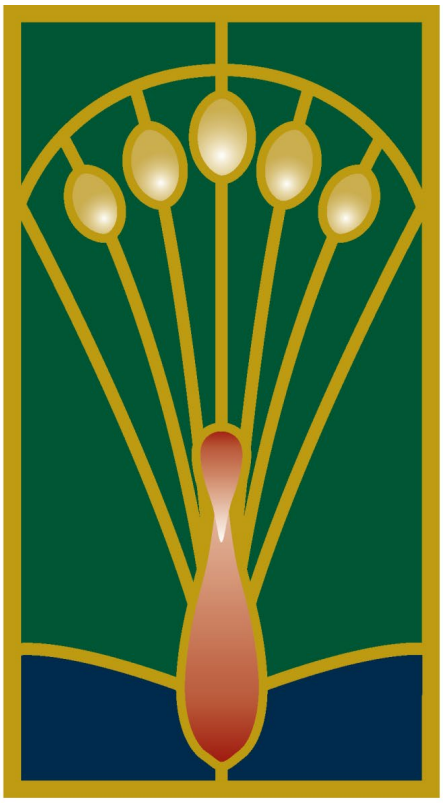
City of Arcadia Local Hazard Mitigation Plan



CITY OF
ARCADIA

May 11, 2022

City of Arcadia
Local Hazard Mitigation Plan 2022
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Introduction

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Five -Year Action Plan Matrix
The City of Arcadia's Local Hazards Mitigation Action Plan includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for local hazards. The mitigation plan provides a list of activities that may assist City of Arcadia in reducing risk and preventing loss from future hazardous events. The action items address multi-hazard issues, as well as activities for earthquakes, flooding, debris flow / Slope Failures, windstorms, wildfires, drought, hazardous materials, transportation emergencies and terrorism

How is the Plan Organized?
The Mitigation Plan contains a five-year action plan matrix, background on the purpose and methodology used to develop the mitigation plan, a profile of City of Arcadia, sections on hazards that occur within the City, and a number of appendices.

Who Participated in Developing the Plan?
The City of Arcadia's Local Hazard Mitigation Action Plan is the result of a collaborative effort between City of Arcadia's citizens, public agencies, non-profit organizations, the private sector, and regional and state organizations. Public participation played a key role in development of goals and action items. A meeting was held with stakeholders in the City, and two public meetings were held to include City of Arcadia's residents in plan development. A Hazard Mitigation Committee guided the process of developing the plan.

What is the Plan Mission?
The mission of the City of Arcadia's Local Hazard Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from potential hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the City towards building a safer, more sustainable community.

What are the Plan Goals?
The plan goals describe the overall direction that City of Arcadia's agencies, organizations, and citizens can take to work toward mitigating risk from hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items.

<u>Protect Life and Property</u>

- Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.
- Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to hazards.

Public Awareness

- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools; partnership opportunities, and funding resources to assist in implementing mitigation activities.

Natural Systems

- Balance natural resource management, and land use planning with local hazard mitigation to protect life, property, and the environment.
- Preserve, rehabilitate, and enhance natural systems to serve local hazard mitigation functions.

Partnerships and Implementation

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.
- Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

Emergency Services

- Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.
- Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

How are the Action Items Organized?

The action items are a listing of activities in which City agencies and citizens can be engaged in to reduce risk. The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan. Data collection, research, and the public participation process resulted in the development of these action items (see Section 9). The matrix includes the following information for each action item:

Coordinating Organization

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

Time line

Action items include both short and long-term activities. Each action item

includes an estimate of the time line for implementation. Short-term action items are activities which City agencies are capable of implementing with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

Ideas for Implementation

Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources.

Plan Goals Addressed

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

1. Protect Life and Property
2. Public Awareness
3. Natural Systems
4. Partnerships and Implementation
5. Emergency Services

Constraints

Constraints may apply to some of the action items. These constraints may be a lack of city staff, lack of funds, or vested property rights, which might expose the City to legal action as a result of adverse impacts on private property.

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

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

Plan Adoption

Adoption of the Natural Hazard Mitigation Plan by the local jurisdiction's governing body is one of the prime requirements for approval of the plan. Once the plan is reviewed, the City Council will be responsible for adopting the City of Arcadia's Local Hazard Mitigation Plan. The local agency governing body has the responsibility and authority to promote sound public policy regarding hazards. The City Council will periodically need to re-adopt the plan as it is revised to meet changes in the hazard risks and exposures in the community. The approved Local Hazard Mitigation Plan will be significant in the future growth and development of the community.

Coordinating Body
The City of Arcadia's Hazard Mitigation Advisory Committee will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Manager will assign representatives to the Hazard Mitigation Committee and assign a Project Manager.

Convener
The City Council will adopt the City of Arcadia's Local Hazard Mitigation Plan, and the Hazard Mitigation Committee will take responsibility for plan implementation. The Project Manager will serve as a convener to facilitate the Hazard Mitigation Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the committee. Plan implementation and evaluation will be a shared responsibility among all of the Local Hazard Committee Members.

Implementation through Existing Programs
The City of Arcadia addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, Fire Codes, City Building & Safety Codes and other related documents. The Local Hazard Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of these existing planning programs. City of Arcadia will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Economic Analysis of Mitigation Projects
The Federal Emergency Management Agency's approaches to identify costs and benefits associated with hazard mitigation strategies or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Formal Review Process
The City of Arcadia's Local Hazard Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and time line, and identifies the local agencies and organizations participating in plan evaluation. The Project Manager or designee will be responsible for contacting the Hazard Mitigation Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

Continued Public Involvement

The City of Arcadia is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be catalogued and made available at city hall, City Clerk' office and at City of Arcadia Library. The existence and location of these copies will be publicized in City newsletters. In addition, locations of the Plan and any proposed changes will be posted on the City website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

Changes to Priorities

The City of Arcadia updated its Local Hazard Mitigation Plan in 2012. There have been no changes in priorities since the adoption of the plan.

On May 3, 2022 this plan was adopted by the Arcadia City Council. The staff report and Resolution are included in this section.

STAFF REPORT

Fire Department

DATE: May 3, 2022

TO: Honorable Mayor and City Council

FROM: Barry R. Spriggs, Fire Chief
By: Chen Suen, Deputy Fire Chief
Maria Lourdes A. Taylor, Sr. Management Analyst

SUBJECT: RESOLUTION NO. 7429 APPROVING THE CITY OF ARCADIA LOCAL HAZARD MITIGATION PLAN
Recommendation: Adopt

SUMMARY

Local governments are required to have an approved Local Hazard Mitigation Plan in place to receive pre-disaster and post-disaster mitigation federal funding. The City has updated its Plan to address modern threats to the community and to adhere to federal standards and guidelines. Therefore, it is recommended that the City Council adopt Resolution No. 7429, approving the City of Arcadia's Local Hazard Mitigation Plan, prior to its submittal to the Federal Emergency Management Agency ("FEMA") for final approval.

BACKGROUND

The Disaster Mitigation Act of 2000 was a law enacted by the federal government that places emphasis on hazard mitigation planning for local municipalities. The law requires local governments to develop and adopt a Local Hazard Mitigation Plan ("LHMP") with final approval given by FEMA. An LHMP is a document that identifies potential natural and human-caused disasters specific to a community and contains information to assist the community, its residents, and other interested parties to plan for local hazards. Essentially, FEMA requires a local government to update their LHMP every five years. The City of Arcadia's previous LHMP was adopted in 2013. For this most recent LHMP update, City staff began working with FEMA in 2017 with the final draft subsequently approved by FEMA in April 2022.

On April 5, 2022, after completing its review of the LHMP, FEMA advised staff that the plan was eligible for final approval pending its adoption by the City. Upon City Council's approval of the LHMP, formal adoption documentation will be forwarded to FEMA to satisfy the final requirement of the review process.

DISCUSSION

After a disaster strikes, repair and construction efforts are often undertaken to restore infrastructure to pre-disaster conditions. Although such efforts expedite a return to normal functioning, the replications of pre-disaster conditions could result in a cycle of damage, reconstruction, and repeated damage. Hazard mitigation planning ensures such cycles are broken and that post-disaster repairs and reconstruction result in vulnerability reduction.

While disasters may be unpreventable, the devasting effects may be reduced or eliminated through well-organized public education and awareness efforts, preparedness, and mitigation. For those hazards that cannot be fully mitigated, the community must be prepared to provide efficient and effective response and recovery services.

The mission of the LHMP is to promote sound public policy designed to protect residents, critical facilities, infrastructure, private property, and the environment from natural and human caused hazards. This mission will be achieved by increasing public awareness, documenting resources for risk reduction and loss prevention, and identifying activities that will guide the City toward building a safer, more sustainable community.

The document was prepared through a concerted and collaborative effort of City departments, citizens in the community, and major stakeholders in the region. All City departments met regularly, coordinated resources, and compiled information required for the document. Public workshops were held to gather ideas and opinions on community mitigation goals and activities. In addition, a stakeholder meeting was conducted, which was attended by emergency service coordinators within the region, representatives from the Arcadia Unified School District, American Red Cross, Santa Anita Racetrack, civic groups, and the Arcadia Chamber of Commerce.

The end-product is a comprehensive City of Arcadia Local Hazard Mitigation Plan. Over 100 pages in length, excluding appendices and maps, the document reviews action items from the previous LHMP and evaluates if those goals have been met. It also discusses in detail nine (9) possible natural and human-caused hazards that could impact the City, which include the following:

1) Earthquake
2) Flood
3) Slope Failure Debris/Mud Flow
4) Windstorm
5) Wildfire
6) Drought
7) Hazardous Materials
8) Terrorism

9) Train Accident

The LHMP includes a description, risk analysis, and mitigation strategies for each hazard. For example, the earthquake section of the document discusses: the definition of an earthquake; earthquakes in Southern California and in Arcadia; earthquake hazard assessment and a list of the nearby fault lines that affect Arcadia; risk analysis of the probability of an earthquake with a magnitude of 5.0 or greater occurring in the next five (5), 10, 20, and 50 years; the City's current mitigation of earthquake hazards; and a resource directory pertaining to earthquake preparedness and mitigation. Other sections follow similar patterns.

The adoption of Resolution No. 7429 by the City Council is the final requirement in the plan approval process. The document has already been approved by the California Office of Emergency Services ("Cal-OES"). Additionally, the document has been approved by FEMA, pending the formal adoption by the City Council. Upon City Council's adoption, the document will be available for public review in the City Manager's Office, City Clerk's Office, and the Arcadia Public Library. A copy will also reside on the City's website.

ENVIRONMENTAL IMPACT

The LHMP is subject to a statutory exemption pursuant to Section 15252 of the California Environmental Quality Act guidelines because it is a feasibility and planning study. Additionally, the document is consistent with the City's General Plan in implementing certain Public Safety Element goals, objectives, and policies outlined in Resolution No. 7429.

FISCAL IMPACT

Adoption of Resolution No. 7429 has no direct fiscal impact to the City. Arcadia will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Failure to adopt an LHMP will forfeit the City's eligibility to receive federal funding for both pre-disaster and post-disaster mitigation projects.

RECOMMENDATION

It is recommended that the City Council adopt Resolution No. 7429 approving the City of Arcadia's Local Hazard Mitigation Plan.

Approved:

Dominic Lazzaretto
City Manager

Attachments: Resolution 7429
City of Arcadia Local Hazard Mitigation Plan

ADOPTED

RESOLUTION NO. 7429

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ARCADIA, CALIFORNIA, APPROVING THE CITY OF ARCADIA LOCAL HAZARD MITIGATION PLAN

WHEREAS, the City of Arcadia recognizes that on October 30, 2000, the Disaster Mitigation Act of 2000 ("DMA") was signed into law, amending provisions of the Robert T. Stafford Disaster Relief Act of 1988; and

WHEREAS, the DMA (Public Law 106-390) states that for a community to receive pre-disaster and post-disaster funds and Federal Emergency Funds, a Local Hazard Mitigation Plan ("LHMP") must be submitted to the California Office of Emergency Services and the Federal Emergency Management Agency ("FEMA"), and the failure to submit a plan will disqualify a community from receiving disaster assistance; and

WHEREAS, the DMA reinforces the importance of pre-disaster infrastructure mitigation planning to reduce disaster losses nationwide because it focuses on planning and recognizes the significance of hazard mitigation planning at the local level, and the necessity for effective coordination between state and local entities to promote an integrated, comprehensive approach to mitigation planning; and

WHEREAS, the DMA requires local agencies like the City of Arcadia to develop and update a mitigation plan that includes a detailed City profile and identification of specific threats and vulnerabilities within the City, and which sets forth specific mitigating measures to address such threats and vulnerabilities; and

WHEREAS, the DMA requires detailed documentation of all actions, meetings, studies, and directives undertaken in furtherance of the DMA plan; and

WHEREAS, the DMA includes new criteria for local mitigation planning, including the development and submittal of mitigation plans as a condition to receiving Local Hazard Mitigation Grant Program funds; and

WHEREAS, the City of Arcadia has met all federal requirements of the Stafford Act and applicable amendments, and has further met all requirements of the Disaster Mitigation Act of 2000, including development of and updating the Local Hazard Mitigation Plan through public participation and steering committee establishment, and development of a maintenance program for annual plan review and federal plan review every five (5) years.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ARCADIA, CALIFORNIA, DOES HEREBY FIND, DETERMINE AND RESOLVE AS FOLLOWS:

SECTION 1. Pursuant to the foregoing recitals, the following findings and determinations are hereby made:

1. The City of Arcadia's Local Hazard Mitigation Plan is subject to a statutory exemption pursuant to the California Environmental Quality Act ("CEQA") Guidelines, Section 15252, because it is a feasibility and planning study;
2. The City Council expresses its full support for, and willingness to devote appropriate resources to, the DMA program and the adoption of a DMA plan for the City; and
3. The City Council supports the active participation of all interested agencies, departments, community groups, and the public with respect to the DMA program.

SECTION 2. The Local Hazard Mitigation Plan is consistent with the City's General Plan in that it implements the following Public Safety Element goals, objectives, and policies:

1. Minimize potential for loss of life, physical injury, and property damage resulting from earthquakes and geologic hazards.
2. Continue enforcing the most rigorous building and grading codes which govern seismic safety
3. Superior storm drainage and flood control facilities that minimize risk of flooding.
4. Prioritize improvements to Arcadia's storm drain system in areas that are prone to localized ponding and flooding.
5. High level of protection from the dangers of wildland and urban fires.
6. Practice fire prevention, engineering, enforcement, and education as the primary means to reduce incidents of wildland and urban fires.
7. A continued high level of protection from risks to life, the environment, and property associated with human-caused hazards in Arcadia.
8. Minimize exposure of the environment, critical facilities, and residences to hazardous materials.
9. Provide the City of Arcadia with an all-risk fire service by providing and maintaining a full range of services that are intended to instill a sense of safety and well-being throughout the community. Services will include emergency medical services; fire prevention and education; protection from hazards of fire; hazardous materials, and domestic terrorism; and urban

search and rescue.

10. To provide a continued high level of fire and police protection services, with an emphasis on prevention and education.

11. Comprehensive and effective emergency and disaster response preparedness.

SECTION 3. The City Council hereby approves and adopts the City of Arcadia's Local Hazard Mitigation Plan.

Passed, approved and adopted this 3rd day of May, 2022.

/s/ Tom Beck
Mayor of the City of Arcadia

ATTEST:

/s/ Gene Glasco
City Clerk

APPROVED AS TO FORM:

Stephen P. Deitsch
Stephen P. Deitsch
City Attorney

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS:
CITY OF ARCADIA)

I, GENE GLASCO, City Clerk of the City of Arcadia, hereby certifies that the foregoing Resolution No. 7429 was passed and adopted by the City Council of the City of Arcadia, signed by the Mayor and attested to by the City Clerk at a regular meeting of said Council held on the 3rd of May, 2022 and that said Resolution was adopted by the following vote, to wit:

AYES: Danielson, Tay, Verlato, Cheng, and Beck

NOES: None

ABSENT: None

/s/ Gene Glasco
City Clerk of the City of Arcadia

On May 11, 2022, this plan was approved by FEMA. The approval letter and crosswalk are included in this section.

U.S. Department of Homeland Security
FEMA Region 9
1111 Broadway, Suite 1200
Oakland, CA 94607

FEMA

May 11, 2022

Barry Spriggs
Fire Chief
Arcadia Fire Department
710 S. Santa Anita Ave.
Arcadia, CA 91006

Dear Chief Spriggs:

The *City of Arcadia Local Hazard Mitigation Plan 2022* was officially adopted by the City of Arcadia on May 3, 2022 and submitted for review and approval to the Federal Emergency Management Agency (FEMA). The review is complete, and FEMA finds the plan to be in conformance with the Code of Federal Regulations, Title 44, Part 201, Section 6 (44 C.F.R. 201.6).

This plan approval ensures the City of Arcadia's continued eligibility for funding under FEMA's Hazard Mitigation Assistance programs, including the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities program (BRIC), and the Flood Mitigation Assistance (FMA) program. All requests for funding are evaluated individually according to eligibility and other program requirements. Approved hazard mitigation plans may also be eligible for points under the National Flood Insurance Program's Community Rating System (CRS).

FEMA's approval is for a period of five years, effective starting the date of this letter. Prior to **May 11, 2027**, the City of Arcadia must review, revise, and submit their plan to FEMA for approval to maintain eligibility for grant funding. The enclosed plan review tool provides additional recommendations to incorporate into future plan updates.

If you have any questions regarding the planning or review processes, please contact the FEMA Region 9 Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

KATHRYN J LIPIECKI

Digitally signed by KATHRYN J LIPIECKI
Date: 2022.05.11 12:53:29 -07'00'

Kathryn Lipiecki
Director, Mitigation Division
FEMA Region 9

Enclosure (1)
City of Arcadia Plan Review Tool, dated May 11, 2022

cc: Alison Kearns, Planning and Implementation Branch Chief, FEMA Region 9
Jennifer Hogan, State Hazard Mitigation Officer, California Governor's Office of Emergency Services
Victoria LaMar-Haas, Hazard Mitigation Planning Chief, California Governor's Office of Emergency Services

REGION IX LOCAL HAZARD MITIGATION PLAN REVIEW TOOL

Last Updated: April 12, 2021

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 Arcadia, California	**Title of Plan:** City of Arcadia Local Hazard Mitigation Plan	**Date of Plan:** December 31, 2019
Local Point of Contact: Barry Spriggs		**Address:** 710 S. Santa Anita Ave. Arcadia, CA 91006
Title: Fire Chief		
Agency: Arcadia Fire Department		
Phone Number: 626 574 5107		**E-Mail:** bspriggs@ArcadiaCA.gov

State Reviewer(s): Karen McCready-Hoover (916) 845-8177 karen.mccready-hoover@caloes.ca.gov	**Title:** Emergency Services Coordinator	**Date:** April 13, 2021
Date Received at State Agency	1/9/20, 6/24/20, 3/12/21, 3/17/21, 4/7/21	
Date Sent to FEMA	4/13/21	

FEMA Reviewer(s): Emily Breen	**Title:** Community Planner	**Date:** May 3, 2021
Date Received in FEMA Region IX	April 13, 2021	
Date(s) Revisions Requested	May 24, 2021, April 1, 2022	
Date Approvable Pending Adoption (APA)	April 5, 2022	
Date Approved	May 11, 2022	

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 the planning team members who were involved.	P 5-1 & 5-2	X	
	b. Does the plan list the jurisdiction(s) participating in the plan that are seeking approval?	P 1-3	X	
	c. Does the plan identify who represented each jurisdiction on the planning team? At a minimum, it must identify the jurisdiction represented and the person's position or title and agency within the jurisdiction.)	P 5-1 & 5-2	X	
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 stakeholders from 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?	P 5-3	X	
	b. Does the plan identify how the stakeholders were invited to participate in the process?	P 5-3	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		**Location in Plan** (section and/or page number)	**Met**	**Not Met**
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?	P 5-3, 6-1	X	
	b. Does the plan document how the public's feedback was incorporated into the plan?	P 1-1, 5-3, 6-1	X	
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))		P 5-3 to 5-4, P 7.1-10, 7.2-7, 7.3-8, 7.4-9, 7.5-10	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))		P 1-5, 10-3	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?	P 1-3 to 1-4, 10-1 to 10-2	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?	P 1-3 to 1-4, 10-1 to 10-2	X	
	c. Does the plan identify how, when, and by whom the plan will be **updated** during the 5-year cycle?	P 1-3 to 1-4, 10-2 to 10-3	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 jurisdiction(s)? (Requirement §201.6(c)(2)(i))	a. Does the plan include a general description of all natural hazards that can affect each jurisdiction?	P 6-1	X	
	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?	P 6-1	X	
	c. Does the plan include a description of the **type** of all natural hazards that can affect each jurisdiction?	P 7.1-1, 7.2-1 to 7.2-2, 7.3-1, 7.4-1, 7.5-1, 7.6-1	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		**Location in Plan** (section and/or page number)	**Met**	**Not Met**
	d. Does the plan include a description of the **location** for all natural hazards that can affect each jurisdiction?	P 7.1-10, 7.1-4, 7.2-4, 7.2-8, 7.2-9, 7.3-6, 7.3-9, 7.4-5, 7.5-11, 7.6-1	X	
	e. Does the plan include a description of the **extent** for all natural hazards that can affect each jurisdiction?	P 7.1-1 to 7.1-4, 7.2-3, 7.3-1, 7.4-1 to 7.4-4, 7.5-3 to 7.5-6, 7.6-1 to 7.6-3, 7.6-8	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?	P 7.1-1 to 7.1-3, 7.2-2 to 7.2-4, 7.3-2 to 7.3-4, 7.4-3 to 7.4-4, 7.5-2 to 7.5-4, 7.5-6, 7.6-2 to 7.6-6	X	
	b. Does the plan include information on the **probability** of future hazard events for each jurisdiction?	P 7.1-5, 7.2-4, 7.2-8, 7.2-9, 7.3-5 to 7.3-6, 7.4-4, 7.5-6, 7.6-8	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.)?	P 7.1-1 to 7.1.-3, 7.1-5 to 7.1-9, 7.2-3, 7.2-5 to 7.2-6, 7.3-2 to 7.3-4, 7.3-6 to 7.3-7, 7.4-3 to 7.4.9, 7.5-1, 7.5-4, 7.6-6 to 7.6-7	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
	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?	P 7.1-5 to 7.1-9, 7.2-5 to 7.2-7, 7.3.4, 7.3-6 to 7.3-8, 7.4.3-7.4.9, 7.5-1, 7.5-5, 7.5-7, 7.5-10 to 7.5-11, 7.6-10	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))		7.2-4	X	
ELEMENT B: REQUIRED REVISIONS				
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?	P 9-6 to 9-9	X	
	b. Does the plan document each jurisdiction's ability to expand on and improve these existing policies and programs?	P 9-7 to 9-9	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))		P 7.2-4	X	
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))		P 1-1 to 1-3	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?	9-1 to 9-6	X	
	b. Does the plan identify mitigation actions for every hazard posing a threat to each participating jurisdiction?	9-1 to 9-6	X	
	c. Do the identified mitigation actions and projects have an emphasis on new and existing buildings and infrastructure?	P 9-1, 9-2, 9-4, 9-6	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)		Location in Plan (section and/or page number)	Met	Not Met
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)?	P 9-1, 10-2	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?	P 9-1 to 9-4, 9-6	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 plans, when appropriate? (Requirement §201.6(c)(4)(ii))	a. Does the plan identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated?	P 1-4, 9-6 to 9-7, 10-1 to 10-2	X	
	b. Does the plan describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms?	P 9-6 to 9-7, 10-1 to 10-2	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.	P 9-6 to 9-7, 10-1 to 10-2	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))		P 4-1, 4-4	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))		P 5-4 to 5-9	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))		P 1-5	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))		P 2-1	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
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			
OPTIONAL: HIGH HAZARD POTENTIAL DAM RISKS (Applicable to jurisdictions interested in becoming sub applicants to FEMA's Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program only)			
HHPD1. Did Element A4 (planning process) describe the incorporation of existing plans, studies, reports, and technical information for high hazard potential dams?			
HHPD2. Did Element B3 (risk assessment) address HHPDs?			
HHPD3. Did Element C3 (mitigation goals) include mitigation goals to reduce long-term vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?			
HHPD4. Did Element C4-C5 (mitigation actions) address HHPDs prioritize mitigation actions to reduce vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?			
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

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Strengths:

1) The City did a nice job of involving the public through both a public meeting and surveys.
2) The City clearly incorporates the review of existing studies, reports, and technical information into the plan.

