrofit of Fire Station #37
- Seismic Retrofit of Fire Station #38
- Seismic Retrofit of Public Works Building at the City Yards

Questions

Fire Department

- Lisa Derderian
  - (818) 744-7276
  - lderderian@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

10

PASADENA
CALIFORNIA · WWW.CITYOFPASADENA.NET

NEWS RELEASE

FOR IMMEDIATE RELEASE: September 10, 2018

NEWS MEDIA CONTACT:
Lisa Derderian, Acting Pasadena Public Information Officer, City Manager's Office
(626) 744-4755, lderderian@cityofpasadena.net

CITY OF PASADENA ANNOUNCES COMMUNITY MEETING FOR PUBLIC REVIEW OF UPDATED LOCAL HAZARD MITIGATION PLAN

(PASADENA, CA) - The City of Pasadena will be conducting a community meeting to seek comment and public review of the draft update to the 2013 City of Pasadena Local Hazard Mitigation Plan (LHMP). The meeting will take place at 7:00 pm on Monday, September 17, 2018 at Villa Parke (Conference Room 131A), 363 E. Villa Street, Pasadena. The Plan will then be open for public review and comment at https://ww5.cityofpasadena.net/fire/ beginning Tuesday, September 18 through close of business Tuesday, September 25. A hardcopy of the draft updated LHMP will be available at Fire Administration, 215 N. Marengo Ave., #195, Pasadena.

The California Office of Emergency Services (CalOES) and Federal Emergency Management Agency (FEMA) requires that the LHMP be reviewed, updated and submitted for approval at least once every five years. The City must have an approved LHMP to maintain eligibility for State and Federal Hazard Mitigation grant programs. The LHMP's list of hazards includes earthquakes, floods, fires and windstorms. It also addresses man-made hazards such as hazardous material accidents, gas pipeline ruptures, and homeland security threats. The purpose of the City's LHMP is to identify goals, objectives, and mitigation strategies for reducing the impact of the hazards. Mitigation strategies should address findings in in the LHMP and can be based on working knowledge, best practices, and innovative ideas.

The draft updated LHMP is a demonstration of the City's commitment to reducing the impact of disasters. Your participation in the planning process will help ensure the successful implementation of the City's LHMP and enable the City to be better prepared for future disasters. Your time and cooperation will be greatly appreciated.

For further information please Chief Jon Trautwein, Pasadena Fire Department at 626-744-4745

PASADENA

Fire Department

Local Hazard Mitigation Plan (HMP) Public Outreach Meeting

Deputy Chief Jon Trautwein
Laura D. Hernandez

September 17, 2018

Legislative Requirement

Fire Department

The Federal Disaster Mitigation Act of 2000 (DMA 2000) requires that states review LHMPs as part of their state hazard mitigation planning process. The intent is three-fold:

1. Gather hazard, vulnerability, and mitigation information from the local level for use in state-level planning
2. Ensure that state and local hazard mitigation planning is coordinated to the greatest extent practical
3. Ensure local jurisdictions are made aware of the hazards and vulnerabilities within their jurisdiction and to develop strategies to reduce those vulnerabilities.
4. This is accomplished through the LHMP

Purpose of Local Hazard Mitigation Plan

Fire Department

- Ensure local jurisdictions are made aware of the hazards and vulnerabilities within their jurisdiction and to develop strategies to reduce those vulnerabilities.
- The LHMP is preventative and not an Emergency Response Plan.

Goals of the Pasadena LHMP

Fire Department

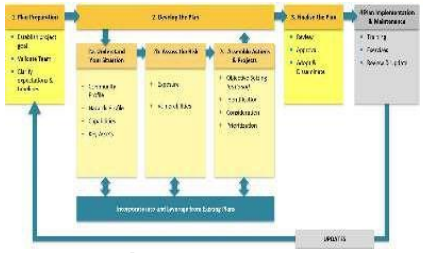
- Update the Hazard Mitigation Plan (HMP)
  - Must be updated every 5 years to remain eligible to receive Hazard Mitigation Assistance grants
  - Last approved in 2013
- Ensure regional coordination and encourage regional mitigation strategies
- Provide technical assistance
- Provide a catalyst for implementation

4

Methodology

Fire Department

- Steering Committee
- Public Outreach
- External Stakeholders



5

Objective of HMPs

Fire Department

- Utilize a comprehensive approach
  - Multi-hazards
  - Engage the public and others
- Understand capabilities and vulnerabilities
- Identify projects and actions
- Integrated with other planning efforts
- Meet eligibility requirements to receive HMA grants

