City of Downey

Hazard Mitigation Plan

2024 | DRAFT

Fire Department, Office of Emergency Management

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CHAPTER 4: MITIGATION STRATEGIES

ES EXECUTIVE SUMMARY

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ES.1 Plan Requirements and Objectives

The City of Downey (City) Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities. Hazard mitigation involves strategies to reduce short and long-term vulnerability to identified hazards. This document serves as the framework for the ongoing identification and implementation of hazard mitigation strategies developed in the City.

This Hazard Mitigation Plan serves as an update to the 2018 approved Plan.

Background Information

In 2000, the United States Congress determined that disasters and, more importantly, lack of preparedness for disasters, were significant causes of loss of life, human suffering, loss of income, and property loss and damage. Furthermore, because disasters often disrupt the normal functioning of governments and communities and adversely affect individuals and families with great severity, special measures designed to assist the efforts of the affected States in expediting the rendering of aid, assistance, and emergency services, and the reconstruction and rehabilitation of devastated areas, were necessary. As a result, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000), or Public Law 106-390, to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. This provides an opportunity for States, Tribal governments, and local jurisdictions to apply for assistance from the Federal government in carrying out their responsibilities to alleviate the suffering and damage which results from such disasters by:

a. revising and broadening the scope of existing disaster relief programs;

b. encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the States and by local governments;

c. achieving greater coordination and responsiveness of disaster preparedness and relief programs;

d. encouraging individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance;

e. encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and

f. providing Federal assistance programs for both public and private losses sustained in disasters.

DMA 2000 allows State, Tribal, and local jurisdictions to obtain Federal assistance through pre-disaster hazard mitigation planning. As part of the requirements for receiving Federal grants for improving a locality's resistance to disasters, each locality must determine their existing vulnerabilities and develop a plan to reduce or eliminate these vulnerabilities and must have this plan approved by the appropriate State and Federal officials. Upon approval of this plan, each locality is eligible to receive various types of disaster-related assistance through FEMA's Hazard Mitigation Assistance (HMA) Program. This includes the Building Resilient Infrastructure and Communities (BRIC) program and Hazard Mitigation Grant Program (HMGP) which releases grant funds before and after a hazard event as well as the Flood Mitigation Assistance Grant (FMA) Program which appropriates funds for projects and planning that will reduce long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP).

The BRIC program provides funds for hazard mitigation planning and the implementation of mitigation actions prior to a disaster event. These grants are funded and approved through the Federal Emergency Management Agency (FEMA) on a competitive basis. The HMGP provides grants to implement long-term hazard mitigation measures after a major disaster declaration. These grants are funded by FEMA but are distributed by the State. In California, that agency is the Governor's Office of Emergency Services (Cal OES).

FEMA has developed guidance to assist communities in developing both the vulnerability assessments and plans to reduce or eliminate their vulnerabilities to disasters. These tools, coupled with techniques from the safety and security industries were used to develop the City's Hazard Mitigation Plan[1]. In order to be eligible for certain Federal disaster assistance and mitigation funding, the City is required to have a Cal OES- and FEMA-approved Hazard Mitigation Plan in place. As a result, the City obtained grant funding to update this document to fulfill Cal OES and FEMA requirements and provide direction and guidance on implementing hazard mitigation actions on a hazard-level, probability, and cost-priority basis. The overall goal of the Hazard Mitigation Plan is to reduce the potential for damage to critical assets from natural and man-made hazards. In addition, the plan describes past and current hazard mitigation activities , and outlines future mitigation goals and strategies.

FEMA Requirements

FEMA requires that the Hazard Mitigation Plan meet certain requirements. First, the planning process must be open and public, and must allow the public to have an

[1] FEMA Hazard Mitigation Assistance Grants (n.d.) Retrieved from (http://www.fema.gov/hazard-mitigation-assistance

opportunity to comment during the drafting stage and prior to plan approval. Second, the process must allow other local jurisdictions to be involved in the planning process. Third, the Plan must incorporate, if appropriate, existing plans, studies, reports, and technical information.

FEMA expects that each Hazard Mitigation Plan have the following information:

1. Documentation of the ***planning process*** used to develop the plan
2. A ***risk assessment*** that provides a factual basis for upgrades and recommendations
3. A ***description of the natural hazards*** that can affect the jurisdiction
4. A ***description of the jurisdiction's vulnerability*** to these hazards
5. A ***description of land usage***, and an ***estimate of losses*** should a disaster occur
6. A ***mitigation strategy***
7. A plan ***maintenance process***
8. ***Documentation*** that the plan has been adopted by the jurisdiction's governing body
9. ***Review*** by the State Hazard Mitigation Officer

ES.2 Mitigation Definition

Mitigation is the ongoing effort to prevent or lessen future emergency or disaster incidents, and the impacts they might have on people, property, and the environment. Examples of mitigation activities include the following:

- Legislation, laws, and regulations
- Variances
- Zoning and land use management
- Engineering and building codes
- Hazard mitigation plans & teams
- Technical guidance & assistance
- Financial assistance
- Hazard Identification
- Risk Analysis
- Evaluation
- Research
- Education

Mitigation decreases the demand for emergency response resources, reduces the principal causes of injuries and deaths, enables a quicker lifesaving response and economic recovery because the community infrastructure remains intact, and reduces the societal impacts of the emergency because it results in less disruption to the social environment. In essence, mitigation is the foundation of sustainable community development.

ES.3 Planning Process Summary

Hazard mitigation planning is a dynamic process built on realistic assessments of past and present information that enables the City to anticipate future hazards and provide mitigation strategies to address possible impacts and identified needs. The overall approach to the Hazard Mitigation Plan included developing a baseline understanding of natural and man-made hazards, determining ways to reduce those risks, and prioritizing mitigation recommendations for implementation.

To complete these objectives, the City compiled a qualified team with various expertise, including risk management, public safety and health, engineering and public works, water infrastructure, and emergency response agencies to participate on a Steering Committee to guide the development of the City's comprehensive Hazard Mitigation Plan. In addition, the Steering Committee solicited public involvement throughout the planning process, including the release of a public survey through the City's website and social media platforms, allowing the public to comment during the drafting stage, and making the draft Plan available to allow the public to comment on its content. Chapter 1: Planning Process contains descriptions of the Planning process, including information on the Steering Committee and public involvement.

ES.4 Hazard Analysis

The City is vulnerable to a wide range of natural and man-made hazards that threaten life and property. In order to identify the hazards that the City and neighboring communities perceive as the largest threat, each member of the Steering Committee participated in the Hazard Identification Workshop during the first Steering Committee Meeting. The Steering Committee brainstormed potential hazards based on past incidents that have impacted the City and information incorporated from other studies. (Incorporated Plans and studies are described in Chapter 1, Section1.3 - Review and Incorporation of Existing Plans. Each identified hazard was then qualitatively ranked based upon hazard probability/frequency, consequence/severity, and the City's overall vulnerability. See Chapter 3, Section 3.1 Hazard Identification and Risk Assessment, contains detailed information regarding the hazard ranking. Figure 3.1 also outlines the risk formula. Table ES.1 provides a summary of the hazard ranking.

Table ES.1: City of Downey Hazard Ranking Summary

Hazard Rank
High
Earthquake
Wildfire Smoke/Air Quality
Medium
Hazardous Materials Release
Cyber Incident
Utility Loss
Acts of Mass Violence
Drought
Civil Unrest
Severe Weather/Storm
Mass Transportation Accident
Pandemic
Low
Dam Failure
Urban Flood
Tornado
Urban Fires
Windstorm

ES.5 Mitigation Strategies and Implementation Plan

Plan Goals and Objectives

As part of the development process, Plan goals and objectives were revalidated to provide a framework for mitigating hazards and proposing potential mitigation actions. The goals are consistent with the California State Hazard Mitigation Plan and the Los Angeles County Hazard Mitigation Plan and were developed by the Steering Committee. The City's overall Plan goals are to:

- Protect Life, Property, and Commerce
- Promote Public Awareness of the Vulnerability to Hazardous Events and Ongoing Mitigation Strategies
- Preserve the Environment
- Promote Community-wide Involvement with Hazard Mitigation
- Increase the Capacity of Emergency Operational Functionality

Mitigation Strategies

Mitigation strategies are administrative and/or engineering project recommendations to reduce the vulnerability to the identified hazards. The Steering Committee identified specific mitigation actions to reduce the impact or likelihood of the hazards. The specific objectives served as a starting point for developing the mitigation actions.

Implementation Plan

Following the identification of mitigation actions, a simplified benefit/cost analysis was applied in order to prioritize the mitigation actions for implementation. The benefits of proposed actions were weighed against multiple factors as part of the project prioritization process.

Results from the benefit/cost analysis are collocated in Chapter 4, Table 4.2 New and Ongoing Strategies in the status column labeled STAPLEE+E prioritization score. Chapter 4, Section 4.1.6 Mitigation Strategy/Action Prioritization Process contains additional information regarding the prioritization approach.

ES.6 Monitoring, Evaluating, and Updating the Plan

The Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the Hazard Mitigation Planning process and adhere to regulatory requirements, the Plan will be reviewed annually, and any major revisions will be incorporated into the five-year update. In addition, public involvement will be requested when applicable. Chapter 5: Plan Maintenance outlines the update requirements and planning mechanisms the City has in place for ongoing hazard mitigation.

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1 PLANNING PROCESS

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1.1 Planning Process

Hazard mitigation planning is a dynamic process built on realistic assessments of past and present information that engages the City of Downey (City) to anticipate future hazards and provide meaningful strategies to address possible impacts and identified needs. The hazard mitigation planning process involves the following tasks.

- Organizing resources
- Assessing risks
- Developing mitigation strategies, goals, and priorities
- Adopting a plan
- Implementing the plan
- Monitoring progress
- Revising the plan as necessary

The overall approach to updating the Hazard Mitigation Plan includes building off the baseline understanding of the natural hazards as defined in the 2018 Hazard Mitigation Plan, determining ways to continue reducing those risks, and prioritizing those recommendations for implementation. The following task descriptions provide a detailed narrative of the overall project progression.

1.1.1 Organize Resources

Identify Stakeholders and Compile Steering Committee

Rakdy Khlok, Emergency Manager for the City, invited and coordinated participation for a Steering Committee from the appropriate law enforcement, emergency response, health organizations, City personnel, and local government representatives. The Steering Committee was responsible for providing essential insight into past hazard events, current hazard vulnerability (including specific locations), critical assets, and possible mitigation projects. The following groups were invited to participate in the plan development:

- Key City Personnel (Finance, Community Development, Emergency Management, Public Works, Engineering, Administration, Public Information Office, Code Enforcement and Parks & Recreation)
- City of Downey Police Department

- City of Downey Fire Department
- Private Utility Area Personnel
- Economic Development and Housing

In addition, the local Area E Disaster Management Area Coordinator, who is familiar with the cities hazards who make up Area E, was invited to take part in the planning process. Norwalk and Paramount cities also participated in the planning process although not official members of the Steering Committee provided insight on regional hazard vulnerability and mitigation strategies.

Public Process

The Disaster Mitigation Act of 2000 requires an "Open and Public Process" for developing the Hazard Mitigation Plan. This process requires, at a minimum, that the public be allowed to comment on the Hazard Mitigation Plan during the drafting phase and prior to adoption. To meet this requirement, the City published a public survey and solicited public comments during the drafting stage of the Hazard Mitigation Plan prior to submittal of the Plan for Federal Emergency Management Agency (FEMA) review. The public survey was announced through the City website and social media platforms on February 24, 2023. The public comment period was held from October 3 through October 17, 2023. Documentation of public involvement/outreach is provided in ***Appendix B*** – Stakeholder Engagement, section B.1.

FEMA has declared 11 emergencies and disasters for the state of California between 2019 and February 2024. Emergency declarations allow states access to FEMA funds for Public Assistance (PA), and disaster declarations allow for additional PA funding, including Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP). The tables below list emergencies and disasters in the state.

Table 1.1: State Disaster Declarations

Declaration Title	Number	Declaration Date
California Wildfires	4610-DR-CA	Aug 24, 2021
California Wildfires	DR-4569-CA	Oct 16, 2020
California Wildfires	DR-4558-CA	Aug 22, 2020
California Covid-19 Pandemic	DR-4482-CA	Mar 22, 2020
California Severe Winter Storms, Flooding, Landslides, and Mudslides	DR-4434-CA	May 18, 2019

Declaration Title	Number	Declaration Date
California Severe Winter Storms, Flooding, Landslides, and Mudslides	DR-4431-CA	May 1, 2019

Table 1.2: Emergency Declarations

Declaration Title	Number	Declaration Date
California Severe Winter Storms, Flooding, Landslides, and Mudslides	EM-3592-CA	Mar 10, 2023
California Severe Winter Storms, Flooding, and Mudslides	EM-3591-CA	Jan 9, 2023
California Caldor Fire	3571-EM-CA	Sep 1, 2021
California Covid-19	EM-3428-CA	Mar 13, 2020
California Earthquakes	EM-3415-CA	Jul 8, 2019

1.1.2 Risk Assessment

Identify Hazards

Although FEMA only requires and reviews natural hazards in hazard mitigation plans, the City decided to rank and mitigate against a comprehensive list of natural, technological, and human-caused hazards that could impact the planning area. In order to compile the list, the Steering Committee built upon the list of hazards identified in the 2018 Hazard Mitigation Plan and then continued to research historical records, and empirical evidence to determine any additional hazards. Due to the nature of non-natural hazards the following hazards of interest have been assessed for their inclusion within the hazard ranking and mitigation process. Hazards that have been identified as significant in this City and that will be considered in this plan are listed below.

1. Acts of Mass Violence
2. Civil Unrest
3. Cyber Incident
4. Dam Failure
5. Drought
6. Earthquake
7. Hazardous Materials Release
8. Pandemic
9. Severe Weather/Storm
10. Tornado
11. Transportation Accident
12. Urban Flood
13. Urban Fires
14. Utility Loss

15. Windstorm
16. Wildfire Smoke/ Air Quality

Per FEMA's mandate to consider all natural hazards, the following were not included because they do not directly impact the City's geographic location:

- Avalanche
- Hurricanes
- Sea Level Rise
- Storm Surge
- Tsunami

Hazard definitions are included in the Risk Assessment.

Profile Hazard Events

The hazard event profiles consist of either a map indicating the area impacted by each hazard or an important piece of data regarding the characteristics of hazard events within the City and surrounding area. To update the detailed hazard profiles, the Project Team researched and reviewed relevant open-source natural hazard studies and mapping projects. In addition, the City supplied any hazard studies that have been developed specifically for the City. This task determined the hazard magnitude, frequency, and location characteristics (e.g., predicted ground acceleration values, fault locations, flood plains, etc.) that were used as the design-basis for the loss estimates and hazard ranking.

Loss Estimates

FEMA developed a standardized natural hazard loss estimation methodology containing models for estimating potential losses from earthquake, wind (hurricanes, thunderstorms, tornadoes, and extra-tropical cyclones), and flood (river basin and coastal) hazards. The City used HAZUS-MH, a PC-based software, which implements the FEMA-developed methodology and runs on a Geographic Information System (GIS) platform, to map and display earthquake hazard data, as well as the results of earthquake damage for buildings and infrastructure within the City.

HAZUS-MH contains baseline data such as:

- Demographic data (population, age, ethnicity, and income);
- General building stock (square footage of occupancy classes for each census tract);
- Emergency response facilities (fire, police, emergency operations centers);
- Dams;
- Hazardous materials facilities;

- Roads, airports, and other transportation facilities; and
- Electric power, oil, and gas lines and other utility facilities.

In estimating losses, HAZUS-MH takes into account various physical impacts of a hazard event including:

- Damage to residential and commercial buildings;
- Schools ;
- Critical facilities;
- and infrastructure.

1.1.3 Mitigation Strategy Development

Development of Mitigation Goals and Objectives

The Project Team, based upon information provided by the Steering Committee, discussed the mitigation features and resources that the City currently has in place. These mitigation features provided a framework to determine where practical improvements could be made and where sufficient improvements would be prohibitive due to cost, schedule, or impracticality of implementation.

For each of the hazard events, mitigation goals and objectives were developed with the intention of reducing or eliminating the potential hazard impacts. The mitigation goals and objectives were developed at a Steering Committee Meeting to provide the basis for determining the associated mitigation projects.

Identify and Prioritize Mitigation Actions

Mitigation strategies are administrative and/or engineering project recommendations to reduce the vulnerability to the identified hazards. It was imperative to have City planners and community developers involved in this phase of the Plan in order to develop strategies and projects that will mitigate the hazards cost-effectively, as well as ensure consistency with the City's long-term mitigation goals and capital improvements. At a Steering Committee Planning Workshop, a team-based approach was used to brainstorm mitigation projects based on the identified hazards. The evaluation and prioritization of the mitigation actions produced a list of recommended mitigation actions to incorporate into the Hazard Mitigation Plan.

1.1.4 Implementation & Monitoring

Preparation of Implementation Strategy

The Project Team developed an action plan to detail how the mitigation recommendations will be prioritized, implemented, and administered by the City. During the Hazard Mitigation Plan creation process, the Project Team coordinated with the Steering Committee to determine the mitigation project implementation strategy (including identifying responsible departments, funding resources, and estimated implementation timeframe).

1.2 Steering Committee & Public Involvement

While the City and Integrated Solutions Consulting (ISC) had lead responsibility for the update of the City's Hazard Mitigation Plan, neighboring communities, agencies, businesses, and supporting organizations were invited to participate on the Steering Committee to review the Hazard Mitigation Plan during each phase of the document development. The City and ISC assessed community support through active community leaders, built a Steering Committee, and engaged the public participants through the use of a public community survey. Each member of the Steering Committee had the opportunity to participate in all aspects of the planning process. Table 1.3 provides a list of the Steering Committee participants. Individuals are listed in alphabetical order by last name.

1.2.1 Steering Committee & Participant Solicitation

The City solicited participation in the Hazard Mitigation Plan by contacting both internal and external City boundary stakeholders. Internal stakeholders included members of the various City departments. External stakeholders were comprised of representatives from local agencies and neighboring communities, including the Area E Disaster Management Area Coordinator who is familiar with the hazards of the 25 cities within Area E. Various stakeholders from supporting organizations were given the opportunity to provide feedback via email on the plan during the commend period to ensure equitable opportunity. See ***Appendix B*** – *Stakeholder Engagement Table B.1* for a list of support organizations invited to participate.

1.2.2 Steering Committee Participants

The City brought together personnel from management, police, fire, administration, finance, community development, engineering, public works, and recreation departments to ensure the Steering Committee included a variety of departments and provided a mechanism for receiving input from each participant. Additionally, the City compiled historical hazard data, provided relevant planning documents for incorporation into the Hazard Mitigation Plan, and coordinated participation with the public. Each draft chapter was reviewed by the Steering Committee and specific comments and input were incorporated into the plan. The multidisciplinary Steering Committee enabled the City to work together and incorporate each individual's expertise to provide a comprehensive Hazard Mitigation Plan.

The Hazard Mitigation Plan was developed with assistance and advice from participants from the City and neighboring agencies. Table 1.3 provides a list of the Steering Committee participants. Individuals are listed in alphabetical order by last name.

Table 1.3: Steering Committee Participants

Name	Affiliation	Title	SCM 1	SCM 2
Brian Aleman	Engineering, City of Downey	Engineer		
Cullen Armet	Area E Disaster Management	Disaster Management Area Coordinator		
David Ashman	Area E Disaster Management Area	Disaster Management Area Coordinator		X
Matthew Baugardner	Public Works, City of Downey	Director of Public Works		
Socorro Cottle	Hospitals, Kaiser Downey	Environmental Health & Safety Director	X	X
Vaniah De Rojas	City Manager/Administrator's Office, City of Downey	ADA/Section 504 Coordinator		
Paul Edwards	Police, City of Downey	Sergeant, Downey Police Department	X	
Julia Emerson	Gas Company, SoCal Gas	Public Affairs Manager		X
Elyzabeth Estrada	Integrated Solutions Consulting	Senior Planner	X	X
Jessica Flores	Community Development, City of Downey	Economic Development and Housing Manager	X	X
Carlos Guerra	Emergency Medical Services, City of Downey	Ambulance Operator Coordinator		
Desi Gutierrez	Capital Improvements, City of Downey	Principal Civil Engineer		X
Anthony Hildebrand	Fire, City of Downey	Assistant Chief	X	X
Robert Jagielski	School Board/Administrator, Downey Unified	Senior Director of Student Safety	X	X
Melissa Johnston	Hospitals	Disaster Resource Center Coordinator		
Josef Kekula	Road Department, City of Downey	Superintendent Maintenance and Facilities	X	X

Name	Affiliation	Title	SCM 1	SCM 2
Rakdy Khlok	Emergency Management, City of Downey	Emergency Manager	X	X
Alvin Lam	Information Technology, City of Downey	IT Manager	X	
Matthew Lauwers	Code Enforcement, City of Downey	Code Enforcement Supervisor	X	
Isaac Magdaleno	Integrated Solutions Consulting	Planner	X	X
James McQueen	Equity and Inclusion, City of Downey	Program Manager		
Daniel Mueller	Water/Sewer/Watershed, City of Downey	Deputy Director of Public Works and Utilities Manager	X	
Dorian Munoz	City Manager/Administrator's Office, Columbia Memorial Space Center	Senior Activity Specialist		
Francesca Navarro	Grants Management, City of Downey	Principal Accountant		X
Richard D. Newton	Emergency Preparedness Manager, City of Norwalk	Emergency Preparedness Manager		X
Edwin Norris	Engineering, Columbia Memorial Space Center	Deputy Director of Public Works		
Jayro Roman	School Board/Administrator, Downey Unified	Program Administrator	X	X
Jasmine Salas	Public Safety Officer, City of Norwalk	Public Safety Officer		X
Matt Stanley	Integrated Solutions Consulting	Project Manager	X	X
Carole Synder	Hospitals, PIH Health	Director, Emergency Preparedness		X
Eric Wosick	City of Paramount	Assistant Public Safety Director		X

The Steering Committee met three times during the course of the project to discuss project progress and obtain valuable input and information for documenting the Hazard Mitigation Plan. The meetings are detailed over the subsequent pages. See ***Appendix B*** – Stakeholder Engagement for Steering Committee meeting sign in sheets and workshop photos and respective sign in sheets.