Opportunities for Improvement:

1) In future plans, please provide documentation such as sign-in sheets or # of surveys received that evidence how the public was given the opportunity to be involved in the HMP development process.
2) With respect to monitoring plan implementation, in future plans, consider describing the system by which the status of actions will be tracked – this could be as simple as a spreadsheet or a more complex web-based tool.
3) In addition to the avenues for public involvement listed in the plan, consider celebrating successes with the community, such as sharing with the public when the plan is approved, or when a mitigation action is successfully completed, through avenues such as websites, newsletters, or social media.

Element B: Hazard Identification and Risk Assessment

Strengths:

1) The plan contains succinct and clear descriptions of the hazards that can affect the City, and comprehensive descriptions of potential impacts and previous occurrences.

Opportunities for Improvement:

1) The plan includes a well-developed community profile section. In future plans, consider weaving these community aspects in with the discussion of vulnerabilities for each hazard. This was done nicely with wildfire hazard – connecting development growth into Wildland Urban Interface areas and the vulnerabilities associated with wildfire. Are there other unique sectors of communities within Arcadia that are particularly vulnerable to the other hazards potentially impacting the city?
2) In some cases, only certain areas of a community may be at risk to an identified hazard, while in other cases, the whole community may be equally at risk to a particular hazard. In future plans, if the whole city is at equal risk to a hazard, please note this explicitly in the plan.

Element C: Mitigation Strategy

Strengths:
1) The plan does an excellent job listing existing authorities, policies, programs and resources and directly addresses how the jurisdiction could expand and improve.

Opportunities for Improvement:
1) It is important that mitigation actions and strategies be clear and actionable. While the mitigation strategies included in the current plan are adequate, they are somewhat broad which could make implementation challenging. In future plans, consider crafting strategies that are more detailed and actionable, such as the items listed under the 'ideas for implementation'.

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

Strengths:
1) The plan comprehensively and clearly addresses changes in development and how these changes increase vulnerabilities, particularly in the Wildland Urban Interface.

Opportunities for Improvement:
1) None at this time.

B. Resources for Implementing and Updating Your Approved Plan

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

Level Up! Podcast Series on Hazard Mitigation
https://www.georgetownclimate.org/articles/level-up-audio-project.html

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

Coastal Plan Alignment Compass
https://resilientca.org/topics/plan-alignment/

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

Guides to Expanding Mitigation
https://www.fema.gov/about/organization/region-2/guides-expanding-mitigation

Community Rating System User Manual
https://www.fema.gov/media-library/assets/documents/8768

U.S. Climate Resilient Toolkit
https://toolkit.climate.gov/

2018 National Climate Assessment
https://nca2018.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

A Guide to Supporting Engagement and Resiliency in Rural Communities
https://www.fema.gov/sites/default/files/documents/fema_rural-guide_jan-2021.pdf

Guide to Virtual Hazard Mitigation Planning Meetings
https://www.mass.gov/doc/guide-to-virtual-hazard-mitigation-planning-meetings/download#:%7E:text=Guide%20to%20Virtual%20Hazard%20Mitigation%20Planning%20Meetings.%20This,valuable%20input%20into%20the%20mitigation%20planning%20process,%20from

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

Building Resilient Infrastructure and Communities Grant Program

- POC: FEMA Region IX and State Hazard Mitigation Officer
- Website: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

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	P 7.1-1	P 7.1-10, 7.1-4	P 7.1-1 to 7.1-4	P 7.1-1 to 7.1-3	P 7.1-5	P 7.1-1 to 7.1.-3; P 7.1-5 to 7.1-9	P 7.1-5 to 7.1-9	9-2
Flood	P 7.2-1 to 7.2-2	P 7.2-4, 7.2-8, 7.2-9	P 7.2-3	P 7.2-2 to 7.2-4	P 7.2-4, 7.2-8, 7.2-9	P 7.2-3, 7.2-5 to 7.2-6	P 7.2-5 to 7.2-7	
Slope Failure - Debris/Mud Flow	P 7.3-1	P 7.3-6, 7.3-9	P 7.3-1	P 7.3-2 to 7.3-4	7.3-5 to 7.3-6	P 7.3-2 to 7.3-4, 7.3-6 to 7.3-7	P 7.3.4, 7.3-6 to 7.3-8	9-3
Windstorm	P 7.4-1	P 7.4-5	7.4-1 to 7.4-4	P 7.4-3 to 7.4-4	7.4-4	7.4-3 to 7.4.9	P 7.4.3-7.4.9	9-4
Wildfire	P 7.5-1	7.5-11	7.5-3 to 7.5-6	P 7.5-2 to 7.5-4, 7.5-6	7.5-6	7.5-1, 7.5-4	P 7.5-1, 7.5-5, 7.5-7, 7.5-10 to 7.5-11	9-1
Drought	P 7.6-1	7.6-1	7.6-1 to 7.6-3, 7.6-8	P 7.6-2 to 7.6-6	7.6-8	7.6-6 to 7.6-7	7.6-10	9-6

Why Plan for Hazards in City of Arcadia?

Hazards can impact citizens, property, environment, and the economy of City of Arcadia. Earthquakes, flood, Slope Failures, windstorms, wildfires, drought, hazardous materials, transportation emergencies and terrorism have exposed City of Arcadia residents and businesses to the financial and emotional costs of recovering after disasters. The risk associated with hazards increases as more people move to areas affected by those hazards.

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

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

Geography and the Environment

City of Arcadia has an area of 11.3 square miles and is located in Greater Los Angeles County area. Elevations in the City range from a high of 1,200 feet to a low of 300 feet. The terrain of the city is from the valley floor sweeping to the foothills.

Community Profile

The 11.3 square mile City of Arcadia is one of the Southland's finest communities. Located in the western San Gabriel Valley south of the San Gabriel Mountains, Arcadia, also known as the "Community of Homes", is a picturesque, affluent, largely built out community, with an outstanding public school system. The Los Angeles County Arboretum, Westfield Mall at Santa Anita, Santa Anita Race Track, Arcadia County Park, and the Santa Anita Golf Course annually attract a substantial number of visitors into Arcadia from Southern California. With its rich history and quality of development, Arcadia will remain a premier community.

Transportation

The 210 freeway serves the City, and the major arterial highways are Santa Anita Avenue and Baldwin Avenue, which run north to south and Huntington Drive (Route 66), Live Oak Avenue, Duarte Road, Foothill Boulevard and Longden Avenue, which run east to west.

The City also has a light rail transportation system running through the center of town. Los Angeles County Metropolitan Transportation Authority operates the Metro Gold Line light rail system. The Gold Line operates a 31 mile light rail between Azusa and East Los Angeles. There is a station in the center of town with parking for 300 vehicles. The estimated weekday ridership of the Gold Line is 49,500 riders.

The MTA also operates various bus lines within the City of Arcadia.

Major Rivers
The nearest major river is the Los Angeles River (or San Gabriel River). This River does not have any potential impact on the City of Arcadia. Normally this river channel is dry and only carries a significant water flow during a major rainstorm. The river channel is a concrete channel and part of the Los Angeles County Flood Control District.

Climate
Temperatures in the City of Arcadia range from 40 degrees in the winter months to 100 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures and very low humidity. Temperatures rarely exceed 110 degrees F in the summer months (June - September), and rarely drop below 30 F in the winter months (November-March).

The City of Arcadia over the last seventy years of recorded rainfall has had a low of 5.27 inches of rainfall in 1947 to a high of 41.23 in 1969. Rainfall in the city averages eighteen inches of rain per year.

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

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

Arcadia is located at the foothills of the San Gabriel Mountains in the Transverse Ranges Geomorphic province of Southern California. The City overlays two groundwater basins: The Raymond Water Basin on the north and the San Gabriel Water Basin on the south. The basins are separated by the northeast trending Raymond Fault, which acts as a hydrological barrier, and defines the boundary between the two.

The Raymond Basin is an alluvial valley covering approximately 40 square miles and is bordered by the San Gabriel Mountains on the north, San Rafael Hills on the west, and the Raymond Fault on the south and east. The general east-west trend of the San Gabriel Mountains, the north-south trend of the San Rafael Hills, and northeast trend of the Raymond Fault result in the basin having a triangular form.

The limits of the San Gabriel Valley are generally defined on the north by the San Gabriel Mountains and the Raymond Fault, on the west by the Repetto and Merced Hills, on the south by the Puente Hills, and on the east by the San Jose Hills. The total area of

the alluvial valley is approximately 167 square miles. Arcadia is located at the extreme northwest portion of the San Gabriel Valley.

Bedrock:
The bedrock geology of the Raymond Basin and vicinity consists of a complex array of granitic and metagranitic rocks of pre-Cretaceous age. Although outcrops are typically fractured, the granitic bedrock underlying the alluvial sediment at the base of the basin is not considered water bearing.

Older and Younger Alluvium:
Total alluvial thickness is as much as 1,100 feet in the Raymond Basin and as much as 1,900 feet in the San Gabriel Basin. The older alluvium is distributed throughout the entire basin and its water transmitting properties vary depending upon the degree to which it has been weathered and/or cemented. Older alluvium consists primarily of sand, gravel and boulders with minor interbedded clay layers.

Younger alluvium consists predominantly of sand, gravel and boulders, is less consolidated than the older alluvium and yields water more readily and consistently.

Faulting and Ground Water Barriers:
Major faults in the vicinity of Arcadia include the Sierra Madre Fault Zone and the Raymond Fault. The Raymond Fault is the most geohydrologically significant fault in Arcadia. The fault acts as a barrier impeding ground water movement from the Raymond Basin into the Main San Gabriel Basin to the south. The barrier effect is reflected by significant differences in ground water level across the fault. In addition, artesian conditions and ponded surface water have been observed north of the fault during periods of high water levels resulting from the "damming" effect of the fault.

Concerns:
Based on the Raymond Fault creating a ground water barrier the area located to the north of the fault can be prone to the occurrence of liquefaction or has the potential for permanent ground displacement. The steep foothills of the San Gabriel Mountains have a potential of the earthquake-induced Slope Failures or the permanent ground displacement in the north part of Arcadia.

Other Significant Geologic Features
The City of Arcadia, like most of the Los Angeles Basin, lies over the area of one or more known earthquake faults, and potentially many more unknown faults, particularly so-called lateral or blind thrust faults.

The major faults that have the potential to affect the greater Los Angeles Basin, and therefore the City of Arcadia are: San Andreas, Newport Inglewood, Palos Verdes, Whittier, Santa Monica, Raymond, and Sierra Madre.
In addition, many areas in the Los Angeles Basin have sandy soils that are subject to liquefaction and land movement.

Population and Demographics
City of Arcadia has an estimated population of about 59,000 in an area of 11.3 square miles. It is estimated by the U.S. Census Bureau that the City of Arcadia's population has increased annually at a rate of 4.3% since 2010.

The increase of people living in City of Arcadia creates more community exposure, and changes how agencies prepare for and respond to hazards. For example, more people living on the urban fringe increase the risk of wildfire. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage.

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

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

Vulnerable populations, including seniors, disabled citizens, women, and children, those people may be disproportionately impacted by disasters.

Land and Development

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

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

Housing and Community Development
In the City of Arcadia, the demand for housing outstrips the available supply, and the recent low interest rates have further fueled a pent up demand. There are more single family homes in the City in comparison to the number of apartments and condominiums. The development of condominiums has increased significantly along with the development of mixed-use properties.

Employment and Industry
Employment and Industry - The City of Arcadia has a very broad employment base. There are major retail, industrial, office, and specialty employers throughout the City.

The major employers in the City include the Santa Anita Race Track, Methodist Hospital of Southern California, and the Westfield at Santa Anita.

The City of Arcadia also lies within a "Sixty Mile Circle" centered on Los Angeles, a dynamic concentration of population, employment, business, industry and finance. Two-thirds of the State's 100 largest corporations are headquartered within the circle. Additionally, several federal and state highways, two nearby rail lines, and three international airports, as well as the 210 Freeway passing through Arcadia, provide ready access to regional, national and international markets.

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

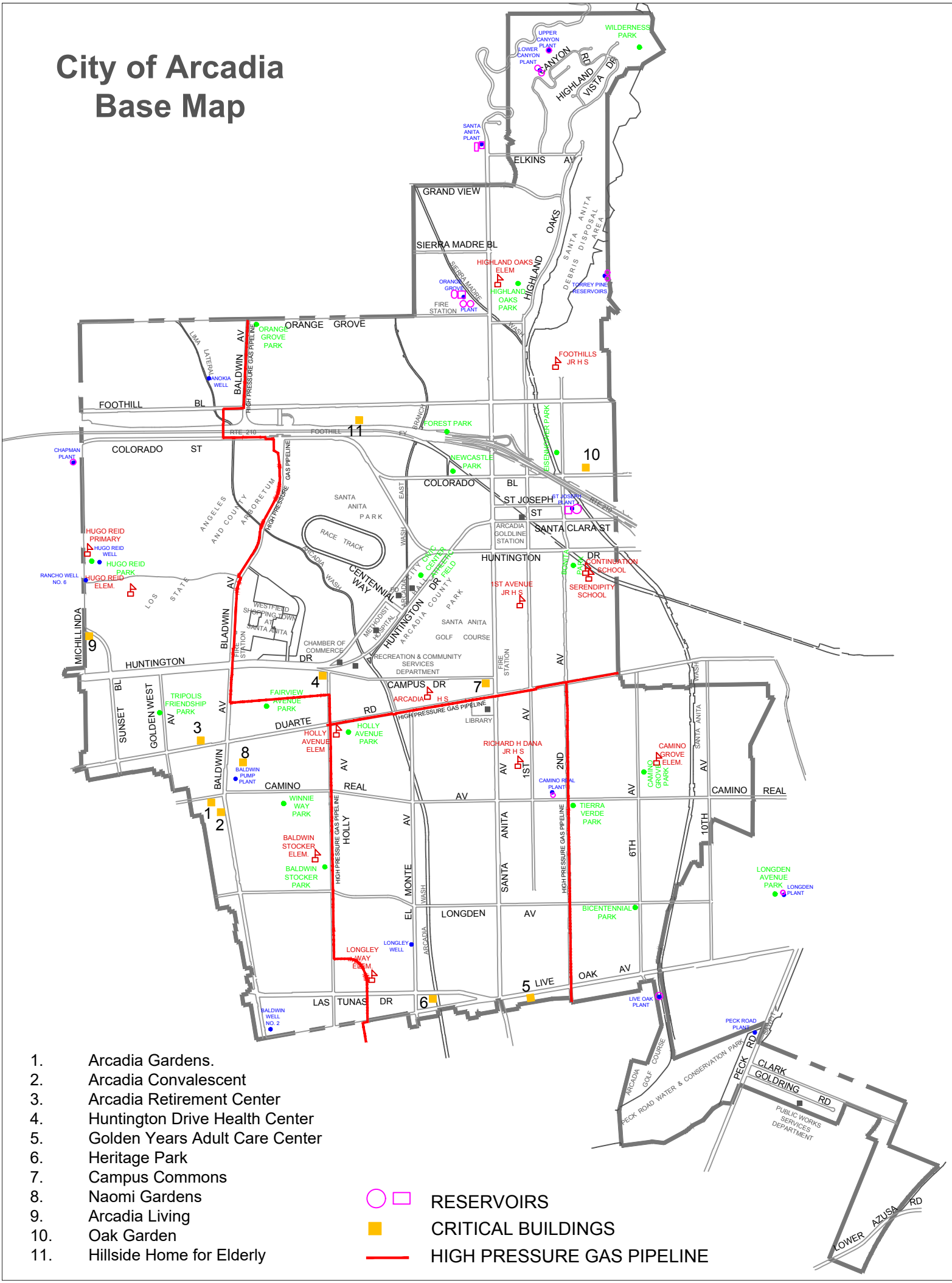
Transportation and Commuting Patterns

The City of Arcadia is located in the Los Angeles Metropolitan Statistical Area (LAMSA)

The I-210 Foothill Freeway traverses the City of Arcadia, connecting the city to east and north valleys of Los Angeles County, and the I-605 San Gabriel Freeway is located four (4) miles east of Arcadia and runs south to the coast. The City's 150-mile road system includes 37 miles of arterial highways, 113 miles of local roads, and 37 bridges.

Private automobiles are the dominant means of transportation in Southern California and in the City of Arcadia. However, the City of Arcadia meets its public transportation needs utilizing the numerous local public transportation options available in the region. The Los Angeles County Metropolitan Transportation Authority (LACMTA) and Foothill Transit operate a total of 11 bus routes and one light rail line through the city. Additionally, the Arcadia Transit offers Arcadia residents convenient, affordable transit within the city limits and to five (5) designated medical facilities located beyond the city limits. The City participates in regional efforts to improve air quality by promoting rideshare alternatives to its employees.

City of Arcadia Base Map



1. Arcadia Gardens.
2. Arcadia Convalescent
3. Arcadia Retirement Center
4. Huntington Drive Health Center
5. Golden Years Adult Care Center
6. Heritage Park
7. Campus Commons
8. Naomi Gardens
9. Arcadia Living
10. Oak Garden
11. Hillside Home for Elderly

RESERVOIRS

CRITICAL BUILDINGS

HIGH PRESSURE GAS PIPELINE

The City of Arcadia Local Hazard Mitigation Plan integrates a cross-section of citizen input throughout the planning process. To accomplish this goal, the City of Arcadia Hazard Mitigation Advisory Committee developed a public participation process through three components: (1) developing a planning committee; (2) conducting stakeholder interviews to target the specialized knowledge of individuals working with populations or areas at risk from natural hazards; and (3) conducting one public workshops to identify common concerns and ideas regarding hazard mitigation and to discuss specific goals and actions of the mitigation plan.

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

Local Hazard Mitigation Plan Committee

The first step in reviewing and updating the Local Hazard Mitigation Plan was to develop a committee comprised of at least one member of each department within the City. Table B.1 lists the committee members and their department at the beginning of the review. Table B.2 lists the current committee members and their department.

Initial Local Hazard Mitigation Planning Committee Table B.1

Name	Title	Department
Barry Spriggs	Battalion Chief - Project Manager	Fire
Todd Morehead	Fire Captain	Fire
Paul Foley	Police Captain	Police
Jackie Mercado	Management Analyst	Public Works
Ryan Wright	Assistant Recreation Director	Recreation and Community Services
Roger Hiles	Library Services Manager	Library and Museum Services
Vanina Rynkiewicz	Purchasing Officer	Administrative Services
Jim Kasama	Planning and Community Development Director	Development Services
Laena Shakarian	Management Analyst	City Manager's Office

Current Local Hazard Mitigation Planning Committee Table B.2

Name	Title	Department
Barry Spriggs	Fire Chief - Project Manager	Fire
Tom Devlin	Battalion Chief	Fire
Charlie Tuggle	Fire Captain	Fire
Tom Cullen	Lieutenant	Police
Carmen Masud	Senior Management Analyst	Public Works

Candice Cheung	Assistant Recreation Director	Recreation and Community Services
Roger Hiles	Library Services Manager	Library and Museum Services
Vanina Rynkiewicz	Purchasing Officer	Administrative Services
Lisa Flores	Planning and Community Development Director	Development Services
Jennifer Brutus	Senior Management Analyst	City Manager's Office

Meetings

Members of the Committee had several meetings amongst themselves, with employees with special areas of expertise, and with outside representatives. Though not every meeting was logged the following list gives a brief synopsis of the meetings and their content.

January 18, 2017 to February 25, 2017
There were many meetings amongst only two individuals that did not get logged. The meetings were often between the project leader and another committee member to ensure the timely completion of a specific task. They also entailed preparation for upcoming stakeholder, committee, and community meetings.

January 11, 2017
The City of Arcadia Local Hazard Mitigation Plan Committee assembled and provided an overview to the committee about the current Natural Hazard Mitigation Plan and the review process that was about to be undertaken.

The project Manager introduced the planning committee. Each committee member described the department they represented. The goals from the current NHMP were reviewed and assessed as to their completion. Various tasks were assigned to each member of the committee. The committee agreed on the need to add drought, hazardous materials, and terrorism to the new LHMP.

February 8, 2017
The Committee met and the project manager discussed the following:

- Committee Members completed Worksheet #1 Identifying the hazards and Worksheet #2 Asset Identification Checklist.
- Committee members reviewed the base map from the previous plan and added an additional 12 critical facilities to the base map including the Gold Line Light Rail.
- Methods to gain community input were discussed including a community meeting, stakeholder meeting and advertising the process through the City Hot Sheet and Quarterly Newsletter.

March 17, 2017
The Committee met and the project manager discussed the following:

- LHMP hazards were discussed in the February meeting. The committee decided to group the hazards into two large categories, natural and human caused. The natural hazards addressed by the plan are: Wildfire, Earthquake, Flood, Windstorm, Debris Flow/Landslide, Drought.
- The human caused hazards will be Hazardous Materials, Transportation and Terrorism
- Dates were set for the public meeting and the stakeholder meeting. The public meeting will be April 10, 2017 and the Stakeholder Meeting will be April 12, 2017.
- Mitigation items for the hazards were also discussed at this meeting.

October 2018
Project manager met with Arcadia Public Works Services Division and updated base maps and hazard maps for the community.

February 12, 2019
The LHMP Committee met and were asked to provide feedback to develop mitigation goals for the new plan. Feedback from the committee was obtained the following week and the mitigation goals for the plan were finalized.

Community Meeting
Community members were invited to a meeting to review the current and new hazards the City is including in the mitigation plans. This was an opportunity for the community to learn what the City is doing and also for members of the community to provide their input on the hazards that they felt necessary to plan for. The committee also provided a questionnaire to the attendees in order to gain further input.

The meeting was announced to the public following the Cities regular announcement procedures. The meeting information was published in the newspaper and on the City website

Meeting was conducted on:

April 10, 2017 at 1900hrs in the Council Chambers Conference Room

Stakeholders Meeting
Stakeholders were invited to a meeting on April 12, 2017 at Fire Station 106 to review the current and new hazards the City is including in the mitigation plans. This was an opportunity for the organizations to learn what the City is doing and also to provide their input on the hazards that they felt necessary to plan for. The committee also provided a questionnaire to the stakeholders in order to gain further input.

The following stakeholders were all contacted about the meeting via phone and or email.

Mitigation Plan Stakeholders Table B.3

Arcadia Methodist Hospital
American Red Cross
Sierra Madre Fire Department
Monrovia Fire and Rescue
Arcadia Unified School District
Chamber of Commerce
Santa Anita Racetrack
Westfield Shopping Towne
SoCal Edison
SoCal Gas Company
CalTrans
Office of Civil Defense Disaster Management
Metro Goldline

Review of the 2012 Local Hazard Mitigation Plan
An important part of the planning process is to evaluate the plan that was approved by the City Council and FEMA in 2012. During its meetings the Local Hazard Mitigation Plan Committee reviewed the sections of the plan. Both the multi hazard goals and the specific hazard goals were reviewed to see if they had been achieved during the five-year period or if the goals were still a work in progress.

The hazards that were addressed in the 2012 plan were also looked at. The eight hazards: Earthquake, Landslide/Debris Flow, Flood, Wildfire, Windstorm, Drought, Terrorism, Hazardous Materials were considered to still be hazards to the community.

Action Items from the 2012 Natural Hazard Mitigation Plan

The following action items were placed into three categories based on the 2012 Local Hazard Mitigation Plan Committee's recommendations. The LHMP Committee considered ease, cost, and importance of completion. The following three categories rank the achievability of each action item; category one action items being the action items to be completed first, and respectively category three being the last.

Category One

Flood A
Enhance the City of Arcadia's dam failure preparedness.

Ideas for Implementation:

- Incorporate dam inundation maps into the EOP. - **Completed**

  Coordinating Organization: Fire Department

Funding Source:	Fire Department
Timeline:	Within the next six months
Constraints:	Limited staff time

Wildfire A
Enhance emergency services to increase the efficiency of wildfire response.