3

Hazard Mitigation Plan Outline

Fire Department

1. Introduction
2. Authority
3. Planning Process
4. Capabilities Assessment
5. Hazard Assessment
6. Vulnerability Assessment
7. Mitigation Strategy
8. Plan Maintenance

7

Community Hazards

Fire Department

1. Earthquake
2. Wildfire
3. Flood
4. Landslides
5. Drought/Water Shortage
6. Extreme Heat
7. Hailstorm
8. Windstorm
9. Energy Shortage
10. Air Pollution
11. Oil Spill
12. Dam Failure
13. Agricultural Pest/Disease
14. Infectious Disease
15. Hazardous Material
16. Radiological Incident
17. Terrorism
18. Cyber Threat
19. Aircraft Crash
20. Train Accident
21. Natural Gas Pipeline / Storage Failure
22. Civil Disturbance

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Mitigation Actions

Fire Department

- Any long term action taken that reduces or eliminates effect of the hazard or increases capabilities
- Multi-hazard action items are those activities that pertain to two or more of the six hazards.
- Mitigation action items are in order of priority at the time of submittal of this LHMP and are prioritized.
- Required to have implementation plan (timeline, cost estimate, responsible department)

Sample List of Projects (Prioritized)

Fire Department

	Social	Technology	Admin	Political	Environ	Econ	Total
Develop and adopt a soft-story retrofit ordinance, possibly administer an implementation program for the ordinance	5	5	3	4	5	2	24
Upgrade Traffic Signal, Street Lighting Poles, and Systems citywide to meet or exceed modern loading requirements	5	5	4	4	5	3	26
Seismic Retrofit of City-owned Essential Buildings, including Fire Stations and Evacuation Centers	5	5	4	5	5	2	26
Seismic Retrofit of City-owned Bridges	4	5	4	4	3	2	22
Utility infrastructure improvements against earthquake and other hazards including seismic upgrade of power and water facilities, Sunset reservoir improvements, and upgrades and replacements of local generating units.	5	5	4	4	3	2	23
Restoration of habitat, improvements to the watershed, and enhancement of spreading activities of water runoff to enhance the flood protection systems and preserve the natural systems	4	4	4	3	5	2	22
Vegetation management on City lands in the watershed for water supply enhancement and fire reduction; Improvements to the Arroyo Seco Canyon; Azusa Hydro upgrades and replacements, and rainwater capture and recycling	5	3	3	3	4	2	20
Evaluate and implement protective measures of critical utility buildings, plants and facilities against natural hazards (fire, flood, windstorm)	4	5	3	3	5	2	22
Evaluate and take necessary actions to ensure robust cyber security of utility infrastructure and protection of critical information systems from cyber-attacks/incidents	5	4	3	4	5	3	24

Next Steps

Fire Department

- Receive comments back
- Work with Steering Committee
- Submit to OES to review
- Make requested changes
- Submit to FEMA for approval
- Submit to City Council for Approval
- City implementation!

How to Review and Comment

Fire Department

The Plan will be open for public review and comment at https://ww5.cityofpasadena.net/fire/ beginning Tuesday, September 18 through close of business Tuesday, September 25.

A hardcopy of the draft updated LHMP will also be available at Fire Administration, 215 N. Marengo Ave., #195, Pasadena.

Questions

Fire Department

- Deputy Chief Jon Trautwein
  - 626-744-4745
  - jtrautwein@cityofpasadena.net
- Andy Petrow
  - (818) 294-5472
  - petrowa@msn.com
- Laura Hernandez
  - (805) 844-1720
  - Laurah@soteriaem.com