1.2.3 Steering Committee Meeting & Workshop Descriptions

Steering Committee, Meeting #1 – Project Initiation, Hazard Identification, and Information Collection

Date: March 15, 2023

During the Project Initiation, Hazard Identification, and Information Collection Meeting, ISC gave an overview presentation that detailed the objectives and scope of the project. After a review of the project schedule and key tasks, the Steering Committee Meeting also served as a mechanism to determine the hazards to profile in detail. To effectively characterize the City's risk and vulnerability, ISC facilitated a discussion of the historical hazards with the Steering Committee members during this meeting. This meeting also served as a forum to discuss information for background information and asset inventory.

Steering Committee, Meeting #2 –Mitigation Goals, Objectives, and Mitigation Action updates

Date: April 26, 2023

The Plan's mitigation goals and objectives were updated with the intention of reducing or eliminating the potential hazard impacts, which also provided the basis for determining the associated mitigation projects. The Steering Committee reviewed the goals and objectives from the City's 2018 Hazard Mitigation Plan, the California State Multi-Hazard Mitigation Plan, and the Los Angeles County Hazard Mitigation Plan as a baseline for determining the City's current mitigation goals and objectives. Results from the Community Survey, Disaster Preparedness and Mitigation Questionnaire were also shared during the meeting to better inform the steering committee members of community priorities that resulted in 105 total responses.

Planning Workshop, Meeting #3 – Hazard Risk Rank Review, Mitigation Action Identification

Date: June 14, 2023

The Steering Committee determined the hazard profile ranking through a facilitated workshop where the information gathered was analyzed to assess risk and vulnerability of people, property, the environment, and its own operations from these hazards.

Chapter 3: Risk Assessment outlines the methodology used for hazard rankings. Additionally, all Steering Committee participants were requested to provide existing plans and technical studies, GIS data, and identify existing mitigation features as part of a detailed information request.

The meeting also identified potential mitigation actions and projects that will reduce the impact of identified hazards. First, the mitigation goals and objectives from Steering Committee Meeting #2 were reviewed and validated. Then, during the workshop, the Steering Committee participants brainstormed possible projects and actions to mitigate the effects of the identified hazards.

1.2.4 Public Meetings & Outreach

The public was invited to attend one of two (May 16, 2023, and May 22, 2023) public meetings to review the risk assessment results and discuss mitigation strategies. The public meetings were advertised locally in advance. See ***Appendix B*** – *Stakeholder Engagement section B.1.1 Public Meetings* for details.

On October 3, 2023, the City posted an advertisement on the City's website inviting the public to participate in a comprehensive public survey that resulted in 105 total responses. The survey assessed the community's level of concern with various hazards and the steps each respondent had taken to prepare for a disaster. The results from the disaster preparedness and mitigation survey were integrated into the overall assessment to include the categories of social vulnerability and community resilience. See ***Appendix B*** – *Stakeholder Engagement section B.5 Public Survey* for complete survey responses to all thirty-two questions.

The City actively solicited public involvement through several advertisements and various social media platforms. See ***Appendix B*** – Stakeholder Engagement for social media screengrabs of Instagram and Facebook posts during the public survey period in *section B.5.1 Social Media.*

Members of the public were also able to provide direct input to the Hazard Mitigation Plan during the drafting stage and provide comments. The draft Hazard Mitigation Plan was provided on the City website for two weeks to allow the public to review the document and provide comments. Comments were received by the Community Development Department via email to Rakdy Khlok, Emergency Manager for the City. More information about public participation during the Hazard Mitigation Plan update can be found in ***Appendix B*** – *Stakeholder Engagement.*

1.3 Review and Incorporation of Existing Plans

While developing the City's Hazard Mitigation Plan, the Project Team reviewed existing plans (detailed below) and incorporated relevant information into the planning efforts.

City of Downey 2018 Hazard Mitigation Plan

The City of Downey 2018 Hazard Mitigation Plan was crucial in comparing the previous mitigation ideas and attitudes to the City's current needs and concerns. The project team referred to this plan constantly throughout the updating process. The Natural Hazards Mitigation Plan provides insight into hazard ranking, hazard history, and previously proposed mitigation projects.

Downey Vision 2025

The City's "General Plan Vision 2025," contains guidelines and policies that serve as the City's vision for future planning and development. Mitigation projects defined in the Hazard Mitigation Plan will be required to align with the objectives outlined in the Safety Element of the General Plan. Proposed mitigation actions are found in Chapter 4 of this document.

City of Downey Urban Water Management Plan (UWMP) 2020

The City of Downey 2020 UWMP is updated every five years to monitor water supply issues and mitigate drought situations. As part of Urban Water Management Plan updates, the City will review the drought hazard profile in the Hazard Mitigation Plan and incorporate the drought mitigation actions identified in the plan.

City of Downey Emergency Operations Plan

The City of Downey periodically updates the Emergency Operations Plan (EOP). The multi-hazard EOP includes specific response procedures for many hazard scenarios that might affect the City. In order to ensure the plan includes an appropriate response, the City will incorporate the Risk Assessment element of the Hazard Mitigation Plan into the EOP update, as appropriate.

The California State Hazard Mitigation Plan (SHMP) 2018

The SHMP was reviewed to ensure consistency between the State and City Plan, with respect to identified hazards and vulnerability, goals and objectives, and mitigation actions. The State goals served as the basis for developing the goals at the City level. City goals and objectives are outlined in Chapter 4.

County of Los Angeles All-Hazards Mitigation Plan 2020

The County of Los Angeles All-Hazard Mitigation Plan was reviewed to ensure consistency between the County and City Plan. The County Plan, updated in 2020, outlines the County's approach to hazard mitigation, focusing on natural hazards, human-caused events, and technological emergencies.

California Earthquake Loss Reduction Plan

California's Seismic Safety Commission developed the Earthquake Loss Reduction Plan to identify actions to mitigate seismic hazards. This plan was reviewed for an overall seismic hazard evaluation for the Risk Assessment found in Chapter 3, as well as the identification of potential seismic mitigation actions.

California Water Plan 2018

The state updated the California Water Plan in 2018 in order to address drought hazard mitigation over the long term. This Plan outlines the state's approach to integrated water management and sustainability. This information was used when developing the drought hazard profile.

California Adaptation Planning Guide 2020

FEMA, the California Governor's Office of Emergency Services (Cal OES), and the California Natural Resources Agency developed the California Adaptation Planning Guide to assist municipalities in recognizing local climate change and to provide guidance addressing potential vulnerabilities. The information was used to develop potential hazards and to provide background information that allowed the Steering Committee to make educated decisions regarding mitigation actions designed to alleviate the effects of climate change.

2 PLANNING AREA PROFILE

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2.1 City Description

The City of Downey (City) is a municipality characterized by a combination of residential, industrial, and commercial developments. The City is located in the southeastern part of Los Angeles County, California, about 13 miles southeast of the City of Los Angeles. The City is bordered by the cities of South Gate and Paramount to the west; Bell Gardens, Commerce, and Pico Rivera to the north; Santa Fe Springs and Norwalk to the east, and Bellflower to the south. The City is located near three major Los Angeles County freeways, including Interstates 5, 605 and 105. Additionally, the City is in close proximity to Los Angeles International Airport, Hollywood Burbank Airport, the ports of Los Angeles and Long Beach, and is about 19 miles east of the Pacific Ocean.

According to the 2020 U.S. Census Bureau the City has a total area of 12.41 square miles.[1] Elevations in the City range from a high of 145 feet in the northern region of the City to a low of 85 feet in the southern region, with an average elevation of 117 feet as stated in the City's Emergency Operations Plan. The terrain of the City is primarily flat, without any major geographical features.

The climate is consistent with coastal Southern California and is generally characterized by warm summers and cool winters. Average temperatures range from the low-80's in the summer to the high-40's in the winter.[2] Precipitation occurs mainly in the winter months with an average annual rainfall of approximately 17 inches.[3] In 2020, NOAA's Fullerton Municipal Airport Weather Station, the nearest weather station to the City, recorded February as the wettest month for the region with 3.02 inches of rainfall.[4]

According to the City's website, the City began as a 96-acre parcel segmented from Rancho Santa Gertrudes in 1873. The new community was named "Downey City" after John Gatley Downey; a California governor who built the economic foundation of southern

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[1] United State Census Bureau. (2020). QuickFacts: Downey City, California. Retrieved from https://www.census.gov/quickfacts/downeycitycalifornia

[2] Weather Spark. (2023). Climate and average weather year round in Downey. Retrieved from https://weatherspark.com/y/1624/Average-Weather-in-Downey-California-United-States-Year-Round#Figures-Temperature

[3] Weather and Climate. (2023). Average monthly snow and rainfall in Downey (California) in inches. Retrieved from Average monthly rainfall and snow in Downey (California), the United States of America (inches) (weather-and-climate.com)

[4] National Oceanic and Atmospheric Administration. (2020). U.S. Climate Normals Quick Access. Retrieved from https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&location=CA&station=USW00003166

California.[5] With the expansion of the railroad system, the area continued to develop and by the beginning of the twentieth century had become a prominent agriculture and commercial leader in the area.

The City was incorporated on December 4, 1956, and experienced a period of rapid growth around that time. In 1940, the total population was 12,000, and by 1960 the population had surpassed 86,000.[6] According to the 2023 estimates, the City has over 106,859 residents.[7] The City has 12 parks, two public golf courses, a model city library, live theater, symphony orchestra, historical society and art museum.[8] Figure 2.1, on the following page, provides an profile map of the City and demonstrate its location within Los Angeles County.

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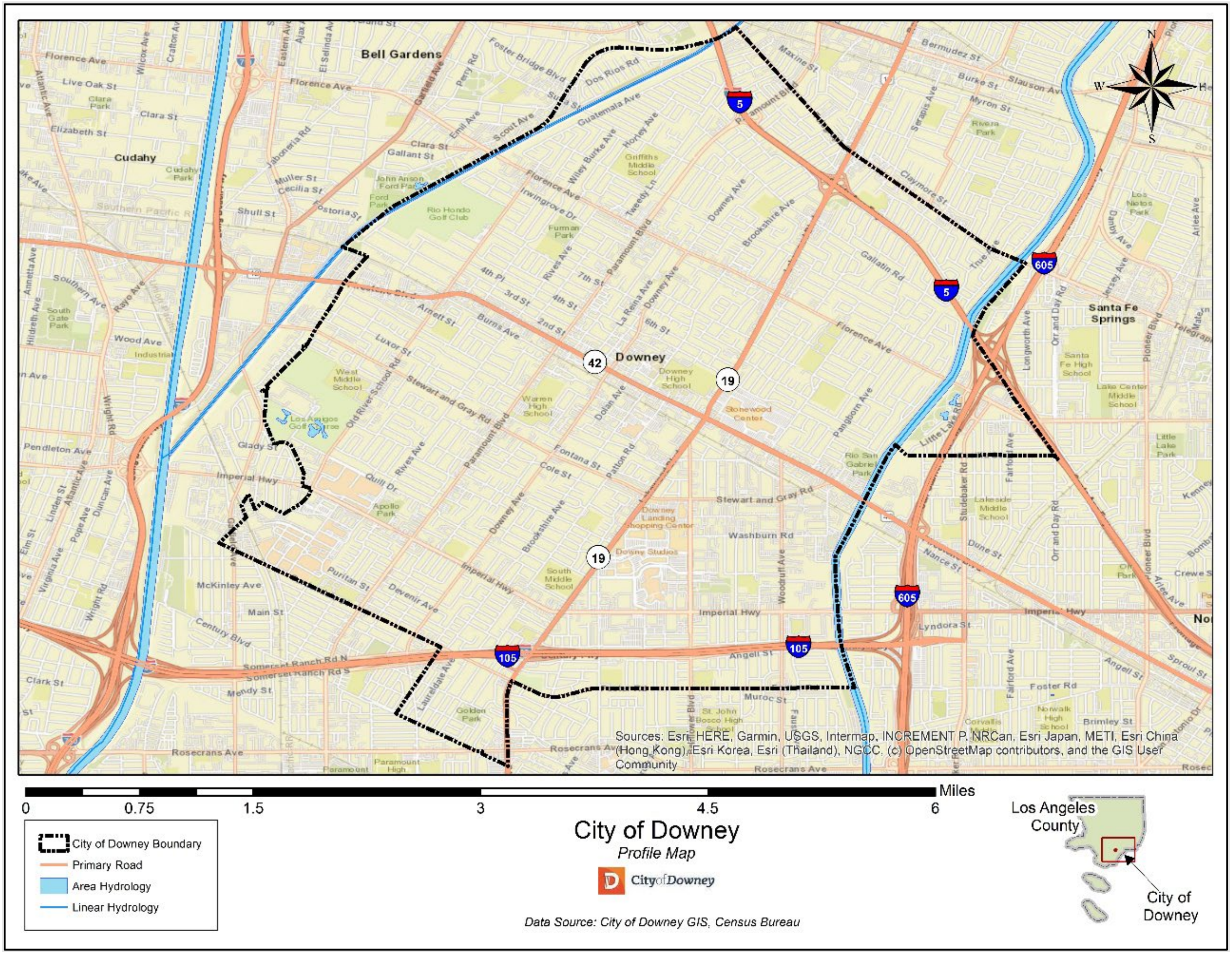
[5] City of Downey. (2023). City History & Profile. Retrieved from https://www.downeyca.org/our-city/city-profile
[6] City of Downey. (2023). City history & profile. Retrieved from https://www.downeyca.org/our-city/city-profile
[7] World Population Review. (2023). Downey, California Population 2023 . Retrieved from https://worldpopulationreview.com/us-cities/downey-ca-population
[8] CountyOffice.org. (2023). Golf courses in Downey, California. Retrieved from https://www.countyoffice.org/downey-ca-golf-course/

Figure 2. 1: City of Downey Profile Map



2.2 Development Trends

As mentioned in Section 2.1, the City has 12.41 square miles of land area. The Land Use Element of the City's "General Plan Vision 2025" provides a guide for land use, future growth, and development within the City.

The following describes the City's land use designations. These descriptions are excerpted from Downey's General Plan Vision 2025 document that was adopted in January 2005 in an attempt to designate the proposed general distribution and intensity of uses of the land for housing, business, industry, open space, public facilities, and other categories of public and private uses.

The existing data is the most updated and readily available for use. Additional information has been provided by the Community Development Department in the City of Downey.

Residential Land Uses

Low Density Residential Development

This land use designation makes up 51% of the City's overall land area.9 Typically, these areas contain detached, single-family residential units with a maximum approximate density of one housing unit per standard 5,000 square foot lot.10 The projected population for these areas is about 28 persons per acre. The City monitors population growth closely in these areas and has statutes in place to maintain a single-family image even as neighborhoods build out.

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[9] City of Downey. (2005). Vision 2025 general Plan Downey, California. Retrieved from https://www.downeyca.org/home/showpublisheddocument/134/636977201776000000
[10] Ibid.

Low/ Medium Density Residential Development

This land use designation involves population densities of 9 to 17 housing units per acre or two housing units per a standard 5,000 square foot lot.[11] Population projections for this type of land use ranges from 29 to 53 person per acre. Generally, lots in this category have two separate housing units sharing the same lot or two attached units (i.e. duplex, townhouses). This land use designation makes up 3% of the City's overall land area.[12].

Medium Density Residential Development

Making up 7% of the City land area, this residential designation involves densities of 18 to 24 housing units per acre or approximately 3 housing units per standard 6,000 square foot lot.[13] Population projections, based on an average household size of 3.17 persons per unit, are estimated at a range of 57 to 76 person per acre.[14] This land use is characterized by triplex properties, townhouses, condominiums, and apartment complexes.

Commercial Land Uses

Office - Commercial

Land use designated under this category is intended for professional and medical uses. This land use category accounts for 3% of the overall land area of the City.[15]

Neighborhood Commercial

Neighborhood commercial land use applies to a range of commercial establishments whose customer base is drawn from the immediate surrounding neighborhood. Examples of businesses that belong under this category include grocery stores, barber shops, dry cleaners, and convenience markets. This classification accounts for 2% of the overall land area of the City.[16]

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[11] Ibid,
[12] City of Downey. (2005). Vision 2025 general plan Downey, California. Retrieved from https://www.downeyca.org/home/showpublisheddocument/134/636977201776000000
[13] City of Downey. (2005). Vision 2025 general plan Downey, California. Retrieved from https://www.downeyca.org/home/showpublisheddocument/134/636977201776000000
[14] Ibid.
[15] Ibid.
[16] Ibid.

General Commercial

Making up 6% of the overall land use, the general commercial designation permits a full range of commercial uses.[17] In contrast to the neighborhood commercial designations, uses in this category can be larger commercial establishments such as hotels, offices, and automotive repair businesses.

Manufacturing Land Uses

General Manufacturing

This classification includes manufacturing, wholesaling, and other industrial land uses. Generally, the City attempts to separate this type of land use from others because businesses in this classification have the potential for creating traffic, noise, odor, vibration, and other undesirable impacts on the surrounding community. General Manufacturing makes up 4% of the overall City land area. [18]

Commercial Manufacturing

The Commercial Manufacturing designation includes larger business establishments and is intended to provide areas for businesses that generate a great deal of employment opportunities. Some example uses of this land designation are shopping centers, large offices, and light industrial uses. This designation accounts for 5% of the City's overall land area.[19]

Other Land Uses

Open Space

Approximately 106 acres of public parks make up the open space land designation.[20] Areas under this category are intended to give the community places that provide relief from the built environment. In addition to park areas, the open space designation includes utility easements, riverbeds, parks, cemeteries, and golf courses. This designation accounts for 8% of the City's total land area. [21]

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[17] Ibid.
[18] City of Downey. (2005). Vision 2025 general plan Downey, California. Retrieved from https://www.downeyca.org/home/showpublisheddocument/134/636977201776000000
[19] Ibid.
[20] Ibid.
[21] Ibid.

Schools

Making up 6% of the overall City land area, this designation is intended for public and private schools offering K through 12 instruction.[22] The City has 13 public elementary schools, 4 public middles schools, 3 public high schools, and at least 3 private schools located within the City boundaries.

Public

This land designation includes areas that are intended for facilities that support community services which are owned by public agencies. Examples of uses in this category are the Civic Center, the City Public Works Yard, Rancho Los Amigos Medical Center, and Los Padrinos Juvenile Hall. This land designation makes up 2% of the City's overall land use.[23]

Mixed Use

This land designation blends a combination of the residential, commercial, and public spaces for establishments whose functions are interconnected. This type of land area provides flexibility to the City and accounts for 5% of the City's overall land use.[24]

Table 2.1 provides a summary of the land use designations described in the sections above.

Table 2. 1:Land Use Designations

Land Use Designation	Area (acres)	Percentage
Low Density Residential	3,188	51
Low/ Medium Density Residential	187	3
Medium Density Residential	414	7
Office Commercial	163	3
Neighborhood Commercial	103	2
General Commercial	372	6
General Manufacturing	229	4
Commercial Manufacturing	304	5
Open Space	516	8
Schools	348	6
Public	104	2

[22] Ibid.
[23] Ibid.
[24] City of Downey. (2005). Vision 2025 general plan Downey, California. Retrieved from https://www.downeyca.org/home/showpublisheddocument/134/636977201776000000

Land Use Designation	Area (acres)	Percentage
Mixed Use	301	5
Total	6,229	≈100

Figures 2.2 and 2.3 illustrate the City's zoning and land use designations, respectively, and were extracted from the 2023 revision of the General Plan Vision 2025 plan. As mentioned above, the City's designations have not changed since the previous planning period. Figures 2.2 and 2.3 are current and are still in use.