Ideas for Implementation:

- Continue to update the City of Arcadia Brush Plan. **Updated Summer 2021**
- Develop, approve, and promote fire protection agreements and partnerships. **Updated June 2021**

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Ongoing
Constraints:	none

Wildfire B
Continue to educate the public on wildfire safety.

Ideas for Implementation

- Continue to utilize the Arcadia Fire Department Brush Clearance Inspection Program. - **Completed**
- Continue to utilize the Arcadia Fire Prevention Bureau public service announcements. – **Completed and Ongoing**

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Ongoing
Constraints:	Funding

Multi Hazard A & B

Multi Hazard A
Continue to develop and implement programs that encourage Arcadia residents and business owners to prepare for an emergency or disaster situation.

Multi Hazard B
Create and maintain communication vehicles through which the City can communicate with the public on both an outgoing and incoming basis.

Implementation Ideas:

- As necessary, update the City's ACTION Emergency Preparedness Handbook.

- Work with City departments to develop and distribute informational pamphlets concerning specific areas of emergency and disaster preparedness. - **Ongoing**
- Work with City departments and the School District to provide age-appropriate emergency preparedness information to students. - **Ongoing**
- Promote emergency/disaster preparedness to the local business community by reaching out to local merchants and to the Chamber of Commerce. – **Conducted safety presentations**
- As appropriate, work with the Fire and Police Departments to update the preparedness information contained on the City website. In the event of a significant local disaster use the website to inform the public on a timely basis of the status of the emergency, evacuation plans and any other information that is pertinent to their well-being. On an ongoing basis advise the public that the website will be used to relay important information in the event of an emergency.
- Look into the possibility of purchasing a "Reverse 911 System" that would be used to relay information to residents and businesses by way of telephone in the event of a significant disaster. – **Entered into contract in 2016**
- Be prepared to implement in a timely fashion, a telephone hotline that residents can call for information and a distribution system that can be used in coordination with other methods to relay critical information. – **Changed from hotline to links to information on city website.**
- Keep City employees informed about the need to be prepared for an emergency both at home and at work and advise employees annually of the City's disaster recall policy. – **Completed and ongoing**

Coordinating Organization:	City Manager's Office
Funding:	General Fund/City Operating Budget/City Manager's Office, Fire Department, Police Department, Public Works Services Department
Timeline:	Ongoing
Constraints:	Staff time

Multi Hazard C

Develop an evacuation plan for future disastrous events.

Ideas for implementation:

- Establish procedures for notifying residents in the event that a mandatory evacuation is necessary. - **Completed**

- Determine primary and alternate routes for the safe evacuation of residents. Integrate the evacuation routes data into the City of Arcadia's Emergency Operations Plan. – **Completed and Evacuation annex was evaluated after being put into use during 2020 Bobcat Fire**.

- Develop a plan to coordinate the restriction of inbound traffic into the hazard area. - **Completed**

Coordinating Organization:	City of Arcadia Development Services, Fire and Police Departments
Funding Source:	General Fund
Timeline:	Within the next one year
Constraints:	Limited staff time, cost

Category Two

Landslide A

Improve the capabilities of managing debris from Landslide events by developing a debris management strategy for the City of Arcadia.

Ideas for implementation:

- Determine the necessary equipment and personnel needed to develop a coordinated response to managing debris. – **Completed debris management plan annex in City Emergency Operations Plan**

- Identify local debris removal sites and routes to expedite the process of debris removal. - **Ongoing**

Coordinating Organization:	City of Arcadia Public Works Services
Funding Source:	Public Works
Timeline:	Within the next three years
Constraints:	Limited staff time, lack of equipment needed to manage debris, cost associated with purchasing equipment.

Windstorm A

Identify and implement projects to reduce the damage caused by trees during a windstorm.

Ideas for Implementation:

- Continue regular tree trimming procedures:
    - Continue four-year tree trimming grid for optimum effectiveness to maintain healthy trees.
    - Ensure trees in the public right-of-way are trimmed to maintain a clearance from all electric power lines as specified in the California Code of Regulations and the California Public Utilities Commission
    - Continue to remove trees that are dead, diseased, or dying.
    - Continue the Crown Restoration Program to preserve the health of large aging trees
    - Ensure proper tree trimming techniques as approved by the Professional Arborist Association
    - Provide public education materials to residents to make them aware of the need to regularly maintain and trim their own trees

  - Update Urban Forest Master Plan to include type of trees to plant, when to plan, where easement trees will be placed, and how and when they will be maintained.
  - **Completed and updated regularly**
- Create and include a coordination plan with Southern California Edison to determine power line maintenance program and emergency procedures for fallen power lines. **- Completed and updated regularly**
- Create an emergency contact list for mutual aid or other responsible agencies to be added to the EOP. – **Completed and updated regularly**

Coordinating Organization:	Public Works Services Department
Funding Source:	General Fund and Gas Tax
Timeline:	Ongoing
Constraints:	Limited staff time and capital resources to fund Tree Trimming Contractors

Status – Ongoing

Hazardous Materials A
Enhance the City's preparedness for a hazardous materials event.

Ideas for Implementation:

- Update the City's Haz-Mat policy and incorporate it into the EOP. - **Completed and ongoing**
- Update known hazardous material storage locations. - **Completed and ongoing**

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Annually
Constraints:	Staff time for updating policies

Terrorism A
Create a Standing Operating Guideline for City personnel responding to a terrorist incident.

Implementation Ideas:

- Meet with representation from the appropriate City departments to develop a SOG that will outline the guidelines for the safest and most efficient way to respond and operate during a terrorist incident. – **Completed and Ongoing.Terrorism annex added to Emergency Operations Plan**.

Coordinating Organization:	Police Department
Funding Source:	General Fund, Police, Fire, and Public Works budgets
Timeline:	One year
Constraints:	Limited staff time

Category Three

Multi Hazard D
Integrate new earthquake, wildfire, Landslide, and flood hazard mapping data for the City of Arcadia and improve technical analysis of earthquake hazards.

Ideas for Implementation:

- Develop the City of Arcadia earthquake HAZUS data using more localized data including the building inventory to improve accuracy of the vulnerability assessment for the City Arcadia. – **Not completed**
- Conduct risk analysis incorporating HAZUS data and hazard maps using GIS technology to identify risk sites and further assist in prioritizing mitigation activities and assessing the adequacy of current land use requirements. – **Not completed**

Coordinating Organization:	Development Services
Funding:	Unfunded; possibly EOC
Timeline:	Within the next three years
Constraints:	Funding for a HAZUS computer; staff time

Drought –
Identify and implement projects to reduce the impact of drought.

Ideas for Implementation:

- Conserve water resources by:
  - Improving leak detection capability of the Public Works Services Staff
  - Continuing to provide water audits for indoor/outdoor uses
  - Updating the City's Urban Water Management Plan to ensure water supply in the future
  - Funding Capital Improvement Projects to improve the reliability and sustainability of the City's water distribution system
  - Develop and implement a Tiered Water Rate Pricing Structure
  - **Completed - City Public Works developed Drought Master Plan**

Coordinating Organization:	Public Works Services Department
Funding Source:	Water Fund (revenue generated from billing for water service)
Timeline:	Short Term (within the next five years)
Constraints:	Limited staff time, resistance from public and lack of public participation.

What is a Risk Assessment?
Conducting a risk assessment can provide information on the location of hazards, the value of existing land and property in hazard locations, and an analysis of the risk to life, property, and the environment that may result from hazardous events. The following steps were taken into consideration during the risk assessment.

Hazard Identification
This is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. In the plan approved in 2012, the hazards that were identified were earthquake, landslide, windstorm, wildfire, flooding, drought, terrorism, and hazardous materials.

Part of the planning process was to survey residents and stakeholders to see what they felt to be hazards that could affect the City of Arcadia. In addition to the above eight hazards, the surveys indicated that one additional hazard could adversely affect the City of Arcadia. The one additional hazard is transportation. The main reason to add transportation is that since the adoption of the previous plan, a countywide light rail mass transportation system has been extended to and through Arcadia.

There are many possible hazards listed by FEMA in Guide 386-2, Understanding Your Risks. This Local Hazard Mitigation Plan will only address those hazards listed above. All of the hazards were considered but many were ruled out based on the survey completed by stakeholders and looking back through historical data for this community.

Profiling Hazard Events
This process describes the causes and characteristics of each hazard, how it has affected the City of Arcadia in the past, and what part of the City's population, infrastructure, and environment has historically been vulnerable to each specific hazard. The hazards impacting the City of Arcadia can be divided into two broad categories. The categories are natural caused hazards and human caused hazards. A profile of each hazard is provided in each hazard specific section. For a full description of the history of hazard specific events, please see the appropriate hazard chapter.

Vulnerability Assessment/Inventorying Assets
This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these entities provide essential products and services to the general public that are necessary to preserve the welfare and quality of life in the City and fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified, mapped, and are illustrated in the City base map. In addition, this plan includes a community issues summary in each hazard section to identify the most vulnerable and problematic areas in the City, including critical facilities, and other public and private property.

Risk Analysis

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. Risk Analysis discusses the possible effect of hazards on parts of the City including but not limited to: bridges, critical infrastructure, dams, businesses, and residential areas.

Assessing Vulnerability/ Analyzing Development Trends

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

Maps can be found at the back of each hazard specific section for which they are appropriate.
**Infrastructure and critical facilities maps have been withheld due to security concerns post 9-11*.

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

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

Regardless of the data available for hazard assessments, there are numerous strategies the City can take to reduce risk. These strategies are described in the action items detailed in the Mitigation Strategy section of this Plan. Mitigation strategies can further reduce disruption to critical services, reduce the risk to human life, and alleviate damage to personal and public property and infrastructure. Action items throughout the hazard sections provide recommendations to collect further data to map hazard locations and conduct hazard assessments.

Federal Requirements for Risk Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201 include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are nine hazards profiled in the mitigation plan, including earthquakes, earth movements, flooding, wildfires, windstorms, drought, terrorism, transportation and hazardous materials. The Federal criteria for risk assessment and information on how the City of Arcadia's Local Hazard Mitigation Plan meets those criteria is outlined in Table 3-2 below.

Table 3-2. Federal Criteria for Risk Assessment

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

Critical Facilities and Infrastructure

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: 911 centers, emergency operations centers, police and fire stations, public works facilities, communications centers, sewer

and water facilities, hospitals, light rail lines, bridges and roads, shelters, and facilities that, if damaged, could cause serious secondary impacts may also be considered "critical." A hazardous material facility is one example of this type of critical facility.

Critical and essential facilities are those facilities that are vital to the continued delivery of key government services or that may significantly impact the public's ability to recover from the emergency. These facilities may include: buildings such as the jail, law enforcement center, public services building, community corrections center, the courthouse, and juvenile services building and other public facilities such as schools. The attached charts/maps illustrate the critical facilities, essential facilities, public infrastructure, and emergency transportation routes within the City of Arcadia.

Summary

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

Local Hazard Mitigation Plan 2022
Section 7 Natural Hazards

When developing the Local Hazard Mitigation Plan for the City of Arcadia, the committee decided to place the hazards into two broad categories. The categories are Natural Hazards and Human Caused Hazards. Section 7 of the plan covers Natural Hazards. The hazards are:

Section 7.1	Earthquake
Section 7.2	Flood
Section 7.3	Slope Failure - Debris/Mud Flow
Section 7.4	Windstorm
Section 7.5	Wildfire
Section 7.6	Drought.

All data tables and maps included in this section were updated during the revision of this plan.

Local Hazard Mitigation Plan 2022
Section 7.1 Earthquake

Definition of an Earthquake
A shaking or trembling of the earth that is volcanic or tectonic in origin.[1]

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

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

Earthquake Induced Slope failures
Earthquake induced slope failures are secondary earthquake hazards that occur from ground shaking. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes. Map 7-3 identifies the areas vulnerable to slope failures within the city of Arcadia.

Liquefaction
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases, this ground may be subject to liquefaction, depending on the depth of the water table. Map 7-3 also identifies areas vulnerable to liquefaction within the city of Arcadia.

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

History of Earthquakes in Southern California
The most recent significant earthquake event affecting Southern California was the 2019 Ridgecrest Earthquake. The Ridgecrest earthquake sequence included a magnitude-6.4 foreshock on July 4, followed by a magnitude-7.1 mainshock nearly 34 hours later. The earthquakes resulted in one death, 25 people injured and approximately 5.3 billion dollars in damages.[ii]

The most impactful to the L.A. Basin was the 6.7 magnitude Northridge Earthquake that occurred on January 24, 1994. 57 people were killed, and more than 1,500 people seriously injured. For days afterward, thousands of homes and businesses were without electricity, tens of thousands had no gas, and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. About 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. Ground shaking caused extensive damage, 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.

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

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

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

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is relatively remote from the urban centers of Southern California. Refer to the following table 7.1-1 of Earthquake Events in the Southern California Region.

Table: 7.1-1 Southern California Earthquakes with a Magnitude 5.0 or Greater since 1960

1971	San Fernando	1992	Landers	2001	Anza
1973	Point Mugu	1992	Big Bear	2003	Big Bear
1986	North Palm Springs	1994	Northridge	2004	Parkfield
1987	Whittier Narrows	1999	Hector Mine	2008	Chino Hills
2010	Baja California	2014	La Habra	2019	Ridgecrest

History of Earthquakes in the City of Arcadia

The most recent large-scale destruction to strike Arcadia was during the 1994 earthquake. Although the City's businesses, residences, and infrastructure suffered only light damage it is estimated that the event directly or indirectly affected about 3% of the City's 53,000 residents. The City sought and received a County, State, and Presidential Disaster Declaration to obtain assistance for its recovery effort. Even though the earthquake was not a strong event, it showed that a large disaster would affect the City's ability to respond and repair large-scale damage without the assistance of the county, state, and federal government.

Even though a lesser known fault line, the Raymond Fault, is only predicted to have a major rupture about once every 4500 years it still crosses right through the City of Arcadia, and there are even a couple of schools sitting directly on the Fault itself. The last major rupture of the Raymond Fault occurred sometime in the last 2000 years. However, the most recent notable seismic activity of the Fault occurred in the southern area of Pasadena with a magnitude of 5.0. Even though there were only a few minor injuries and slight damage reported, the Raymond Fault still has the potential to cause severe damage to the City of Arcadia and its residents.

A more well know fault that crosses through the north end of Arcadia is the Sierra Madre Fault Line. Though its last major rupture occurred in the Holocene era and it is predicted to have major seismic activity about once every several thousand years it could still cause great damage to the City of Arcadia and its neighboring communities.

Although the Clamshell-Sawpit Canyon Fault does not cross directly through Arcadia it should still be considered a great threat to the community. On June 28, 1991 seismic activity of about a 5.8 magnitude occurred on the Clamshell-Sawpit Canyon Fault, an offshoot of the Sierra Madre fault zone in the San Gabriel Mountains. [iv]Because of its depth and moderate size, it caused no surface rupture, but it did trigger rockslides that blocked some of the local mountain roads. Roughly $40 million in property damage occurred in the San Gabriel Valley; unreinforced masonry buildings were hardest hit, and many brick chimneys collapsed. Two deaths resulted from this earthquake -- one person was killed in Arcadia, and one person in Glendale died from a heart attack. In all, at least 100 others were injured, though the injuries were mostly minor. [v]

Earthquake Hazard Assessment

The San Gabriel Valley is littered with both surface and blind fault lines. Though the Raymond and Sierra Madre Fault Lines cross directly through the City of Arcadia there are many other faults that pose a great risk to the community including but not limited to the Clamshell-Sawpit, San Gabriel, and San Andreas Faults.

Many organizations, in partnership with other state and federal agencies, have undertaken a rigorous program in California to identify seismic hazards and risks including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced slope failures. Seismic hazard maps have been published and are available for many communities in California through the State Division of Mines and Geology. Map 7-1 illustrate the known earthquake faults in the San Gabriel Valley, and Arcadia.

The City of Arcadia is at risk from many fault lines throughout California. The following Table 7.1-2 shows the distance between the fault line and the City of Arcadia.

Table 7.1-2 Distances and Estimated Earthquake Strengths for Regional Faults

Fault Name	Approximate Distance from Arcadia	Maximum Credible Earthquake (MCE)
Sierra Madre	0 miles	6.7 MCE
Raymond	0 miles	6.5 MCE
Clamshell-Sawpit	1 mile	6.5 MCE
San Gabriel	4 miles	7.0 MCE
Verdugo	8 miles	6.7 MCE
Whittier-North Elsinore	10 miles	7.0 MCE
Elysian Park	11 miles	6.7 MCE
Santa Monica-Hollywood	13 miles	6.6 MCE
San Jose	14 miles	6.5 MCE
Chino	18 miles	6.7 MCE
San Andreas (Mojave section)	21 miles	7.1 MCE
Cucamonga	22 miles	7.0 MCE
Newport-Inglewood	23 miles	6.9 MCE
Oak Ridge	24 miles	6.9 MCE
Newport-Inglewood (offshore)	26 miles	6.9 MCE

Probability

The U.S.G.S. in March 2015 published Version 3 of the Uniform California Earthquake Rupture Forecast (UCERF).[vi] This document lists the probability and magnitude of an earthquake occurring in many regions of California including the Los Angeles Region. Below is the table for the Los Angeles Region:

Magnitude Greater or Equal Than To	Average Repeat Time	30 Year Likelihood or one or more events
5	1.4	100%
6	10	96%
6.7	40	60%
7	61	46%
7.5	109	31%
8	532	7%

Risk Analysis

Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, slope failure susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location.

Damages from a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, tens of thousands of older existing buildings were built under less rigid codes. California has laws affecting unreinforced masonry buildings (URM's) and although many building owners have retrofitted their buildings, hundreds of pre-1933 buildings still have not been brought up to current standards. All existing uncensored masonry buildings in the City of Arcadia have been seismically retrofitted to comply with the "1990 Revised Model Ordinance for the Seismic Retrofit of Hazardous unreinforced Masonry Buildings" as developed by the State of California Seismic Safety Commission.

Economic Impact

The City of Arcadia has a total assessed valuation of $15,676,471,562. This can be further broken into:

Residential properties valued at	$12,959,501,963
Commercial properties valued at	$ 1,524,210,934
Other properties valued at	$ 1,192,758,665

Arcadia's Current Mitigation of Earthquake Hazards

Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines)

suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by the city.

Dams

There is a total of 103 dams in Los Angeles County, owned by 23 agencies or organizations, ranging from the Federal government to Homeowner Associations.[vii] These dams hold billions of gallons of water in reservoirs.

There are portions of the City that are located within the flood hazard areas (or inundation areas) of three (3) dams, including the Eaton Wash Dam in East Pasadena, the Santa Anita Dam, which is located in the Angeles National Forest above Arcadia, and the Sawpit Dam, which is located in Monrovia. A portion of the Sierra Madre Dam hazard area is also located within the City boundary but the dam was recently modified and no longer poses a potential threat to the City. For further information on dams and flood waters please see Section 7.2 Flooding Hazards.

Infrastructure and Communication

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

Bridge Damage

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

The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. CalTrans checks when the bridges are inspected because they administer the Federal funds for bridge projects. Even though the bridges in the City of Arcadia are state, county, or privately owned (including railroad bridges) all of the inspected bridges earned a Satisfactory rating or better. Prior to the opening of the Goldline Light Rail Extension through Arcadia in 2016, all four of the bridges for the Light Rail’s right of way were rebuilt to current building code standards.

Damage to Lifelines

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

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Many critical facilities are housed in older buildings that are not up to current seismic codes. However, all critical public buildings in Arcadia have been built to code and are considered seismically sound.

Individual Preparedness

Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the City of Arcadia, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured, and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake. The residents and business owners of Arcadia can visit any fire station to obtain literature on earthquake preparedness and survival.

Fire

Downed power lines or broken gas mains can trigger fires. Major incidents will demand a larger share of resources, and initially smaller fires and problems will receive little or insufficient resources in the initial hours after a major earthquake event. Loss of electricity may cause a loss of water pressure in some communities, further hampering firefighting ability. In the event of an earthquake the Arcadia Fire Department has an Earthquake Policy. The policy states: when and where off-duty personnel should report, initial tasks of on duty personnel, and provides initial assignments for determining the amount of damage the City and its occupants suffered. The City of Arcadia also has a Disaster Recall Policy encompassing all departments which details when and where City Employees are to report and the responsibilities of each person.

Debris

After damage to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. The City of Arcadia has a debris management annex in its Emergency Operations Plan. City staff is also working with Los Angeles County Public Works on a Debris Management Plan for the entire county of Los Angeles.

Buildings

The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damages is great. In most California communities, including the city of Arcadia, many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings. All unreinforced masonry buildings both publicly and privately owned in are Arcadia have been retrofitted to meet current standards.

City of Arcadia Codes

Implementation of earthquake mitigation policy most often takes place at the local government level. The City of Arcadia Development Services Department enforces building codes pertaining to earthquake hazards. The City of Arcadia has adopted the 2019 California Building Code. Therefore, all earthquake hazard mitigation measures specified in the Code are enforced by the City of Arcadia for new and remodeled buildings and structures. This ensures that all buildings be built and remodeled at the most current seismic standards.

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

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

Businesses/Private Sector

Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses. When a company is forced to stop production for just a day, the economic loss can be tremendous. In fact, of all businesses which close following a disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.[viii] The Institute of Business and Home Safety has developed “Open for Business”, which is a disaster planning toolkit to help guide businesses in preparing for and dealing with the adverse effects of natural hazards. The kit integrates protection from natural disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

Hospitals

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

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

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old. Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to the public after disasters). SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

Community Issues Summary

One fault line runs diagonally through Arcadia. A large earthquake on that fault would impact:

- City owned roadways, water infrastructure and radio repeater site.
- Interstate 210
- Metro Gold Line Light Rail
- One middle school
- Two elementary schools
- A Regional Mall
- A horse racing track with a capacity for over 50,000 patrons
- A major natural gas distribution line feeding the San Gabriel Valley runs through Arcadia and crosses the fault line

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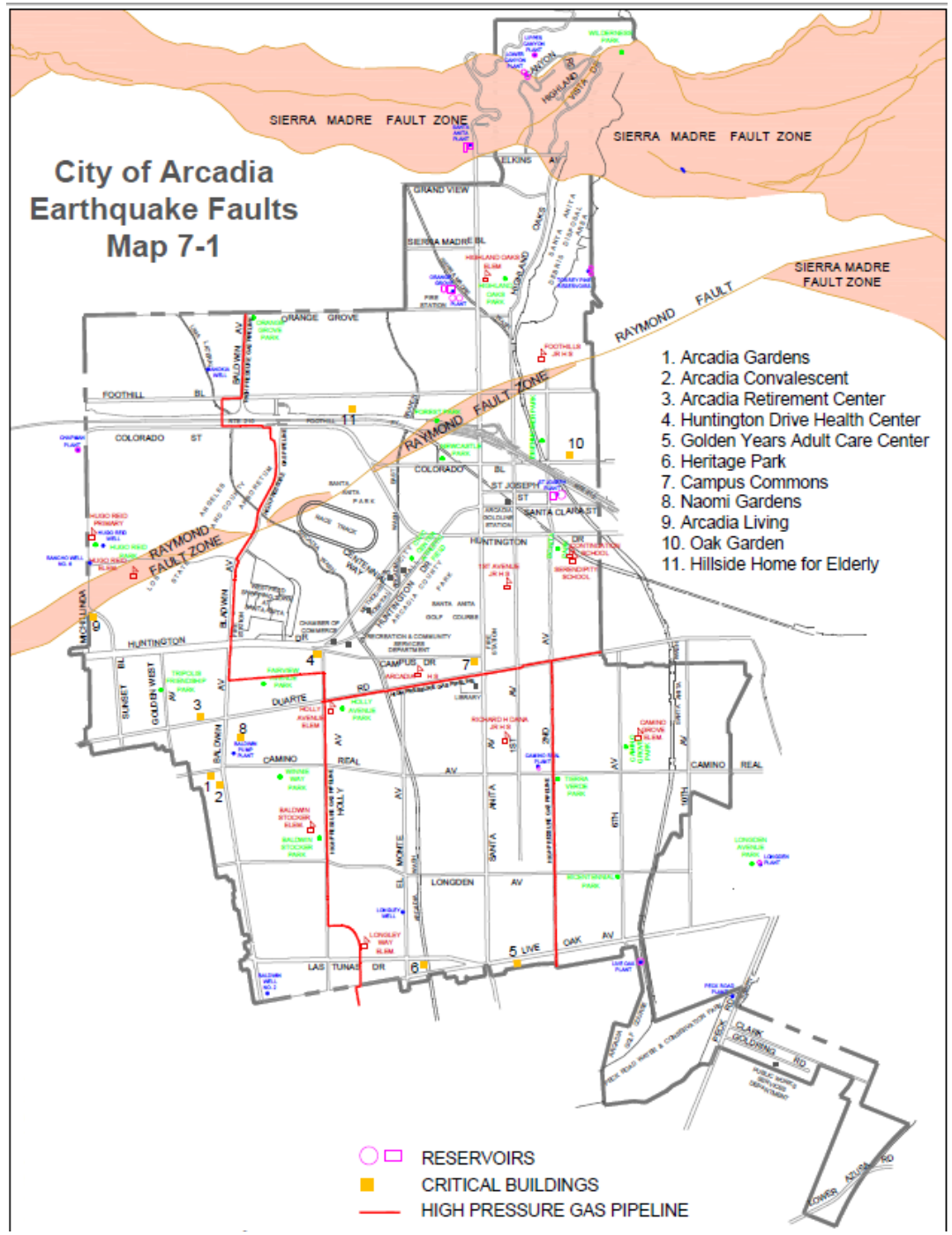
City of Arcadia
Earthquake Faults
Map 7-1
SIERRA MADRE FAULT ZONE
SIERRA MADRE FAULT ZONE
SIERRA MADRE FAULT ZONE
RAYMOND FAULT
RAYMOND FAULT ZONE
RAYMOND FAULT ZONE
1. Arcadia Gardens
2. Arcadia Convalescent
3. Arcadia Retirement Center
4. Huntington Drive Health Center
5. Golden Years Adult Care Center
6. Heritage Park
7. Campus Commons
8. Naomi Gardens
9. Arcadia Living
10. Oak Garden
11. Hillside Home for Elderly
RESERVOIRS
CRITICAL BUILDINGS
HIGH PRESSURE GAS PIPELINE

Definition of Flooding
A rising and overflowing of a body of water especially onto normally dry land.[i]

Flood Related Hazards
Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course. While the City of Arcadia has some of these conditions, it has been fortunate enough to have no experience of flooding in the City.