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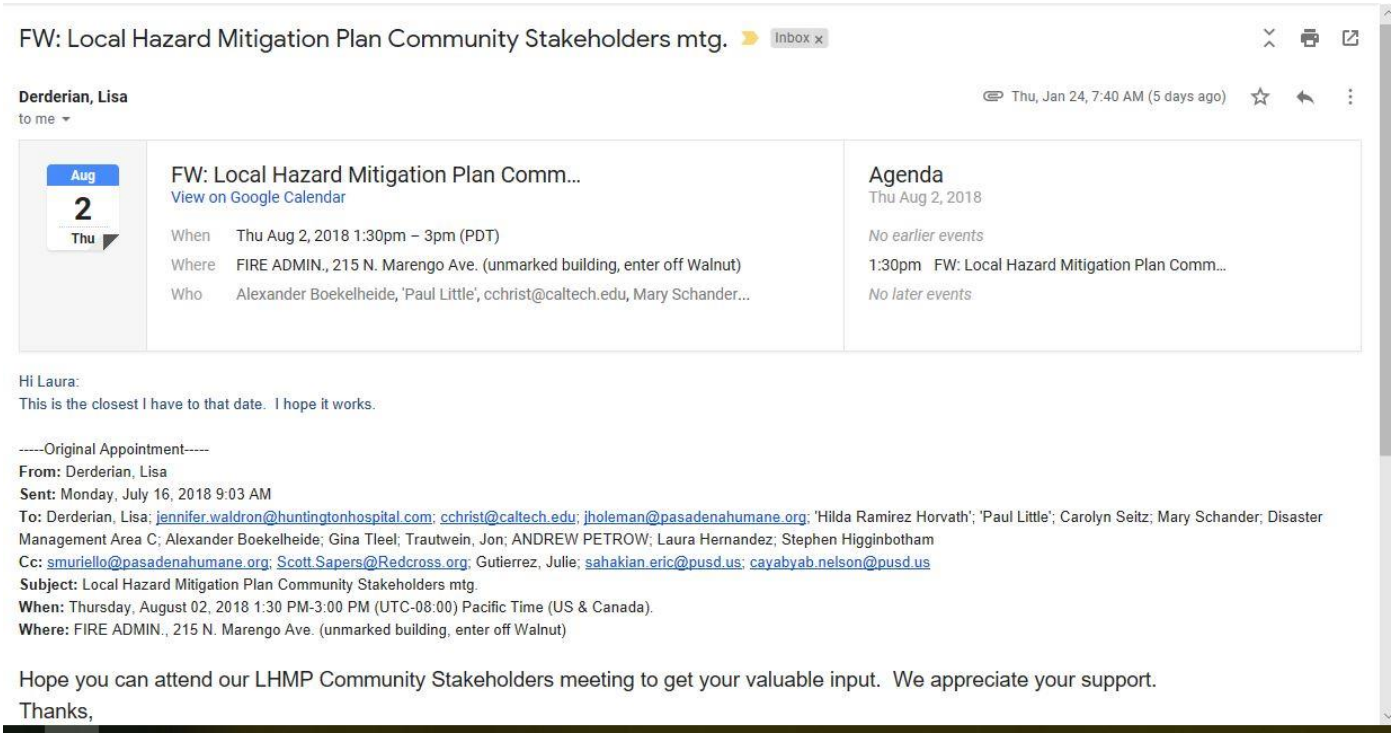
Invite to Community Stakeholders



FW: Local Hazard Mitigation Plan Community Stakeholders mtg. Inbox ×

Derderian, Lisa
to me

Thu, Jan 24, 7:40 AM (5 days ago)

Aug
2
Thu

FW: Local Hazard Mitigation Plan Comm...
View on Google Calendar

When Thu Aug 2, 2018 1:30pm – 3pm (PDT)
Where FIRE ADMIN., 215 N. Marengo Ave. (unmarked building, enter off Walnut)
Who Alexander Boekelheide, 'Paul Little', cchrist@caltech.edu, Mary Schander...

Agenda
Thu Aug 2, 2018

No earlier events
1:30pm FW: Local Hazard Mitigation Plan Comm...
No later events

Hi Laura:
This is the closest I have to that date. I hope it works.

-----Original Appointment-----
From: Derderian, Lisa
Sent: Monday, July 16, 2018 9:03 AM
To: Derderian, Lisa; jennifer.waldron@huntingtonhospital.com; cchrist@caltech.edu; jholeman@pasadenahumane.org; 'Hilda Ramirez Horvath'; 'Paul Little'; Carolyn Seitz; Mary Schander; Disaster Management Area C; Alexander Boekelheide; Gina Tleel; Trautwein, Jon; ANDREW PETROW; Laura Hernandez; Stephen Higginbotham
Cc: smuriello@pasadenahumane.org; Scott.Sapers@Redcross.org; Gutierrez, Julie; sahakian.eric@pusd.us; cayabyab.nelson@pusd.us
Subject: Local Hazard Mitigation Plan Community Stakeholders mtg.
When: Thursday, August 02, 2018 1:30 PM-3:00 PM (UTC-08:00) Pacific Time (US & Canada).
Where: FIRE ADMIN., 215 N. Marengo Ave. (unmarked building, enter off Walnut)

Hope you can attend our LHMP Community Stakeholders meeting to get your valuable input. We appreciate your support.
Thanks,