Figure 2. 2: City of Downey General Plan Zoning Map

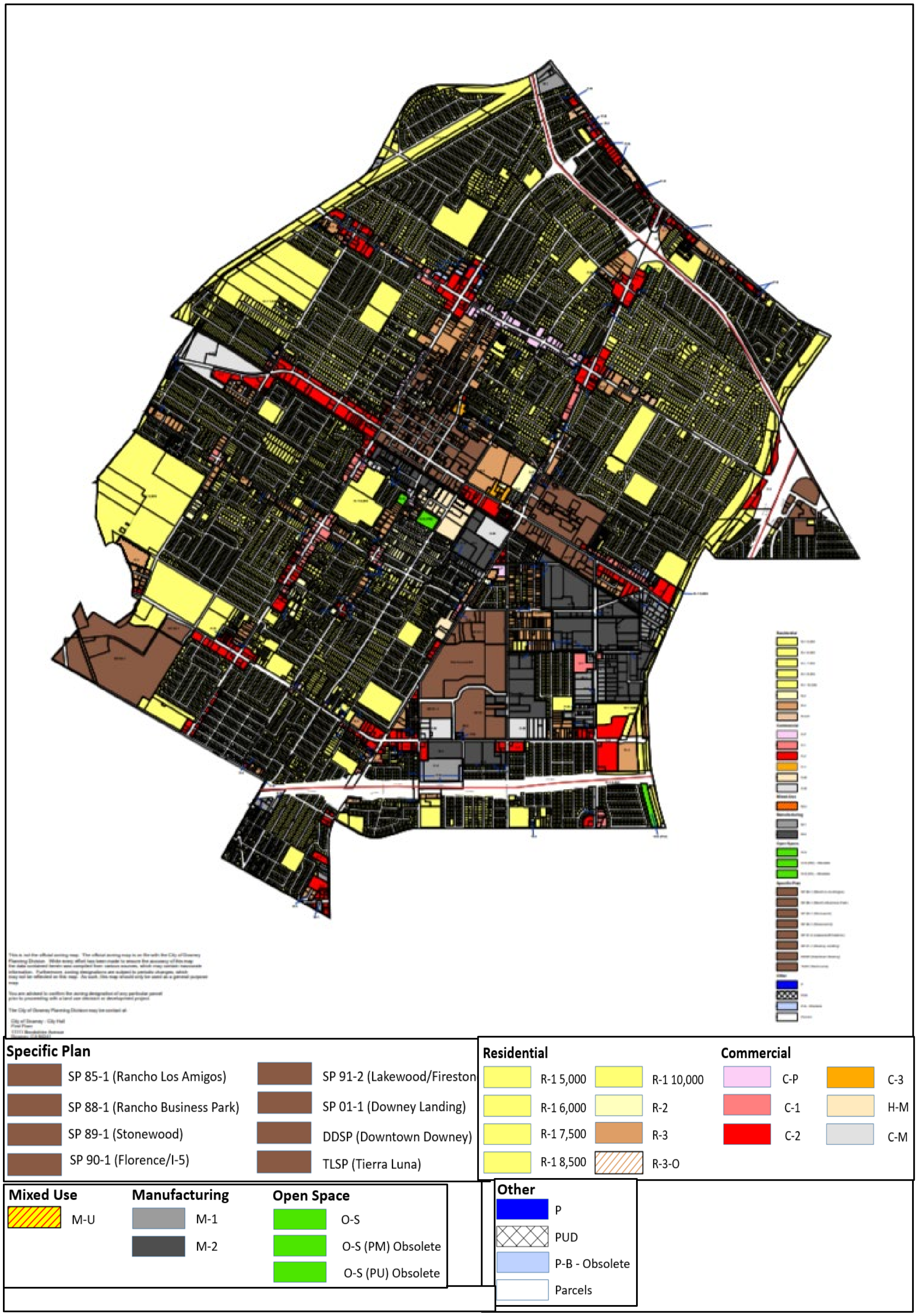
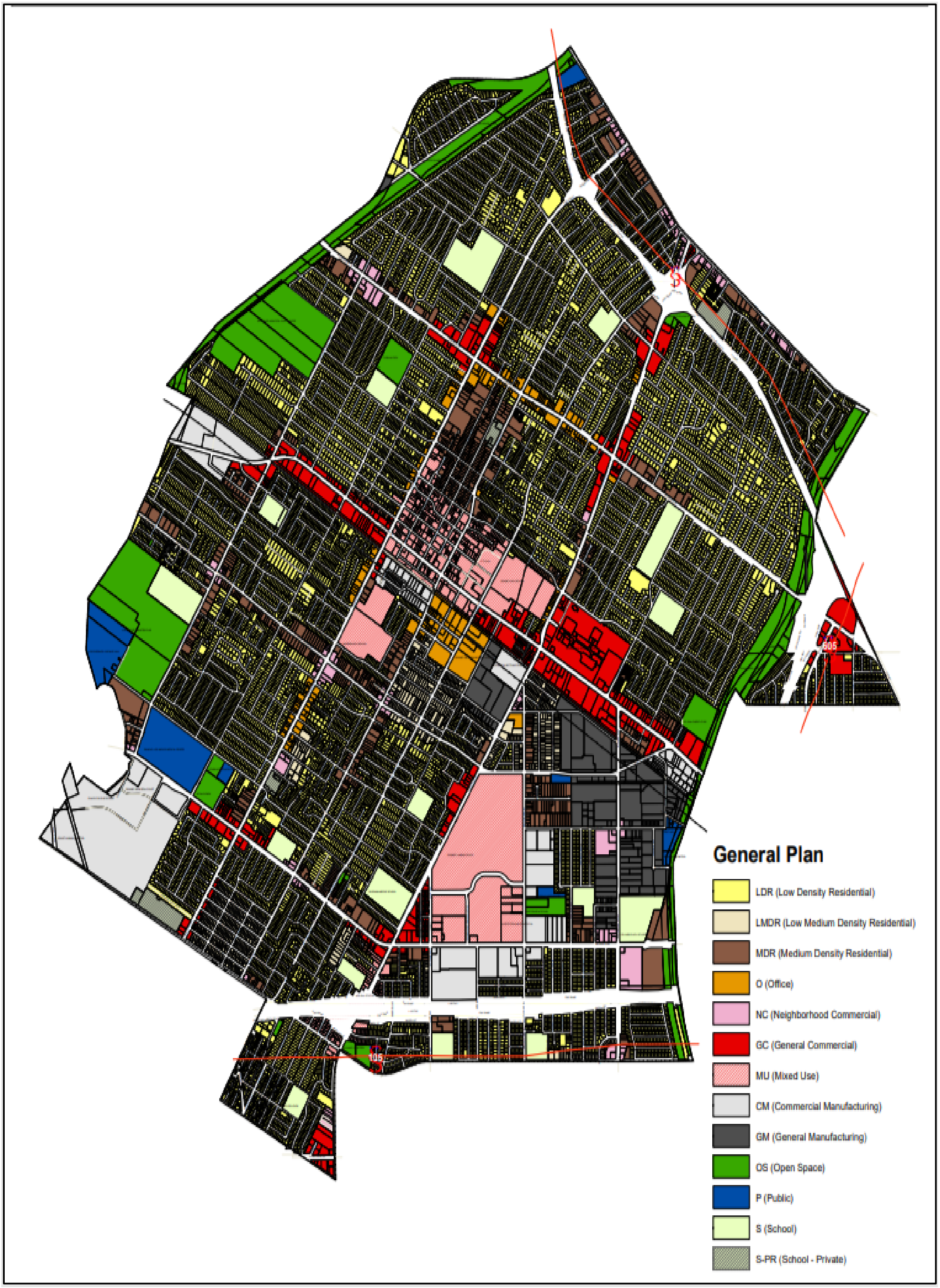


Figure 2. 3: City of Downey Land Use Map



2.3 Population

Since 1940, the City's population has increased from about 12,000 residents to over 106,859 in 2023.[25] Between 2020 and 2022, the population of Downey decreased approximately -3.9%.[26] Conversely, future population growth is expected to grow slowly as development opportunities become increasingly limited and the City reaches its potential for building out.

Table 2.2 provides the City's projected population growth through 2045. Population projections were estimated by calculating the average growth rate of 0.9% and 5.6%.[27] Census data for those years was acquired through the Southern California Association of Governments (SCAG).[28] Table 2.3 provides the census data used and population estimations.

Table 2. 2: Projected Growth for the City of Downey

Year	2010	2020	2045	% Change 2010 – 2020	% Change 2020 – 2045
Population	111,922	112,901	199,200	0.9%	5.6%

Demographics

The City's population is a dynamic group representing people from many walks of life. While many factors could influence the public's opinion of the City's emergency preparedness culture, the following subsections will focus on age, ethnicity, and income levels as well as the changes observed by the City for each of these categories.

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25 World Population Review. (2023). Downey, California Population 2023. Retrieved from https://worldpopulationreview.com/us-cities/downey-ca-population

26 United Census Bureau. (2022). QuickFacts: Downey city, California. Retrieved from https://www.census.gov/quickfacts/fact/table/downeycitycalifornia/PST120222#PST120222

27 City of Downey. (2022) City of Downey 2021-2029 housing element. Retrieved from https://www.downeyca.org/home/showpublisheddocument/7275/638127636738570000

28 City of Downey. (2022) City of Downey 2021-2029 housing element. Retrieved from https://www.downeyca.org/home/showpublisheddocument/7275/638127636738570000

Population Age

According to the 2019 city profile developed by the Southern California Association of Governments (SCAG), the City experienced a significant increase in the 55-64 year age group.[29] Growing from 7.2% of the population in the year 2000 to 11.2% in 2018; this group experienced the largest increase during the study period.[30] Conversely, the 5-20 years age group decreased from 25.4% to 20.7% during the same timeframe. During this period, the largest group was the 35-54 years age group representing more than 25% of the City's population.[31] In 2020, the largest age group consisted of 20- to 44-year-old at approximately 37.1%, followed by the 0 to 19 age group at 26.7%[32]

Ethnicity

In the same study, it was reported that those identifying as Hispanic or Latino of any race increased from 57.9% to 74.0 % of the population during the 2000 to 2018 study period.[33] This group represented the largest increase and the largest ethnicity group in the City. All other identified ethnicity groups experienced a decrease in percentage. The table below demonstrates the change in composition for each identified ethnic group from 2000 to 2018.

Table 2. 3: Evolution of Ethnic Composition

Ethnic Group	Year 2000 Population Total Population 107,323		Year 2018 Total Population 114,146	
	Population	Percentage	Population	Percentage
Hispanic/Latino	62,140	57.9	84,468	74.0
Non-Hispanic White	30,802	28.7	15,752	13.8
Non-Hispanic Asian	8,157	7.6	8,104	7.1
Non-Hispanic Black	3,756	3.5	3,881	3.4
Other	2,468	2.3	1,826	1.6

[29] Southern California Association of Governments (SCAG). (2019). Profile of the City of Downey. Retrieved from https://scag.ca.gov/sites/main/files/file-attachments/downey_localprofile.pdf?1605664387
[30] Ibid.
[31] Ibid.
[32] City of Downey. (2022) City of Downey 2021-2029 housing element. Retrieved from https://www.downeyca.org/home/showpublisheddocument/7275/638127636738570000
[33] Ibid.

Household Income

The City's median annual household income from 2017- 2021 was $77,972 according to the United States Census Bureau.[34] As of 2021, 35% of households earned less than $13.5% annually while 17.8% of households earned $100,000 or more.[35] According to City of Downey, 9.9 percent of residents live in poverty, as defined by federal guidelines.[36] Table 2.4 demonstrates the percent of households by income for 2021.

Table 2. 4- Percent of Households by Household Income for 2021

Income Range	Percentage
Less than $10,000	3.3
$10,000 to $14,999	2.0
$15,000 to $24,999	5.4
$25,000 to $34,999	6.2
$35,000 to $49,999	13.5
$50,000 to $74,999	17.4
$75,000 to $99,999	16.4
$100,000 to $149,999	17.8
$150,000 to $199,999	9.2
$200,000 or more	8.9

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[34] United Census Bureau. (2021). QuickFacts: Downey city, California. Retrieved from https://integratedsolutionscorp.sharepoint.com/sites/DowneyHMP/Shared%20Documents/Technical/HMP%20(Prior,%20Current)/HMP%202023%20Draft%20Files/AppendixA_RASupportDoc.FINAL.pdf
[35] United Census Bureau. (2021).Income in the past 12 months (in 2021 inflation-adjusted). Retrieved from
[36] City of Downey. (2022) City of Downey 2021-2029 housing element. Retrieved from https://data.census.gov/table?g=160XX00US0619766&tid=ACSST5Y2021.S1901https://www.downeyca.org/home/showpublisheddocument/7275/638127636738570000

2.4 National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an alternative to disaster assistance and reduce the escalating costs of repairing damage to buildings and their contents caused by floods. The table below summarizes the City of Downey's participation in the program.

Table 2. 5: NFIP Participation

CID	Community Name	County	Init. FHBM Identified	Init. FIRM Identified	Curr. Eff. Map Date	Reg-Emer. Date
060645	City of Downey	Los Angeles	07/19/74	09/26/08	(NSFHA)	09/07/84

Note: Non-Special Flood Hazard Area (NSFHA)

Each NFIP participating community has a designated Floodplain Manager/coordinator that is charged with enforcing floodplain regulations, routinely monitoring the floodplains, and providing community assistance such as encouraging owners to maintain flood insurance.

Table 2. 6: Floodplain Manager[37] in the City of Downey

Name	Title	Phone Number
Roger Bradley	City Manager	562.299-6603

As part of the City of Downey's continued compliance with NFIP, the Downey Municipal Code includes Chapter 8 Floodplain Management, Grading and Paving. This is designed to promote public health, safety, and general welfare as well as minimize public and private losses due to flood conditions in flood-prone areas. The ordinance outlines several methods for reducing flood losses including controlling activities which increase

[37] California Department of Water Resources (2023). Data provided by Division of Regional Assistance-Southern Region Office.

vulnerability to erosion hazards, mitigation flood damage for new buildings during the construction stage, controlling any activity of diversions of flood paths, and controls for filling; grading; or and dredging.

3 RISK ASSESSMENT

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3.1 Hazard Identification & Risk Assessment

The Risk Assessment identifies the natural, technological, and human-caused hazards that have potential impacts on all or portions of the City. Hazard identification, historical occurrences, and risk modeling (where applicable and available for specific hazards) information was collected from multiple sources including but not limited to:

- Environmental Systems Research Institute (ESRI),
- Federal Emergency Management Agency (FEMA),
- National Centers for Environmental Information (NCEI),
- National Fire Incident Reporting System (NFIRS),
- National Weather Service (NWS),
- United States Geological Survey (USGS),
- and local repositories.

This information was then analyzed to assess risk and vulnerability of people, property, the environment, and its own operations from these hazards. To that end, a risk ranking was performed for the hazards of concern described in this plan. The risk ranking is a key step in developing an action plan, as it allows the City to compare the risk factors of one hazard to another. That comparison provides critical information to use in selecting hazard mitigation actions and their priorities. This process is not only intended to help focus actions on the hazards with the highest rankings, but also to ensure the City does not forget about hazards that ranked low yet still pose significant risk.

In order to provide an informed and comprehensive ranking of the hazards addressed in this plan, several categories of factors were considered: extent, vulnerability impact and probability. The sum of all the weighted factors for the extent, vulnerability, and impact categories were combined into a final consequence score. Probability multiplied by consequence resulted in a total risk score for each hazard.

Figure 3. 1: Total Risk Score Formula

$$Extent + Vulnerability + Impact = Consequence$$

$$Consequence \times Probability = TotalRiskScore$$

These results were determined by following a data-driven quantitative assessment, from reviewing and ranking local knowledge from local subject matter experts, to developing other risk elements by the Core Planning Team (the City and Integrated Solutions Consulting (ISC)) based on the data collected. These elements were then aggregated to inform the analysis.

At the fundamental level, consequence is an assessment of the potential impact(s) if the hazard incident actually occurs. In this assessment, the consequence of an event (or the impact) will be interdependent on the following factors: vulnerabilities (i.e. social, physical, and community conditions), capabilities and capacities, mitigation, and the characteristics (i.e. magnitude, scale, etc.) of the hazard event. Again, the frequency/probability of the hazard is not included in assessing the consequence because without the event, there is no consequence or impact.

3.1.1 Extent Factors

Extent was assessed in two sub-categories: hazard duration and intensity potential. Numerical impact factors were assigned as follows:

Duration—Duration is defined as the range of time that the hazard, its impact, and the following recovery could potentially be.

- **High**—The hazard, its impacts and the recovery could last for years (Extent Factor = 3)
- **Medium**—The hazard, its impacts and the recovery could last for months (Extent Factor = 2)
- **Low**—The hazard, its impacts and the recovery could last for weeks (Extent Factor = 1)
- **Unlikely**—The hazard, its impacts and the recovery could last for days at most (Extent Factor = 0)

Intensity—The potential that an occurrence of this hazard could be catastrophic. Catastrophic incidents are those that cause extraordinary levels of mass casualties, damage, or disruption that could severely affect a jurisdiction's operations, populations, economy, and/or morale.Historical studies, probabilistic models, and subject matter expertise all influence determinations of potential hazard intensity.

- **High**—High potential that this hazard could be catastrophic (Extent Factor = 3)
- **Medium**—Medium potential that this hazard could be catastrophic (Extent Factor = 2)
- **Low**—Low potential that this hazard could be catastrophic (Extent Factor = 1)
- **Unlikely**—Virtually no potential that this hazard could be catastrophic (Extent Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 1 was assigned for *Duration* and a factor of 3 was assigned to *Intensity*.

3.1.2 Vulnerability Factors

Vulnerabilities were assessed in three sub-categories: population exposure, property exposure, and exposure based on changes in development. Numerical factors were assigned as follows:

People—Values were assigned based on the percentage of the total population exposed to the hazard event.

- **High**—25% or more of the population is exposed to, or could be impacted by, a single occurrence of the hazard (Vulnerability Factor = 3)
- **Medium**—6% to 24% of the population is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 2)
- **Low**—5% or less of the population is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 1)
- **No Vulnerability**—None of the population is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 0)

Property Exposed—Values were assigned based on the percentage of the total property value exposed to the hazard event.

- **High**—25% or more of the total assessed property value is exposed to, or could be impacted by, a single occurrence of the hazard (Vulnerability Factor = 3)

- **Medium**—6% to 24% of the total assessed property value is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 2)
- **Low**—5% or less of the total assessed property value is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 1)
- **No Vulnerability**—None of the total assessed property value is exposed to, or could be impacted by, a single occurrence of this hazard (Vulnerability Factor = 0)

Changes in Development —Changes in development since the previous plan was approved have increased or decreased the community's vulnerability/exposure to this hazard.

- **High**—Changes in development have significantly increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 3)
- **Medium**—Changes in development have increased the vulnerability/exposure of the community to this hazard, but not significantly (Vulnerability Factor = 2)
- **Low**—Changes in development have minimally increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 1)
- **No Vulnerability**—Changes in development have had no effect and/or have decreased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *People*, a factor of 2 *Property Exposed,* and 1 for *Changes in Development*.

3.1.3 Impact Factors

Hazard impacts were assessed in eight sub-categories: population and life/safety, underserved/equity, property damages, economy, own operations, future development, environment, and climate change. Numerical impact factors were assigned as follows:

Population and Life/Safety—Values were assigned based on 1.) subject matter expertise and/or best available data for populations vulnerable to the hazard event, and 2). whether affected populations are likely to experience adverse impacts from the hazard incident.

- **High**—Populations exposed to this hazard are likely to experience significant adverse impacts (Impact Factor = 3)

- **Medium**—Populations exposed to this hazard are likely to experience some adverse impacts (Impact Factor = 2)
- **Low**—Populations exposed to this hazard are likely to experience minimal adverse impacts (Impact Factor = 1)
- **No impact**—Populations exposed to this hazard are not likely to experience significant adverse impacts (Impact Factor = 0) ....

Impact to Underserved/Equity—Values were 1). assigned based on subject matter expertise and/or best available data for underserved populations vulnerable to the hazard event, and 2). whether affected populations are likely to experience adverse/disproportionate impacts from the hazard incident resulting in greater disparity in equity.

- **High**—Underserved populations exposed to this hazard are likely to experience significant adverse/disproportionate impacts (Impact Factor = 3)
- **Medium**—Underserved populations exposed to this hazard are likely to experience some adverse/disproportionate impacts (Impact Factor = 2)
- **Low**—Underserved populations exposed to this hazard are likely to experience minimal adverse/disproportionate impacts (Impact Factor = 1)
- **No impact**—Underserved populations exposed to this hazard are not likely to experience significant adverse/disproportionate impacts (Impact Factor = 0)

Property Damage—Values were assigned based on the expected total property damages incurred from a hazard incident. It is important to note that values represent estimates of the loss from a major incident based on historical data or probabilistic models/studies.

- **High**—More than $5,000,000 in property damages is expected from a single major hazard event, or damages are expected to occur to 15% or more of the property value within the jurisdiction (Impact Factor = 3)
- **Medium**—More than $500,000, but less than $5,000,000 in property damages is expected from a single major hazard event, or expected damages are expected to more than 5%, but less than 15% of the property value within the jurisdiction (Impact Factor = 2)
- **Low**—Less than $500,000 in property damages is expected from a single major hazard event, or less than 5% of the property value within the jurisdiction (Impact Factor = 1)
- **No impact**—Little to no property damage is expected from a single major hazard event (Impact Factor = 0)

Economy—An estimation of the impact, expressed in terms of dollars, on the local economy is based on a loss of business revenue, crops, worker wages and local tax revenues or on the impact on the local gross domestic product (GDP).

- **High**—Where the total economic impact is likely to be greater than $10 million (Impact Factor = 3)
- **Medium**—Total economic impact is likely to be greater than $100,000, but less than or equal to $10 million (Impact Factor = 2)
- **Low**—Total economic impact is not likely to be greater than $100,000 (Impact Factor = 1)
- **No Impact**—Virtually no significant economic impact (Impact Factor = 0)

Impact to Own Operations—An estimate of the impact on the ability of the affected jurisdiction to meet the essential day-to-day operational demands and needs of the community after a single major hazard event.

- **High**—Significant impact on the organization's own operations and/or the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 3)
- **Medium**—Some impact on the organization's own operations and/or the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 2)
- **Low**—Minimal impact on the organization's operations and/or the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 1)
- **No Impact**—No impact on the organization's operations and/or the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 0)

Future Development—The potential that future development will have on increasing or decreasing the impact/consequence of this hazard.