Winter Rainfall
Over the last 125 years, the average annual rainfall in Los Angeles has been 14.9 inches. But the term "average" means very little as the annual rainfall during this time period has ranged from only 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884. In fact, in only fifteen of the past 125 years, has the annual rainfall been within plus or minus 10% of the 14.9 inch average. And in only 38 years has the annual rainfall been within plus or minus 20% of the 14.9 inch average. This makes the Los Angeles basin a land of extremes in terms of annual precipitation. The City of Arcadia is centrally located in the San Gabriel Valley. It is up against the San Gabriel Mountains or hills, which could increase the collection of rainwater.

Monsoons
Another relatively regular source for heavy rainfall, particularly in the mountains and adjoining cities is from summer tropical storms.

Riverine Flooding
Riverine flooding is the overbank flooding of rivers and streams. The natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers.

Shallow Area Flooding
Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated by the 100-year flood with flood depths of only one to three feet. These areas are generally flooded by low velocity sheet flows of water.

100-Year Flood
The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood.

Urban Flooding
As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in flood waters that rise very

rapidly and peak with violent force.

Dam Failure Flooding

Loss of life and damage to structures, roads, and utilities may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects could certainly accompany the failure of one of the major dams surrounding the City of Arcadia. There are no dams within the City's boundaries. However, there are portions of the City that are located within the flood hazard areas (or inundation areas) of three (3) dams, including the Eaton Wash Dam in East Pasadena, the Santa Anita Dam, which is located in the Angeles National Forest above Arcadia, and the Sawpit Dam, which is located in Monrovia.

History of Flooding in Southern California

There are a number of rivers in the Southern California region, but the river with the best recorded history is the Los Angeles River. The flood history of the Los Angeles River is generally indicative of the flood history of much of Southern California.

Records show that since 1811, the Los Angeles River has flooded 30 times, on average once every 6.1 years. But averages are deceiving, for the Los Angeles basin goes through periods of drought and then periods of above average rainfall. Between 1889 and 1891 the river flooded every year, and from 1941 to 1945, the river flooded 5 times. Conversely, from 1896 to 1914, a period of 18 years, and again from 1944 to 1969, a period of 25 years, the river did not have serious floods.[ii]

A Sample of Major Floods of the Los Angeles River	**Table 7.2**
1825	L.A. River changed its course back from the Ballona wetlands to San Pedro
1861-62	Heavy flooding. Fifty inches of rain falls during December and January.
1867	Floods create a large, temporary lake out to Ballona Creek.
1884	Heavy flooding caused river to change course, turning east to Vernon & then south to San Pedro.
1914	Heavy flooding. Great damage to the harbor.
1934	Moderate flood starting January 1. Forty dead in La Canada.
1938	Great County-wide flood with 4 days of rain. Most rain on day 4.
1941-44	L.A. River floods five times.
1969	One heavy flood after 9 day storm. One moderate flood.
1979	Los Angeles experiences severe flooding and mudslides.
1980	Flood tops banks of river in Long Beach. Sepulveda Basin spillway almost opened.
1983	Flooding kills six people.
1992	15 year flood. Motorists trapped in Sepulveda basin. Six people dead.
1994	Heavy flooding
Sources: http://www.lalc.k12.ca.us/target/units/river/tour/hist.html and (http://www.losangelesalmanac.com/topics/History/hi01i.htm)	

While the City of Arcadia is 15 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 sides of the valley, seldom reach heights above three thousand feet. The western San Gabriel Mountains, in contrast, have elevations of more than seven thousand feet. These higher ridges often trap eastern-moving winter storms. Although downtown Los Angeles averages just fifteen inches of rain a year, some mountain peaks in the San Gabriels receive more than forty inches of precipitation annually"[iii]

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

In Southern California, stories of floods, debris flows, persons buried alive under tons of mud and rock and persons swept away to their death in a river flowing at thirty-five miles an hour are without end. No catalog of chaos could contain all the losses suffered by man and his possessions from the Regions Rivers and streams.

This next section is taking from the City of Arcadia's General Plan from the Chapter on Safety. "Arcadia and surrounding areas are, like most of Southern California, subject to unpredictable seasonal rainfall. Most years, the scant winter rains are barely sufficient to turn the hills green for a few weeks, but every few years the region is subjected to periods of intense and sustained precipitation that sometimes results in localized flooding. Natural (Storm) Flooding In Southern California, storm flooding is difficult to predict, and thus plan for, because rainfall varies from year to year. Flood hazards related to storm events generally are described in terms of a 100- or 500-year flood. A 100-year flood is defined as a major flood event that has a one percent or greater chance of occurring during any one year. Flood hazard planning practices addresses such storms, as well as 500-year events. These floods are considered severe; however, these floods can be reasonably predicted and therefore reasonably mitigated. As noted above, the Los Angeles County Department of Public Works has constructed regional flood and debris control facilities throughout the region, including the flood control channels in Arcadia that direct runoff water through the City into regional facilities to the south. A system of spreading basins manages storm water runoff and helps recharge groundwater basins. Locally, the City maintains approximately four miles of subsurface storm drains that flow into the regional channels. Due to the combination of these two systems, no areas in Arcadia lie within a 100-year floodplain". [iv]

The City has experienced Urban Flooding. This occurred during the heavy rains in the mid 90's when the City's sewer system could not handle the amount of water being generated from the storm. The water overflowed onto the City streets but caused little to no damage to any public or private property. Once the rainfall lessened, the sewer system was able once again channel the

water through and away from the City. The 2010 City of Arcadia General Plan under Chapter 8 – Safety lists City of Arcadia's goal to have superior storm draining and flood control facilities that minimize the risk of flooding. The goal is achieved through the following policies:

- Policy S-2.1: Prioritize improvements to Arcadia's storm drain system in areas that are prone to localized ponding and flooding.

- Policy S-2.2: Continue rigorous maintenance of storm drainage and flood control facilities within the City's jurisdiction.

- Policy S-2.3: Require that new development projects retain as much runoff as possible on the development site to reduce flow volumes into the storm drain system, allow for recharge of the groundwater basins, and comply with the City's storm water permitting requirements (consistent with the National Pollutant Discharge Elimination Systems program, or NPDES) and employ Best Management Practices (BMPs).

- Policy S-2.4: Support efforts of the Los Angeles County Department of Public Works and other agencies responsible for the maintenance of dams and reservoirs above Arcadia to improve conditions of the facilities and reduce the risk of inundation resulting from dam or reservoir failure.

National Flood Insurance Program

The City of Arcadia does not participate in the National Flood Insurance Program.

Flooding Hazard Assessment

The most current FEMA map confirms that the City of Arcadia is rated area X, areas to be outside the .2% annual chance floodplain and in area D, areas in which flood hazards are undetermined but possible. Due to the fact Arcadia does not have areas considered to be flood prone the City does not have recurring loss properties. However, there are portions of the City that are located within the inundation areas of three (3) dams, including the Morris S. Jones Reservoir in East Pasadena, the Santa Anita Dam, which is located in the Angeles National Forest above Arcadia, and the Sawpit Dam, which is located in Monrovia. See Map 7.2a for flood inundation areas.

Risk Analysis

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

Using GIS technology and flow velocity models, it is possible to map the damage that can be expected from flood events over time. It is also possible to pinpoint the effects of certain flood events on individual properties.

Economic Impact

There are four dam inundation zones that impact the City of Arcadia. As mentioned in this section, the zones are Morris S. Jones Reservoir Inundation Area, Santa Anita Dam Inundation Area, and Sawpit Dam Inundation. The assessed valuation for the three areas are as follows:

Sawpit Dam Inundation Area	$276,166,986
Santa Anita Dam Inundation Area	$669,813,106
Morris Jones Reservoir	$271,501,566

Community Flood Issues

What is Susceptible to Damage during a Flood Event?

The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage are extensive. Property loss from floods strikes both private and public property. Because the City of Arcadia does not lie in a flood plain, the damage to property in the City has been minimal since incorporation.

Property Loss Resulting from Flooding Events

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

Business/Industry

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

Public Infrastructure

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

Roads

During natural hazard events, or any type of emergency or disaster, dependable road connections

are critical for providing emergency services. The Public Works Services Department maintains roads systems in the City of Arcadia. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Transportation agencies responsible for road maintenance are typically aware of roads at risk from flooding.

Bridges

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

Storm Water Systems

Local drainage problems are common throughout the City of Arcadia. While the City does not have a drainage master plan, Public Works staff is aware of local drainage threats. The problems are often present where storm water runoff enters culverts or goes underground into storm sewers. Inadequate maintenance can also contribute to the flood hazard in urban areas.

Water/Wastewater Treatment Facilities

There is one sanitary district that services the City of Arcadia (Los Angeles County Sanitation). There are also four (4) water service companies and or districts in the City of Arcadia. This number includes the water service provided to the residents by the City of Arcadia.

Wastewater Management

Arcadia's sewer system is a series of privately owned lateral connections from individual businesses and residences, which connect to larger City-owned main lines - then to subsequently larger trunk lines, which then take Arcadia's sanitary and industrial wastes to treatment plants operated by the LA County Sanitation District. These wastes are treated to varying degrees and either used for specific industrial purposes such as freeway irrigation or power (plant) generation, or discharged in to water bodies of the State, where they flow to the Pacific Ocean.

Water Districts

All of the water districts in the City as well as the City Public Works Services Department are in the process of replacing old cast iron pipes with more ductile iron pipes, which will be more resilient in disaster situations. During a disaster, water districts in the region work together to provide water for the city of Arcadia residents.

Water Quality

The City of Arcadia is committed to making sure that water from the water supply as well as storm water, which make its way into the water conveyance system, are safe and reliable by complying with all Federal and State water standards. The City of Arcadia water supply is always tested to make sure there are no harmful constituents.

Community Issues Summary

Flood is not a high hazard for the City of Arcadia. This statement is based on lack of a history of flooding within the City of Arcadia along with what is depicted on the most current FEMA map. The details from the most current FEMA map can be found on page 7.2-4 under the heading "Flood Hazard Assessment" The City of Arcadia does not have areas considered to be flood prone and does not have recurring loss properties.

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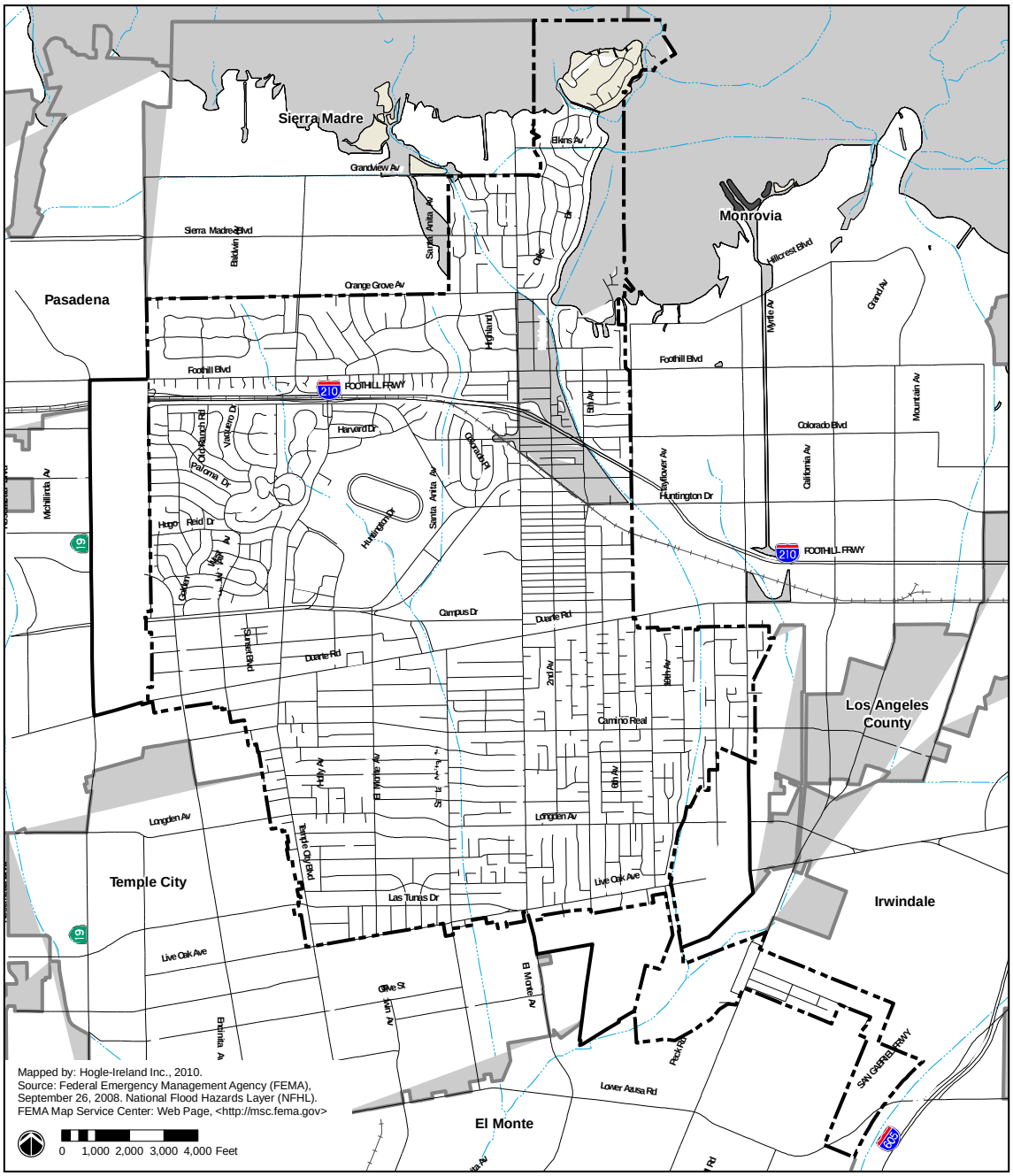


Flood Hazard Zones

- Areas of 0.2% annual chance flood.
- Areas in which flood hazards are undetermined, but possible.
- Areas determined to be outside the 0.2% annual chance floodplain.

Base Map Features

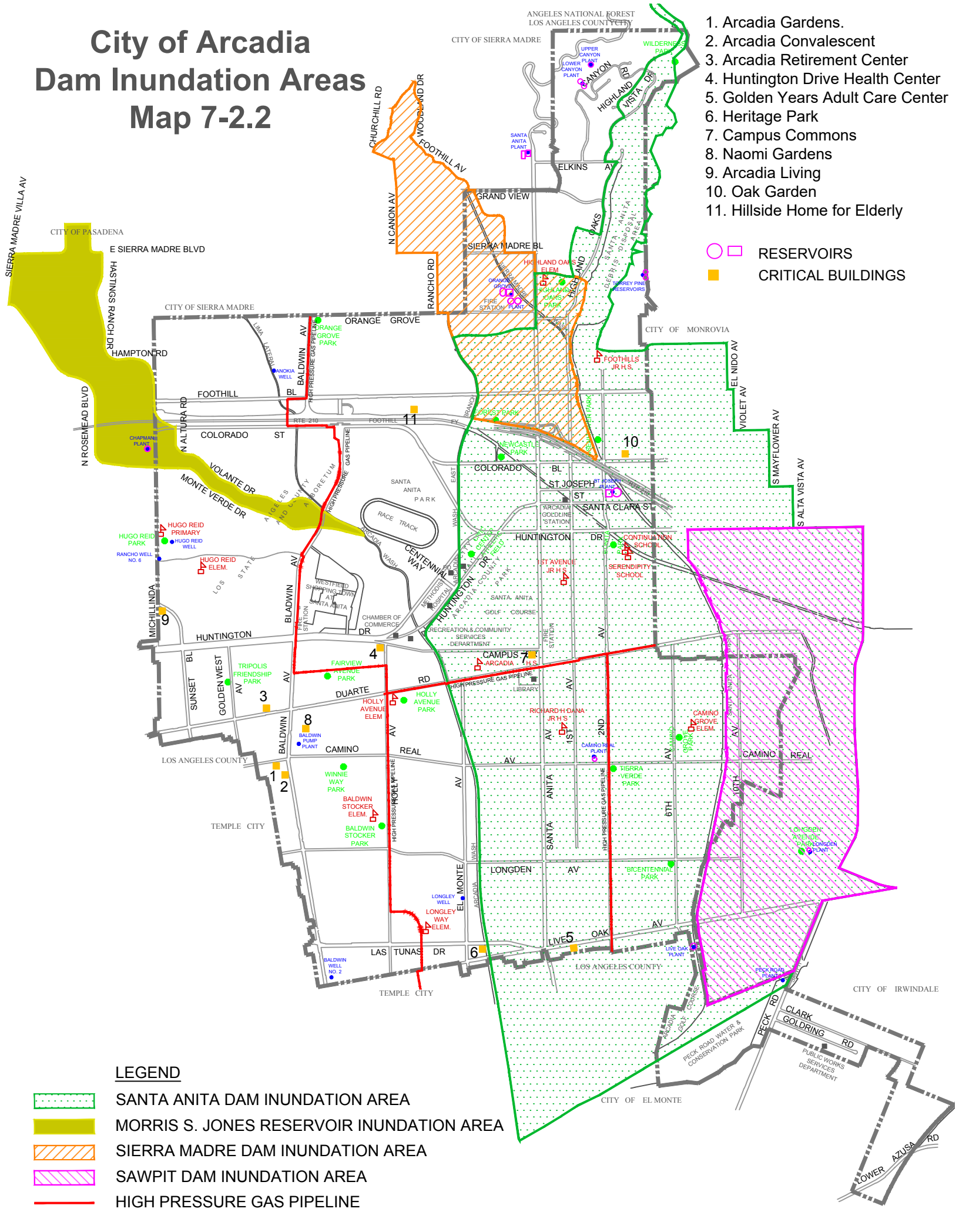
- City Boundary
- Sphere of Influence
- Freeway
- Railroad
- City Road
- Water Feature

City of Arcadia

Flood Hazards Map

MAP 7-2.1

City of Arcadia
Dam Inundation Areas
Map 7-2.2



Definition of a Slope Failure

Slope failure, also referred to as mass wasting, is the. downslope movement of rock debris and soil in response to gravitational stresses. Three major types of mass wasting are classified by the type of downslope movement: falls, slides, and flows.[1]

Slope Failure Hazards

The term "Slope Failure" encompasses events such as rock falls, topples, slides, spreads, and flows. Slope Failures can be initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by fabricated construction activities, or any combination of these factors.

The size of a Slope Failure usually depends on the geology and the initial cause of the Slope Failure. Slope Failures 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 Slope Failure are slope of the hillside, moisture content, and the nature of the underlying materials. Slope Failures are given different names, depending on the type of failure and their composition and characteristics.

Slides move in contact with the underlying surface. These movements 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. Slow-moving Slope Failures can occur on relatively gentle slopes and can cause significant property damage, but they are far less likely to result in serious injuries than rapidly moving Slope Failures.[2]

"Failure of a slope occurs when the force that is pulling the slope downward (gravity) exceeds the strength of the earth materials that compose the slope. They can move slowly (millimeters per year), or they can move quickly and disastrously, as is the case with debris-flows. Debris-flows can travel down a hillside of speeds up to 200 miles per hour (more commonly, 30 – 50 miles per hour), depending on the slope angle, water content, and type of earth and debris in the flow. These flows are initiated by heavy, usually sustained, periods of rainfall, but sometimes can happen because of short bursts of concentrated rainfall in susceptible areas. Burned areas charred by wildfires are particularly susceptible to debris flows, given certain soil characteristics and slope conditions."[3]

A debris or mudflow is a river of rock, earth, and other materials, including vegetation that is saturated with water. This high percentage of water gives the debris flow a very rapid rate of movement down a slope. Debris flows often with speeds greater than 20 mile per hour and can often move much faster.[4] This high rate of speed makes debris flows extremely dangerous to people and property in its path.

History of Slope Failures in Southern California

Slope Failures are a serious geologic hazard in almost every state in America. Nationally, Slope Failures cause 25 to 50 deaths each year.[5] The best estimate of direct and indirect costs of Slope Failure damage in the United States range between $1 and $2 billion annually.[6] As a seismically active region, California has had significant number of locations impacted by Slope Failures. Some Slope Failures result in private property damage; other Slope Failures impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

Below is a list of some of the major Slope Failures and their results in recent Southern Californian history.

1963 Baldwin Hills Dam Failure.

On December 14, the 650-foot long by 155-foot high earth fill dam gave way and sent 360 million gallons of water in a fifty-foot high wall cascading onto the community below, killing five persons, and damaging 50 million (1963 dollars) dollars in property.

1971 Upper and Lower Van Norman Dams, San Fernando, California

Earthquake-induced Slope Failures. Cost estimate $302.4 million (2000 dollars). Damage due to the February 9, 1971, magnitude 7.5 San Fernando, California, earthquake. The earthquake of February 9 severely damaged the Upper and Lower Van Norman Dams.[7]

1971 Juvenile Hall, San Fernando, California

Slope Failures caused by the February 9, 1971, San Fernando, California, earthquake Cost, $266.6 million (2000 dollars). In addition to damaging the San Fernando Juvenile Hall, this 1.2 km-long slide damaged trunk lines of the Southern Pacific Railroad, San Fernando Boulevard, Interstate Highway 5, an electrical converter station, and several pipelines and canals.[8]

1978 Bluebird Canyon Orange County, California

October 2, 1978. Cost estimate $52.7 million (2000 dollars). Sixty houses destroyed or damaged. Unusually heavy rains in March of 1978 may have contributed to initiation of the Slope Failure. Although the 1978 slide area was approximately 3.5 acres, it is suspected to be a portion of a larger, ancient Slope Failure.[9]

1978-1979, 1980 San Diego County, California

Experienced major damage from storms in 1978, 1979, and 1979-80, as did neighboring areas of Los Angeles and Orange County, California. One hundred and twenty Slope Failures were reported to have occurred in San Diego County during those two years. Rainfall for the rainy seasons of 1978-79 and 1979-80 was 14.82 and 15.61 inches (37.6 and 39.6 cm) respectively, compared to a 125-year average (1850-1975) of 9.71 inches (24.7 cm). Significant Slope Failures occurred in the Friars Formation; a unit that was noted as slide-prone in the Seismic Safety Study for the City of San Diego. Of the nine Slope Failures that caused damage in excess of $1 million, seven occurred in the Friars Formation, and two in the Santiago Formation in the northern part of San Diego

County.[10]

1994 Northridge, California, earthquake Slope Failures
As a result of the magnitude 6.7 Northridge, California, earthquake, more than 11,000 Slope Failures occurred over an area of 10,000 km2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. Destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure.