APPENDIX D

List of Key Assets

ID	Category	Address Mapped	Occupancy	Description
1	COMMUNITY CENTER	1020 N FAIR OAKS AVE	COMMUNITY CENTER	JACKIE ROBINSON CENTER
2	COMMUNITY CENTER	1081 N FAIR OAKS AVE	GYM, RESTROOMS	JACKIE ROBINSON PARK (Values incl in Loc 53)
3	COMMUNITY CENTER	1415 N RAYMOND AVE	YOUTH COUNCIL	PASADENA AREA YOUTH COUNCIL aka NorthWest School
4	COMMUNITY CENTER	1835 N FAIR OAKS AVE	COMM HEALTH CTR - BUILDING 2	PASADENA COMMUNITY HEALTH CENTER
5	COMMUNITY CENTER	1845 N FAIR OAKS AVE	COMM HEALTH CTR - BUILDING 1	PASADENA COMMUNITY HEALTH CENTER
6	COMMUNITY CENTER	1855 N FAIR OAKS AVE	COMM HEALTH CTR - BUILDING 3	PASADENA COMMUNITY HEALTH CENTER
7	COMMUNITY CENTER	2575 PALOMA ST	COMM CNTR GYM, PICNIC AREA	VICTORY PARK
8	COMMUNITY CENTER	363 E VILLA ST	RECREATION CENTER	VILLA PARKE COMM CTR, POOL AND RESTROOMS
9	COMMUNITY CENTER	85 E HOLLY ST	PASADENA SENIOR CENTER	CENTRAL DISTRICT & SUB-DIVISION
10	COMMUNITY CENTER	85 E HOLLY ST	SR CITIZEN COMM CENTER	SR. CITIZEN CENTER
11	EQUIPMENT	100 N GARFIELD AVE	EQUIPMENT - RC	CONTRACTORS EQUIPMENT
12	EQUIPMENT	100 N GARFIELD AVE	RC	YARD MACHINERY AND EQUIPMENT
13	EQUIPMENT	1000 E WASHINGTON BLVD	PARK - EQUIPMENT	MACDONALD PARK
14	EQUIPMENT	2057 N LOS ROBLES AVE	TELECOMMUNICATIONS EQUIPMENT	PCAC OFFICE HENS TEETH - Telecom Property
15	EQUIPMENT	300 E GREEN ST	BUSINESS INTERRUPTION COVERAGE	CONFERENCE CENTER - BI COVERAGE
16	FIRE	1140 N FAIR OAKS AVE	FIRE STATION	FIRE STATION #36
17	FIRE	1150 LINDA VISTA AVE	FIRE STATION	FIRE STATION #38
18	FIRE	135 S FAIR OAKS AVE	FIRE STATION	FIRE STATION #31
19	FIRE	1360 E DEL MAR BLVD	FIRE STATION	FIRE STATION 34 - Constr Cost $2,660,312
20	FIRE	199 S LOS ROBLES AVE	FIRE DEPT ADMN OFFICES	FIRE HEADQUARTERS (STORY VALUES INCL IN L 15)
21	FIRE	2424 E VILLA ST	FIRE STATION	FIRE STATION #32
22	FIRE	3430 FOOTHILL BLVD	FIRE STATION	FIRE STATION #37
23	FIRE	50 AVENUE 64	FIRE STATION	FIRE STATION #39
24	FIRE	515 N LAKE AVE	FIRE STATION	FIRE STATION #33
25	FIRE	515 N LAKE AVE	TOWER AND CLASSROOM	FIRE STATION #33 (VALUES INCLUDED IN LOC #8)
26	FIRE	845 E VILLA ST	VEHICLE REPAIR	FIRE STATION #33 (VALUES INCLUDED IN LOC #8)
27	GOVERNMENT	100 N GARFIELD AVE	CITY HALL - HIGH END	1741 FLOOD.JPG - City Hall
28	GOVERNMENT	145 N RAYMOND AVE	ARMORY	ARMORY BUILDING
29	GOVERNMENT	150 S LOS ROBLES AVE	LEASED BLDG - DEPT OF WATER & POWER	GROSVENOR BUILDING
30	GOVERNMENT	187 N GARFIELD AVE	OFFICE	PERMIT CENTER - Hale Building
31	GOVERNMENT	207 N GARFIELD AVE	JAIL	POLICE STATION
32	GOVERNMENT	233 W MOUNTAIN ST	SHOP BUILDING	CITY YARDS - PUBLIC WORKS BLDG - Lockers, parking