- **High**—Future development trends will significantly increase the impact/consequence of this hazard (Impact Factor = 3)
- **Medium**—Future development trends will increase the impact/consequence of this hazard, but not significantly (Impact Factor = 2)
- **Low**—Future development trends will minimally increase impact/consequence of this hazard (Impact Factor = 1)

- **No Impact**—Future development trends will not increase the impact/consequence of this hazard, and/or may even decrease the impact/consequence of this hazard (Impact Factor= 0)

Environment—An estimate of the environmental impact from a single major hazard event requiring outside resources and support; and/or repair, clean-up, restoration, and/or preservation work.

- **High**—Environmental impact from a single major hazard event is likely to be significant, requiring extensive outside resources and support; and/or repair, clean-up, restoration, and/or preservation work that may take a year or longer to complete (Impact Factor = 3)
- **Medium**— Environmental impact from a single major hazard event is likely to be localized, requiring some outside resources and support; and/or repair, clean-up, restoration, or preservation work that may take up to a month to complete (Impact Factor = 2)
- **Low**—Environmental impact from a single major hazard event is likely to be minimal, requiring little to no outside resources and support; and/or minimal repair, clean-up, restoration, or preservation work that may take a week to complete (Impact Factor = 1)
- **No Impact**—No environmental impacts from a single major hazard event are likely (Impact Factor = 0)..

Climate Change—The potential that Climate Change will increase the risk of this hazard (i.e., type, location, and range of anticipated intensities of the identified hazard and impacts).

- **High**—Climate Change trends will significantly increase the risk of this hazard and its impacts (Impact Factor = 3)
- **Medium**—Climate Change trends will increase the risk of this hazard and its impacts, but not significantly (Impact Factor = 2)
- **Low**—Climate Change trends will minimally increase the risk of this hazard and its impacts (Impact Factor = 1)
- **No Impact**—Climate Change trends will not increase the risk of this hazard and its impacts (Impact Factor = 0)

Each sub-category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting of 3 was assigned for *Population and Life/Safety* and *Underserved/Equity*, and a weighting factor of 2 was assigned for *Property Damages.* A weighting factor of 1 was assigned for *Economic*, *Own Operations, Future Development, Environment,* and *Climate Change*.

3.1.4 Probability of Occurrence Factors

The probability of occurrence of a hazard is indicated by a factor based on the likelihood of annual occurrence. The probability of occurrence factors used in the risk assessment calculations are:

- **High**—Significant hazard event is likely to occur annually (Probability Factor = 3)
- **Medium**—Significant hazard event is likely to occur within 10 years (Probability Factor = 2)
- **Low—**Significant hazard event is likely to occur within 50 years (Probability Factor = 1)
- **Unlikely—**There is little to no probability of significant occurrence, or the recurrence interval is greater than every 100 years (Probability Factor = 0)

The assessment of hazard frequency is generally based on past hazard events in the area in conjunction with the professional judgement of local subject matter expects.

3.2 FEMA National Risk Index

The Federal Emergency Management Agency (FEMA) National Risk Index (NRI) is a dataset and online tool to help illustrate the United States communities most at risk communities for 18 natural hazards. These include:

- Avalanche
- Coastal Flooding
- Cold Wave
- Drought
- Earthquake
- Hail
- Heat Wave
- Hurricane
- Ice Storm
- Landslide
- Lightning
- Riverine Flooding
- Strong Wind
- Tornado
- Tsunami
- Volcanic Activity
- Wildfire
- Winter Weather

All the hazards on this list are not applicable to the City planning area; therefore, only those hazards with a defined risk to the City planning area will be included in this Plan. The NRI's goal is to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

The NRI leverages available source data for expected annual loss due to these 18 natural types of hazards, social vulnerability, and community resilience to develop a baseline relative risk measurement for each United States county and Census tract. These measurements are calculated using average past conditions, but they cannot be used to predict future outcomes for a community.

3.2.1 NRI Score

In the NRI, risk is defined as the potential for negative impacts as a result of a natural hazard. The Risk Index is based on three (3) components – a natural hazards component (Expected Annual Loss), a consequence enhancing component (Social Vulnerability), and a consequence reduction component (Community Resilience). Using these components, the composite and hazard type Risk Index values are calculated for each community (county and

Census Tract). Risk Index values form an absolute basis for measuring Risk within the NRI and are used to generate Risk Index percentiles and ratings across communities.[1]

The table below illustrates the Risk Index rating and score for the City planning area (Census Tracts).

Table 3.1: Overall FEMA National Risk Index for the City of Downey Planning Area

Census Tract	Rating	FEMA National Risk Index Score
550501	Relatively Moderate	69.23
550502	Relatively Moderate	72.15
550601	Relatively Moderate	77.86
550602	Relatively Moderate	82.01
550700	Relatively High	89.37
550801	Relatively Moderate	84.16
550802	Relatively Moderate	69.37
550901	Very High	97.34
550902	Relatively High	86.23
551001	Relatively Moderate	82.72
551002	Relatively Moderate	70.66
551101	Very High	98.77
551102	Very High	98.57
551201	Relatively Moderate	83.37
551203	Relatively Moderate	67.48
551204	Relatively Moderate	73.89
551300	Very High	98.87
551401	Relatively Moderate	79.08
551402	Relatively High	85.35
551501	Relatively Moderate	83.96
551502	Relatively Moderate	77.06
551700	Relatively Moderate	77.53
551801	Relatively Moderate	82.52
551802	Relatively Moderate	81.18
553400	Relatively Moderate	68.27
980012	Relatively High	90.39
Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience. (Expected Annual Loss X Social Vulnerability / Community Resilience = Risk Index).		

[1] Federal Emergency Management Agency. (2023). Determining Risk. Retrieved from https://hazards.fema.gov/nri/determining-risk.

3.2.2 Expected Annual Loss

The Expected Annual Loss (EAL), the natural hazards component of the NRI, represents the average economic loss in dollars resulting from natural hazards each year. It is calculated for each hazard type and quantified loss for relevant consequence types such as, buildings, people, and agriculture. The EAL score and rating represents a community's relative level of expected losses each year when compared to other communities at the same level. Since the score is associated to a community's risk; the higher EAL score results in a higher Risk Index score.[2] The table below illustrates the EAL rating and score for the City planning area (Census Tracts).

Table 3.2: Expected Annual Loss for the City of Downey Planning Area

Census Tract	Rating	FEMA National Risk Index Score
550501	Relatively Moderate	62.24
550502	Relatively Moderate	76.54
550601	Relatively Moderate	72.44
550602	Relatively Moderate	81.70
550700	Relatively High	86.06
550801	Relatively Moderate	83.57
550802	Relatively Moderate	64.90
550901	Relatively High	94.43
550902	Relatively Moderate	82.04
551001	Relatively Moderate	83.17
551002	Relatively Moderate	64.89
551101	Relatively High	96.96
551102	Relatively High	97.01
551201	Relatively Moderate	75.19
551203	Relatively Moderate	63.98
551204	Relatively Moderate	67.45
551300	Very High	97.66
551401	Relatively Moderate	68.60
551402	Relatively Moderate	77.95
551501	Relatively Moderate	79.26
551502	Relatively Moderate	73.78

[2] Federal Emergency Management Agency. (2023). Expected Annual Loss. Retrieved from https://hazards.fema.gov/nri/expected-annual-loss.

Census Tract	Rating	FEMA National Risk Index Score
551700	Relatively Moderate	72.26
551801	Relatively Moderate	83.14
551802	Relatively Moderate	75.49
553400	Relatively Low	58.95
980012	Relatively High	85.68
Expected annual loss scores are calculated utilizing an equation that combines values for exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio).		

An EAL score and rating is calculated independently for each consequence type (i.e., buildings, population, and agriculture) for each county and Census Tract. The population EAL is measured in fatalities and injuries while the building and agriculture values are measured in dollars. However, for consistency in the unit of measurement, the population EAL was monetized into population equivalence using a value of statistical life (VSL) approach where each fatality or 10 injuries is treated as $11.6 Million of economic loss.

3.2.3 Social Vulnerability

Social vulnerability, the consequence enhancing risk component of the NRI, measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. The Social Vulnerability score and rating represent the relative level of a community's social vulnerability compared to all other communities at the same level. A higher Social Vulnerability score results in a higher Risk Index score.[3] The table below illustrates the Social Vulnerability rating and score for the City planning area (Census Tracts).

Table 3.3: Social Vulnerability for the City of Downey Planning Area

Census Tract	Rating	FEMA National Risk Index Score
550501	Relatively High	71.87
550502	Relatively Low	28.85
550601	Relatively High	72.22
550602	Relatively Moderate	52.15

[3] Federal Emergency Management Agency. (2023). Social Vulnerability. Retrieved from https://hazards.fema.gov/nri/social-vulnerability.

Census Tract	Rating	FEMA National Risk Index Score
550700	Relatively High	72.69
550801	Relatively Moderate	53.81
550802	Relatively High	63.88
550901	Very High	91.36
550902	Relatively High	74.18
551001	Relatively Moderate	47.93
551002	Relatively High	69.05
551101	Very High	94.68
551102	Very High	88.91
551201	Very High	86.37
551203	Relatively Moderate	59.22
551204	Relatively High	73.33
551300	Very High	87.36
551401	Very High	89.56
551402	Very High	85.91
551501	Relatively High	74.36
551502	Relatively High	63.49
551700	Relatively High	71.49
551801	Relatively Moderate	47.09
551802	Relatively High	76.08
553400	Relatively High	78.05
980012	Very High	81.25
Social Vulnerability is measured using the Social Vulnerability Index (SoVI) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).		

3.2.4 Community Resilience

Community resilience, the consequence reduction risk component, measures the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. The Community Resilience score and rating represent the relative level of a community's resilience compared to all other communities at the same level. Since the score is inversely proportional to a community's risk; the higher

Community Resilience score results in a lower Risk Index score.[4] The table below illustrates the Community Resilience rating and score for the City planning area (Census Tracts).

Table 3.4: Community Resilience for the City of Downey Planning Area

Census Tract	Rating	FEMA National Risk Index Score
550501	Very Low	15.43
550502	Very Low	15.43
550601	Very Low	15.43
550602	Very Low	15.43
550700	Very Low	15.43
550801	Very Low	15.43
550802	Very Low	15.43
550901	Very Low	15.43
550902	Very Low	15.43
551001	Very Low	15.43
551002	Very Low	15.43
551101	Very Low	15.43
551102	Very Low	15.43
551201	Very Low	15.43
551203	Very Low	15.43
551204	Very Low	15.43
551300	Very Low	15.43
551401	Very Low	15.43
551402	Very Low	15.43
551501	Very Low	15.43
551502	Very Low	15.43
551700	Very Low	15.43
551801	Very Low	15.43
551802	Very Low	15.43
553400	Very Low	15.43
980012	Very Low	15.43
Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).		

[4] Federal Emergency Management Agency. (2023). Community Resilience. Retrieved from https://hazards.fema.gov/nri/community-resilience.

3.3 Total Risk Scores

The following table represents the new overall risk scores for the City based on the Risk Assessment Methodology defined at the beginning of this chapter. Following a data-driven quantitative assessment, from reviewing and ranking local knowledge from local subject matter experts, to developing other risk elements by the Core Planning Team based on the data collected. These elements were then aggregated to inform the analysis. The development of the Total Risk Score is organized based on the following: ranked by ranked by Total Risk Score. If same Risk score, ranked by Probability Factor. If same Probability Factor, ranked by Impact Factor and if same Impact Factor, ranked by Vulnerability Factor.

Table 3.5: 2023 Hazard Risk Scores for the City of Downey

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Earthquake	3	12	16	37	65	**95**
Wildfire Smoke/ Air Quality	3	7	15	23	45	**69**
HazMat Release	2	8	10	32	50	**53**
Cyber Incident	2	7	10	28	45	**49**
Utility Loss	2	7	12	26	45	**49**
Acts/Threats of Mass Violence	2	11	10	23	44	**48**

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Drought	2	6	12	23	41	**45**
Civil Unrest	2	4	12	24	40	**44**
Severe Weather /Storm	2	4	15	19	38	**42**
Transportation Accident	2	4	10	19	33	**37**
Pandemic	1	12	16	32	60	**34**
Dam Failure	1	5	12	33	50	**29**
Urban Flood	1	8	12	22	42	**25**
Tornado	1	8	7	23	38	**23**
Urban Fires	1	5	10	23	38	**23**
Windstorm	1	4	12	19	35	**22**

Classification	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard. The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors. The Total Risk Score is a product of Probability and Consequence.

Limitations

The assessment of data and identifying the risk to a community is not a hard science, as the analysis of hazards is complicated by several factors including laws, customs, ethics, values, attitudes, political preferences, complex infrastructures, and the built environment. It is not possible to fully predict hazards or their impacts. Furthermore, the perception of what constitutes a significant risk or impact can easily differ between individuals. Despite the inherent limitations, a well thought out risk assessment can act as a guide and provide a wealth of valuable information that is essential for identifying goals, prioritizing actions, planning and preparedness, and recovering and mitigating future hazards. The hazard analysis developed for this Plan should be best considered as an initial step in the process of continuously evaluating, preparing for, and mitigating the community's hazards.

3.4 Hazard Profiles & Description

The hazard profiles identify the hazards that can affect the City. It analyzes each of the hazards with respect to where each hazard might affect the planning area, its potential magnitude, how often events have happened in the past, how likely they are to occur in the future; what parts of the City are most likely to be affected; and the potential consequences.

3.5 Acts/Threats of Mass Violence

Table 3.6: Acts/Threats of Mass Violence Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Acts/Threats of Mass Violence	2	11	10	23	44	**48**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.5.1 Acts/Threats of Mass Violence Description

There is not a universal definition of mass violence crimes, mass murders, or mass killings; researchers, criminal justice experts and public policy bodies use many different definitions.

U.S. Congress has defined mass violence in legislation in three ways.

- **Mass Killings –** three or more killings in a single incident that occur in a public place.
- **Mass Shooting –** a multiple homicide incident in which four or more victims are. murdered with firearms, within one event, in one or more locations in close proximity.
- **Mass Public Shooting –** a multiple homicide incident in which four or more victims are murdered with firearms, within one event, in one or more locations in at least one or more public locations; a workplace, school, restaurant, house of worship, neighborhood or other public setting.4F[5]

[5] National Mass Violence Victimisation Resource Center. (2023). About Mass Violence. Retrieved from https://www.nmvvrc.org/learn/about-mass-violence/.

Terrorism as an act or threat of mass violence can take many forms. It is the unlawful use of force or violence against people or property to intimidate or coerce a government or civilian population in protest of political or social objectives. Terrorism and active assailant events are often violent mass casualty incidents. These events typically occur without warning, or without any warning signs. These events have recently taken the form of mass shootings, however, can also be caused by other means, such as bombs and vehicle-based attacks. These events can kill and injure multiple people in a single incident.

In recent years, terrorists have used mass transportation, explosive devices, guns, knives, biological weapons, kidnappings, and other methods to inflict terror on their target audience. Although much focus has been placed on international terrorist groups targeting the United States and other western countries, terrorists can also be citizens of the targeted country. Active assailants are armed intruders engaged in killing or attempting to use deadly force on other people in a confined space or populated area. Most terrorist attacks stem from a political or religious disagreement with the target country or population.

The convergence of cyber incidents and terrorism is cyber terrorism. It is the use of technology and the internet to disrupt society and promote widespread fear. The worst possible cyberterrorism events include a breach in computers that control dams or air traffic control. The possible extent is endangering millions of lives and national security.

The Federal Bureau of Investigation (FBI) has categorized two types of terrorism in the U.S.:

- **International Terrorism:** Violent, criminal acts committed by individuals and/or groups who are inspired by, or associated with, designated foreign terrorist organizations or nations (state-sponsored).
- **Domestic Terrorism:** Violent, criminal acts committed by individuals and/or groups to further ideological goals stemming from domestic influences, such as those of a political, religious, social, racial, or environmental nature.

According to the Central Intelligence Agency, there are more than 65 terrorist groups designated by the U.S. State Department as Foreign Terrorist Organizations (FTOs).

Well-known international terrorist groups include Islamic Fundamentalist groups, such as Islamic State (IS) in Iraq and Syria, ISIS in numerous countries (10 affiliated groups as of May 2023), Al Qa'ida (5 affiliate groups as of May 2023), Segunda Marguetalia, and Revolutionary Armed

Forces of Columbia – People's Army. Currently, there are 58 Designated Foreign Terrorist Organizations (including affiliated groups) on the Department of State watch list.[6]

In 2022, the deadliest terrorist groups in the world were Islamic State (IS) and its' affiliates, al-Shabaab, Baluchistan Libertarian Army (BLA), and Jamaat Nusrat Al Islam wal Muslimeen (JNIM).[7]

Domestic terrorism began to rise in recent years with the Department of Homeland Security declaring that the United States remains in a heightened threat environment. Lone offenders and small groups motivated by a range of ideological beliefs and/or personal grievances continue to pose a persistent and lethal threat to the United States.

According to the Department of Homeland Security, there have been 231 domestic terrorism incidents from 2010 to 2021 with 35% being racially or ethnically motivated. Over the last 10 years, investigations into domestic terrorism have risen more than 357% with the greatest number of incidents occurring in states with large metropolitan areas; California with Los Angeles, San Francisco and San Diego, New York with New York City and in Washington D.C. [8]

Some notable domestic terrorism attacks include a 2018 attack on a Pittsburgh P.A. synagogue that left eleven people dead and a racially motivated attack in 2022 on a Buffalo, N.Y. grocery store where ten people were killed.

In the U.S., there are numerous extremist groups. Examples include The Boogaloo Movement, Neo-Fascist Skull mask Movement, The Proud Boys, and Oath keepers, with the first three listed having members in California.[9] Additionally the Southern Poverty Law Center list 103 hate groups in California; 13 of which appear in the Los Angeles area, and six in nearby Orange County.[10]

In recent years, there have been several domestic terrorism incidents from those opposed to LGBTQ+ rights, animal rights activists, environmentalist groups and white supremacists.

The figure below shows the number of domestic terrorism incidents by state from 2010 to 2021.

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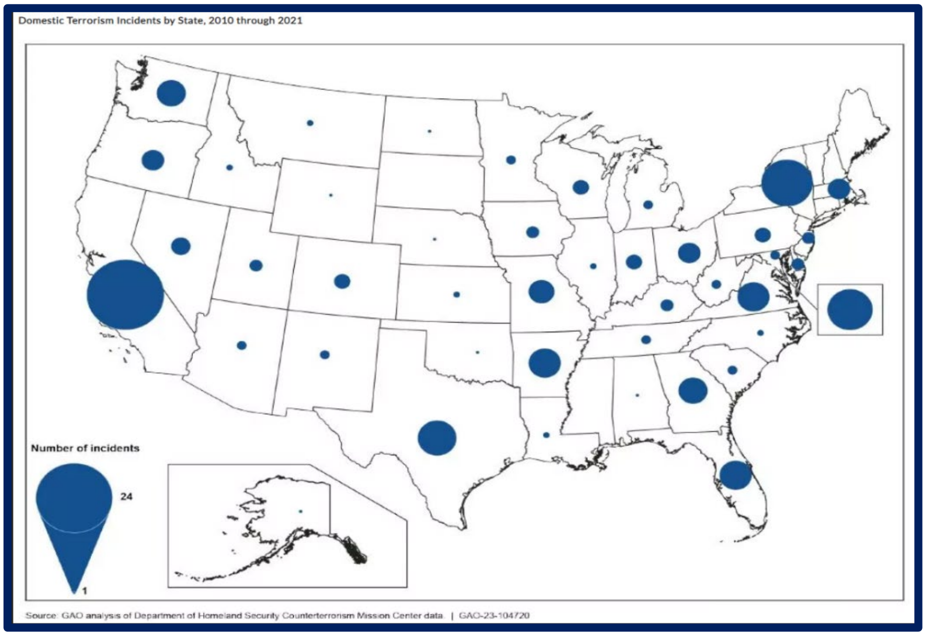
[6] U.S. Department of State. (2023). Foreign Terrorist Organizations. Retrieved from https://www.state.gov/foreign-terrorist-organizations/
[7] Relief Web. (2023). Global Terrorism Index 2023. Retrieved from https://reliefweb.int/report/world/global-terrorism-index-2023
[8] U.S, Government Accountability Office. (2023). The Rising Threat of Domestic Terrorism in the U.S. and Federal Efforts to Combat It. Retrieved from https://www.gao.gov/blog/rising-threat-domestic-terrorism-u.s.-and-federal-efforts-combat-it
[9] George Washington University Program on Extremism. (2023). Domestic Extremism Tracker. Retrieved from https://extremism.gwu.edu/domestic-extremism-tracker
[10] Southern Poverty Law Center. (2023) Hate Map. Retrieved from https://www.splcenter.org/hate-map

Figure 3.2: Domestic Terrorism Incidents by State 2010-2021[11]



There are several methods a terrorist may use to carry out their objective, including attacks of a chemical, biological, radiological, nuclear, explosive, and cyber nature. In addition, terrorists conduct hijackings, assassinations, armed assaults, kidnappings/hostage taking, arson fires, sabotage of critical infrastructures such as utilities and transportation, and the dissemination of confidential or otherwise sensitive information for the planning of terrorist attacks. Preventing these incidents is in the purview of local, state, and federal law enforcement. The City of Downey assessed this hazard to determine where and how they can mitigate the effects of terrorism in the community.

3.5.2 Acts/Threats of Mass Violence Hazard History

The U.S. has proven to be a high priority target for both domestic and international terrorists. Acts or threats of mass violence have become increasingly alarming in their magnitude in recent years. Examples of this include the bombing of the Alfred P. Murray Federal Building in Oklahoma City in 1995 and the attacks of September 11, 2001, on the World Trade Center complex and the Pentagon. Not all attacks, however, are at this level of intensity. The U.S.