March 1995 Los Angeles and Ventura Counties, Southern California
Above normal rainfall triggered damaging debris flows, deep-seated Slope Failures, and flooding. Several deep-seated Slope Failures were triggered by the storms, the most notable was the La Conchita Slope Failure, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 km west of Ventura. There also was widespread debris-flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire two years before.[11]

June 2005 Bluebird Canyon, Laguna Beach, California
In the early morning of June 1, 2005, a Slope Failure began moving in the Bluebird Canyon area of Laguna Beach, California. No rainfall or earthquake activity occurred during or immediately before the Slope Failure movement. This movement is almost certainly related to the extremely heavy winter rains that occurred from December through February. Rainfall from the winter season has been slowly percolating downward through the soil and is gradually raising ground-water levels. As ground water rises, slopes can become unstable and begin to move, even if no rain is presently occurring.[12]

January 2005 La Conchita, California
On January 10, 2005, a Slope Failure struck the community of La Conchita in Ventura County, California, destroying or seriously damaging 36 houses and killing 10 people. Although rainfall intensities were not extreme, moderate- to high-intensity rainfall persisted for more than two weeks, and the Slope Failure occurred at the culmination of this 15-day high-rainfall period. [13]

January – February 2010 La Cañada Flintridge, California
Heavy winter storms hit the hills of La Cañada Flintridge in the early months of the year. The area had already been devastated in the summer of 2009 with one of the largest wildfires in modern history. The loss of so much vegetation combined with the downpour of rains caused significant mudslides to the area. Over 500 homes evacuated, about fifty homes were damaged, and another twenty were red tagged. Initial estimates of damage were in excess of $20 million (2010 dollars).

January 2018 Montecito, CA
A heavy winter storm hit the mountains above Montecito and Carpenteria California in January of 2018. The area had burned during the devastating Thomas Fire in December of 2017 which burned 115,000 acres. The mudflow caused 21 reported deaths.

Approximately 163 people were hospitalized with various injuries, including four in critical condition. The mudflows caused at least $177 million (2018 dollars) in property damage, cost at least $7 (2018 dollars) million in emergency responses, and another $43 (2018 dollars) million to clean up.

History of Slope Failures in Cities in the San Gabriel Valley

December 2008 – Sierra Madre, CA. In May 2008, over 600 acres of mountainside north of our neighboring city of Sierra Madre burned again in the Santa Anita II Fire. Portions of their hillside communities were inundated with mud and debris following the rains in the winter of 2008 and 2009.

November 2013 – Monrovia, CA. In May of 2013, approximately 213 acres above the city of Monrovia were burned in the Madison Fire. In the fall of that year, the foothills of City of Monrovia experienced mud and debris flows in the neighborhoods up against the foothills.

November 2014 – Glendora/Azusa, CA. In January of 2014, the Colby Fire burned 1,192 acres above the cities of Azusa and Glendora approximately 14 miles from the City of Arcadia. In November and December of 2014 both communities developed mudflow action plans and placed the plans into action and during periods of heavy rain during late fall and winter.

November 2016 – Duarte/Azusa CA. In June of 2016, the Fish Fire burned 3,700 acres in the foothills above Duarte and Azusa, CA 4 miles from the City of Arcadia. In November and December of 2016 both communities developed mudflow action plans and placed the plans into action and during periods of heavy rain during late fall and winter.

History of Slope Failures in Arcadia

January – February 2000

In the wake of the December 27, 2000, Santa Anita Wildfire heavy rains brought mudslides to the north end of Arcadia. The Arcadia City Council appropriated $334,000 to purchase K-rail, fill sandbags, clear debris basins, among numerous other costs in order to shelter the homes and properties from major damage. Due to the City's proactive response, minimal damage occurred to private properties. [14]

January 2005

Heavy rainstorms triggered as many as 18 mudslides in Santa Anita Canyon, two of which were enormous events that buried the roadway under mounds of debris. The first major slide deposited about 6,000 cubic yards of debris on the road. A Forest Service Fire Station had to be shut down due to lack of access and a pack station owner said that the road closures had devastated her business financially. [15]

Slope Failure Hazard Assessment

Locations at risk from Slope Failures or debris flows include areas with one or more of

the following conditions:

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

On December 27, 1999, a fire occurred in the Angeles National Forest north of the City of Arcadia that resulted in the burning of over 500 acres of chaparral. The U.S. Forestry Service classified this as a medium intensity fire that burned off vegetation at the surface level, however left the root structures intact. Initial estimates are that the natural recovery process will take between four to ten years for full restoration of the vegetation and chaparral.

In the interim, the burn area is barren of vegetation. The soil is composed of loose gravel and dirt and due to burn, which creates a coating, having a water repelling effect. This means that the normal absorption and stability of the soil is diminished. With the lack of vegetation and water repellency of the soil, geologists and hydrologists surveying the area forecast the likelihood of natural soil erosion and runoff with or without rainfall.

The City of Arcadia anticipated that with rainfall, flooding and mudslides were likely. The degree of flooding or mudslides depended upon the amount and intensity of rainfall; however, experts believe that one-half inch of rain falling over a short period of time could be sufficient to create a problem.

Several residences were identified as being threatened to varying degrees by mudslides and flooding due to their proximity to the mountainside and the watersheds where water and debris naturally flowed. Furthermore, several streets possessed the potential of being impacted by flooding, mud, and debris flow.

The Public Works Services Department created an action plan to coincide with the overall city emergency operations plan in preparation for the anticipated flood, mud, and debris programs.

Probability

Once a wildfire occurs the next greatest concern for the foothill community that experiences the wildfire is a Slope Failure or debris flow when the winter rains arrive. Looking at other data from debris flows in Los Angeles County, once a wildfire burns through an area, that location is an area of concern for the next five years. A significant rainstorm in the year following a wildfire creates the highest degree of probability of Slope Failure or debris flow. This probability is directly tied to a wildfire occurring in

the months leading up to the rainy season. The communities of Monrovia, Duarte, Azusa and Glendora, California all experienced significant Slope Failure or debris flows in the winter months after the Madison, Fish and Colby Fires. With the foothills above Arcadia experiencing a wildfire every 4.5 years as outlined in the Wildfire section of this report, the probability of Slope Failure or debris flows in the fire impacted areas could also be every 4.5 years.

Risk Analysis

Vulnerability assessment for Slope Failures will assist in predicting how different types of property and population groups will be affected by a hazard.[16] Data that includes specific Slope Failure-prone and debris flow locations in the city can be used to assess the population and total value of property at risk from future Slope Failure occurrences.

The City of Arcadia's Development Services Department uses percent slope as an indicator of hill slope stability. The City uses a 20% or greater threshold to identify potentially unstable hill slopes. The Mt. Wilson and El Monte seismic hazard maps, which are published by the California Department of Conservation, Division of Mines, show that the extreme northeast section of the City is the only portion of the City with the potential for Slope Failures. Although the acreage has not been calculated, it accounts for a very small part of the City.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for City of Arcadia Slope Failure events, there are many qualitative factors that point to potential vulnerability. Slope Failures can impact major transportation arteries, blocking residents from essential services and businesses.

Past Slope Failure events have caused property damage or significantly impacted City residents and continuing to map City Slope Failure and debris flow areas will help in preventing future loss.

Factors included in assessing Slope Failure risk include population and property distribution in the hazard area, the frequency of Slope Failure or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. This type of analysis could generate estimates of the damages to the City due to a specific Slope Failure or debris flow event. At the time of publication of this plan, data was insufficient to conduct a risk analysis and the software needed to conduct this type of analysis was not available.

To view potential areas for Slope Failures, see the Slope Failure and Debris Flow Map 7-3

<u>Economic Impact</u>

The City of Arcadia has a total assessed valuation of $15,676,471,562. This can be further broken into:

Residential properties valued at	$12,959,501,963

Commercial properties valued at	$1,524,210,934
Other properties valued at	$ 1,192,758,665

A Slope Failure or debris flow could only affect a small portion of the City of Arcadia. Until further studies are run, no more specific information is available.

Arcadia's Current Mitigation of Slope Failure Hazards
Slope Failures can affect utility services, transportation systems, and critical lifelines. Communities may suffer immediate damages and loss of service. Disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power, are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes as small as an inch or two may also be at risk of breaking during Slope Failure movements.

Roads and Bridges
Losses incurred from Slope Failure hazards in the City of Arcadia have been associated with roads. The City of Arcadia Public Works Services Department is responsible for responding to slides that inhibit the flow of traffic or are damaging a road/bridge.

Lifelines and Critical Facilities
Lifelines and critical facilities should remain accessible, if possible, during a hazardous event. The impact of closed transportation arteries may be increased if the closed road or bridge is critical for hospitals and other emergency facilities. Therefore, inspection and repair of critical transportation facilities and routes is essential and should receive high priority. Losses of power and phone service are also potential consequences of Slope Failure events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause Slope Failures, which can have serious impacts on gas lines that are located in vulnerable soils.

Slope Failure Building/Zoning Codes
The City of Arcadia's Municipal Code addresses development on steep slopes in its building and zoning codes. The codes outline standards for development within the hillside area of the City. Generally, the ordinance requires geotechnical and engineering geologic studies for developments proposed on slopes of 20 percent or greater. More detailed surface and subsurface investigations shall be warranted if indicated by the geotechnical and geologic studies. This may include soils, vegetation, geologic formations, and drainage patterns. Site evaluations may also occur where stability might be lessened by proposed grading/filling or land clearing.

Residential Areas
Even minor amounts of rain and mud flow have the potential to cause extensive damage to homes and properties. In order to assist the residents of Arcadia, the City provides free sandbags to help in their mitigation activities.

Community Issues Summary

The hillsides above the residences in the WUI area of Arcadia are very steep. In the past rainstorms following a wildland fire have created slope failures and debris flows in the residential areas.

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[8] Ibid

[9] Ibid.

[10] Ibid.

[11]Ibid.

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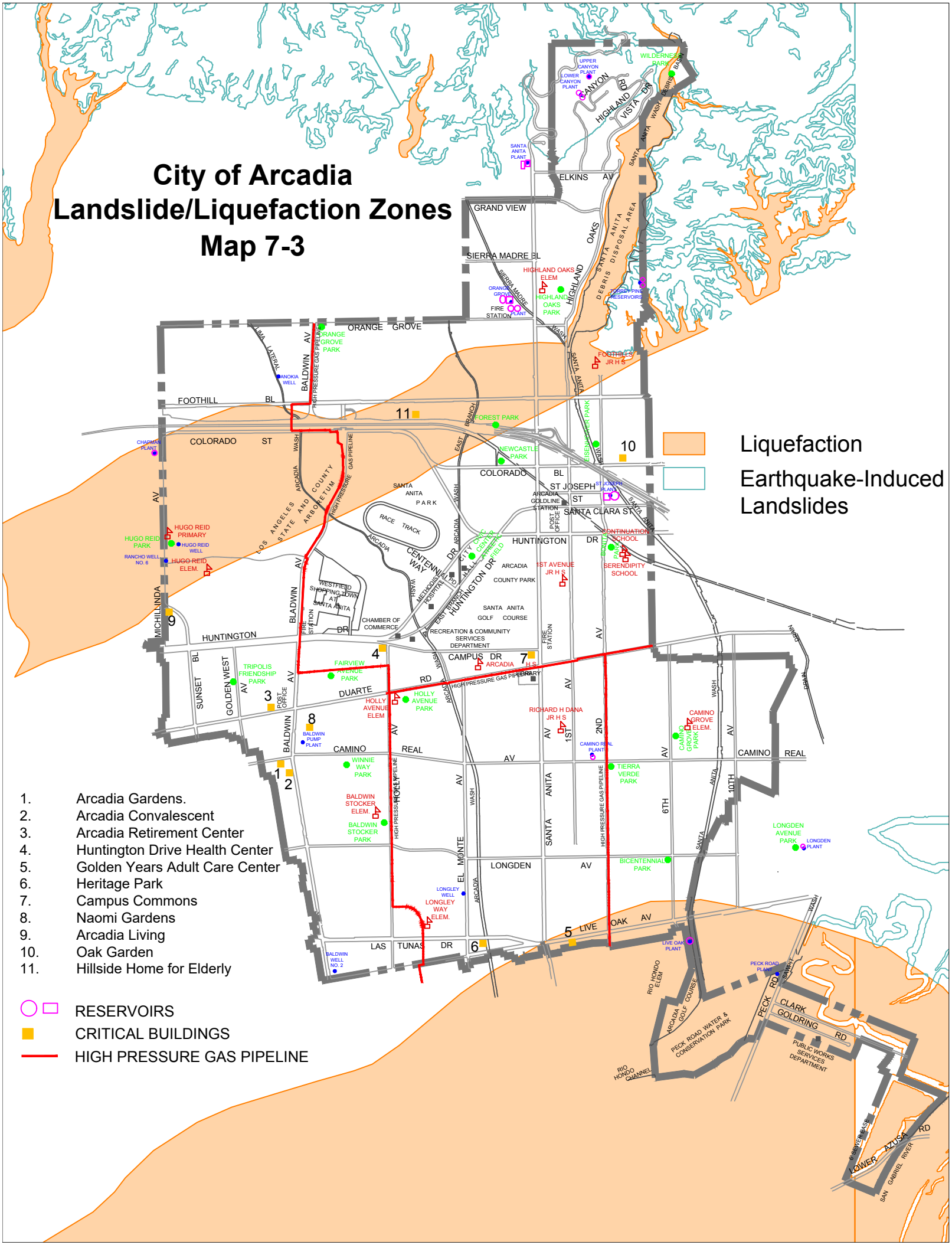
[14]Pasadena Star News, Feb 24, 2000

[15] Pasadena Star News, Jan 29, 2005 Pg. A1 and A4

[16] Burby, R. (Ed.) Cooperating With Nature (1998) Washington D.C.: Joseph Henry Press.

City of Arcadia
Landslide/Liquefaction Zones
Map 7-3



LOCAL HAZARD MITIGATION PLAN 2022
Section 7.4 WINDSTORM

Definition of a Windstorm
A storm marked by high wind with little or no precipitation

Windstorm Related Hazards

Santa Ana Winds
Santa Ana winds are generally defined as warm, dry winds that blow from the east or northeast (offshore). 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). 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.[1] These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.

The complex topography of Southern California combined with various atmospheric conditions creates numerous scenarios that may cause widespread or isolated Santa Ana events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra mountains and west of the Rocky mountains including most of Nevada and Utah). Clockwise circulation around the center of this high-pressure area forces air down slope from the high plateau. The air warms as it descends toward the California coast at the rate of 5 degrees F 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.[2]

These regional winds typically occur from October to March, and, according to most accounts, are named either for the Santa Ana River Valley where they originate or for the Santa Ana Canyon, southeast of Los Angeles, where they pick up speed.

Tornados
Tornadoes are spawned when there is warm, moist air near the ground, cool air aloft, and winds that speed up and change direction. An obstruction, such as a house, in the path of the wind causes it to change direction. This change increases pressure on parts of the house, and the combination of increased pressures and fluctuating wind speeds creates stresses that frequently cause structural failures.

In order to measure the intensity and wind strength of a tornado, Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale. This scale compares the estimated wind velocity with the corresponding amount of suspected damage. The scale measures six classifications of tornadoes with increasing magnitude from an “F0” tornado to a “F6+” tornado.

The chart below depicts the Fujita Tornado Damage Scale:

Scale	Wind Estimate (mph)	Typical Damage
F0	< 73	**Light damage.** Some damage to chimneys and TV antennas; breaks twigs off trees; pushes over shallow-rooted trees.
F1	73-112	**Moderate damage.** Peels surface off roofs; windows broken; light trailer houses pushed or overturned; some trees uprooted or snapped; moving automobiles pushed off the road. 74 mph is the beginning of hurricane wind speed.
F2	113-157	**Considerable damage.** Roofs torn off frame houses leaving strong upright walls; weak buildings in rural areas demolished; trailer houses destroyed; large trees snapped or uprooted; railroad boxcars pushed over; light object missiles generated; cars blown off highway.
F3	158-206	**Severe damage.** Roofs and some walls torn off frame houses; some rural buildings completely demolished; trains overturned; steel-framed hangar-warehouse-type structures torn; cars lifted off the ground; most trees in a forest uprooted snapped, or leveled.
F4	207-260	**Devastating damage.** Whole frame houses leveled, leaving piles of debris; steel structures badly damaged; trees debarked by small flying debris; cars and trains thrown some distances or rolled considerable distances; large missiles generated.
F5	261-318	**Incredible damage.** Whole frame houses tossed off foundations; steel-reinforced concrete structures badly damaged; automobile-sized missiles generated; trees debarked; incredible phenomena can occur.
F6-F12	319 to sonic	**Inconceivable damage.** Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Source: http://weather.latimes.com/tornadoFAQ.asp

Microbursts

Unlike tornados, 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. However, unlike a tornado, they affect only a rather small area.

Tornados, like those that occur every year in the Midwest and Southeast parts of the United States, are a rare phenomenon in most of California, with most tornado-like activity coming from microbursts.

History of Windstorms in Southern California

While the effects of Santa Ana Winds are often overlooked, it should be noted that in 2003, two deaths in Southern California were directly related to the fierce condition. A falling tree struck one woman in San Diego.[3] The second death occurred when a flying pickup truck cover launched by the Santa Ana Winds hit a passenger in a vehicle.[4]

Windstorms in Arcadia

December 1988 - Windstorm

Fifty- to sixty-mile per hour winds blew through Arcadia. Over forty trees were uprooted, power lines were knocked down, structures were damaged, and there was even a 150-gallon diesel fuel spill when a semi-truck's fuel line was ripped apart by a fallen street sign. Some residents were left without power for days and about 200 lost telephone services. City officials said it would take about a week to 10 days to clean up all the debris. [5]

January 2003 – Windstorm

Eighty- to one hundred-mile an hour winds swept through Arcadia causing major damage to the south end of the City. Twenty-nine Edison power poles were knocked down and another six suffered severe damage; all needing to be replaced by metal poles. More than 250,000 people were without power. Businesses suffered damage, lost customers, and product spoiled. One business owner said he lost over $500 in spoiled food that required refrigeration and at least twenty-five regular customers. [6]

October 2009 -Windstorm

High winds with gusts up to eighty miles per hour blew through Southern California. Although Arcadia received less damage than some other southland cities, power lines were damaged and caused 16,000 Edison customers in and around Arcadia to be without electricity. [7]

December 2011 – Windstorm

High north winds with gusts up to 70 miles per hour blew through the San Gabriel Valley. For a period of time the entire community of Arcadia was without electrical power and many major transportation arteries were blocked with down trees and wires. The City of Arcadia activated its Emergency Operations Center and declared a local emergency. The EOC remained fully

activated through December 5, 2011. Many residents were without electrical service for up to one week. The City of Arcadia opened up a warming/charging center for residents during the event. Emergency crews worked through the first week clearing trees from roadways to gain emergency access. Public works crews worked through January 2012 clearing debris piles in the public right of ways. The total cost to the City of Arcadia for response to and recover from the incident was approximately $2,800.000.

Windstorm Hazard Assessment

A windstorm event in the region can range from short term microburst activity lasting only minutes to a long duration Santa Ana wind condition that can last for several days as in the case of the January 2003 Santa Ana wind event. Windstorms in the City of Arcadia area can cause extensive damage including heavy tree stands, exposed coastal properties, road and highway infrastructure, and critical utility facilities.

Map from NASA's "Observatorium"

The map shows clearly the direction of the Santa Ana winds as they travel from the stable, high-pressure weather system called the Great Basin High through the canyons and towards the low-pressure system off the Pacific. Clearly the area of the City of Arcadia is in the direct path of the ocean-bound Santa Ana winds.

Probability

When looking at damaging wind events, it is important to look at the frequency they have occurred in order to estimate the probability of an event taking place in the future. After the 2011 Windstorm event, Scott Sukup of the NOAA/NWS Oxnard, CA office wrote a paper titled "Damaging Downslope Wind Events in the San Gabriel Valley of Southern California" In the paper he stated, "Damaging wind events in the San Gabriel Valley that are associated with strong north to NNE flow over the San Gabriel Mountain Range are a very rare phenomenon. From October 1979 through March 2014, there were only nine events with documented wind damage in this area. Of these nine events, the 1 December 2011 and 6 January 1997 events were the only events to produce widespread damage across most of the foothill and valley areas south of the SGM. It is estimated that extreme events such as these occur about once every 10-20 years, while less significant events occur once every 3-5 years."[8]

Risk Analysis

With an analysis of the high wind and tornado events depicted in the "Local History" section, we can deduce the common windstorm impact areas including impacts on life, property, utilities, infrastructure, and transportation. Additionally, if a windstorm disrupts power to local residential communities, the American Red Cross and City resources might be called upon for care and shelter duties. Displacing residents and utilizing City resources for shelter staffing and disaster cleanup can cause an economic hardship on the community.

Life and Property

Based on the history of the region, windstorm events can be expected, perhaps annually, across widespread areas of the region, which can be adversely impacted during a windstorm event. This can result in the involvement of City of Arcadia'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. Such damage occurred to property on December 2011 when severe windstorm knocked down power lines, disrupted traffic and electrical service.

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.

The Beaufort scale below, coined and developed by Sir Francis Beaufort in 1805, illustrates the effect that varying wind speed can have on sea swells and structures:

Beaufort Force	Speed (mph)	Wind Description - State of Sea - Effects on Land
0	Less 1	Calm - Mirror-like - Smoke rises vertically
1	1-3	Light - Air Ripples look like scales; No crests of foam - Smoke drift shows direction of wind, but wind vanes do not
2	4-7	Light Breeze - Small but pronounced wavelets; Crests do not break - Wind vanes move; Leaves rustle; You can feel wind on the face
3	8-12	Gentle Breeze - Large Wavelets; Crests break; Glassy foam; A few whitecaps - Leaves and small

		twigs move constantly; Small, light flags are extended
4	13-18	Moderate Breeze - Longer waves; Whitecaps - Wind lifts dust and loose paper; Small branches move
5	19-24	Fresh Breeze - Moderate, long waves; Many whitecaps; Some spray - Small trees with leaves begin to move
6	25-31	Strong Breeze - Some large waves; Crests of white foam; Spray - Large branches move; Telegraph wires whistle; Hard to hold umbrellas
7	32-38	Near Gale - White foam from breaking waves blows in streaks with the wind - Whole trees move; Resistance felt walking into wind
8	39-46	Gale - Waves high and moderately long; Crests break into spin drift, blowing foam in well marked streaks - Twigs and small branches break off trees; Difficult to walk
9	47-54	Strong Gale - High waves with wave crests that tumble; Dense streaks of foam in wind; Poor visibility from spray - Slight structural damage
10	55-63	Storm - Very high waves with long, curling crests; Sea surface appears white from blowing foam; Heavy tumbling of sea; Poor visibility - Trees broken or uprooted; Considerable structural damage
11	64-73	Violent Storm - Waves high enough to hide small and medium sized ships; Sea covered with patches of white foam; Edges of wave crests blown into froth; Poor visibility - Seldom experienced inland; Considerable structural damage
12	>74	Hurricane - Sea white with spray. Foam and spray render visibility almost non-existent - Widespread damage. Very rarely experienced on land.