33	GOVERNMENT	233 W MOUNTAIN ST	TEMPORARY MOBILE HOME	CITY YARDS-SOLID WASTE - Recycling Ctr Ofc
34	GOVERNMENT	245 W MOUNTAIN ST	OFFICE	CITY YARD-WATER & POWER OFC AND EOC
35	GOVERNMENT	300 E GREEN ST	AUDITORIUM	CIVIC CENTER (AUDITORIUM)
36	GOVERNMENT	300 E GREEN ST	CONFERENCE CENTER	CONVENTION CENTER - EAST PAVILION
37	GOVERNMENT	300 E GREEN ST	CONFERENCE CENTER - EXHIB HALL	EXHIBITION BUILDING - West PAVILION
38	GOVERNMENT	323 W MOUNTAIN ST	SHEDS, WAREHOUSE, OFFICE	CITY YARDS BLDGS 4,5,6 Fleet Maint Truck Repair
39	GOVERNMENT	345 W MOUNTAIN ST	SHOP BUILDING	WAREHOUSE/OFFICE/SHOPS - Bldg Maint #1
40	GOVERNMENT	500 LAKE AVE	JOB CENTER	JOB CENTER
41	LIBRARY/MUSEUM	100 N GARFIELD AVE	ART PIECES PLACED THROUGHOUT CITY	FINE ART - ROTATING ART PROGRAM
42	LIBRARY/MUSEUM	1130 S MARENGO AVE	LIBRARY BLDG AND BOOKS ONLY	ALLENDALE LIBRARY (PP INCL. IN LOC. #17)
43	LIBRARY/MUSEUM	1240 NITHSDALE RD	LIBRARY BLDG & BOOKS ONLY	SAN RAFAEL BRANCH LIBRARY (PP INCL. IN LOC. #17)
44	LIBRARY/MUSEUM	1281 BRYANT ST	LIBRARY BLDG & BOOKS ONLY	LINDA VISTA BRANCH LIBRARY (PP INCL. IN LOC. #17)
45	LIBRARY/MUSEUM	1355 N RAYMOND AVE	LIBRARY BLDG & BOOKS ONLY	LA PINTORESCA LIBRARY (PP INCL. IN LOC. #17)
46	LIBRARY/MUSEUM	140 S ALTADENA AVE	LIBRARY BLDG & BOOKS ONLY	LAMANDA PARK LIBRARY (PP INCL. IN LOC. #17)
47	LIBRARY/MUSEUM	285 E WALNUT ST	LIBRARY	CENTRAL LIBRARY
48	LIBRARY/MUSEUM	285 E WALNUT ST	LIBRARY BOOKS (PP INCL IN #17)	CENTRAL LIBRARY - BOOKS
49	LIBRARY/MUSEUM	285 E WALNUT ST	FINE ART COLLECTION	MAIN LIBRARY - FINE ART COLLECTION
50	LIBRARY/MUSEUM	3325 E ORANGE GROVE BLVD	LIBRARY BLDG & BOOKS ONLY	HASTINGS BRANCH LIBRARY (PP INCL. IN LOC. #17)
51	LIBRARY/MUSEUM	363 E VILLA ST	LIBRARY BOOKS ONLY	VILLA PARKE BRANCH LIBRARY (PP incl in Loc #17)
52	LIBRARY/MUSEUM	55 S HILL AVE	LIBRARY BLDG & BOOKS ONLY	HILL AVENUE LIBRARY (PP INCL. IN LOC. #17)
53	LIBRARY/MUSEUM	999 E WASHINGTON BLVD	LIBRARY BLDG & BOOKS ONLY	SANTA CATALINA BRANCH LIBY (PP INCL. IN LOC. #17)
54	MISC	1 E GREEN ST	PARKING GARAGE	SCHOOL HOUSE PARKING
55	MISC	100 N GARFIELD AVE	PLATE GLASS	PLATE GLASS
56	MISC	100 N GARFIELD AVE	PERSONAL PROPERTY FOR VRSS PARKS	PERSONAL PROPERTY
57	MISC	1133 ROSEMONT AVE	CLUBHOUSE, RESTAURANT, PRO SHOP	BROOKSIDE GOLF COURSE
58	MISC	150 HOLLY ST	UNICORN PARKING GARAGE	HOLLY STREET PARKING
59	MISC	1501 E VILLA ST	PUBLIC RESTROOMS	JEFFERSON PARK
60	MISC	171 N RAYMOND AVE	SUBTERRANEAN PARKING GARAGE	MARRIOTT PKG GAR - BI ONLY - 146 spaces, air leased to city
61	MISC	177 S ARROYO PL	LOWER ARROYO CLUBHOUSE	LA CASITA DEL ARROYO
62	MISC	178 W VILLA ST	VACANT LAND	
63	MISC	198 S RAYMOND AVE	UNDERGROUND PARKING GARAGE	DEL MAR TRAIN STATION PARKING GARAGE
64	MISC	2180 E FOOTHILL BLVD	VACANT (SET FOR DEMOLITION)	RESTAURANT