[11] GAO Highlights. (2023). Domestic Terrorism. Retrieved from https://www.gao.gov/assets/D23104720HIGH.pdf

has also been subject to small scale attacks in the past such as the bombing at the Boston Marathon in 2013. On the local level, in January 2023, a shooting at a Lunar New Year party in Monterey Park, approximately 13 miles from the City, left twelve people dead and nine injured. The shooter did take his own life.

There was a breach on the U.S. Capitol on January 6, 2021, that disrupted the joint session of Congress in the process of affirming the 2020 U.S. Presidential election results. More than 2,000 rioters from all fifty states traveled to Washington D.C. in support of Donald Trump who refused to accept the 2020 election results and falsely claimed that he won. Some were armed with Molotov cocktails and weapons and dressed in tactical gear. They broke windows and knocked down doors, violently pushing past and attacking Capitol Police as they searched for then Vice President Mike Pence and Speaker of the House Nancy Pelosi, vandalizing and looting offices and the House chamber. Damages are estimated at more than $2.734 million while 5 people died, including a Capitol police officer while several Capitol police officers committed suicide in the days and months following the riot. Approximately 140 police officers were assaulted on January 6th. More than 1,000 people have been arrested in connection to the violence at the Capitol on January 6, 2021. The City has not been directly impacted by terrorism events in the past.

3.5.3 Acts/Threats of Mass Violence Hazard Probability, Frequency, and Magnitude

While there has not been a large-scale event with the City, the City recognizes the potential for a terrorism event to impact residents. Given current escalating terrorism trends, the threat of a terrorist event within the U.S. is a credible possibility and the City ranked the probability of terrorism accordingly during the Hazard Identification Workshop. Although the City has few hard targets within its boundaries, such as the Public Health Lab which houses protected classes of biological agents, the threat of terrorism exists due to its proximity to the City and County of Los Angeles, the Los Angeles Airport, and other identified targets.

The City previously completed a Security Vulnerability Assessment of City Hall to comply with the Bioterrorism Act of 2002. The Security Vulnerability Assessment evaluated the City's vulnerability to malevolent attacks, including terrorism and contamination, and developed recommendations to protect against malevolent attacks. However, because of the security sensitive nature of the information, the terrorism risk assessment results are not repeated as part of the Hazard Mitigation Plan.

Vulnerability and Impacts

Mass violence impacts the life safety and health of the city by threatening the well-being off the Public through potential injury and death. Mass violence impacts property damage and critical infrastructure of the city by potentially damaging or destroying buildings and critical facilities in the area of the event. Mass violence impacts the economy of the city by disrupting business in the affected area, potentially for an extended period of time. Mass violence impacts the changes in development and impact of future development for the city by slowing down development in a specific area or causing businesses to relocate to a lower-risk area. Mass violence impacts underserved and at-risk populations of the city by limiting critical services within the area, disproportionately affecting individuals who rely on such services day-to-day. Research regarding the effects of climate change in severity of impact for Mass violence for the City indicates that countries and populations impacted by climate change are more vulnerable to terrorism recruitment, and violence, thus increasing the overall likelihood.[12]

[12] United Nations. Meetings Coverage and Press Releases. (2021). People, Countries Impacted by Climate Change Also Vulnerable to Terrorist Recruitment, Violence, Speakers Tell Security Council in Open Debate. Retrieved from https://press.un.org/en/2021/sc14728.doc.htm

3.6 Civil Unrest Hazard Profile

Table 3.7: Civil Unrest Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Civil Unrest	2	4	12	24	40	**44**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.6.1 Civil Unrest Hazard Description

Civil Unrest is generally the result of, and a form of protest, some form of socio-political problem. It typically consists of a disruption of normal, orderly conduct in urban areas, or an outbreak of rioting or violence that is of a large nature. Examples of civil disorders or civil strife, as it is sometimes referred to, might include illegal parades, sit-ins, riots, sabotage, and other forms of crime. It is typically spurred by specific events, such as criminal trials, sporting events, or political disfavor. Damage to local City buildings, critical facilities, and infrastructure resulting from these types of demonstrations could potentially leave citizens without critical resources. Incidents of Civil Unrest often occur sporadically and without warning.

In addition to the physical losses a demonstration can bring to the City, they often require a response from local authorities which diminishes their ability to provide a service to other parts of the City. If a demonstration were to occur in conjunction with a hazardous event, it would be possible for the authorities to be overwhelmed, leaving the city vulnerable to extensive damage.

3.6.2 Civil Unrest Hazard History

The City of Downey is in close proximity to the City of Los Angeles which has been the host of several demonstrations of civil unrest historically. Below are a few examples of public demonstrations which have taken place in the region.

Watts Riot 1965

As stated by the Martin Luther King Jr Research and Education Institute, the Watts Riot was a six-day race riot that began on August 11th, 1965, and lasted until August 17th. By the time the National Guard was able to restore peace, 34 were dead, 1,032 were injured, 3,438 citizens had been arrested and the City of Los Angeles has sustained over $40 million in damages. The riot was started after police officers allegedly mistreated Marquette Fry, a 21-year-old African American man, after pulling him over for drunk driving. While the facts about the incident are unclear, rumors of police misconduct spread throughout the community inciting six days of chaos. It is estimated that between 31,000 and 35,000 adults actively participated in destroying and looting local neighborhoods.

Los Angeles Riot 1992

The Los Angeles Riot was a race riot that manifested after Rodney King, an African American man, was beaten by a group of police officers that stopped him for driving intoxicated on March 3, 1991, according to U.S News. The Los Angeles District Attorney charged the four officers with excessive force and for a year the case was covered heavily by the media. On April 29th, 1992, the jury acquitted all four officers of assault and three of the fours of using excessive force. Within the first half hour of the announcement of the verdict, at least 300 people gathered outside the Los Angeles County courthouse to protest. By the time the six-day demonstration was over the numbers of protesters had swelled, the City had sustained $1 billion in property damages, and widespread looting, assault, arson, and murder had been reported all over the city. Over 2,000 had been injured and 53 had been killed before Mayor Bradley declared the end of the riot on May 4th, 1992.

May Day Demonstration

On March 29th, 2006, according to the Los Angeles Times, over 500,000 gathered in the heart of Los Angeles, California to protest Congressional efforts to intensify illegal immigration legislation. While the protest was peaceful, several businesses had to shut down operations and traffic hazards resulted from the demonstration.

Black Lives Matter Demonstrations

The group Black Lives Matter (BLM) is an activist movement which campaigns against violence and racism directed towards black people. BLM regularly organizes demonstrations in response to shooting deaths of black people by law enforcement throughout the nation including protests in and near Los Angeles County. On July 10th, 2016, more than 1,000 protesters marched through the streets of Inglewood in a BLM protest against police violence. The protest was peaceful, and no arrests were made though the 405 Freeway was temporarily blocked in both directions.

Figure 3.3: Black Lives Matter Protest in Los Angelos

Klu Klux Klan Rally

On February 28, 2016, violence broke out during a Klu Klux Klan rally in Anaheim, CA. Around noon, seven Klan members arrived at Pearson Park when counter-protesters swarmed Klan members setting off a series of brawls up and down West Cypress Street. When police arrived on the scene, 5 were hurt and 13 were arrested. Orange County District Attorney, Tony Rackauckas, issued the following statement regarding the following legal proceedings. “This case is not about who was holding the protest rally, their racist message, or who was counter-protesting. This is about the mob mentality turning violent, which shut down neighboring streets, access to the park, and endangered the community.”

Anti Trump Protests 2016

Dozens of people were arrested after demonstrators entered the 101 Freeway in Los Angeles in protest of the presidential election of Donald Trump. An estimated 3,000 people congregated at city hall before moving down the road and onto the freeway, which subsequently snarled traffic for miles. There were reports of protestors throwing rocks and bottles at police, vandalizing city buildings, and damaging at least one police car.

George Floyd Protests 2020

On May 27, 2020, crowds protested in the streets of downtown Los Angeles and blocked the 101 Freeway. There were additional neighborhood protests throughout the city. Most were peaceful, but some erupted in violence, looting, arson, and vandalism. Additionally, some groups were witnessed throwing objects at police. As police focused on crowd control and peaceful protests, some less than lethal force was used. Allegedly, the majority of injuries reported by people in crowds were due to the less than lethal rounds, with injuries ranging from minor to significant, some about the head, neck, back, and eyes. More than 4,000 individuals were arrested on various charges during the protests, which continued for weeks.[13]

3.6.3 Civil Unrest Hazard Probability, Frequency, and Magnitude

The potential for Civil Unrest is difficult to predict and can happen anywhere in the City. Demonstrations are often unplanned and arise as the result of an emotional response to current social and political issues. The threat of disturbances is always present as local governments attempt to respond to changes in the political climate. For example, declining financing for education, protocol for dealing with illegal immigrants, and many other issues that could potentially recreate the events of previous riots. The City has dealt with small uprisings in its past but acknowledges the potential for larger demonstrations. As a result, Civil unrest was included in the Plan update.

[13] An Independent Examination of the Los Angeles Police Department 2020 Protest Response. (2021). Print. Retrieved from https://clkrep.lacity.org/onlinedocs/2020/20-0729_rpt_CLA_03-11-21.pdf

Vulnerability and Impacts

Civil unrest impacts the life safety and health of the city by threatening the well-being of the public, potentially over a wide area. Civil unrest impacts property damage and critical infrastructure of the city by potentially damaging or destroying buildings within the affected area. Civil unrest impacts the economy for the city by disrupting or destroying businesses within the affected area, and potentially driving future businesses to relocate. Civil unrest impacts the changes in development and impact of future development for the city by reducing the likelihood of future development opportunities as the Public and businesses relocate to lower-risk areas. Civil unrest impacts underserved and at-risk populations of the city by limiting access to essential services within the event area. The effects of climate change in severity of impact for Civil unrest for the City is still being studied, but higher temperature may corelate with increased civil unrest through numerous, indirect factors.[14]

[14] United Nations Climate Change. (2022). Conflict and Climate. Retrieved from https://unfccc.int/news/conflict-and-climate

3.7 Cyber Incident Hazard Profile

Table 3.8: Cyber Incident Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Cyber Incident	2	7	10	28	45	**49**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.7.1 Cyber Incident Hazard Description

A cyber incident is an anticipated or unanticipated disruption to information systems and networks. Events that cause cyber incidents are cyber-attacks, power outages, earthquakes, hurricanes, and other manmade and natural hazards. A cyber-attack is an effort by hackers to gain access to an electronic network or system. Cyber-attacks happen all day, every day, around the world. Major targets typically include governments, banks, and businesses, but any online network can be attacked. Common cyber-attacks are malware, phishing, and ransomware.

- **Malware** using any software used to gain unauthorized access to IT systems in order to steal data, disrupt system services or damage IT networks in any way.
- **Ransomware** is a type of malware identified by specified data or systems being held captive by attackers until a form of payment or ransom is provided.
- **Phishing** is an online scam enticing users to share confidential information using deceitful or misleading tactics.

Advancements in technology have increased the productivity of our nation and made daily operations and markets reliant on cyber systems. As a result, the United States has become, and will increasingly continue to be, vulnerable to non-traditional attacks including cyber-attacks on information and operations. Cyberspace is the nervous system for all critical infrastructures and is composed of hundreds of thousands of interconnected computers, servers, routers, switches, and fiber optic cables that allow our critical infrastructures to work. According to the Cybersecurity and Infrastructure Agency, 1 in 3 homes with computers are infected with malicious software, 47% of American adults have had their personal information stolen, and 600,000 Facebook accounts are hacked every day. Between 2015 and 2020, over 440,000 complaints were received on average every year and in 2020 victims of cyber-attacks lost $4.2 billion in total.

The attacks on computer systems can come in the form of viruses, Trojans, worms, spoofs, or hoaxes from virtually anywhere in the world. Computer viruses, ranging from devastating to simply annoying, are sent out daily by organizations and individual hackers, and intermittently by people who fail to protect their computer software.

3.7.2 Cyber Incident Hazard History

Cyber incidents occur regularly in California but are not typically reported in a local central database. Previous occurrences provided below are national and regional examples:

- On or around May 31, 2023, Progress Software, the provider of MOVEit Transfer software disclosed a vulnerability in their software that had been exploited by an unauthorized third party. Pension Benefit Information utilizes MOVEit in the regular course of our business operations to securely transfer files, including with Prudential and our other customers.
- On March 5, 2023, Sysco became aware of a cybersecurity event perpetrated by a threat actor believed to have begun on January 14, 2023, in which the threat actor gained access to Sysco systems without authorization and claimed to have acquired certain data. Personal information for some current and former colleagues has been impacted.
- On January 11, 2023, the FAA had a system outage, grounding all domestic and international flights nationally, because a contractor unintentionally deleted files on a database.

- On May 5, 2022, the City of Chula Vista identified evidence of unauthorized access to certain systems in the City's computer network. As a result, City learned that an unauthorized party may have accessed or acquired certain data that was stored on their systems.
- To regain control of servers encrypted in an attack on September 17, 2021, Pottawatomie County, Kansas, officials agreed to pay a ransom of $71,606.25, which could be seen as a bargain considering the initial asking price attackers demanded—a cool $1 million to release control of the county's data. The attack impacted the county's driver's license system and the tax department. It persisted for two weeks.
- In May, 2021, An attack involving Babuk ransomware resulted in the theft of 250 gigabytes of police data, including police officer personnel files, arrest records, and intelligence memos. Screenshots shared by cybercriminals online included extensive personal data stolen from the department, as well as performance reviews and polygraph records. When attackers were denied a ransomware payment of $4 million, 22 personnel files were published online, each more than 100 pages.
- An attack in May 2019, which began when an employee in the police department opened an infected email, took the City of Riviera's main computer system offline, affecting every department. The city's finance department was forced to manually issue payroll checks that would otherwise have been automatically deposited in employee accounts electronically. To secure the safe return of stolen data taken during the ransomware attack, city council members approved the payment of a $600,000 ransom, payable in bitcoins by the city's insurance company.

3.7.3 Cyber Incident Hazard Probability, Frequency, and Magnitude

While the City of Downey has not experienced significant cyber incidents, the risk and vulnerabilities are realized through historical accounts in other places. The State of California Office of the Attorney General acknowledges 406 cyber incidents between June 1, 2022, and May 31, 2023. Most of these incidents originated outside of the state and impacted private companies collocated in the State. Cyber incidents occur virtually. They can originate from anywhere in the world and can target information technology anywhere in the world.

As society becomes increasingly dependent on technology, the threat and likelihood of cyber incidents will only increase.

Increased dependency on technology and the internet has resulted in a significant risk to cyber incidents.

Cyber incidents can disrupt the intended flow of information and cause business interruption, target private information, or physically manipulate items connected to the network. In major cyber-attacks, information can be stolen from millions of people. The extent and magnitude of a cyber incident is dependent on many variables and may range from a minor to major impact on both the general public and critical infrastructure. Table 3.9 outlines the Cybersecurity & Infrastructure Security Agency's (CISA) practice of classifying cyber incidents. The table elaborates on the National Cyber Incident Scoring System (NCISS), a methodology utilized by CISA to classify the severity of a cyber incident after utilizing various factors to compute a score.

Table 3.9: CISA National Cyber Incident Scoring System[15]

Priority Level	Description
Emergency	An incident that poses an imminent threat to the provision of wide scale critical infrastructure services, national government stability, or the lives of the United States population.
Severe	An incident that is likely to result in a significant impact to public health or safety, national security, economic security, foreign relations, or civil liberties.
High	An incident that is likely to result in a demonstrable impact to public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.
Medium	An incident that may affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.
Low	An incident that is unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.
Baseline Classification	
A baseline priority incident is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence. The bulk of incidents will likely fall into the baseline priority level with many of them being routine data losses or incidents that may be immediately resolved. However, some incidents may require closer scrutiny as they may have the potential to escalate after additional research is completed. In order to differentiate between these two (2) types of baseline incidents, and seamlessly integrate with	

[15] Cybersecurity & Infrastructure Security Agency. (2020). CISA National Cyber Incident Scoring System (NCISS). Retrieved from https://www.cisa.gov/news-events/news/cisa-national-cyber-incident-scoring-system-nciss.

Priority Level	Description
the Cyber Incident Severity Schema (CISS), the NCISS separates baseline incidents into two (2) categories – minor and negligible.	
Minor	An incident that is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence. The potential for impact; however, exists and warrants additional scrutiny.
Negligible	An incident that is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.

Vulnerability to Future Assets/Infrastructure

All existing and future assets/infrastructure are unlikely to receive direct damage. However, the systems and technologies that are integrated within these assets will undoubtedly be affected, especially as technology becomes more advanced and automatedVulnerability Analysis

City of Downey government offices, as well as businesses, non-profits, and private residents can be impacted by cyber incidents. Vulnerability is dependent on what actions the individual or group in charge of the network have done to protect it.

Impact to City of Downey Residents

Any resident of the City that is connected to the internet is vulnerable to cyber incidents and identify theft. These incidents have long been a growing trend along with the increasing adoption of technology. Victims of this hazard are likely to experience substantial monetary loss or harassment. Any disruption to Internet service or critical infrastructure information systems could potentially threaten lives, property, the economy, and national security.

Impact to Essential Facilities and Other Property

Any essential facility connected to a network is at risk for a cyber incident. For example, individuals and businesses are reliant on information systems and the internet for daily tasks; without access to these systems, there could be major financial losses. Furthermore, delivery systems including water, electricity, even things such as groceries rely on information systems to coordinate and complete the delivery. Building Inventory: This hazard typically does not impact the actual building itself.

Impact to Critical Infrastructure

While sabotage of computer systems normally would not lead to harm to health and safety, it is possible. As technology becomes more integrated into society, the more access hackers will have to sensitive systems. Integration of systems (such as electrical grids, air traffic control centers, traffic lights, etc.) can leave these systems vulnerable to attack. If these systems are compromised, it is possible that people may be injured or killed.

Impact to Environment

This hazard typically does not impact the environment.

Impact to Operations

Cyber incidents carried out on public infrastructure can directly impact the City's ability to operate essential facilities and provide services. Forms of sabotage to computer systems include the introduction of viruses, malware or spyware that can cripple a computer network or steal private and public information. Emergency services, such as 911 dispatch would have difficulties because most phone lines work via the Internet. Medical response and care are reliant on electricity, water and information systems and the Internet to access medical records. If the Internet was not available, many information systems would be inoperable and operations for many of the critical infrastructure sectors may stop altogether, causing critical disruptions for both the public and private sector.

3.8 Dam Failure Hazard Profile

Table 3.10: Dam Failure Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Dam Failure	1	5	12	33	50	**29**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.8.1 Dam Failure Hazard Description

Dams are artificial/manmade structures that retain or detain water behind a large barrier. When full, or partially full, the difference in elevation between the water above the dam and below creates large amounts of energy, creating the potential for failure. Dams can fail due to

1) water heights or flows above the capacity for which the structure was designed; or
2) deficiencies in the structure such that it cannot hold back the potential energy of the water.

If a dam fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Dams are an important part of the infrastructure in the U.S., providing avenues for water supply, flood control, irrigation, hydroelectric power, and recreation. According to FEMA's National Inventory of Dams (NID), the United States now has more than 92,000 total dams with an average age of 61 years. Dams in the NID are owned, operated, and regulated by a variety of entities. A breakdown of these 90,000 plus dams is as follows: 80 percent are regulated by the state dam safety offices, nearly 70 percent of the entire inventory is privately-owned, and six percent are owned or regulated by the federal government, which encompasses approximately 35 percent of the tallest dams. 15,030 dams in the NID are classified as high hazard potential meaning there are more than 1,250 dams in California, zero in the City of Downey but two NID high hazard dams are in close proximity to the City and would cause severe consequences should they fail. According to the FEMA website, dam failures are generally caused by one or a combination of the following reasons.

Overtopping

The Association of State Dam Safety Officials (ASDSO) reports 34% of all U.S. dam failures are due to overtopping because of inadequate spillway design, debris blockage of spillways, or settlement of the dam crest. Overtopping occurs when primary and emergency spillways are not sufficient to pass floodwaters and the excess runs over the top of the dam. The overflow can erode the embankment, weakening the dam wall and potentially cause a full dam failure. While the City has not experienced the repercussions of a failed dam, the Sweetwater Dam failure that occurred on January 27, 1916, is an example of a release in Southern California that was the result of overtopping. After experiencing a long period of drought, the area received more than thirty-nine inches of rain. As a result, more than 200 bridges we washed out, entire communities were swept away, levees collapsed, and valleys were inundated. Should the Whittier-Narrows dam fail due to overtopping, this is likely the type of impact the City would encounter.

Acts of sabotage

Sabotage, or deliberate actions aimed at disrupting normal dam operations, can occur for many reasons. Like an act of terrorism or public demonstration, acts of sabotage can be motivated by several factors; political, socio-economic, and religious are just a few. Often, they occur suddenly, and without warning. However, according to the Stanford University National Performance of Dams Program (NPDP), sabotage and vandalism have been the cause of the fewest dam failures between the years 1975 and 2001. Therefore, while the City is vulnerable to acts of sabotage, it is unlikely to occur.

Structural failure of materials used in dam construction.

According to the NPDP, dam failure due to structural deficiencies are only marginally more common the acts of sabotage. Due to state regulations for dam construction and maintenance, failures due to inadequate structural integrity are rare.