Source: http://www.compuweather.com/decoder-charts.html

Utilities

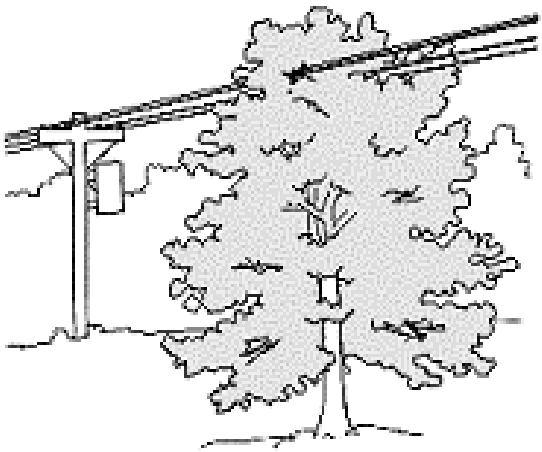
Historically, falling trees have been the major cause of power outages in the region. Windstorms such as strong microbursts and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead 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 damage buildings, power lines, and other property and infrastructure due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

Windstorms can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. 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. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from windstorms related to both physical damages and interrupted services.



Increased Fire Threat

Perhaps the greatest danger from windstorm activity in Southern California comes from the combination of the Santa Ana winds with the major fires that occur every few years in the urban/wildland interface. With the Santa Ana winds driving the flames, the speed and reach of the flames is even greater than in times of calm wind conditions. The higher fire hazard raised by a Santa Ana wind condition requires that even more care and attention be paid to proper brush clearances on property in the wildland/urban interface areas.

Transportation

Windstorm activity can have an impact on local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong Santa Ana winds, major highways can be temporarily closed to truck 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.

Existing Windstorm Mitigation in Arcadia

As stated, one of the most common problems associated with windstorms is power outage. High winds commonly occur during winter storms, and can cause trees to bend, sag, or fail (tree limbs or entire trees), coming into contact with nearby distribution power lines. Fallen trees can cause short-circuiting and conductor overloading. Wind-induced damage to the power system causes power outages to customers, incurs cost to make repairs, and in some cases can lead to ignitions that start wild land fires.

One of the strongest and most widespread existing mitigation strategies pertains to tree clearance. Currently, California State Law requires utility companies to maintain specific clearances (depending on the type of voltage running through the line) between electric power lines and all vegetation.

Enforcement of the following California Public Resource Code Sections provides guidance on tree pruning regulations:[9]

4293: Power Line Clearance Required
4292: Power Line Hazard Reduction
4291: Reduction of Fire Hazards Around Buildings
4171: Public Nuisances

The following pertain to tree pruning regulations and are taken from the California Code of Regulations:

Title 14: Minimum Clearance Provisions
Sections 1250-1258
General Industry Safety Orders
Title 8: Group 3: Articles 12, 13, 36, 37, 38
California Penal Code Section 385

Finally, the following California Public Utilities Commission section has additional guidance:

1http://www.treesaregood.com/treecare/avoiding_conflicts.asp

California Public Utilities Commission
General Order 95: Rule 35

Homeowner Liability

Failure to allow a utility company to comply with the law can result in liability to the homeowner for damages or injuries resulting from a vegetation hazard. Many insurance companies do not cover these types of damages if the policy owner has refused to allow the hazard to be eliminated.

The power companies, in compliance with the above regulations, collect data about tree failures and their impact on power lines. This mitigation strategy assists the power company in preventing future tree failure. From the collection of this data, the power company can advise residents as to the most appropriate vegetative planting and pruning procedures.

Economic Impact

The City of Arcadia has a total assessed valuation of $15,676,471,562. This can be further broken into:

Residential properties valued at	$12,959,501,963
Commercial properties valued at	$ 1,524,210,934
Other properties valued at	$ 1,192,758,665

A windstorm would only influence a specific portion of the city and each event would be unique. A more detailed projected economic impact cannot be obtained. The impact of a wind driven wildfire will be discussed under the section devoted to a wildfire hazard.

Community Issues Summary

A windstorm within Arcadia can create local impacts with power outages in neighborhoods and trees down blocking traffic. Major streets blocked by trees would also impact traffic within neighboring communities. Several major power lines that feed the San Gabriel Valley run through Arcadia and have been impacted by previous windstorms.

Works Cited:

1 http://nimbo.wrh.noaa.gov/Sandiego/snawind.html

2 Ibid

3 www.cbsnews.com, January 8, 2003

4 www.cbsnews.com/stories/2003/01/06/national/

5 Arcadia Tribune 12/11/1988 Pg A1-A2

6 Pasadena Star News 01/08/2003 Pg A1-A4

7 www.nbclosangeles.com/news/loacl-beat/Fierce-Wind-Storm-Rips-Through-Southern

8 DAMAGING DOWNSLOPE WIND EVENTS IN THE SAN GABRIEL VALLEY OF SOUTHERN CALIFORNIA SCOTT SUKUP NOAA/NWS, Oxnard, California

9 www.cpuc.ca.gov/js.asp

Definition of a Wildfire
A sweeping and destructive conflagration especially in a wilderness or a rural area.[i]

Wildfire Related Hazards
There are three categories of interface fire:[ii] 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. Certain conditions must be present for significant interface fires to occur. The most common conditions include hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought and development.

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

The Interface
One challenge Southern California faces regarding the wildfire hazard is from the increasing number of houses being built on the urban/wildland interface. Every year the growing population has expanded further and further into the hills and mountains, including forestlands. The increased "interface" between urban/suburban areas and the open spaces created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage.

Fuel
Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading," or the amount of available vegetative fuel. The type of fuel also influences wildfire. Chaparral is a primary fuel of Southern California wildfires. Chaparral communities experience long dry summers and receive most of their annual precipitation from winter rains. Although chaparral is often considered as a single species, there are two distinct types: hard chaparral and soft chaparral. Within these two types are dozens of different plants, each with its own particular characteristics.

Topography
Topography influences the movement of air, thereby directing a fire course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will

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

Weather

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

Drought

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and may contribute to additional fires, or additional difficulties in fighting fires.

Development

Growth and development in scrubland and forested areas is increasing the number of human-made structures in Southern California interface areas. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation and use natural materials. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and firefighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself.

History of Wildfires in California

Large fires have been part of the Southern California Landscape. Five of the top ten fires based on acreage in California have occurred since 2003. On the next page is the top ten list.

Table 7.5-1 Ten Largest Wildfires in California Based on Acreage.

Fire Name	Date	County	Acres
August Complex	**August 200**	**Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake & Colusa**	**1,032,649**
Mendocino Complex	**July 2018**	**Colusa, Lake, Mendocino & Glenn**	**459,123**
SCU Lightning Complex	**August 2020**	**Stanislaus,, Santa Clara, Alameda, Contra costa, San Joaquin**	**396,624**
Creek Fire	**September 2020**	**Fresno & Madrea**	**377,693**
LNU Lightning Complex	**August 2020**	**Sonoma, Lake, Napa, Yolo & solano**	**363,220**
North Complex	**August 2020**	**Butte, Plumas & Yuba**	**318,930**
Thomas	**December-17**	**Ventura & Santa Barbara**	**287,893**
Cedar	**October-03**	**San Diego**	**273,246**
Rush	**August-12**	**Lassen**	**271,911 CA / 43,666 NV**
Rim	**August-13**	**Tuolumne**	**257,314**

CALFIRE 11/3/2020

History of Wildfires in and near Arcadia

Bobcat Fire

In September 2020 the Bobcat Fire began at the Cogswell Reservoir area of the Angeles National Forest. Throughout the next week fire burned toward the City of Arcadia. One week after the Bobcat Fire started, it had reached the ridge line directly above the City of Arcadia. Three hundred homes were evacuated as a precaution. Due to firefighting efforts, no homes were damaged within Arcadia. All the displaced residents were allowed back into their homes four days later. In total the Bobcat Fire burned for more than three weeks and consumed over 116,000 acres within the Angeles National Forest.

Santa Anita II Fire

In April 2008 the Santa Anita II Fire began on Santa Anita Canyon Road and burned West to the foothills above Sierra Madre, CA. Over 600 acres burned, one out building was lost, and four minor injuries to personnel fighting the fire. Over 400 people had to be evacuated from the community of Sierra Madre as the fire raged dangerously close to homes. The fire consumed almost 600 acres and was contained in about a week.

Madison Fire

In April 2013 the Madison Fire took place in foothills above the community of Monrovia immediately adjacent to the City of Arcadia. When the fire was contained 213 acres had been consumed and no property was damaged.

Colby Fire

In January of 2014 the Colby Fire took place in the foothill above the communities of Azusa and Glendora in the East end of the San Gabriel Valley. The fire burned more than 1,992 acres and destroyed 15 properties including 5 residences.

Fish Fire

In June of 2016 the Fish Fire broke out above the community of Duarte in the San Gabriel Valley. 3,700 acres were burned in the fire and there was no reported damage to structures.

Station Fire

In late August 2009, an arsonist started a fire in the hills above La Cañada Flintridge, California. The flames raged for over two months and experts stated that the embers wouldn't be completely extinguished until a big winter storm. The fire claimed 160,577 acres (251 sq. mi), 209 structures destroyed, including 89 homes, and the lives of two LA County Firefighters The blaze threatened 12,000 structures in the National Forest and the nearby communities of La Cañada Flintridge, Glendale, Acton, La Crescenta, Littlerock and Altadena, as well as the Sunland and Tujunga neighborhoods of the City of Los Angeles. The blaze is the 15th largest in California history.

Wildfire Hazard Assessment

Wildfire hazard areas are commonly identified in regions of the wildland/urban interface. Ranges of the wildfire hazard are further determined by the ease of fire ignition due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control such as the surrounding fuel load, weather, topography, and property characteristics. Generally, hazard identification rating systems are based on weighted factors of fuels, weather and topography. Table 11.3 illustrates a rating system to identify wildfire hazard risk (with a score of 3 equaling the most danger and a score of 1 equaling the least danger.)

Sample Hazard Identification Rating System Table **Table 7.5-2**

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

In order to determine the "base hazard factor" of specific wildfire hazard sites and interface regions, several factors must be taken into account. Categories used to assess the base hazard factor include: topographic location, characteristics, and fuels; site/building construction and design; site/region fuel profile (landscaping); defensible space; accessibility; fire protection response; and water availability.

The use of Geographic Information System (GIS) technology in recent years has been a great asset to fire hazard assessment, allowing further integration of fuels, weather, and

topography data for such ends as fire behavior prediction, watershed evaluation, mitigation strategies, and hazard mapping.

Probability

Southern California and Los Angeles County have an extensive history of wildfires. Between 1993 and today, there have be wildland fires in the foothills of Arcadia on numerous occasions. These include:

Year	Fire Name	Acerage
1993	Kinneloa	5700
1999	Santa Anita I	100
2002	Chantry Rd	11
2008	Santa Anita II	600
2009	Station Fire	160,577
2013	Madison	213
2017	Norumbega	5
2021	Chantry Flats	3
2021	Bobcat	116,000

These fires took place either above Arcadia or an immediate neighbors of Sierra Madre and Monrovia. This averages out to a significant wildland fire once every 4.5 years.

Risk Analysis

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

Key factors included in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence and weather, as well as occurrences of drought. Refer to Map 7-5 to see the wildfire hazard ratings in the City of Arcadia.

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

Growth and Development in the Interface

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

In the event of a wildfire, vegetation, structures and other flammables can merge into unwieldy and unpredictable events. Factors important to the fighting of such fires include access, firebreaks, proximity of water sources, distance from a fire station and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons: Combustible roofing material; Wood construction; Structures with no defensible space; Fire department with poor access to structures; Subdivisions located in heavy natural fuel types; Structures located on steep slopes covered with flammable vegetation; Limited water supply; and Winds over 30 miles per hour.

Economic Impact

The assess valuation of the Wildland Interface Area is $829,408,125.00. This is for all of the properties located in the Interface area as depicted on Map 7-5. A fire impacting the area on a small scale would obviously result in less of an economic impact.

Current Mitigation in Arcadia

Buildings

Often times the reason structures are lost or damaged in wildland urban interface fires is due to wood shake roof coverings. The City of Arcadia Municipal Code 8130.18 has been implemented to reduce the risk of fire to structures in the City.

> Arcadia Municipal Code 8130.18
> The roof covering on any structure regulated by this code shall have a minimum class A rating in the Wildland Interface Fire Area Boundaries and a class A or B rating in all other areas outside the Wildland Interface Fire Area Boundaries of the City. Pressure treated or untreated wood shakes and wood shingles shall not be installed on any building or structure located in the Wildland Interface Fire Area Boundaries. (See Map 7-5).

The City of Arcadia implements Title 19 California Health and Safety Code and the City of Arcadia Municipal Codes to ensure the fire safety in building construction and materials.

Equipment

The Arcadia Fire Department has outfitted all of their stations with new engines capable of producing Compressed Air Foam systems (CAFs). CAFs enable firefighters to pre-treat homes with retardant foam in the event of a fire nearby. It also enables firefighters

to extinguish fires using less water, thus putting less demand on an already inundated water system.

Operations

On Red Flag Warning days the Arcadia Fire Department often staffs extra personnel and makes patrols in areas with high probability of wildfire ignition.

In the event a wildland fire does occur in or around the City of Arcadia the Fire Department has created a Brush and Structure Pre-Fire Plan. The plan includes maps of the City with vital information required for operations on a wildland fire. Information includes but is not limited to: location of hydrants, potential staging areas, potential command posts, safe refuge zones, schools, and other critical information for use in the event of a wildland urban interface fire in or near the City of Arcadia.

Road Access

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

Water Supply

Firefighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained firefighting flows.

In the City of Arcadia all new water main lines are eight inch and fire hydrant laterals are six inch. However, older pipes that were installed years ago do not meet the size standards and may be only four inches. Older pipes are upgraded as funds become available or as an opportunity arises and are addressed in sections of our Water Master Plan. They are also addressed completely in Section 7 (Domestic Water System) in City Water Standards. Replacement of older pipes is ongoing. Fire hydrants in Arcadia are spaced at 300 feet in both commercial and residential areas. Though there are some areas where spacing is greater, Public Works adds hydrants and adjusts spacing as lines are replaced. Most hydrants in the City are supplied at about one hundred psi. However, the City has a minimum pressure of twenty psi that each hydrant is to be supplied at all times. The water system is gravity fed and will supply water to hydrants for at least two hours in the event the City is without power.

Interface Fire Education Programs and Enforcement

The biggest concern during a wildland urban interface fire is loss of life and property. Mitigation of loss to life and property begins with the residents and their pre-plans. To assist the residents in planning for a wildland urban interface fire the Arcadia Fire Department implemented an Annual Brush Clearance Program. The program begins by mailing a pamphlet detailing fire hazard reduction and safety guidelines. The pamphlet includes information about maintaining a defensible space, use of fire resistive building materials, planning escape routes, and preparations in the event of a fire near their home. The program is continued by Fire Department inspections of homes. Every May, firefighters asses the defensible space and specific hazards in order to further mitigate loss of life and property. The inspections also help to familiarize firefighters with the area to further assist them in the event of a fire.

The Arcadia Fire Department Prevention Bureau has also produced various public safety announcements about smoke alarms, wildfire safety, holiday safety, and the use of fire extinguishers. The videos are played on the Arcadia City channel and are designed to help educate the public on fire safety.

Federal Programs

The role of the federal land managing agencies in the wildland /urban interface is reducing fuel hazards on the lands they administer; cooperating in prevention and education programs; providing technical and financial assistance; and developing agreements, partnerships and relationships with property owners, local protection agencies, states and other stakeholders in wildland/urban interface areas. These relationships focus on activities before a fire occurs, which render structures and communities safer and better able to survive a fire occurrence.

Federal Emergency Management Agency (FEMA) Programs, FEMA is directly responsible for providing fire suppression assistance grants and, in certain cases, major disaster assistance and hazard mitigation grants in response to fires. The role of FEMA in the wildland /urban interface is to encourage comprehensive disaster preparedness plans and programs, increase the capability of state and local governments and provide for a greater understanding of FEMA programs at the federal, state and local levels.[iv]

U.S. Forest Service

The U. S. Forest Service (USFS) is involved in a fuel-loading program implemented to assess fuels and reduce hazardous buildup on forestlands. The USFS is a cooperating agency and, while it has little to no jurisdiction in the lower valleys, it has an interest in preventing fires in the interface, as fires often burn up the hills and into the higher elevation US forest lands.

Other Mitigation Programs and Activities

Some areas of the country are facing wildland/urban issues collaboratively. These are model programs that include local solutions. Summit County, Colorado, has developed a hazard and risk assessment process that mitigates hazards through zoning requirements. In California, the Los Angeles County Fire Department has retrofitted more than 100 fire

engines with fire retardant foam capability and Orange County is evaluating a pilot insurance grading and rating schedule specific to the wildland/urban interface. All are examples successful programs that demonstrate the value of pre-suppression and prevention efforts when combined with property owner support to mitigate hazards within the wildland/urban interface.

Community Issues Summary

Radio repeater sites are in the WUI area of Arcadia. These serve radios within Arcadia and neighboring communities. There are four reservoir locations within the WUI area of Arcadia

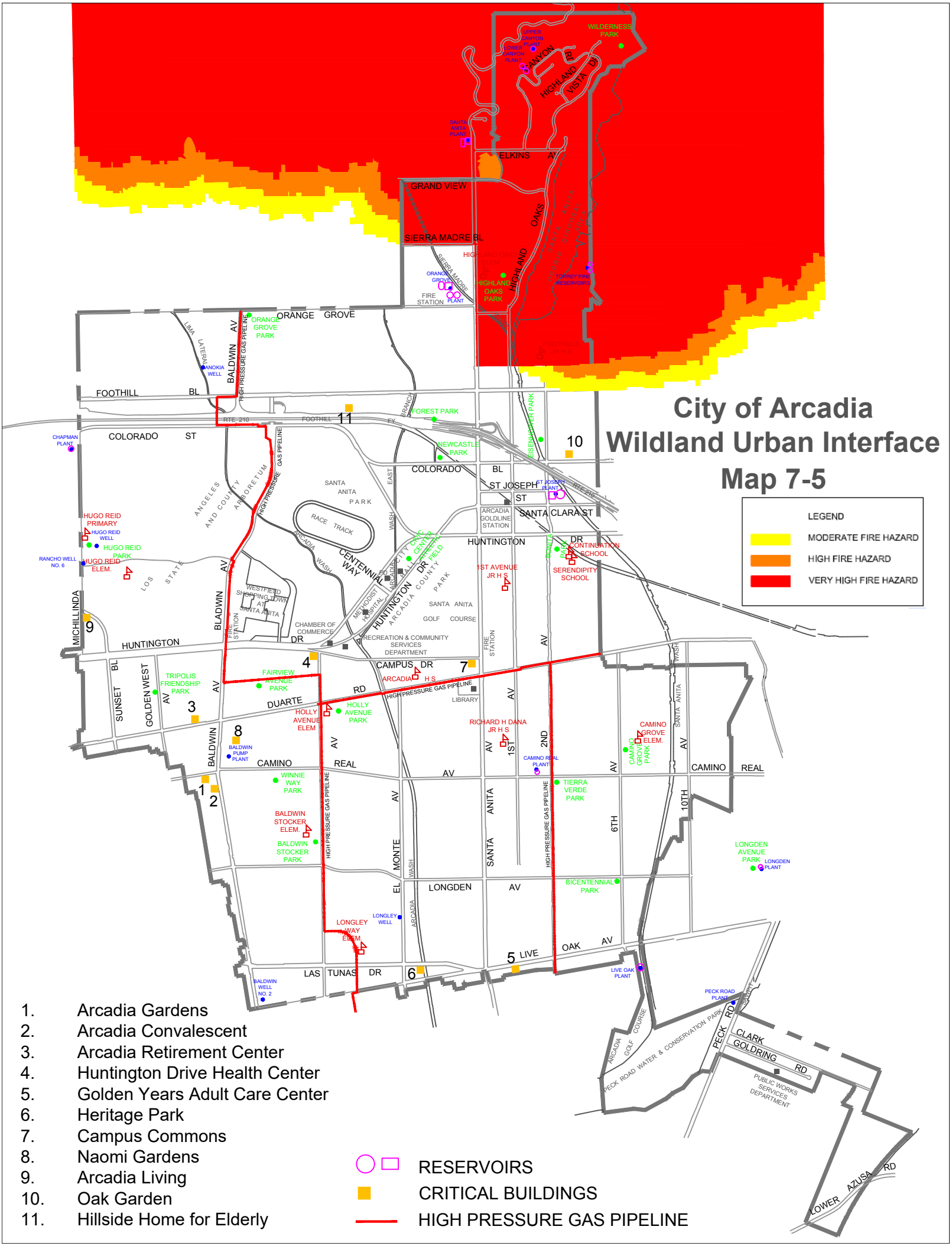
Works Cited

[i] http://www.merriam-webster.com/

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

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

[iv] Source: National Interagency Fire Center, Boise ID and California Division of Forestry, Riverside Fire Lab.


City of Arcadia
Wildland Urban Interface
Map 7-5
LEGEND
MODERATE FIRE HAZARD
HIGH FIRE HAZARD
VERY HIGH FIRE HAZARD
RESERVOIRS
CRITICAL BUILDINGS
HIGH PRESSURE GAS PIPELINE
1. Arcadia Gardens
2. Arcadia Convalescent
3. Arcadia Retirement Center
4. Huntington Drive Health Center
5. Golden Years Adult Care Center
6. Heritage Park
7. Campus Commons
8. Naomi Gardens
9. Arcadia Living
10. Oak Garden
11. Hillside Home for Elderly

Definition of Drought
There are four different ways that drought can be defined:

Meteorological – a measure of departure of precipitation from normal. Due to climatic differences, what is considered a drought in one location may not be a drought in another location.

Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular corp.

Hydrological – occurs when surface and subsurface water supplies are below normal.

Socioeconomic – refers to the situation that occurs when physical water shortage begins to affect people.

Location of Impact

Drought has the potential to impact all areas of the City of Arcadia.

Concept of Drought
Drought is an insidious hazard of nature. Although it has different definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapo-transpiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness of the rains (i.e., rainfall intensity, number of rainfall events). Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity. Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human beings often exacerbate the impact of drought. Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this "natural hazard."

A five-year drought has parched soils, lowered reservoirs and weakened forests. If the past is any guide, the dry spell could go on for decades.

One dry year does not normally constitute a drought in California, but serves as a reminder of the need to plan for droughts. California's extensive system of water supply infrastructure – its reservoirs, groundwater basins, and inter-regional conveyance facilities – mitigates the effect of short-term dry periods for most water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as

rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall – ranchers engaged in dry land grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Criteria used to identify statewide drought conditions do not address these localized impacts. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

Past California Droughts

Droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California reservoirs.

One approach to supplementing California's limited period of measured data is to statistically reconstruct data through the study of tree rings (called dendrochronology). Information on the thickness of annual growth rings can be used to infer the wetness of the season. Site-specific approaches to supplementing the historical record can include age-dating dry land plant remains now submerged in place by rising water levels, or sediment and pollen studies. For example, a 1994 study of relict tree stumps rooted in present-day lakes, rivers, and marshes suggested that California sustained two epic drought periods, extending over more than three centuries. The first epic drought lasted more than two centuries before the year 1112; the second drought lasted more than 140 years before 1350. In this study, the researcher used drowned tree stumps rooted in Mono Lake, Tenaya Lake, West Walker River, and Osgood Swamp in the central Sierra Nevada. These investigations indicate that California has been subject to droughts more severe and more prolonged than those witnessed in the brief historical record.

Between 1986 and 1992, California endured one of its longest droughts ever observed. Drought worsened in 1988 as much of the United States also suffered from severe drought. In California, the six-year drought ended in late 1992 after a significant El Niño event.

Between 2007 and 2009, California saw three years of drought conditions, the 12th worst drought period in the state's history, and the first drought for which a statewide proclamation of emergency was issued. This period of drought also saw greatly reduced water diversions from the state water project. The summer of 2007 saw some of the worst wildfires in Southern California history

Between 2011 and 2017 California was in a statewide drought. In January 2014, California Governor Brown issued a drought emergency proclamation. The actions taken by the City of Arcadia during this time period are listed in the "**Arcadia's Current Mitigation of Drought"** section later in this document.