65	MISC	221 E WALNUT ST	LEASED OFFICE - CONTENTS ONLY	WALNUT PARK CENTER - Transp Dept and Pkg Authority
66	MISC	232 S MICHIGAN AVE	PUBLIC RESTROOMS	GRANT PARK
67	MISC	275 S RAYMOND AVE	PUBLIC RESTROOMS	CENTRAL PARK
68	MISC	2783 EATON CANYON DR	RIFLE RANGE/AUDITORIUM	CIVIL DEFENSE/RIFLE RANGE
69	MISC	2791 EATON CANYON RD	PISTOL RANGE	INDOOR PISTOL RANGE
70	MISC	280 W CALIFORNIA BLVD	PUBLIC RESTROOMS	SINGER PARK
71	MISC	300 E GREEN ST	PARKING GARAGE	CIVIC CENTER PARKING GARAGE
72	MISC	300 E GREEN ST	ICE RINK	CIVIC CENTER - ICE RINK - In same bldg as CC Auditorium
73	MISC	300 E GREEN ST	ICE RINK - ON TOP OF PARKING GARAGE	NEW ICE RINK - CONVENTION CENTER
74	MISC	303 CORDOVA ST	PARKING GARAGE	CENTRAL DISTRICT & SUB-DIVISION
75	MISC	3100 E DEL MAR AVE	PARKS-SEE NOTES - EQUIPMENT	EATON PARKS
76	MISC	311 W MOUNTAIN ST	LEASED OFFICE TRAILER	
77	MISC	311 W MOUNTAIN ST	LEASED OFFICE TRAILER	
78	MISC	350 N ARROYO BLVD	NATATORIUM	ROSE BOWL AQUATICS CENTER - Swimming pools and Clubhs
79	MISC	360 N ARROYO BLVD	BROOKSIDE PARK BUILDING & RESTROOMS	BROOKSIDE PARK
80	MISC	360 N ARROYO BLVD	JR MEM FIELD BLEACHERS	BROOKSIDE PARK (values incl in Loc 45)
81	MISC	3680 CARTWRIGHT ST	PUBLIC RESTROOM	HAMILTON PARK
82	MISC	39 S DELACEY ST	PARKING GARAGE	DELACEY PARKING STRUCTURE
83	MISC	391 S ORANGE GROVE BLVD	MANSION	TOURNAMENT HOUSE (WRIGLEY MANSION)
84	MISC	4024 OAK GROVE DR	PUBLIC RESTROOM	HAHAMONGA WATERSHED
85	MISC	45 E WASHINGTON BLVD	RESTROOMS & PLAY EQUIPMENT	LA PINTORESCA PARK
86	MISC	4550 ORANGE GROVE BLVD	PUBLIC RESTROOMS	OAKGROVE PARK
87	MISC	488 ARBOR ST	CARETAKER'S HOUSE	WRIGLEY MANSION
88	MISC	700 E WASHINGTON BLVD	PUBLIC RESTROOMS	WASHINGTON PARK
89	MISC	700 SECO ST	FLOAT BUILDING WAREHOUSE	ROSEMONT PAVILION (Will be vacant February thru October each year)
90	MISC	78 N MARENGO AVE	HISTORIC PRESERVATION OF YWCA BUILDING	ECONOMIC REDEVELOPMENT Including Office
91	MISC	835 S RAYMOND AVE	FLOAT BUILDING WAREHOUSE	ROSE PALACE (To be vacant as of 8/1/2017 until leased to a new tenant)
92	MISC	85 E HOLLY ST	BANDSTAND & RESTROOMS	MEMORIAL PARK BANDSTAND (contents $ incl in Loc 152)
93	POLICE	2175 YUCCA LN	HELIPORT	POLICE HELIPORT - Hanger, Portable Trailers
94	POLICE	220 S RAYMOND AVE	POLICE SUB - STATION - LEASED SPACE	DEL MAR HISTORIC TRAIN STATION - Leased space in Depot
95	UTILITIES - POWER	1001 N ARROYO BLVD	BROOKSIDE SUBSTATION	BROOKSIDE SUBSTATION