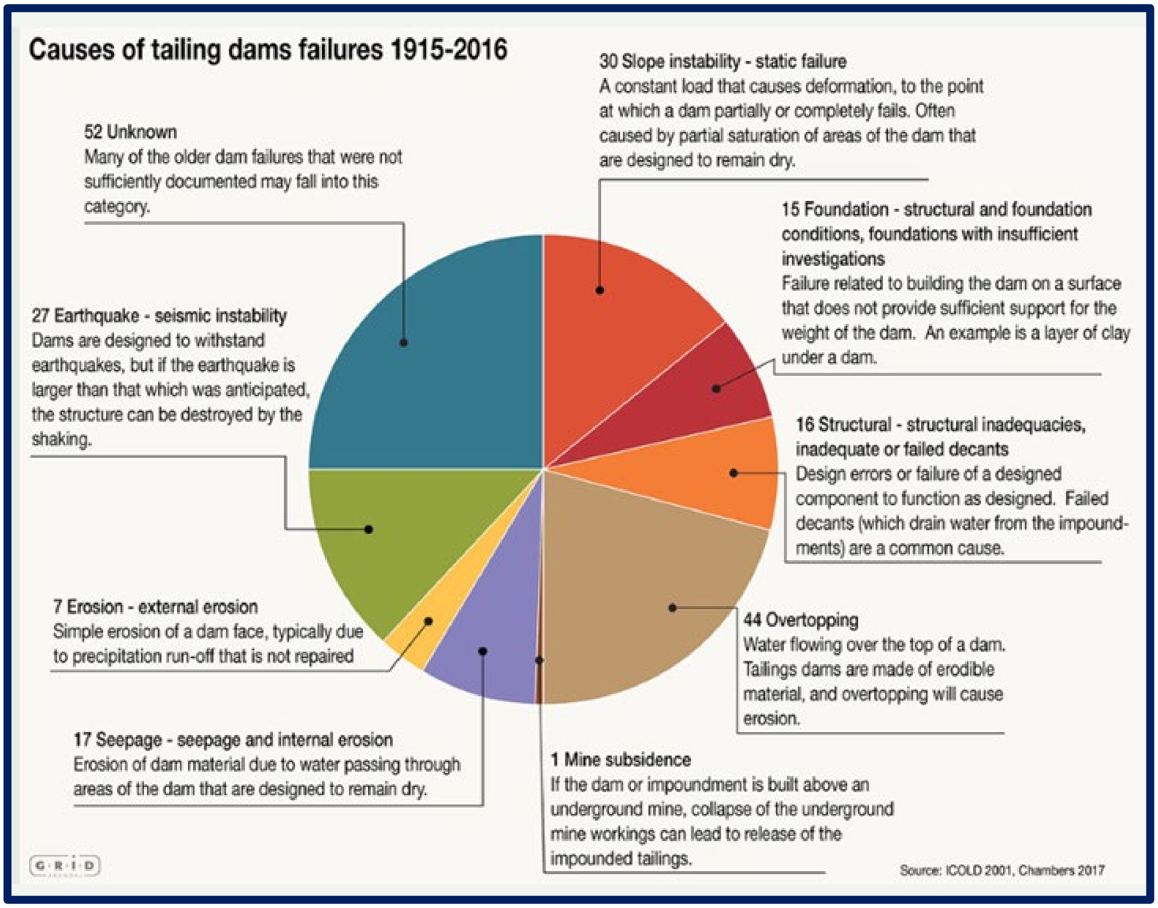
According to FEMA, causes of dam failure in this category may include:

- Movement and/or failure of the foundation supporting the dam,
- Settlement and cracking of concrete or embankment dams,
- Piping and internal erosion of the soil in embankment dams, and
- Inadequate maintenance and upkeep.

One of the most notable dam incidents in California history involved the Baldwin Hills Dam. The dam was constructed in Baldwin Hills, Los Angeles between 1947 and 1951 to provide drinking water for West Los Angeles residents. The dam was constructed on an active fault line which many of the geologists involved in its planning considered unstable for a reservoir. On December 14, 1963, a small crack developed in the embankment which widened to a 75-foot gash resulting in the release of 292 million gallons of water. Five people were killed, sixty-five homes were destroyed, and 210 home and apartments were damaged.

As mentioned previously, causes in this category are considered minor as they comprise a minute fraction of historic dam failures in the U.S. Figure 3.4 shows the causes of recorded dam failures between the years 1915 and 2016.

Figure 3.4: Causes of Dam Failure



3.8.2 Dam Failure Hazard History

As stated previously, the most likely cause of flood within the City would be a dam failure or release. While the City has never been impacted by a dam failure or release, it should be noted, there have been a total of forty-five dam failures in California's history. Failures and releases have occurred for a variety of reasons. According to the U.S. Bureau of Reclamation and as stated in Section 3.8.1, overtopping has accounted for more than 30 percent of all dam failures in the U.S. in the last seventy-five years. Other dams have failed due to specific shortcomings in the dam itself or an inadequate assessment of the surrounding geomorphologic characteristics.

One notable dam failure occurred in 1883 in Sierra County, while a most recent failure occurred in 1965. The greatest catastrophe relating to California dam failure or release was William Mulholland's St. Francis Dam, which failed in 1928, killing more than 450 people Because of this failure and the exposure of the potential risk to the general populace from a number of water storage dams in California, in 1929 legislation was enacted providing for supervision over non-federal dams in the State. Before the enactment of this legislation, either the State Engineer or the State Railroad Commission exercised State supervision over dams. This supervision was limited in scope and extended to less than half of the dams in the State. The statute enacted in 1929 provided for:

- Examination and approval or repair of dams completed prior to the effective date of the statute, August 14, 1929,
- Approval of plans and specifications, and supervision of construction of new dams, and of the enlargement, alteration, repair, or removal of existing dams, and
- Supervision over maintenance and operation of all dams of jurisdictional size.

Overall, there have been at least 460 deaths as a result of dam failures in California. Some of these failures are outlined in the table below.

Table 3.11: Historical California Dam[16] Failures

Year Failed	Dam	Location	Cause of Failure/Deaths
1883	English	Sierra County	Dam crumbles to foundations, decay of timber used
1892	Long Valley Creek	San Jacinto	Heavy rains, dam carried away by flood
1895	The Angels	Calaveras County	Undetermined during flood, poor foundation/ 1 death reported
1896	Vernon Heights	Oakland	Shallow foundation
1898	Snake Ravine	Stanislaus County	Poor compaction
1905	Piedmont No.1	Oakland	Outlet pipe sheared off at core wall
1906	San Andreas	San Mateo County	Crack along axis

[16] Center for Watershed Sciences (n.d.) Research. Retrieved from https://watershed.ucdavis.edu/.

Year Failed	Dam	Location	Cause of Failure/Deaths
1912	Morena	San Diego	Overtopping
1916	Lower Otay	San Diego	Leakage and overtopping due to inadequate spillway
1918	Lake Hodges	San Diego	Cracks in pier
1925	Sheffield	Santa Barbara	Earthquake slide
1926	Puddingston	Pomona	Overtopping during construction
1927	Lake Hemet	Palm Springs	Overtopping
1928	Saint Francis	San Francisquito canyon	Sudden failure at full capacity through foundation - 426 deaths
1934	Cogswell	Monrovia	Breaching of concrete cover
1963	Baldwin Hills	Los Angeles	Leak through embankment turned into washout/ 5 Deaths
1964	Hell Hole	Rubicon River	Failed during construction due to unprecedented rains
1965	Matilija	Ventura	Bad foundation and concrete disintegrating

3.8.3 Dam Failure Hazard Probability, Frequency, and Magnitude

Dams fail for a variety of reasons, including sub-standard construction materials/techniques, spillway design error, geological instability, poor maintenance, and earthquakes, and therefore recurrence probabilities are unknown. State jurisdiction dams are regulated by the California Department of Water Resource's Division of Safety of Dams (DSOD) and each dam undergoes inspection on an annual basis to ensure it is safe, performing as intended, and is not developing issues. However, in 2017, the United States Army Corps of Engineers (USACE) discovered that the Whittier Narrows Dam was structurally unsafe and that an intense storm could prematurely open the dam's massive spillway and flood the area below from Pico Rivera to Long Beach.

The Whittier-Narrows Dam presents the greatest threat for dam failure or release to the City based on proximity. The USACE has reclassified the Whittier Narrows Dam as the agency's highest dam priority nationally because of the risks "due to the combination of loss of life with a very high likelihood of failure only when filled by a rare flood event." Such a storm event has only a 1 in 900 (i.e., 0.1%) chance of occurring in any given year. Construction on the dam is expected to start in 2021 and conclude by 2025.

The Garvey Reservoir Dam is also an identified high hazard dam, however due to data privacy and protected information, this information is not included in the HMP update. Existing EAPs include inundation data for all listed High Hazard dams. According to the NID, most High Hazard dams do not include a USACE risk assessment as outlined via the NID tool's risk tab. Those that have risk assessments available are noted in Figure 3.6 and below.

The San Gabriel Spillway which protects the dam, via nine emergency spillway gates, is commonly opened to permit small releases. If the pool exceeds 228.5 feet, the gates will open automatically to protect the dam but will result in downstream flooding. In addition, erosion from water piping through the foundation are rising concerns. Should the dam fail, according to recent estimates made by the USACE; waters from the Whittier-Narrows Dam would cause flooding in the City within 2-6 hours and reach an average depth of 5-10 feet resulting in loss of life and damage to structures, roads, and utilities. As a result of the potential severity of the consequence surrounding the failure or release of the Whittier-Narrows Dam, the City has identified Dam Failure as a vulnerability in this plan.

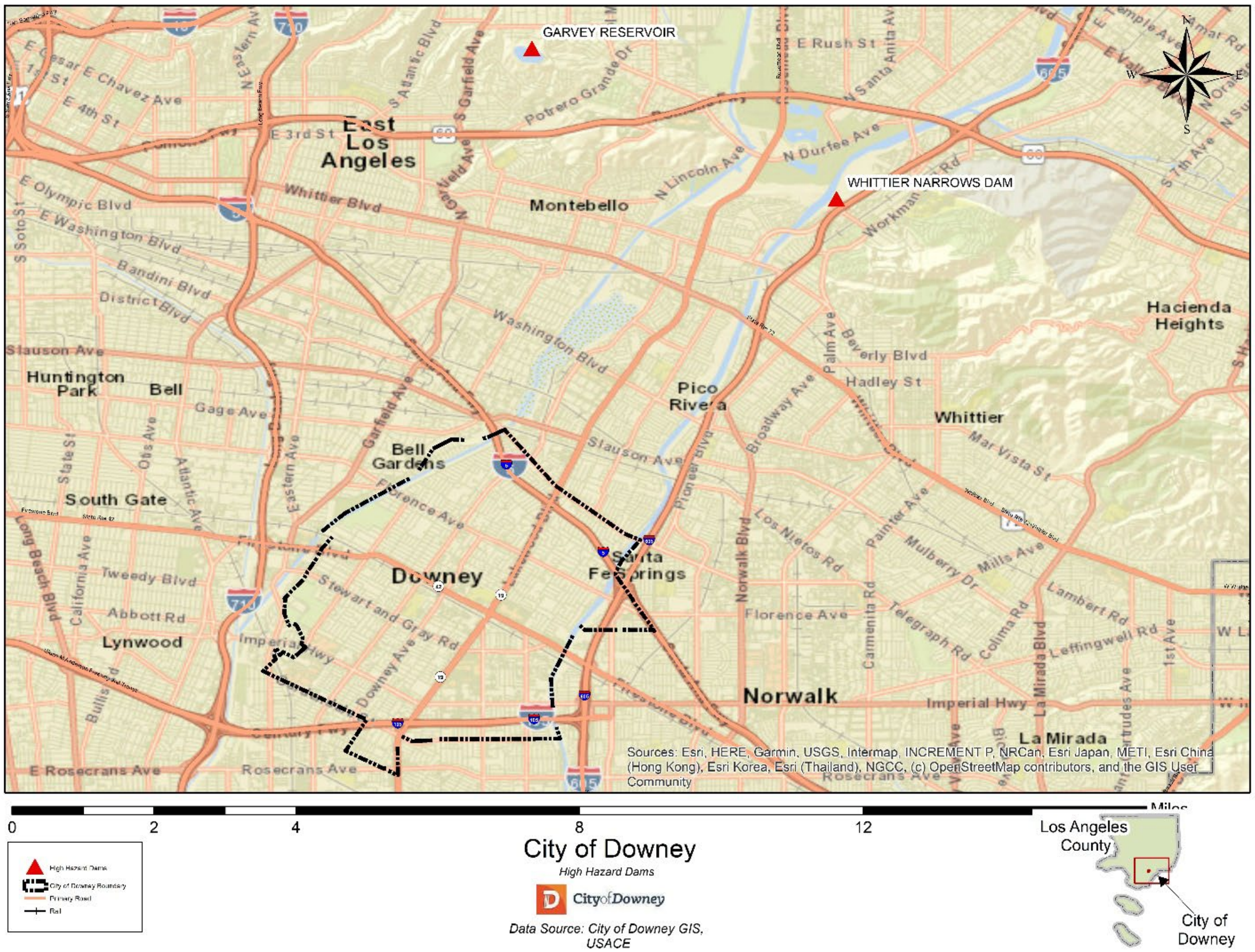
The table below identifies dams outside the City limits that could affect the City if they fail.

Table 3.12: Potential Impacting Dams Outside the City of Downey

Dam Name	Location	NID Hazard Classification	EAP
Garvey Reservoir[17]	Los Angelos, CA	High	Approved
Whittier Narrows Dam	Los Angelos, CA	High	Approved

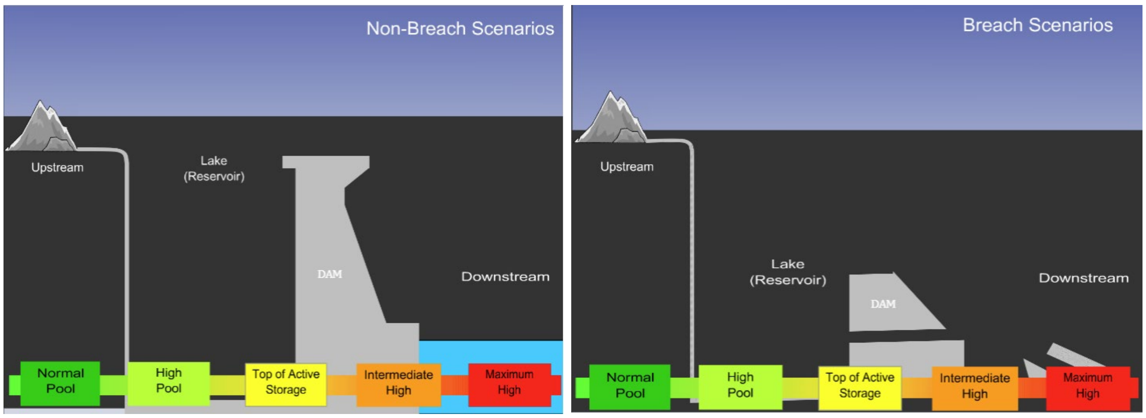
[17] National Inventory of Dams. (2022). Garvey Reservoir Inspection and Summary. Retrieved from https://nid.sec.usace.army.mil/#/dams/system/CA00217/inspections.

Figure 3.5: Potential Impacting High Hazard Dams Outside the City of Downey



While the City has not experienced a dam failure in the past, the entire City is located within the flood inundation area and is vulnerable to the impacts of a flood resulting from dam release or failure. This planning effort did not include inundation mapping. However, a USACE assessment[18] is depicted below for the Whittier Narrows Dam

Figure 3.6: Whittier Narrows Dam Scenarios



Scenarios are designated as either non-breach or breach. In non-breach scenarios the dam is operating as designed for the given pool level, releasing from outlets and controlled or uncontrolled spillways. In breach scenarios the continuity of the structure has been compromised, resulting in uncontrolled water releases that exceed the magnitude of releases in the equivalent non-breach scenario.

The Maximum High (MH) scenario (breach and non-breach) is based on the inflow design flood per FEMA guidelines and indicates the maximum reservoir pool level and likely maximum extent of inundation.

The Normal High (NH) scenario (breach and non-breach) represents normal full reservoir pool elevations with no flooding occurring downstream prior to dam releases. The NH scenarios represent the fair weather or sunny day scenarios per FEMA guidelines. The Intermediate High (IH), Top of Active Storage (TAS) and Security (SS) scenarios are intermediate pool levels between NH and MH. They are established based on the dam's design characteristics and its operating history. The TAS represents the reservoir pool elevation the structure was designed for (such as the top of flood gates) and above which

[18] National Inventory of Dams. (2023). Whittier Narrows Dam Risk Characteristics. Retrieved from https://nid.sec.usace.army.mil/#/dams/system/CA10027/risk.

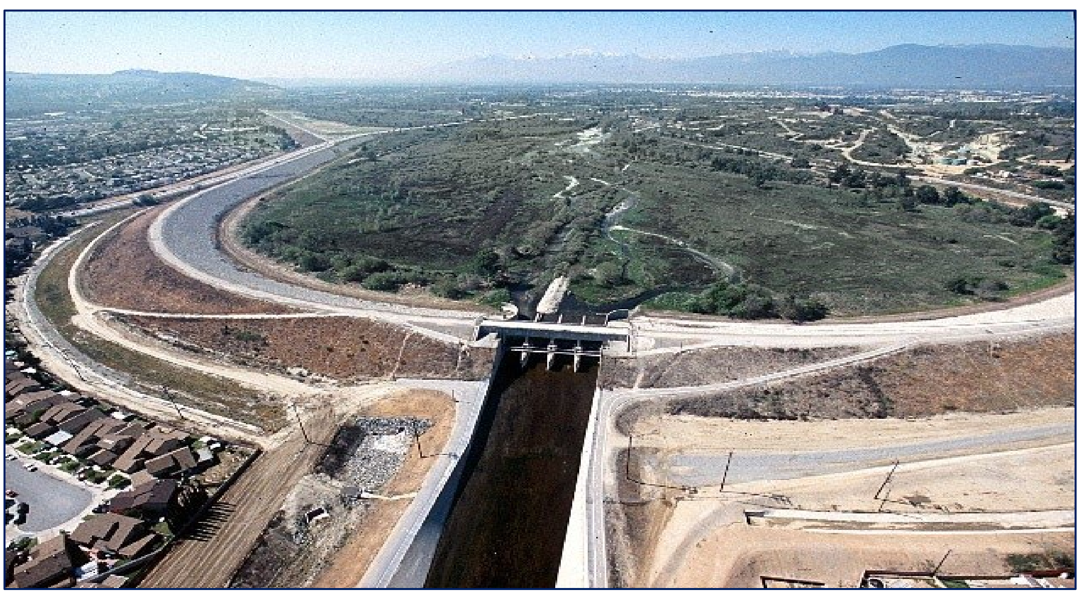
water must be released to ensure the integrity of the dam. The SS represents a high reservoir pool level observed or exceeded 1% of the time during the dam's operating history. The IH represents a realistic operating condition that could be experienced during a major flood where the reservoir pool elevation exceeds Top of Active Storage.

Table 3.13: Whittier Narrows Dam Consequence Estimate

Scenario	Type	Pool Elevation	Daytime People at Risk	Nighttime People at Risk	Buildings at Risk	Economic Cost
Maximum High Pool	Breach	241.3	0	0	0	0
Top of Active Storage Pool	Breach	230.8	304,187	452,708	0	$6,043,625,027
Maximum High Pool	Non-Breach	241.3	0	0	0	0
Top of Active Storage Pool	Non-Breach	230.8	0	0	0	0

As a result of the threat of a dam release coupled with the potential for substantial impacts, the City has included dam failure as an identified hazard.

Figure 3.7: Aerial View of the Whittier Narrows Dam



While the State regulates dams to prevent failure, safeguard life, and protect property, some researchers doubt that the "overall safety of aging federal flood control systems that were not designed with climate change in mind." They argue that as California experiences more intense storms, the aging dams in the area could fail and/or prematurely open and flood homes, schools, businesses, and roads. In 2016, Climate-Safe Infrastructure Bill (Assembly Bill [AB] 2800) became law and “established the Climate-Safe Infrastructure Working Group to develop recommendations to the California legislature on how to build and design our infrastructure to be safer for Californians in the face of growing climate extremes.” The Working Group’s 2018 report identified nearly 700 High hazard dams in California needing repairs and upgrades.

Vulnerability and Impacts

Dam failure impacts the life safety and health of the city by potentially causing injury or death due to rapid floodwaters and lack of essential services. Dam failure impacts property damage and critical infrastructure of the city by damaging or destroying buildings and infrastructure. Dam failure impacts the economy for the city by closing or destroying businesses in the affected flood area, driving away current and future businesses and parties. Dam failure impacts the changes in development and impact of future development for the city by potentially increasing relocation rates for businesses and homes to lower-risk areas. Dam failure impacts underserved and at-risk populations of the city by impacting critical services such as water, healthcare, and power infrastructure. The effects of climate change in severity of impact for dam failure for the City is largely increased precipitation. This in turn increases the chance for a dam failure due to overtopped reservoirs and structures under constant pressure from an increased reservoir.[19]

[19] Jacques Leslie. Time Ideas. (2023). The Growing Danger of Dams. Retrieved from https://time.com/6317451/dams-environmental-impact-libya-danger/

3.9 Drought Hazard Profile

Table 3.14: Drought Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Drought	2	6	12	23	41	**45**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.9.1 Drought Hazard Description

A drought or extreme dry periodic climate is an extended period where water availability falls below the statistical requirements for a region. Drought is not a purely physical phenomenon, but rather an interplay between natural water availability and human demands for water supply. The National Integrated Drought Information System (NIDIS) defines drought as the deficiency of precipitation over an extended period of time (usually a season or more), resulting in a water shortage.[20] The National Weather Service (NWS) defines drought as a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area.[21]

Drought is part of the climate cycle, and it is an underestimated slow-moving hazard that can cause as much damage as other faster-moving hazards (e.g., hurricanes, flooding). Drought can impact agriculture, public health, transportation, ecosystems, wildfire, and

[20] National Integrated Drought Information System. (2023). What is a Drought? Drought Basics. Retrieved from https://www.drought.gov/what-is-drought/drought-basics.
[21] National Oceanic and Atmospheric Administration, National Weather Service. (2009). National Weather Service Glossary. Retrieved from https://w1.weather.gov/glossary/.

water quality. In order to assist with drought classification and monitoring, scientists have defined five (5) types of droughts, listed below. [22]

Table 3.15: Types of Drought

Type	Description
Meteorological	Occurs when dry weather patterns dominate the area.
Hydrological	Occurs when low water supply becomes evident in the water system
Agricultural	Occurs when crops become affected by drought.
Socioeconomic	Occurs when the supply and demand of various commodities is affected by drought.
Ecological	Occurs when natural ecosystems are affected by drought.