Extent of Drought

The Drought Severity Classification Table below describes the significance of each drought category

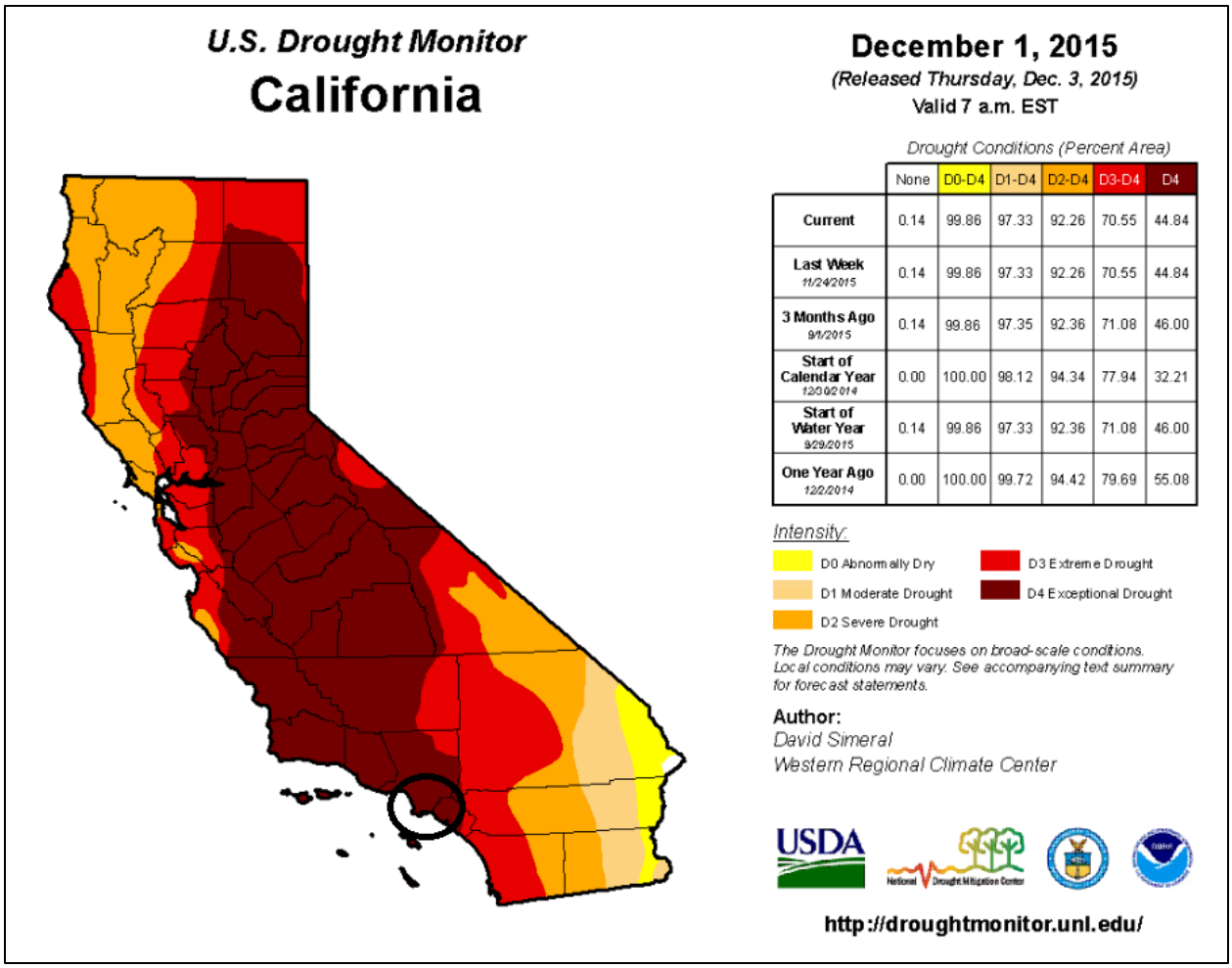
Drought Severity Classifications

			Ranges			
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less

Source: https://www.weather.gov/riw/drought_index

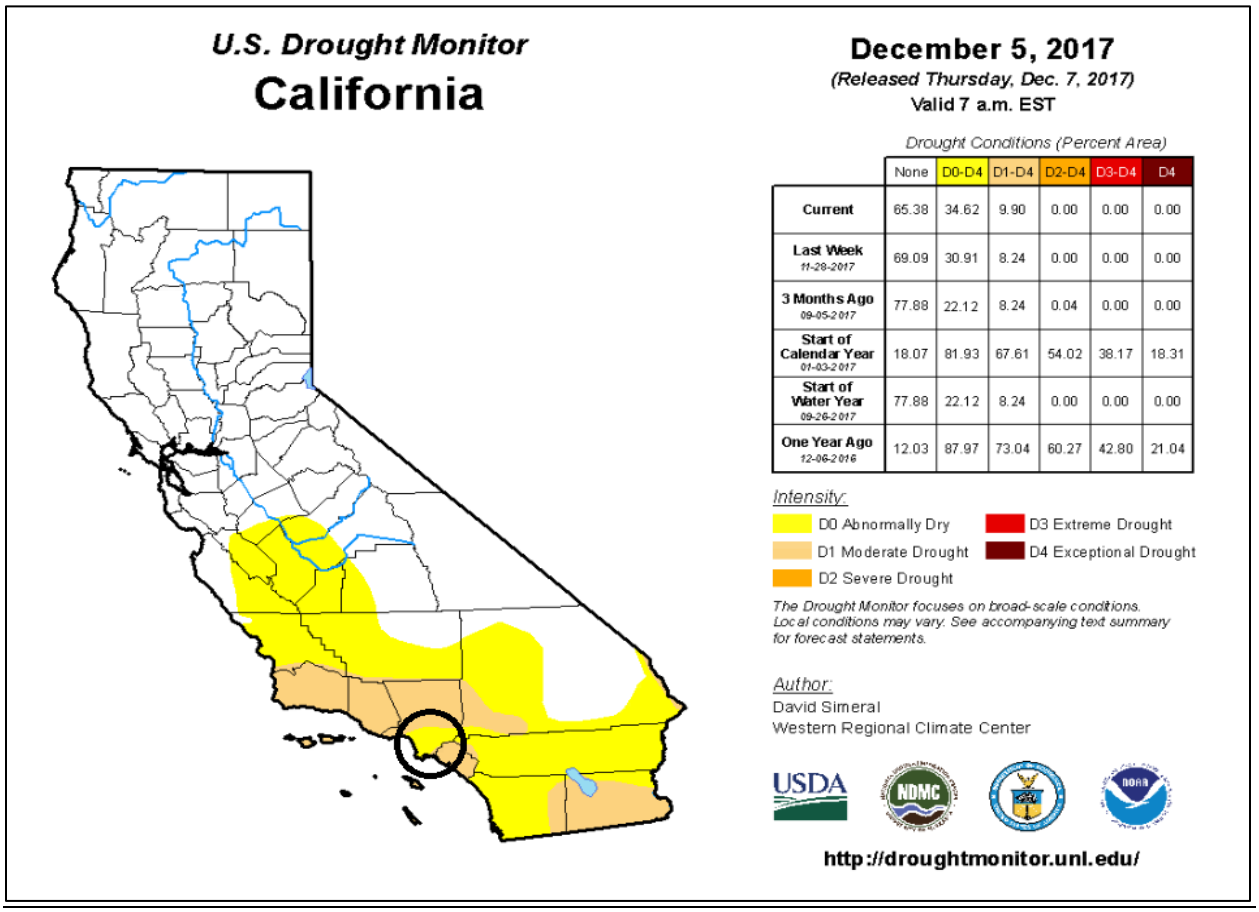
The following maps show the extent of drought between 2015 and 2020. The City of Arcadia is located in Los Angeles County in the State of California. Los Angeles County is circled in each map. The maps can be found at: https://droughtmonitor.unl.edu/Maps/MapArchive.aspx.

2015

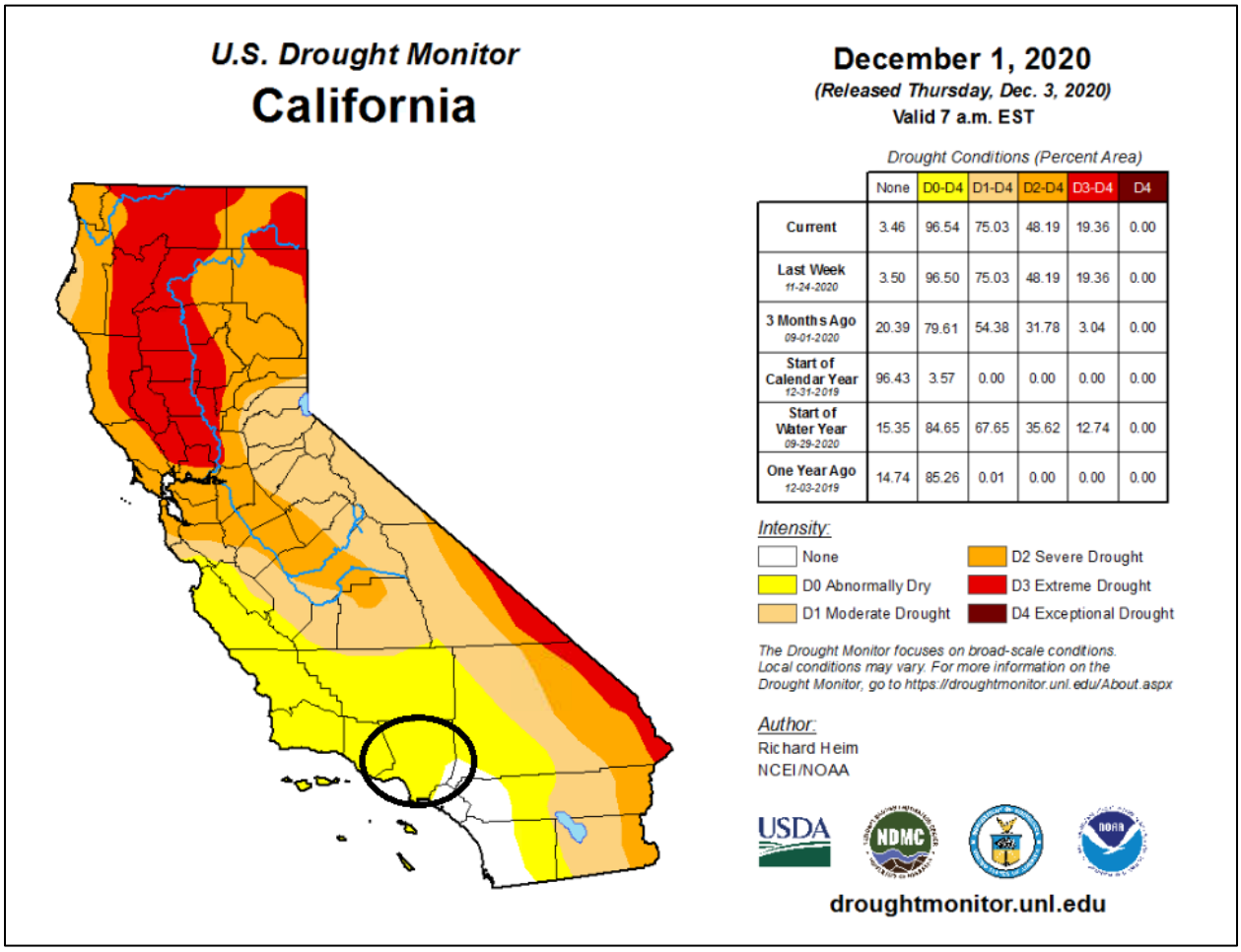


https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

2017


U.S. Drought Monitor
California
December 5, 2017
(Released Thursday, Dec. 7, 2017)
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None D0-D4 D1-D4 D2-D4 D3-D4 D4
Current 65.38 34.62 9.90 0.00 0.00 0.00
Last Week 11-28-2017 69.09 30.91 8.24 0.00 0.00 0.00
3 Months Ago 09-05-2017 77.88 22.12 8.24 0.04 0.00 0.00
Start of Calendar Year 01-03-2017 18.07 81.93 67.61 54.02 38.17 18.31
Start of Water Year 09-26-2017 77.88 22.12 8.24 0.00 0.00 0.00
One Year Ago 12-06-2016 12.03 87.97 73.04 60.27 42.80 21.04
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
David Simeral
Western Regional Climate Center
http://droughtmonitor.unl.edu/

2020



Impacts of Drought

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services.

Impacts are commonly referred to as direct or indirect. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts illustrate indirect impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. Direct or primary impacts are usually biophysical. Conceptually speaking, the more removed the impact from the cause, the more complex the link to the cause.

In fact, the web of impacts becomes so diffuse that it is very difficult to come up with financial estimates of damages. The impacts of drought can be categorized as economic, environmental, or social.

Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

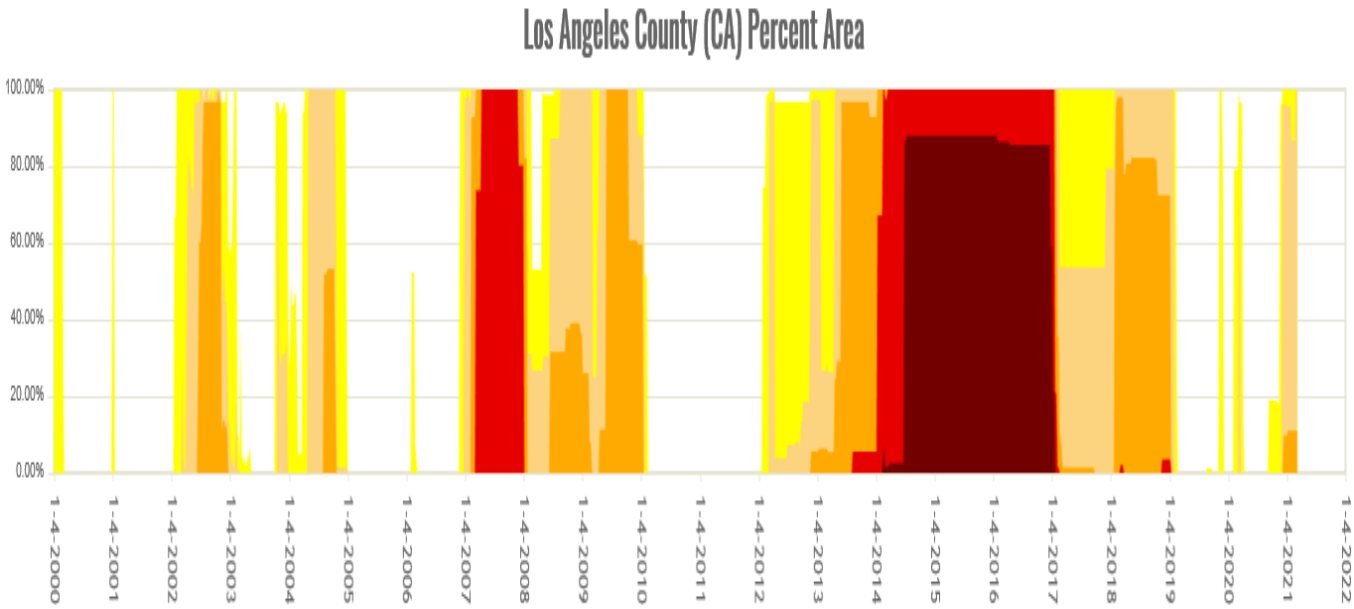
Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the stricken region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by rail or truck. Hydropower production may also be curtailed significantly.

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social components as well. Population out-migration is a significant problem, often stimulated by greater availability of food and water elsewhere. Migration is usually to urban areas within the stressed area or to regions outside the drought area; migration may even be to adjacent countries, creating refugee problems. However, when the drought has abated, these persons seldom return home, depriving rural areas of valuable human resources necessary for economic development. For the urban area to which they have immigrated, they place ever-increasing pressure on the social infrastructure, possibly leading to greater poverty and social unrest.

Probability of Drought

Probability is the likelihood of a hazard occurring in the future. The graph below shows approximately four droughts between 2000 and 2020 in Los Angeles County. The drought between
2014-2017 was severe.



Source: National Weather Service https://droughtmonitor.unl.edu/Data/Timeseries.aspx

Below is a table listing the frequency and severity of drought in Los Angeles County. Based on the table, Los Angeles County has experienced three years of Exceptional Drought in the past 20 years. Therefore, the County has the potential to experience an Exceptional Drought once every 6.7 years. Climate change might increase or decrease this probability in the future.

Year	Drought Condition	Year	Drought Condition
2001	None	2011	None
2002	Moderate Drought	2012	Moderate Drought
2003	Abnormally Dry	2013	Severe Drought
2004	Abnormally Dry	2014	Exceptional Drought
2005	None	2015	Exceptional Drought
2006	Abnormally Dry	2016	Exceptional Drought
2007	Severe Drought	2017	Abnormally Dry
2008	Moderate Drought	2018	Severe Drought
2009	Severe Drought	2019	Abnormally Dry
2010	None	2020	Abnormally Dry

https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

On the site listed above National Weather Service Forecast Offices were used for the Area Type and Los Angeles, CA (LOX) was used as the Area. The data compared the readings from the first week in December between 2001 and 2020.

Arcadia's Source of Water

The City's water supply sources include groundwater rights in the Main San Gabriel Basin, Raymond Basin and direct delivery of treated imported water from Metropolitan Water District. The reliability of the water supply for the City is primarily dependent upon the management of the Main San Gabriel Basin and Raymond Basin. The management of both basins is based on their adjudication. The City pumps groundwater from both basins and can rely on the water supply sources of both basins in an average water year, a single-dry water year and during multiple-dry water years.

California Drought Legislation

The State of California delegates drought planning to local authorities. However, in light of the current drought conditions for the past three (3) years, the California Legislature passed Senate Bill 7x-7 of 2009, and the Governor signed it into law in November 2009. This comprehensive water package was a plan crafted to meet California's growing water challenges. It was a major step towards ensuring a reliable water supply for future generations, as well as restoring the Sacramento-San Joaquin Delta and other ecologically sensitive areas. More importantly, the law is directed at water conservation and includes the requirement that the State reduce urban per capita water use by twenty (20) percent by the year 2020.

Arcadia's Current Mitigation of Drought

Mitigating drought—taking actions in advance of drought to reduce its long-term risk—can involve a wide range of tools. These tools include policies, activities, plans, and programs.

The California Urban Water Management Planning Act, which became effective on January 1, 1985, requires every Urban Water Supplier to prepare and adopt an Urban Water Management Plan and to periodically review its Management Plan every five (5) years and make any amendments or changes which are indicated by review. The primary objective of the Act is to direct urban water suppliers to evaluate their existing water conservation efforts and, to the extent practicable, to review and implement alternative and supplemental water conservation measures. As such, the City has adopted and implemented the Urban Water Management Plan and continues to update it on a regular basis as required by law.

This Management Plan details demand management measures implemented by the City to increase and encourage water conservation in the community. Many demand management measures are in cooperation with the Upper San Gabriel Valley Municipal Water District in addition to the City's own efforts.

In the event of a water shortage or water emergency, the City has also established a Water Conservation Plan (Plan) in the Arcadia Municipal Code:

ARTICLE VII. - PUBLIC WORKS,
CHAPTER 5. - WATER RATES, SERVICE CHARGES AND REGULATIONS

PART 5. - REGULATIONS
DIVISION 3. - WATER CONSERVATION PLAN

The Plan is intended for the conservation of available water supply to minimize the adverse impacts of a drought or water supply emergency conditions. Specifically, the Plan implements water rationing in eight (8) phases, reducing water usage by a certain percentage in each phase.

To further mitigate the impacts of drought, the City is also exploring conservation pricing in order to encourage and enhance water conservation efforts.

In 2014 in response to the California Governor Brown's Emergency Drought Declaration, the Arcadia City Council adopted Resolution No. 7009 in February 2014 to implement a voluntary Water Conservation Program to reduce water use by 20 percent. After several months of voluntary conservation Statewide, the target reduction percentage was far from being met. Therefore, in July 2014, the State Water Resources Control Board adopted emergency water conservation regulations consisting of the following elements: water restrictions on outdoor water use for all Californians; a requirement that water suppliers implement their Water Shortage Contingency Plans; and the requirement that water suppliers provide monthly data on water production.

In order to comply with the regulations, the Arcadia City Council adopted Resolution No. 7044 on August 5, 2015, implementing Phase I of the City's Water Conservation Plan. These regulations are still in effect as of the writing of this plan.

Community Issues Summary

The City of Arcadia has its own water company and draws water from the water table beneath the community. A prolonged drought may impact our ability to obtain water from the aquifer. A prolonged drought would also change the susceptibility of the wildland fuel bed surrounding the north end of Arcadia making it more prone to a wildfire.

Local Hazard Mitigation Plan 2022
Section 8 Human Caused Hazards

When developing the Local Hazard Mitigation Plan for the City of Arcadia, the committee decided to place the hazards into two broad categories. The categories are Natural Hazards and Human Caused Hazards. Section 8 of the plan covers Human Caused Hazards. The hazards are:

Section 8.1	Hazardous Materials Release
Section 8.2	Terrorism Event
Section 8.3	Train Accident

All data tables and maps included in this section were updated during the revision of this plan.

Description of Hazard

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

Explosives
Flammable, nonflammable, and poisonous gases
Flammable liquids
Flammable, spontaneously combustible, and dangerous when wet solids
Oxidizers and organic peroxides
Poisons and infectious substances
Radioactive materials
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. Topography such as h hills and canyons can increase the size of the release or make it more difficult to contain.

Location and Extent of Hazard in Arcadia

Over 160 business owners within Arcadia are required to submit a hazardous materials business plan with the local Certified Unified Program Agencies. In addition to being present at known businesses, hazardous materials are transported within and through Arcadia on a daily basis.

History of Hazardous Materials Releases in Arcadia

Most releases that have occurred in Arcadia 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.

Local Hazard Mitigation Plan 2022
Section 8.2 Terrorism Event

Description of Hazard

There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. The term 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.

Location and Extent of Hazard

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

History of Terrorism Events in Arcadia

The city has little-to-no experience of terrorist events.

Local Hazard Mitigation Plan 2022
Section 8.3 Train Accident

Definition of Train Accident
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.

Train Accident Related Hazards
In September 2015, train service was re-established in the City of Arcadia. The Los Angeles County Metropolitan Transit Authority extended a light rail commuter line through Arcadia connecting communities in the eastern San Gabriel Valley with Downtown Los Angeles. Train accidents are localized, and the incidents result in limited impacts at the community level. However, if the train is in a highly populated death and injuries can occur.

With the exception of the light rail line, no other rail lines run through the City of Arcadia. The closest freight line is the Burlington Northern Santa Fe Railway located 4 miles south of Arcadia in the City of El Monte.

Train Accident Hazard Assessment
There is only one at grade crossing for the light rail train running through the City of Arcadia. A portion of the light rail in Arcadia is located in the center divider of the 210 Freeway. Neighboring communities have had a few events involving big rig trucks that have come off the 210 Freeway and ended up on the train tracks

Train accidents can occur anytime during the year.

The following action items have been placed into three categories based on the Local Hazard Mitigation Plan Committees recommendations. The LHMP Committee considered ease, cost, and importance of completion. The following three categories rank the achievability of each action item; category one action items being the action items to be completed first, and respectively category three being the last.

Category One

Wildfire A

Continue to maintain a separation between flammable vegetation and structures within the Wildland Urban Interface.

Implementation Ideas:

- Continue annual brush safety inspections
- Adopt new standards on building construction for hardening of structures in the wildland urban interface.
- Look into funding options for vegetation clearance on public infrastructure in the wildland-urban interface

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Ongoing
Constraints:	Funding

Wildfire B

Work with partner agencies to limit the threat of a wind driven wildland fire to the community.

Implementation Ideas:

Incorporate SCE Public Safety Power Shutoff plans and grid maps into City of Arcadia Base Map.

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Ongoing
Constraints:	Funding

Earthquake A

Work to ensure minimal interruption in city services in the event of an earthquake

Implementation Ideas

Integrate Earthquake Early Warning Systems into Fire Station Alerting
Integrate Earthquake Early Warning Systems into operation of city water wells and pumping stations
Secure equipment within City facilities to protect employees and citizens.