96	UTILITIES - POWER	1004 N WILSON AVE	WILSON SUBSTATION	WILSON SUBSTATION
97	UTILITIES - POWER	1055 E COLORADO BLVD	POWER	POWER
98	UTILITIES - POWER	1154 S FAIR OAKS AVE	STORAGE -WAREHOUSE BLDG	POWER PLANT HISTORIC BLDG-PACIFIC ELECT RAILWAY
99	UTILITIES - POWER	1180 S FAIR OAKS AVE	ELECTRICAL SHOP	POWER/GENERAL INDUSTRIAL DISTRICT
100	UTILITIES - POWER	120 SIERRA MADRE VILLA AVE	EASTERN SUBSTATION	EASTERN SUBSTATION
101	UTILITIES - POWER	1410 N FAIR OAKS AVE	FAIR OAKS SUBSTATION	FAIR OAKS SUBSTATION
102	UTILITIES - POWER	160 N ALTADENA DR	SANTA ANITA SUBSTATION (HISTORIC SUBSTATION)	SANTA ANITA /LAMANDA PARK SUBSTATION
103	UTILITIES - POWER	176 E VILLA ST	VILLA SUBSTATION	VILLA SUBSTATION
104	UTILITIES - POWER	1850 RANCH RD	AZUSA HYDROELECTRIC POWER PLANT	Power House, Main Transformer, Switch Gear, Pelton Wheel Hydro Generator, Penstock Bypass, Forebay, Afterbay
105	UTILITIES - POWER	1850 RANCH RD	RESIDENCE	AZUSA HYDROELECTRIC
106	UTILITIES - POWER	1850 RANCH RD	SHED	AZUSA HYDROELECTRIC
107	UTILITIES - POWER	300 N HALSTEAD	UTIL/ELECTRO OPTICAL	UTILITIES MACHINERY AND EQUIPMENT
108	UTILITIES - POWER	3001 E FOOTHILL BLVD	GOODRICH SUBSTATION	GOODRICH SUBSTATION
109	UTILITIES - POWER	310 W MOUNTAIN ST	OFFICE & WAREHOUSE	CITY YARDS #7,10,13,15 Dept of Water & Power
110	UTILITIES - POWER	311 W MOUNTAIN ST	TRANSFORMER TEST BLDG	TRANSFORMER TEST BLDG. (values - see Loc 30)
111	UTILITIES - POWER	3665 E SIERRA MADRE BLVD	HASTING SUBSTATION	HASTINGS SUBSTATION
112	UTILITIES - POWER	45 E GLENARM ST	GLENARM SUBSTATION (POWER DISTRIBUTION BUSINESS UNIT)	POWER DISTRIBUTION BUSINESS UNIT
113	UTILITIES - POWER	44 S MICHIGAN AVE	CHESTER SUBSTATION	CHESTER SUBSTATION
114	UTILITIES - POWER	85 E STATE ST	HISTORIC POWER PLANT BLDG - MUSUEM	GLENARM HISTORIC POWER PLANT STRUCTURE
115	UTILITIES - POWER	95 WAVERLY DR	DEL MAR SUBSTATION	DEL MAR SUBSTATION
116	UTILITIES - WATER	1 N SAN RAFAEL AVE	SAN RAFAEL PUMP STATION	SAN RAFAEL PUMP STATION
117	UTILITIES - WATER	125 TUSTIN RD	RESERVOIR/PUMP STATION	EAGLE ROCK RESERVOIR
118	UTILITIES - WATER	1265 FAIRLAWN WAY	RESERVOIR	ANNENDALE RESERVOIR
119	UTILITIES - WATER	1377 GLEN OAKS BLVD	PUMP STATION	ANNENDALE PUMP STATION
120	UTILITIES - WATER	1433 1/2 RUTHERFORD DR	PUMP STATION	MIRADOR PUMP STATION
121	UTILITIES - WATER	1480 HASTINGS RANCH RD	THOMAS RESERVOIR/BOOSTER	THOMAS RESEVOIR
122	UTILITIES - WATER	1599 KNOLLWOOD DR	LIDA PUMP STATION	LIDA PUMP STATION
123	UTILITIES - WATER	1619 GLEN OAKS BLVD	RESERVOIR/PUMP STATION	MIRADOR RESERVOIR
124	UTILITIES - WATER	180 N HALESTEAD	CHAPMAN WELL	CHAPMAN WELL
125	UTILITIES - WATER	1800 N ARROYO BLVD	PUMP STATION	SHELDON RESERVOIR #1
126	UTILITIES - WATER	1800 N ARROYO BLVD	RESERVOIR	SHELDON RESERVOIR #2
127	UTILITIES - WATER	184 N HALSTEAD	2 ATTACHED TRAILERS - TEMPORARY	WATER SERVICES HALSTEAD TRAILER
128	UTILITIES - WATER	1879 E WALNUT ST	WOODBURY WELL	WOODBURY WELL
129	UTILITIES - WATER	201 W MOUNTAIN ST	SUNSET WELL	SUNSET WELL