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. Drought differs from other natural hazards in three (3) ways.

- The onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end.
- The lack of an exact and universally accepted definition adds to the confusion about its existence and severity.
- In contrast with other natural hazards, the impact of drought is less obvious and may spread over a larger geographic area. These characteristics have hindered many governments' preparation of drought contingency or mitigation plans.

3.9.2 Drought Hazard History

Droughts reoccur every few years. Unlike other hazards (e.g., floods and earthquakes), droughts are not easily defined as "events". A Presidentially Disaster Declaration for drought has never been declared in the State of California.

As stated in the City's Urban Water Management Plan, the City supplies most of its water from groundwater pumped from the Central Basin. Additionally, the City is a member agency of the Central Basin Municipal Water District (CBMWD). The CBMWD imports

[22] National Integrated Drought Information System. (2023). What is a Drought? Drought Basics. Retrieved from https://www.drought.gov/what-is-drought/drought-basics.

water from the Metropolitan Water District of Southern California and distributes it to its member agencies. Purchased water is expensive and reserved only for emergencies where the system demand exceeds production capacity. Additionally, the City utilizes recycled water to meet its non-potable demands.

Because water systems are interconnected, the regional impacts of drought may have adverse impacts for the City. It is important to consider current and past droughts throughout the state. Figure 3.8 provides the annual runoff in California provided by the U.S. Geological Survey from 2014-2023 with comparisons of prior years of generally dry and generally wet. (note, 2022 and 2023 are provisional and subject to change when final data is in.) Figure 3.9 provides runoff data for the last century. Runoff is the drainage of precipitation from, in this context, a land area. Commonly associated with the melting of the snowpack in Sierra Nevada mountains, runoff water flows down natural channels recharging reservoirs and groundwater systems in its path. It can be assumed then, that low runoff periods would be followed by periods of limited groundwater supply. The information can be taken as a case in point that periods of low runoff can contribute to and exacerbate drought conditions.

Figure 3.8: Monthly Runoff in California by Years

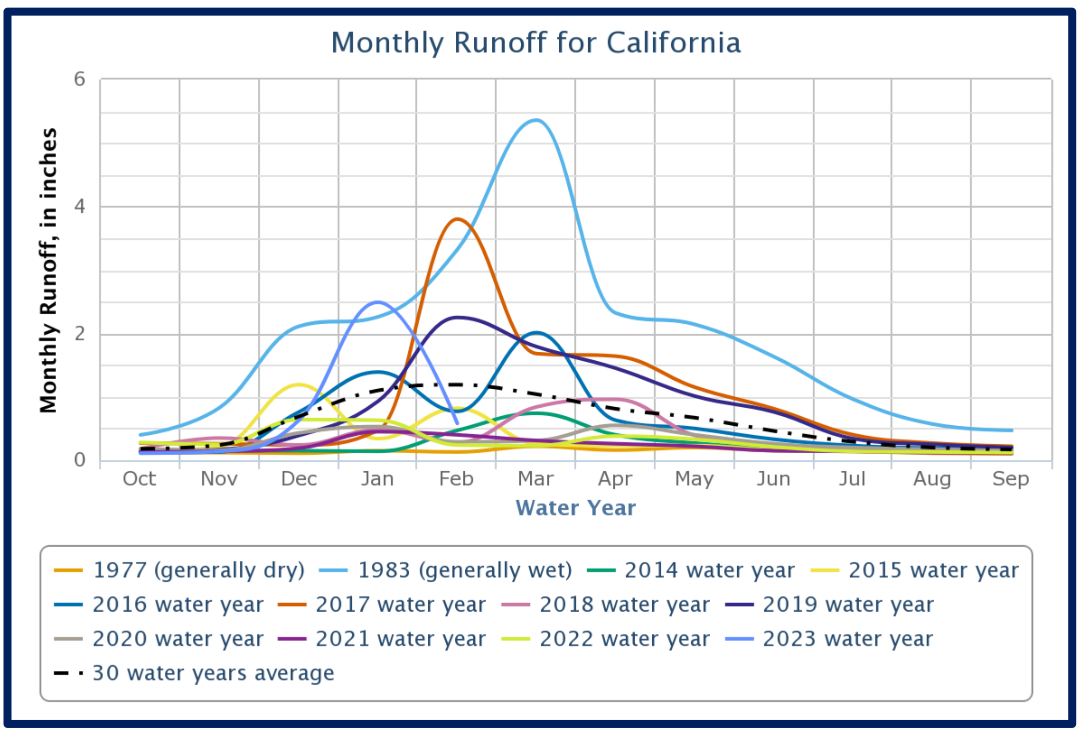
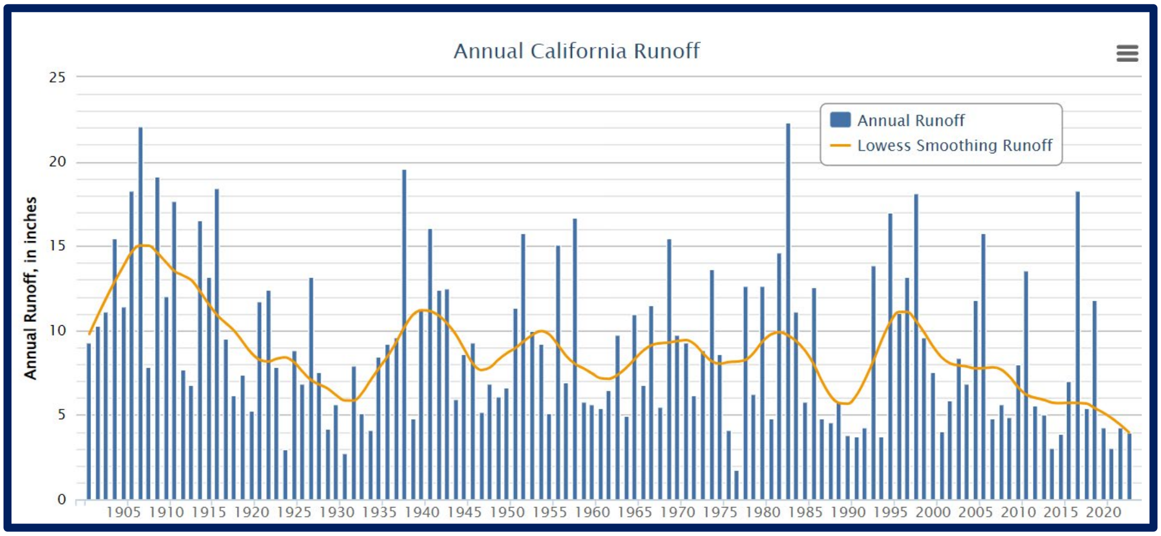


Figure 3.9: Annual Runoff in California



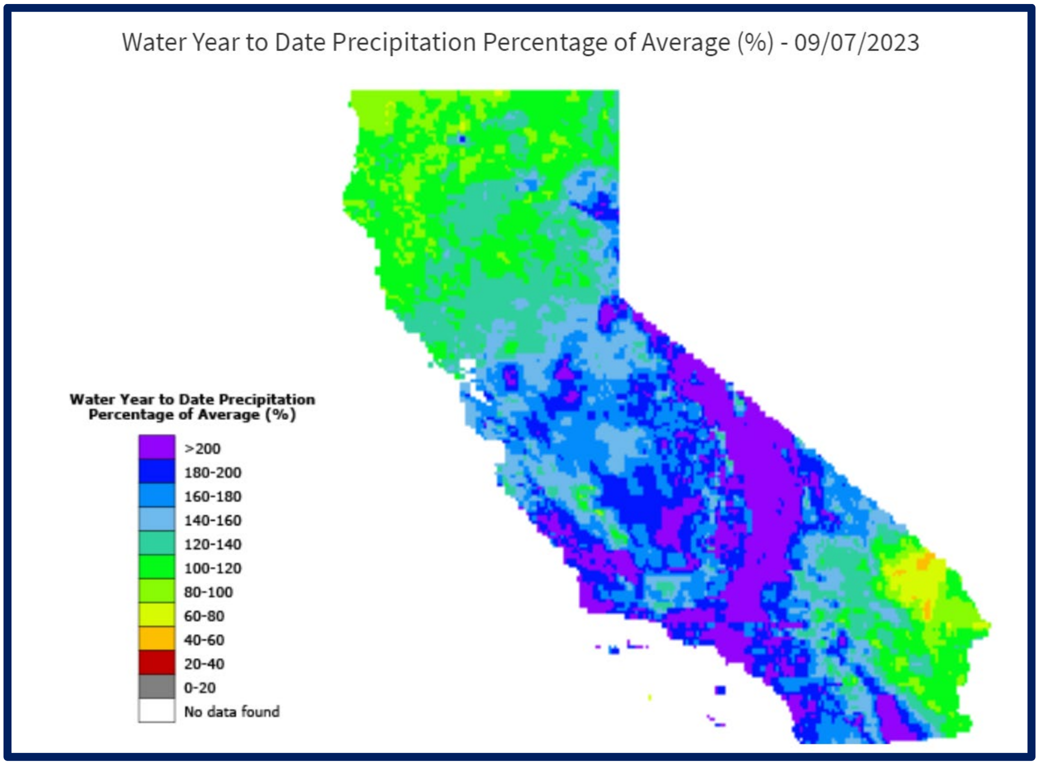
Historic Droughts

Over the past century, many of the droughts experienced in the U.S. affected vegetation, food supply and livelihood for tens of thousands of families. This, in turn, created the need for water conservation and water management efforts across the country, including in California. For example, the California drought of 1976 to 1977 is an example of severe drought conditions. By the end of the “wet season” in 1976, California reservoirs were depleted and melting snow from the Sierra Nevada snowpack was minimal. The following year was marked as one of the driest years on record. Out of the 58 counties in California, 47 of them declared a local drought emergency. The drought hit farmers especially hard, with many experiencing economic losses in every stage of food production and supply. This drought marked the beginning of an extensive water conservation movement across California that has continued even through times of abundance. As a result, farmers have switched to water efficient crops and reduced the aggressive pumping of groundwater.

In 2012, California experienced drought conditions it had not seen in 1,200 years according to a study completed by the University of Minnesota and Woods Hole Oceanographic Institution in Massachusetts. On January 17 of that year, California State Governor, Jerry Brown, declared a drought state of emergency.

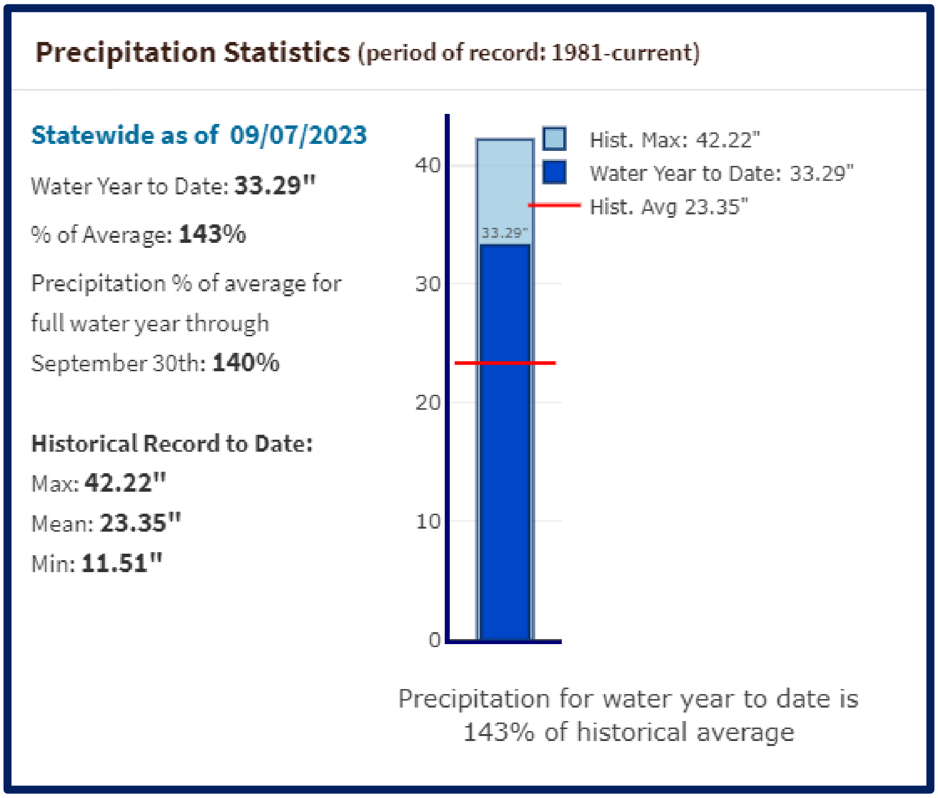
California’s annual precipitation can vary greatly from year to year and region to region. The map of California, figure 3.10 shows how [the 2023] water precipitation compares to what has been observed historically[23]. The chart below, figure 3.11 provides a summary of California's current statewide precipitation statistics[24].

Figure 3.10: California Precipitation (09/07/2023)



[23] California Water Watch. (2023). Precipitation. Retrieved from https://cww.water.ca.gov/.
[24] Ibid.

Figure 3.11: California Precipitation Statistics (1981-2023)



Climate change has made California's dry and wet spells more extreme and unpredictable – after the three driest years on record, recent rain, and snowfall in early 2023 have dramatically changed conditions in many parts of the state. On March 24, 2023, Governor Gavin Newsom eased drought restrictions that are no longer needed while maintaining others to support impacted communities statewide via Executive Order N-5-23[25]. Harnessing water captured and stored from recent storms, (March 2023) the state also announced a major increase in expected State Water Project deliveries to local agencies – now an anticipated 75% allocation[26].The City will rely on the previously discussed infrastructure to maintain water services for its residents.

[25]Executive Department State of California. (2023). Drought Executive Order. Retrieved from https://www.gov.ca.gov/wp-content/uploads/2023/03/3.24.23-Drought-update-executive-order.pdf.
[26]California Department of Water Resources. (2023) Harnessing Series of Winter Storms, California Increases State Water Project Allocation. Retrieved from https://water.ca.gov/News/News-Releases/2023/March-23/Harnessing-Series-of-Winter-Storms-California-Increases-State-Water-Project-Allocation.

3.9.3 Drought Hazard Probability, Frequency, and Magnitude

A drought can occur anywhere in the City. Due to the dynamic nature of droughts, drought conditions are experienced differently based on where someone lives and their sources of water. For example, ranchers grazing livestock on non-irrigated rangeland and rural residents relying on private wells for groundwater can quickly be impacted by dry conditions. On the other hand, large urban water agencies with multiple water resources are able to manage for several dry years. However, if drought conditions in the area continue for an extended period of time, everyone will experience the effects.[27]

The City and the Metropolitan Water District of Southern California work closely together to evaluate new and innovative water management and supply development programs for the region, including water reuse and recycling, recharge facility construction, ocean and brackish water desalination, surface storage, and water use efficiency programs. These efforts are helping to enhance long-term water reliability and water quality as drought continues to impact the City as a whole.

Many drought indices have been developed; however, the Palmer Drought Severity Index (PDSI) is the most prominent index of meteorological drought utilized in the United States for drought monitoring. PDSI uses readily available temperature and precipitation data to estimate relative dryness to indicate the prolonged and abnormal moisture deficiency or excess. As an important climatological tool, the PDSI assists in evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. Furthermore, it can be utilized to identify disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water and potential intensity of wildfires. [28,29]

The PDSI is a standardized measure that compares moisture deficiency and excess on a numerical scale that usually ranges from positive five (5) to a negative five (5). Positive

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[27] California Department of Water Resources. (n.d.). California Water Watch. Retrieved from https://cww.water.ca.gov/droughtindicator.

[28] National Weather Service, Climate Prediction Center. (2005). Drought Indices: Explanation. Retrieved from https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml.

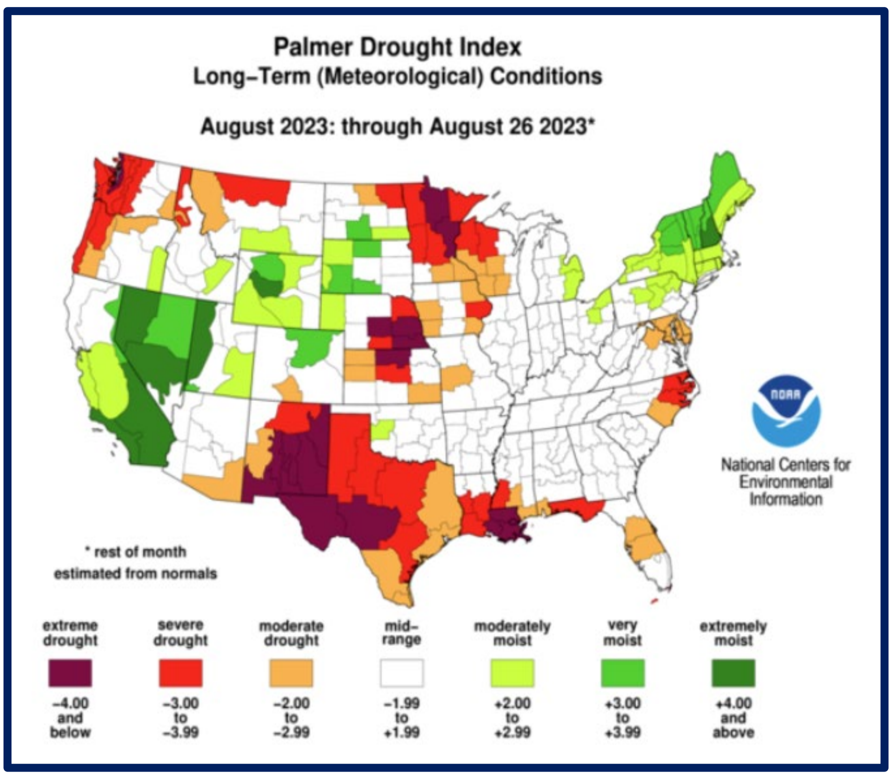
[29] National Center for Atmospheric Research. (n.d.). Climate Data Guide: Palmer Drought Severity Index (PDSI). Retrieved from https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi.

values mean there is an excess in moisture supplies and conversely, negative values indicate moisture demands in excess of supplies. The table below displays the PDSI categories and Figure # illustrates the drought conditions in the contiguous United States as measured by the PDSI for the month of August 2023.