Coordinating Organization	Public Works Services / Fire Department
Funding Source	Operating Budget / Mitigation Grants
Timeline	Ongoing
Constraints	Funding

Earthquake B

Adopt and enforce current building safety and seismic regulations

Implementation Ideas

Adopt and incorporate new versions of Building and Fire Codes

Coordinating Organization	Fire Department / Development Services
Funding Source	Operating Budget
Timeline	During next code update cycle
Constraints	None

Multi Hazard A
Create and maintain communication mediums through which the City can communicate with the public on both an outgoing and incoming basis.

Implementation Ideas:

- Continue to Update and Enhance methods to communicate with the public. Look into process to be able to provide Wireless Emergency Alerts to the community.

Coordinating Organization: City Manager's Office
Funding: General Fund/City Operating Budget/City Manager's Office, Fire Department, Police Department, Public Works Services Department
Timeline: Ongoing
Constraints: Staff time

Multi Hazard B
Work on lessening the impact a loss of electrical power would have on the community.

Implementation Ideas:

- Update and maintain the back-up power that is available for key city infrastructure in the event of a power disruption to windstorm, wildfire, earthquake, etc.

  Coordinating Organization: City of Arcadia Public Works Services
  Funding Source: Public Works
  Timeline: Within the next three years
  Constraints: Cost associated with purchasing equipment.

Category Two

Slope Failure A
Improve the capabilities of managing debris from Slope Failure events by developing a debris management strategy for the City of Arcadia.

Ideas for implementation:

- Work with L.A. County Department of Public Works on establishing a regional Debris Management Plan.

Coordinating Organization: City of Arcadia Public Works Services. L.A. County Department of Public Works
Funding Source: Public Work Agencies
Timeline: Within the next three years
Constraints: Limited staff time,

Windstorm A

Identify and implement projects to reduce the damage caused by trees during a windstorm.

Ideas for Implementation:

- Continue regular tree trimming procedures:
  - Continue four-year tree trimming grid for optimum effectiveness to maintain healthy trees.
  - Ensure trees in the public right-of-way are trimmed to maintain a clearance from all electric power lines as specified in the California Code of Regulations and the California Public Utilities Commission
  - Continue to remove trees that are dead, diseased, or dying.
  - Continue the Crown Restoration Program to preserve the health of large aging trees
  - Ensure proper tree trimming techniques as approved by the Professional Arborist Association
  - Provide public education materials to residents to make them aware of the need to regularly maintain and trim their own trees
  - Update Urban Forest Master Plan to include type of trees to plant, when to plan, where easement trees will be placed, and how and when they will be maintained.

Coordinating Organization:	Public Works Services Department
Funding Source:	General Fund and Gas Tax
Timeline:	Ongoing
Constraints:	Limited staff time and capital resources to fund Tree Trimming Contractors

Hazardous Materials A

Reduce the threat of a Hazardous Materials Release in Arcadia.

Implementation Ideas:

- Provide information to residents on Local Household Hazardous Materials Collection Events
- Update known hazardous material storage locations.

Coordinating Organization:	Fire Department
Funding Source:	Fire Department
Timeline:	Annually
Constraints:	Staff time for updating policies

Terrorism A

Lessen the impact that a terrorist event would have city infrastructure.

Implementation Ideas:

- Strengthen City Facilities and Networks to prevent physical and cyber attacks

Coordinating Organization:	Police Department
Funding Source:	General Fund, Police, Fire, and Public Works budgets
Timeline:	One year
Constraints:	Limited staff time

Terrorism B

Lessen the impact that a terrorist event would have on the community.

Implementation Ideas:

- Develop a Stop the Bleed Campaign and provide stop the bleed materials in City Buildings

Coordinating Organization:	Fire Department
Funding Source:	General Fund, Grants budgets
Timeline:	One year
Constraints:	Limited staff time

Transportation A

Reduce the frequency of vehicle coming into contact with Metro Gold Line Train while travelling along with 210 Freeway

Implementation Ideas:

- Work with CALTRANS to aid in increasing the height of the barrier wall separating the Gold Line right of way from the 210 Freeway to protect the light rail right of way from vehicles losing control and ending up on the tracks.

Coordinating Organization:	Development Services Department
Funding Source:	State of California
Timeline:	Within next three years
Constraints:	Lengthy approval process

Category Three

Drought A

Identify and implement projects to reduce the impact of drought.

Implementation Ideas:

- Conserve water resources by:
    - Improving leak detection capability of the Public Works Services Staff
    - Continuing to provide water audits for indoor/outdoor uses
    - Updating the City's Urban Water Management Plan to ensure water supply in the future
    - Funding Capital Improvement Projects to improve the reliability and sustainability of the City's water distribution system
    - Develop and implement a Tiered Water Rate Pricing Structure

Coordinating Organization:	Public Works Services Department
Funding Source:	Water Fund (revenue generated from billing for water service)
Timeline:	Short Term (within the next five years)
Constraints:	Limited staff time, resistance from public and lack of public participation.

Capability Assessment

Listed below are the City of Arcadia's current capabilities to carry out mitigation efforts. The capabilities are divided into the four categories of Planning and Regulatory, Administrative and Technical, Financial and, Education and Outreach.

Planning and Regulatory

Plans	Yes/No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
City Master Plan (General Plan)	Yes 2010	Safety element of plan discusses hazards
Capital Improvement Plan	Yes 2020	Plan can be used to implement mitigation actions
Economic Development Plan	Yes 2010	No

Local Emergency Operations Plan	Yes 2013	The EOP address various hazards
Continuity of Operations plan	No	
Transportation Plan	Yes	Does not address hazards
Stormwater Management Plan	Yes 2015	Yes
Community Wildfire Protection Plan	No	
Building Code, Permitting and Inspections	**Yes/No Year**	**Are Codes Adequately enforced?**
Building Code	Yes 2019	Yes
Building Code Effectiveness grading schedule (BCEGS) Score	Yes 2019	Score is 2 for residential and commercial
Fire Department ISO Rating	Yes 2018	Class I rating
Land Use Planning and Ordinances	**Yes/No Year**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning Ordinance	Yes	Yes, yes
Subdivision Ordinance	Yes	Yes, Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Yes	Yes, yes
Floor Insurance Rate Maps	No	City does not participate in program.

How can Planning and Regulatory be expanded? This can be expanded by incorporating the plan into the upcoming General Plan update.

Administrative and Technical

Administrative	**Yes/No**	**Describe capability. Is coordination effective?**
Planning Commission	Yes	
Mitigation Planning Committee	Yes	Consists of representatives from each city department
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes	Arcadia Public Works have plans in place.
Mutual aid agreements	Yes	Fire and Law have automatic and mutual aid agreements in place. Coordination is effective.

Staff	Yes/No FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Yes FT	Yes
Emergency Manager	Yes PT	Staff is trained and coordination takes place
Community Planner	Yes FT	
Civil Engineer	Yes FT	
GIS Coordintor	Yes PT	Staff from various departments handle GIS needs for their respective departments
Technical	**Yes/No**	**Describe capability. Has capability been used to assess/mitigate risk in the past?**
Warning systems/services (Reverse 911, outdoor warning signals)	Yes	Reverse 911. System has been used to educate, warn and evacuate public.
Grant writing	Yes	City staff has been assigned to apply for grants. City staff can apply for FEMA mitigation grants and other funding to be used for mitigation activities.
HAZUS analysis	No	

How can these capabilities be expanded and improved to reduce risk? One method to increase in the above area is to get a dedicated GIS coordinator within the city to make the data easily available to all staff. These GIS capabilities can be used for mitigation planning, grant applications and coordination.

Financial

Funding Resource	Access / Eligibility (Yes/No)	Has the funding resource been used in the past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Yes	Funding used for annual maintenance projects, drought mitigation and wildfire response equipment
Authority to levy taxes for specific purposes	Yes	
Fees for water, sever, gas or electric services.	Yes	

Impact fees for new development	No	
Incur debt through general obligation bonds and/or special tax bonds	Yes	Obligation bond passed for build grade separation for light rail commuter line.
Community Development Block Grant	Yes	
Other federal funding programs	Yes	SHSGP Recipient

How can these capabilities be expanded and improved to reduce risk? One method to use is to pursue additional grant opportunities for mitigation activities.

Education and Outreach

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen group or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	City partners with American Red Cross for preparedness outreaches
Ongoing public education or information program (e.g. responsible water use, fire safety, household preparedness, environmental education)	Yes	Public education is conducted through social media, city newsletters, safety demonstrations and information tables at city events.
Natural disaster or safety related school programs	Yes	City annually participates in Great Shakeout with community partners
Firewise Communities certification	No	

How can these capabilities be expanded and improved to reduce risk? One way to expand and/or improve would be to look into opportunities to educate the public on the hazards present in the community and ways individuals can mitigate those hazards to protect their homes and businesses.

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

Monitoring and Implementing the Plan

Plan Adoption

The City Manager or designee will be responsible for submitting it to the State Hazard Mitigation Officer at The California Office of Emergency Services (CAL OES). CAL OES will then submit the plan to the Federal Emergency Management Agency (FEMA) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, The City Council will be responsible for adopting the City of Arcadia's Local Hazard Mitigation Plan. This governing body has the authority to promote sound public policy regarding local hazards.

Coordinating Body

The City of Arcadia's Hazard Mitigation Advisory Committee will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Manager will assign representatives to the Hazard Mitigation Committee and assign a Project Manager.

Convener

The City Council will adopt the City of Arcadia's Local Hazard Mitigation Plan, and the Hazard Mitigation Committee will take responsibility for plan implementation. The Project Manager will serve as a convener to facilitate the Hazard Mitigation Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the committee. Plan implementation and evaluation will be a shared responsibility among all of the Local Hazard Committee Members.

Implementation through Existing Programs

The City of Arcadia addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, City Building and Safety Codes and other city documents. The Local Hazard Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs.

The 2012 Local Hazard Mitigation Plan was referenced in the 2013 update of the City of Arcadia's Emergency Operations Plan (EOP). The previous LHMP was not adopted/referenced into any other City of Arcadia plans since its 2012 adoption.

During fiscal year 2021 – 2022 the Safety Element of the City of Arcadia's General Plan will be updated. At that time staff will work toward adopting the Local Hazard Mitigation Plan into the Safety Element.

The goals and action items in the mitigation plan may be achieved through activities recommended in the city's Capital Improvement Plans (CIP). Various city departments develop CIP plans, and review them on an annual basis.

Economic Analysis of Mitigation Projects

FEMA's approaches to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the City of Arcadia will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Hazard Mitigation Advisory Committee will use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix A of the Plan.

Evaluating and Updating the Plan

<u>Formal Review Process</u>
The City of Arcadia's Local Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and time line, and identifies the local agencies and organizations participating in plan evaluation. The convener or designee will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the annual meeting.

The committee will review the goals and action items to determine their relevance to changing situations in the city, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The committee will also review the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the

success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

Continued Public Involvement

The City of Arcadia is dedicated to involving the public directly in review and updates of the Local Hazard Mitigation Plan.

The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all of the appropriate agencies in the city. The existence and location of these copies will be publicized in the quarterly city newsletter "Arcadia Community News", which reaches every household in the city

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

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

LOCAL HAZARD MITIGATION PLAN 2022
ECONOMIC ANALYSIS
APPENDIX A

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

This appendix outlines several approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural Hazard Mitigation.

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

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

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

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

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

LOCAL HAZARD MITIGATION PLAN 2022
ECONOMIC ANALYSIS
APPENDIX A

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

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

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

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

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

<u>Investing in private sector mitigation activities</u>
Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options: Request cost sharing from public

agencies; Dispose of the building or land either by sale or demolition; Change the designated use of the building or land and the hazard mitigation compliance requirement; Evaluate the most

Estimating the costs and benefits of a hazard mitigation strategy can be a complex process.

Employing the services of a specialist can assist in this process.

feasible alternatives and initiate the most cost effective hazard mitigation alternative.

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

How can an Economic Analysis be Conducted?

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

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

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

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

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

Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

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

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

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

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

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

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

How are Benefits of Mitigation Calculated?

Economic Returns of Local Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of

natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

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

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

Additional Costs of Disasters

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

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

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

LOCAL HAZARD MITIGATION PLAN 2022
ECONOMIC ANALYSIS
APPENDIX A

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for hazard mitigation activities. Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate local hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Assessed Values of City of Arcadia

The total assessed value for the City of Arcadia is $15,676,471,562. The nine hazards that could impact the City of Arcadia, would affect the city in various ways. Of all the hazards, only two would impact a specific area. Wildfire and Flooding. Four separate impact areas were looked at. One for the wildfire impact area and three separate dam inundation areas.

Earthquake, Windstorm, Drought, Terrorism, Transportation, Debris Flow/Landslide, and Hazardous Materials Release hazards have the potential to impact any or all areas of the City of Arcadia so there was no separate study completed for those areas. The chart below indicated the assessed value in the City of Arcadia broken into entire city, residential property, commercial property and other. The chart also displays the assessed valuation in the dam inundation areas and the wildfire hazard area.

Area	Assessed Valuation
Entire City	**15,676,471,562**
Residential	**12,959,501,963**
Commercial	**1,524,210,934**
Other	**1,192,758,665**
Sawpit Dam Inundation Area	**276,166,986**
Sierra Madre & Santa Anita Dam Inundation Area	**669,813,106**
Morris S. Jones Reservoir Inundation Area	**271,501,566**
Wildland Interface	**829,408,125**

Resources

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Local Hazard Mitigation Plan 2022
Acronyms
Appendix B

This list is taken from the Emergency Management Glossary from the California Office of Emergency Services Website.

A - B

A&W - Alert and Warning
AA - Administering Agency
AAR - After Action Report
AFN - Access & Functional Needs
AFO - Area Field Office
ANG - Army National Guard
AO - Administrative Order
AR - Atmospheric River
ARB - Air Resources Board
ARC - American Red Cross
ARP - Accidental Risk Prevention
ATC-20 - Applied Technology Council-20
ATC-21 - Applied Technology Council-21
BCP - Budget Change Proposal
BOC - Business Operations Center
BSA - California Bureau of State Audits

C

CA-ESF - California Emergency Support Function
CAER - Community Awareness & Emergency Response
CalARP - California Accidental Release Prevention
CalBO - California Building Officials
CalEPA - California Environmental Protection Agency
CalREP - California Radiological Emergency Plan
CalSCIP – California Statewide Communications Interoperability Plan
CalSIEC – California Statewide Interoperability Executive Committee
CALSTARS - California State Accounting Reporting System
CARES - California Animal Response Emergency System
CalTRANS - California Department of Transportation
CBO - Community Based Organization
CCC - California Conservation Corps
CD - Civil Defense
CDE - California Department of Education
CDF - California Department of Forestry and Fire Protection
CDFA - California Department of Forest & Agriculture
CDHS – California Department of Health Services
CDMG - California Division of Mines and Geology
CDPH - California Department of Public Health
CDSS - California Department of Social Services

CEC - California Energy Commission
CEPEC - California Earthquake Prediction Evaluation Council
CESRS - California Emergency Services Radio System
CGD - California Geological Survey
CHIP - California Hazardous Identification Program
CHMIRS - California Hazardous Materials Incident Reporting System
CHP - California Highway Patrol
CLETS - California Law Enforcement Telecommunications System
CMD - California Military Department
CMAS – California Multiple Award Schedules
CNG – California National Guard
CONOPS - Continuity of Operations
COOP - Continuity of Operations Plan
CSTI - California Specialized Training Institute
CSWC – California State Warning Center
CTD – Communications and Technology Development Division (of OES)
CUEA - California Utilities Emergency Association
CUPA - Certified Unified Program Agency

D

DAD - Disaster Assistance Division (of the state Office of Emergency Svcs)
DFO - Disaster Field Office
DCPP - Diablo Canyon Power Plant
DGS - California Department of General Services
DGS-PD – Dept General Services Procurement Division
DGS-TD – Dept. General Services Telecommunications Division
DHS – Federal Department of Homeland Security
DHS-RHB - California Department of Health Services, Radiological Health Branch
DMORT – Disaster Mortality Assistance Team
DO - Duty Officer
DOC - Department Operations Center
DOD - Department of Defense
DOE - Department of Energy (U.S.)
DOF - California Department of Finance
DOJ - California Department of Justice
DPA - California Department of Personnel Administration
DPH - Department of Public Health
DPIG - Disaster Preparedness Improvement Grant
DR - Disaster Response
DRCC - Disaster Recovery Center
DRCC – Disaster Resistant California Conference
DSA - Division of the State Architect
DSR - Damage Survey Report
DSS - Department of Social Services
DSW - Disaster Service Worker

DSTC – CA Department of Toxic Substance Control
DWR - California Department of Water Resources

E - H

EAS - Emergency Alerting System
EDIS - Emergency Digital Information System
EDO - Executive Duty Officer
EERI - Earthquake Engineering Research Institute
EF - Emergency Function
EMA - Emergency Management Assistance
EMAC – Emergency Management Assistance Compact
EMAP - Emergency Management Accreditation Program
EMI - Emergency Management Institute
EMMA - Emergency Managers Mutual Aid
EMPG – Emergency Management Performance Grant
EMS - Emergency Medical Services
EO - Executive Order
EOC - Emergency Operations Center
EOP - Emergency Operations Plan
EPA - Environmental Protection Agency (U.S.)
EPEDAT - Early Post Earthquake Damage Assessment Tool
EPI - Emergency Public Information
EPIC - Emergency Public Information Council
ESC - Emergency Services Coordinator
ESF - Emergency Support Function
FAY - Federal Award Year
FCO – Federal Coordinating Officer
FDAA - Federal Disaster Assistance Administration
FEAT - Governor's Flood Emergency Action Team
FEMA - Federal Emergency Management Agency
FFY - Federal Fiscal Year
FIR - Final Inspection Reports
FIRM - Flood Insurance Rate maps
FIRESCOPE - Firefighting Resources of California Organized for Potential Emergencies
FMA - Flood Management Assistance
FMAG – Fire Management Assistance Grant
FSA - Federal Staging Area
FSR - Feasibility Study Report
FY - Fiscal Year
GEOEC – Governor's Emergency Operations Executive Council
GIS - Geographical Information System
GOAR – Governor's Office Action Request
GO-BIZ - California Governor's Office of Business & Economic Development
HAZMAT - Hazardous Materials

HAZMIT - Hazard Mitigation
HAZUS - Hazards-United States (an earthquake damage assessment prediction tool)
HCD - Housing and Community Development
HEICS - Hospital Emergency Incident Command System
HEPG - Hospital Emergency Planning Guidance
HIA - Hazard Identification & Analysis Unit
HMEP - Hazardous Materials Emergency Preparedness
HMGP - Hazard Mitigation Grant Program
HSEEP – Homeland Security Exercise and Evaluation Program
HSGP – Homeland Security Grant Program

I - O

IA - Individual Assistance
IAP - Incident Action Plan
IDE - Initial Damage Estimate
IC - Incident Commander
ICE - U.S. Immigration &Customs Enforcement
ICP – Incident Command Post
ICS - Incident Command System
IFG - Individual & Family Grant (program)
IPA - Information and Public Affairs (of state Office of Emergency Services)
IHP - Individuals & Households Program
IMAT - Incident Management Assistance Team
IND - Improvised Nuclear Device
IOF - Initial Operating Facility
IRG - Incident Response Geographic Information System
IRT – Incident Response Team
JEOC – Joint Emergency Operations Center
JFO – Joint Field Office
JIC – Joint Information Center
JIS - Joint Information System
JRIES – Joint Regional Information Exchange System
LAC – Local Assistance Center
LAN - Local Area Network
LEMA - Law Enforcement Mutual Aid
LEPC - Local Emergency Planning Committee
LEVS – Law Enforcement and Victims Services Branch (of OES)
MAC Group - Multiagency Coordination Group
MARAC - Mutual Aid Regional Advisory Council
MHID - Multi-hazard Identification
MHOAC - Medical Health Operational Area Coordinator
MOA - Memorandum of Agreement
MOU - Memorandum of Understanding
NBC - Nuclear, Biological, Chemical
NDRF - National Disaster Recovery Framework

NEMA - National Emergency Management Agency
NEMIS - National Emergency Management Information System
NFIP - National Flood Insurance Program
NGO - Non-Governmental Organization
NIMS - National Incident Management System
NIMSCAST - National Incident Management System Compliance Assistance Support Tool
NOAA - National Oceanic and Atmospheric Association
NPP - Nuclear Power Plant
NRF - National Response Framework
NSF - National Science Foundation
NWS - National Weather Service
OA - Operational Area
OASIS - Operational Area Satellite Information System
OCC - Operations Coordination Center
OCD - Office of Civil Defense
OCJP – Office of Criminal Justice Planning
OEP - Office of Emergency Planning
OES - California Governor's Office of Emergency Services
OHS – Governor's Office of Homeland Security
OPI – Office of Public Information (of OES)
ORT - Operational Readiness Team
OSHPD - Office of Statewide Health Planning and Development
OSPR - Oil Spill Prevention and Response

P - R

PA - Public Assistance
PC - Personal Computer
PDA - Preliminary Damage Assessment
PFO – Principle Federal Official
PIO - Public Information Officer
POD - Point of Distribution
POST - Police Officer Standards and Training
PPA/CA - Performance Partnership Agreement/Cooperative Agreement (FEMA)
PRA – Public Records Act
PSA - Public Service Announcement
PSC - Public Safety Communications (OES)
PSRSPC – Public Safety Radio Strategic Planning Committee
PSPS - Public Safety Power Shutoff
PTAB - Planning and Technological Assistance Branch
PTR - Project Time Report
PUC - Public Utilities Comission
RA - Regional Administrator (OES)
RADEF - Radiological Defense (program)
RAMP - Regional Assessment of Mitigation Priorities

RAPID - Railroad Accident Prevention & Immediate Deployment
RDD - Radiological Dispersal Device
RDMHS - Regional Disaster Medical Health Coordinator
RDO - Radiological Defense Officer
RDMHC - Regional Disaster Medical Health Coordinator
REOC - Regional Emergency Operations Center
REPI - Reserve Emergency Public Information
RES - Regional Emergency Staff
RIMS - Response Information Management System
RMP - Risk Management Plan
RPU - Radiological Preparedness Unit (OES)
RRCC - Regional Response Coordination Center
RRT - Regional Response Team
RSF - Recovery Support Function
RTTAC – Regional Terrorism Threat Assessment Center

S - W

SA - Special Agent
SAA – State Authorized Agency
SAM - State Administrative Manual
SAP - Safety Assessment Program
SAR - Search & Rescue
SARA - Superfund Amendments & Reauthorization Act
SAVP - Safety Assessment Volunteer Program
SBA - Small Business Administration
SCO - California State Controller's Office
SCO – State Coordinating Officer
SEP - State Emergency Plan
SEMS - Standardized Emergency Management System
SEPIC - State Emergency Public Information Committee
SESC - Senior Emergency Services Coordinator
SHSGP – State Homeland Security Grant Program
SITREP - Situation Report
SLA - State and Local Assistance
SOC - State Operations Center
SONGS - San Onofre Nuclear Generating Station
SOP - Standard Operating Procedure
SPR - Stakeholder Preparedness Review
SSA - Supervisory Special Agent
SSA - State Staging Area
STAC - State Threat Assessment Center
STTAC – State Terrorism Threat Assessment Center
SWAT - Special Weapons & Tactics
SWEPC - Statewide Emergency Planning Committee
TA - Technical Assistance

T&E – Training and Exercise
TEC - Travel Expense Claim
THIRA - Threat Hazards & Identification Risk Assessment
TICP – Tactical Interoperable Communications Plan
TLO - Terrorism Liaison Officer
TRU - Transuranic
TTT - Train the Trainer
TTX - Tabletop Exercise
UASI - Urban Area Security Initiative
UC - Unified Command
UCG - Unified Coordination Group
UOC - Utilities Operations Center
UPA - Unified Program Account
UPS - Uninterrupted Power Source
USA - United States Army
USAF - United States Air Force
USBP - United States Border Patrol
USCG - United States Coast Guard
USDOT - United States Department of Transportation
USFS - United States Forest Service
USGAO - United States Government Accountability Office
USMC - United States Marine DCorps
USN - United States Navy
USAR - Urban Search and Rescue
USGS - United States Geological Survey
VAL - Volunteer Agency Liasion
VOAD - Voluntary Organizations Active in Disasters
WAR – Week Ahead Report
WAN - Wide Area Network
WIPP - Waste Isolation Pilot Project
WSCA - Western States Contracting Alliance