130	UTILITIES - WATER	201 W MOUNTAIN ST	2 RESERVOIRS	SUNSET RESERVOIR
131	UTILITIES - WATER	2040 DUNHAM ALLEY	CRAIG WELL PUMP STATION	CRAIG PUMP STATION
132	UTILITIES - WATER	2073 PINECREST DR	RESERV/PUMP STATION	ALLEN RESERVOIR
133	UTILITIES - WATER	21 KARL JOHNSON PARKWAY	VENTURA WELL/PUMP STATION	VENTURA WELL
134	UTILITIES - WATER	2437 ALTADENA DR	RESERVOIR /PUMP STATION	SANTA ANITA RESERVOIR
135	UTILITIES - WATER	2437 ALTADENA DR	SANTA ANITA PUMP STATION	SANTA ANITA PUMP STATION
136	UTILITIES - WATER	2696 WINDSOR AVE	WINDSOR WELL / RESERVOIR	WINDSOR RESERVOIR
137	UTILITIES - WATER	3030 E WALNUT ST	JURDAN WELL	JURDAN WELL
138	UTILITIES - WATER	311 W MOUNTAIN ST	WATER METER SHOP	WATER METER SHOP (values - see Loc 30)
139	UTILITIES - WATER	34 E ORANGE GROVE BLVD	ONE OF TWO DWELLINGS	COMMUNITY DEVELOPMENT
140	UTILITIES - WATER	34 E ORANGE GROVE BLVD	2ND OF TWO DWELLINGS	COMMUNITY DEVELOPMENT
141	UTILITIES - WATER	3410 FAIR POINT ST	PUMP STATION	MURRAY RESERVOIR
142	UTILITIES - WATER	3416 FIGUEROA ST	RESERVOIR	LIDA RESERVOIR
143	UTILITIES - WATER	345 E VILLA ST	WELL	VILLA WELL
144	UTILITIES - WATER	345 W MOUNTAIN ST	WELL	COPELIN WELL
145	UTILITIES - WATER	3665 E SIERRA MADRE BLVD	RESERVOIR/HAMILTON PARK	JONES RESERVOIR - PUMP STATION ON TOP OF RES
146	UTILITIES - WATER	3671 RANCH TOP RD	WATER TANKS	DON BENITO TANKS #1 AND #2
147	UTILITIES - WATER	521 SECO ST	LINDA VISTA PUMP STATION	LINDA VISTA PUMP STATION
148	UTILITIES - WATER	525 S OAK KNOLL	OAK KNOLL SUBSTATION	OAK KNOLL SUBSTATION
149	UTILITIES - WATER	586 N GARFIELD AVE	GARFIELD AVE WELL	GARFIELD AVE WELL
150	UTILITIES - WATER	64 E CALAVERAS	CALAVERAS RESERVOIR	CALAVERAS RESERVOIR
151	UTILITIES - WATER	691 W WOODBURY RD	PUMPING STATION	ALTADENA PUMPING STATION
152	UTILITIES - WATER	75 KARL JOHNSON PARKWAY	AWELL PUMP STATION	ARROYO WELL
153	UTILITIES - WATER	7700 N FIGUEREA ST	ROSS PUMP STATION	ROSS PUMP STATION
154	UTILITIES - WATER	920 N WILSON AVE	WILSON PUMP STATION	WILSON PUMP STATION
155	UTILITIES - WATER	995 SUNSET AVE	PUMP STATION	GLORIETTA PUMP STATION
156	UTILITIES - WATER	N OF JPL	WATER TANKS	GOULD RESERVOIR
157	UTILITIES - WATER	52 KARL JOHNSON PARKWAY	WELL	WELL S2
158	UTILITIES - WATER	SIERRA MADRE & PALOMA	USMC RESERVE CENTER	USMC RESERVE CENTER
159	VENUE	1001 ROSE BOWL DR	ROSE BOWL STADIUM	STADIUM*
160	VENUE	1001 ROSE BOWL DR	ROSE BOWL VIDEO BOARD	N Video Bd, Loop, Swtichgear
161	VENUE	1001 ROSE BOWL DR	ROSE BOWL DISPLAY BOARD	S&E Scorebds + 10 LED Ad Bds, electrical
162	VENUE	1001 ROSE BOWL DR	ROSE BOWL ROSE SIGN	ROSE SIGN
163	VENUE	1001 ROSE BOWL DRIVE	ROSE BOWL MISC SIGNS	MISC SIGNS