Table 3.16: Palmer Drought Severity Index

Palmer Drought Severity Index	Category
- 4.00 and below	Extreme Drought
- 3.00 to - 3.99	Severe Drought
- 2.00 to - 2.99	Moderate Drought
- 1.99 to + 1.99	Mid-Range
+ 2.00 to + 2.99	Moderately Moist
+ 3.00 to + 3.99	Very Moist
+ 4.00 and above	Extremely Moist

Figure 3.12: U.S. Palmer Drought Index Map (August 2023)



The U.S. Drought Monitor (USDM) is a collaboration between the National Drought Mitigation Center (NDMC), United Stated Department of Agriculture, and NOAA. They also rate drought nationwide by intensity utilizing a D0 (Abnormally Dry) to D4 (Exceptional

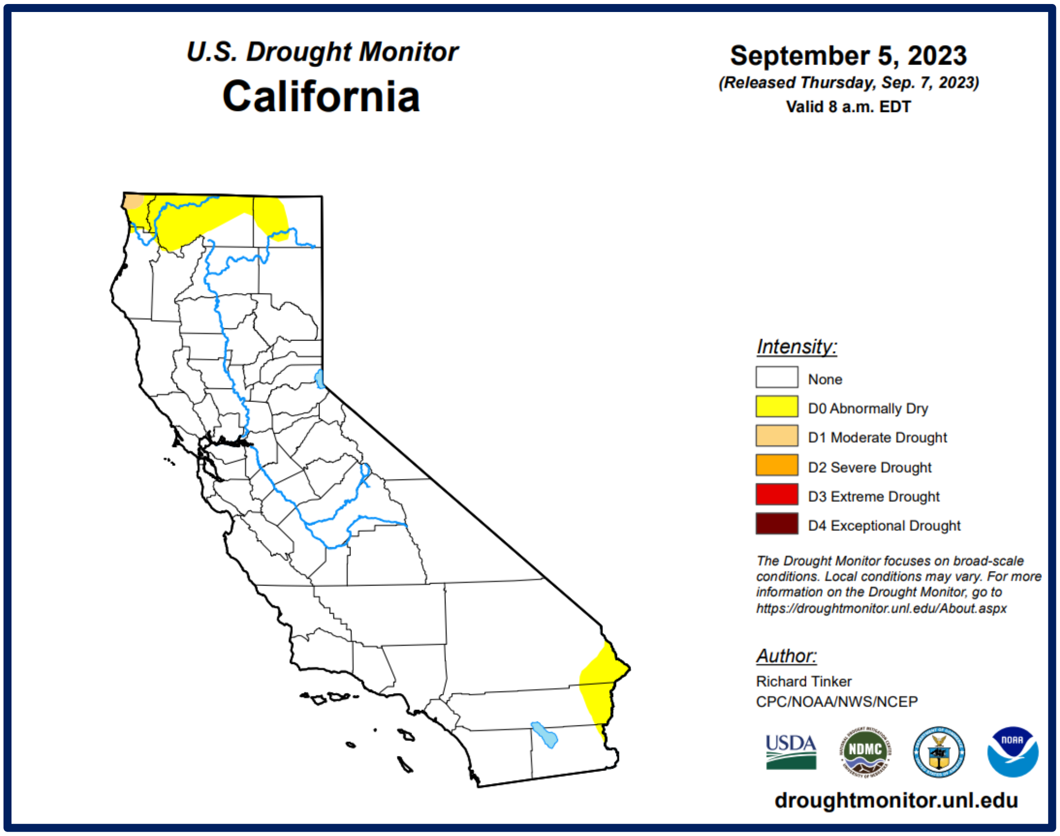
Drought) scale, shown in the table below.[30] The map updates weekly to show the location and intensity of drought across the country. [31] Figure 3.13 illustrates the USDM map for the State of California which shows where drought conditions are occurring and its severity. [32]

Table 3.17: U.S. Drought Monitor Classification

Category	Description	Possible Impacts	PDSI Range
D0	Abnormally Dry	Used for areas showing dryness, but not yet in drought, or for areas recovering from drought. ***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
D1	Moderate Drought	• Some damage to crops and pastures. • Streams, reservoirs, or wells are low, and some water shortages are developing or imminent. • Voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	• Crop or pasture losses are likely. • Water shortages are common. • Water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	• Major crop/pasture losses. • Widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses. • Shortages of water in reservoirs, streams, and wells are creating water emergencies.	-5.0 or less

[30] National Drought Mitigation Center. (n.d.). What is USDM. Retrieved from https://droughtmonitor.unl.edu/About/WhatistheUSDM.aspx.
[31] National Integrated Drought Information System. (2023). U.S. Drought Monitor (USDM). Retrieved from https://www.drought.gov/data-maps-tools/us-drought-monitor.
[32] U.S. Drought Monitor. (2023). California. Retrieved from https://droughtmonitor.unl.edu/Maps/MapArchive.aspx.

Figure 3.13: U.S. Drought Monitor for California[33]



Droughts develop gradually over long periods of time which can make it complicated to recognize when a drought will occur. However, understanding how large-scale climate patterns (e.g., El Niño–Southern Oscillation (ENSO) affect the potential of drought in an area can help forecast when drought conditions will occur. California's Department of Water Resources (DWR)[34] maintains the California Water Watch website which offers current local, at the regional and neighborhood level, and statewide water conditions. The website includes information on precipitation, temperature, reservoirs, streamflow, groundwater, snowpack, soil moisture, and vegetation conditions, and California drought updates. In California, drought is based on impacts to water users and observing and monitoring water availability can help have a better understanding of when and where drought can occur.

[33]Ibid.
[34] California Water Watch (n.d) Track California Water Conditions. Retrieved from https://cww.water.ca.gov/

Estimating drought probability and frequency continues to be difficult, regardless of the improvements in science and technology. According to the 2023 California State Hazard Mitigation Plan, the normal occurrence droughts and documentation of past events and losses determine that the probability for drought events throughout the State will continue.[35]

The drought annualized frequency value represents the average number of recorded drought hazard occurrences, in event days, per year over the period of record (22 years). The table below outlines the annualized frequency for drought, based on FEMA NRI data, for the City.

Table 3.18: Drought Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(2000 – 2021)*	Annualized Frequency
550501	1,624	73.8
550502	1,624	73.8
550601	1,624	73.8
550602	1,624	73.8
550700	1,624	73.8
550801	1,624	73.8
550802	1,624	73.8
550901	1,575	71.6
550902	1,589	72.2
551001	1,575	71.6
551002	1,575	71.6
551101	1,575	71.6
551102	1,575	71.6
551201	1,575	71.6
551203	1,575	71.6

[35] California Governor's Office of Emergency Services. (2023). California State Hazard Mitigation Plan. Retrieved from https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf.

City of Downey Census Tracts	Events on Record *(2000 – 2021)*	Annualized Frequency
551204	1,575	71.6
551300	1,575	71.6
551401	1,575	71.6
551402	1,575	71.6
551501	1,575	71.6
551502	1,575	71.6
551700	1,575	71.6
551801	1,575	71.6
551802	1,575	71.6
553400	1,575	71.6
980012	1,575	71.6
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Vulnerability and Impacts

Population: The entire population of Downey is vulnerable to drought events. Drought impacts the life safety and health of the city by straining water supplies to severely impacted areas. The community may also exhibit a range of abilities to prepare for, respond to, and recover from drought hazards, as these conditions impact populations with health-related issues related to heat-related illness, respiratory problems, and people who work outdoors.

Drought impacts underserved and at-risk populations of the city by increasing the likelihood of health emergencies due to weather conditions usually accompanying droughts. These conditions can also impact lower-income populations, as food and water prices increase, or farmworkers who rely on agriculture for their livelihood.

In Downey, 12,419 residents (11.3 percent) are living with a disability. Disability and poverty are closely tied due to employment limitations. For residents with disabilities, more than 13 percent live in poverty. Many senior-headed households have special needs due to their relatively low incomes, disabilities or limitations, and dependency needs. Specifically, many people aged 65 years and older live alone. In Downey, 12,552 residents are 65 years and older, representing 11.4 percent of the population. For residents 65 years and older, 9.5 percent live in poverty.

Extremely low-income (ELI) is defined as households with income less than 30 percent of area median income (AMI). 13.8 percent of the City's total households (4,525 households) are classified as extremely low income.

Table 3.19: Vulnerability and At-Risk Populations: Drought

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents
Farmworkers	234 persons	Less than 1% of labor force
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count
Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services		

Property: No structures will be directly affected by drought conditions. Drought impacts property damage and critical infrastructure of the city by increasing the strain on the electrical grid or water systems.

Table 3.20: Assets/Structures Vulnerability and Impact Summary: Drought

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Hospitals	3	100%	Reliance on electrical grid and sustained power.
Parks	11	100%	Reliance on water systems for irrigation
Wells	20	100%	Reliance on electrical grid and sustained power; Prolonged drought will impact availability of water.
Lift Stations	2	100%	Reliance on electrical grid and sustained power.
Trees	15,600	100%	Reliance on water systems for irrigation

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Source: Los Angeles County Assessors, City of Downey			

Economic: Downey is located in Southern California, which is a semi arid desert environment with a limited amount of annual rainfall. As such there is a limited supply of surface and groundwater available to the region with most of the water supply imported from as far away as the Colorado River and Northern California. The Water Replenishment District of Southern California is charged with allocating water among the various jurisdictions and addressing potential water supply shortfalls by purchasing imported and reclaimed water for injection and spreading into the basin. Due to its high price, the direct use of imported water by the City is avoided except during periods of extreme drought. Extreme drought would be very costly to the City.

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. While droughts have a direct impact on agriculture, this sector is not a major economic driver for the City.

Changes in Development and Future Development: Drought impacts the changes in development and impact of future development for the city. Growth over the past decade has been modest. Between 2010 and 2020, as reported by the U.S. Census, the population of Downey grew approximately 0.9 percent, from 111,922 to 112,901 residents. The Southern California Association of Governments (SCAG) growth forecasts predict a steady increase in population through 2045. From 2020 to 2045, SCAG projects that the City's population will grow by 5.6 percent, while countywide population is expected to increase by 15.6 percent. The projected growth largely is tied to anticipated increases in housing production, which has not been a factor for the last decade. This projected population growth would add additional strain to water supplies and its 20 wells.

Droughts can directly impact the agricultural sector. In Downey, where there are no agricultural uses, only 234 residents, or 0.4 percent of the workforce are farmworkers. Los Angeles County has seen a significant decrease in agricultural workers. State EDD data (Employment Development Department) shows that between 2000 and 2020, the number of farmworkers countywide decreased by 43 percent, from 7,700 to 4,400 farmworkers in the region. In 2017, the Census of Agriculture from the US Department of Agriculture

(USDA) documented that out of California's approximate 377,500 agricultural workers, less than one percent (3,266) are located within Los Angeles County.

As new developments take place, the City has acknowledged that large or institutional consumers, such as the Downey Landing development project, should procure additional water rights during the conditional use permitting process.

The City of Downey Water Division extracts groundwater typically using around 20 of the 23 city-operated wells. The aquifers underneath the City are grouped into the central groundwater basin, which underlies large portions of central and eastern Los Angeles County. The basin is naturally recharged by regional rainfall, under flow from adjacent basins and runoff from surrounding uplands and mountains but the aquifers also receive supplemental imported water to meet demand and is recharged with highly treated wastewater. The Water Replenishment District of Southern California is charged with allocating water among the various jurisdictions and addressing potential water supply shortfalls by purchasing imported and reclaimed water for injection and spreading into the basin. Due to its high price, the direct use of imported water by the City is avoided except during periods of extreme drought. However, the increasing dependency on imported water to replenish the basin is an issue due to the increasing potential that the supplies of imported water may be curtailed by federal regulations or significant increases in the price. As such, the city must look toward public and private conservation measures to maximize the use of existing water supplies as future development occurs. Water conservation is most successful when the consumer realizes the benefits of reducing demand. Providing apartments and business tenants with individual water meters provide incentives for these users to conserve water.

The use of reclaimed or recycled water for landscape irrigation and other non potable needs can significantly reduce the demand on potable water supplies. Before reuse, reclaimed or recycled wastewater receives at least secondary treatment and basic disinfection at a domestic wastewater treatment facility. There are dual pipes in parts of the city for potable and reclaimed water enabling many public properties and private properties to use reclaimed or recycled water for landscaping and other non potable needs. Expanding the dual pipe system would provide opportunities for other properties to use reclaimed or recycled water. During the development review process, features may be added to a project design that can conserve water over the long term. These features include:

- Restrict the amount of areas devoted to turf and other plant materials that require significant amounts of water and use xeriscape landscaping methods.
- Provide bubbler sprinklers for small boxes and basins
- Use low flow fixtures

Climate Change: The effects of climate change in severity of impact for drought for the city is that droughts are likely to become more likely due to erratic and extreme temperatures and precipitation.[36] As global climate change causes more variability in weather patterns, longer and more severe droughts are anticipated. The likelihood of experiencing an extreme drought has doubled over the past century. In 2023, California is in its third year of drought and needs to use less water.

The California Department of Water Resources states climate change is responsible for the decrease in the Sierra snowpack levels which provide as much as a third of California's water supply. Warmer temperatures cause the snow to melt faster and earlier, making water more difficult to store and use. Higher temperatures and increasing variation in precipitation patterns are likely to increase the vulnerability of communities and impacts from extreme events (including drought), compounding already existing stressors.

FEMA NRI Expected Annual Loss Estimates

A Drought NRI Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to droughts when compared to the rest of the United States. Upon review, FEMAs NRI tool resulted in no available data for drought in the twenty-six census tracts for the City of Downey.

[36] The World Bank. (2023). What You Need to Know About Climate Change and Drought. Retrieved from https://www.worldbank.org/en/news/feature/2023/09/11/what-you-need-to-know-about-climate-change-and-drought

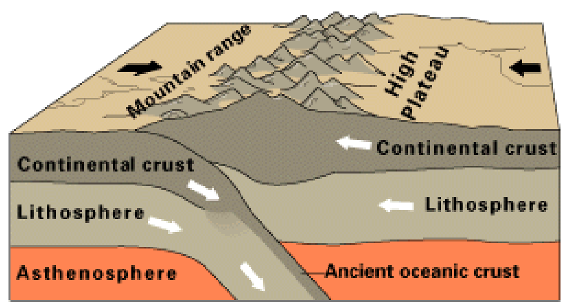
3.10 Earthquake Hazard Profile

Table 3.21: Earthquake Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	**Sum of Weighted Extent Factors**	**Sum of Weighted Vulnerability Factors**	**Sum of Weighted Impact Factors**	**Consequence Score**	**Total Risk Score** (Probability x Consequence)
Earthquake	3	12	16	37	65	**95**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.10.1 Earthquake Hazard Description



Continental-continental convergence

Plate tectonics is a starting point for understanding the forces within the Earth that cause earthquakes. Plates are thick slabs of rock that make up the outermost 100 kilometers of the Earth. The term "tectonics" describes the deformation of the Earth's crust, the forces producing such deformation, and the geologic and structural features that result. The constant motion of the plates causes stress in the brittle upper crust of the Earth. These tectonic stresses build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, ruptures occur along a fault. The rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

Faults are more likely to produce future earthquakes if they have rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. “Active” faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). In contrast, “potentially active” faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is “active” or “potentially active” depends on geologic evidence which may not be available for every fault.

The Alquist-Priolo Earthquake Fault Zoning Act was signed into California Law on December 22, 1972, to mitigate the hazard of surface faulting to structures for human occupancy. The Act was a direct result of the significant damage to homes and businesses that occurred in the 1971 San Fernando Earthquake. It enforces the following to increase earthquake safety:[37]

- Directs the California Geological Survey (CGS) to create maps of known fault zones.
- Requires the sale of any home located within the fault zone designated on the maps to disclose that the property lies adjacent to a known fault.
- Prohibits new construction of homes within these zones unless geologic studies are performed to prove that the fault will not pose a hazard to new structures proposed in these zones.

The State provides extensive regulations on earthquake-related issues. A key area for regulation is the California Building Standards Commission (CBSC). It is authorized by California Building Standards Law to administer the development, adoption, approval, publication, and implementation of California's building codes.

The California Building Standards Code, Title 24, serves as the basis for the design and construction of buildings in California. Improved safety, sustainability, maintaining consistency, new technology, construction methods, and reliability are paramount to the development of building codes. California’s building codes are published in their entirety every three (3) years. Intervening Code Adoption Cycles produce supplement pages halfway (18 months) into each triennial period. Amendments to California’s building

[37] Structural Engineers Association of Northern California. (1972). Events/Alquist-Priolo Earthquake Fault Zoning Act. Retrieved from https://legacy.seaonc.org/event/alquistprioloact/.

standards are subject to a lengthy and transparent public participation process throughout each code adoption cycle. The California Seismic Safety Commission provides an array of regulatory and advisory information regarding seismic safety.[38]

Shaking

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter scale, developed in 1932 by Dr. Charles F. Richter of the California Institute of Technology. The most used scale today is the Moment Magnitude (Mw) Scale. Moment magnitude is related to the total area of the fault that ruptured and the amount of offset (displacement) across the fault. It is a more uniform measure of the energy released during an earthquake.

The other commonly used measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. In general, it decreases with distance from the source of an earthquake, but it may be increased or decreased by several factors.

Amplification of Seismic Shaking

Although seismic waves radiate from their source like ripples on a pond, the radiation is not uniform due to the complex nature of an earthquake rupture, the different paths the waves follow through the Earth, and the different rock and soil layers near the Earth's surface. Large earthquakes begin to rupture at their hypocenter deep in the Earth and the fault ruptures outward from that point. Because the speed of an earthquake rupture on a fault is similar to the speed of seismic waves, waves closer to the epicenter can be compounded by waves from farther along the rupture, creating a pulse of very strong seismic waves that moves along the fault in the direction of the fault rupture. Seismic waves may also be modified as they travel through the Earth's crust.

As seismic waves approach the ground surface, they commonly enter areas of loose soil where the waves travel more slowly. As the waves slow down, their amplitude increases, resulting in larger waves with frequencies that are more likely to damage structures. Waves can also be trapped within soft sediments between the ground surface and deep,

[38] California Seismic Safety Commission. (n.d.) Retrieved from ssc.ca.gov

hard basement rocks, their destructive energy multiplying as they bounce back and forth, producing much greater shaking at the ground surface.

Ground Failure

Fissuring, settlement, and permanent horizontal and vertical shifting of the ground often accompanies large earthquakes. Although not as pervasive or as costly as the shaking itself, these ground failures can significantly increase damage and, under certain circumstances, can be the dominant cause of damage. The following is a list of different ground failure scenarios.

Fault Rupture

The sudden sliding of one part of the earth's crust past other releases the vast store of elastic energy in the rocks as an earthquake. The resulting fracture is known as a fault, while the sliding movement of earth on either side of a fault is called fault rupture. Fault rupture begins below the ground surface at the earthquake hypocenter, typically between three and ten miles below the ground surface in California. If an earthquake is large enough, the fault rupture will actually travel all the way to the ground surface, severely damaging structures built across its path.

Liquefaction

In addition to the primary fault rupture that occurs right along a fault during an earthquake, the ground many miles away can also fail during the intense shaking. One common type of failure occurs when soft, water-saturated soil settles, causing the water to eject sediment particles as it works its way to the ground surface. This phenomenon, known as liquefaction, turns the soil into a fluid, causing it to lose the ability to support buildings and other structures. Areas susceptible to liquefaction include places where sandy sediments have been deposited by rivers along their course or by wave action along beaches.

Landslides

Landslides are the result of the down-slope movement of unstable hillside materials under the influence of weathering and gravity over time. Strength of rock and soil, steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas. Weathering and absorption of water can weaken slopes, while the added weight of saturated materials or overlying construction can increase the chances of slope failure.

Sudden failure can be triggered by heavy rainfall, excavation of weak slopes, and earthquake shaking, among other factors.

3.10.2 Earthquake Hazard History

To indicate the potential for an earthquake event, Table 3.21 lists significant recorded earthquakes in Southern California and the associated magnitudes (excerpted from the SCEDC (2013): Southern California Earthquake Data Center):

Table 3.22: Southern California Historical Earthquakes

■ Under Magnitude 4.5	■ Magnitude 4.5 - 5.4	■ Magnitude 5.5 - 6.4
■ Magnitude 6.5 to 7.4	■ Magnitude > 7.5	

Magnitude	Year	Earthquake Name
■ Magnitude 5.5 - 6.4	1796	LA Basin Earthquake
■ Magnitude 6.5 to 7.4	1800	San Diego Earthquake
■ Magnitude 6.5 to 7.4	1812	Wrightwood (or San Juan Capistrano) Earthquake
■ Magnitude 6.5 to 7.4	1812	Santa Barbara Earthquake
■ Magnitude 6.5 to 7.4	1852	Volcano Lake Earthquake
■ Magnitude 5.5 - 6.4	1855	Los Angeles Region Earthquake
■ Magnitude > 7.5	1857	Fort Tejon Earthquake
■ Magnitude 5.5 - 6.4	1858	San Bernardino Earthquake
■ Magnitude 5.5 - 6.4	1862	San Diego Earthquake
■ Magnitude > 7.5	1872	Owens Valley Earthquake

Under Magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Name
Magnitude 5.5 - 6.4	1881	Parkfield Earthquake
Magnitude 5.5 - 6.4	1883	Santa Barbara Channel Earthquake
Magnitude 6.5 to 7.4	1890	San Jacinto or Elsinore Fault Region Earthquake
Magnitude 6.5 to 7.4	1892	San Jacinto or Elsinore Fault Region Earthquake
Magnitude 6.5 to 7.4	1892	Laguna Salada Earthquake
Magnitude > 7.5	1892	Imperial Valley Earthquake
Magnitude 5.5 - 6.4	1899	Cajon Pass Earthquake
Magnitude 6.5 to 7.4	1899	San Jacinto Earthquake
Magnitude 5.5 - 6.4	1901	Parkfield Earthquake
Magnitude 5.5 - 6.4	1906	Imperial Valley Earthquake
Magnitude 5.5 - 6.4	1908	Death Valley Region Earthquake
Magnitude 5.5 - 6.4	1910	Elsinore Earthquake
Magnitude 5.5 - 6.4	1915	Imperial Valley Earthquake
Magnitude 5.5 - 6.4	1916	South of Death Valley Earthquake
Magnitude 6.5 to 7.4	1918	San Jacinto Earthquake

Under Magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Name
Magnitude 5.5 - 6.4	1922	Parkfield Earthquake
Magnitude 5.5 - 6.4	1923	North San Jacinto Fault Earthquake
Magnitude 5.5 - 6.4	1925	Santa Barbara Earthquake
Magnitude 6.5 to 7.4	1927	Lompoc Earthquake
Magnitude 5.5 - 6.4	1933	Long Beach Earthquake
Magnitude 5.5 - 6.4	1934	Parkfield Earthquake
Magnitude 5.5 - 6.4	1937	San Jacinto Fault ("Terwilliger Valley") Earthquake
Magnitude 6.5 to 7.4	1940	Imperial Valley Earthquake
Magnitude 5.5 - 6.4	1941	Santa Barbara Earthquake
Magnitude 4.5 - 5.4	1941	Torrance-Gardena Earthquakes
Magnitude 6.5 to 7.4	1942	Fish Creek Mountains Earthquake
Magnitude 5.5 - 6.4	1946	Walker Pass Earthquake
Magnitude 6.5 to 7.4	1947	Manix Earthquake
Magnitude 5.5 - 6.4	1948	Desert Hot Springs Earthquake
Magnitude > 7.5	1952	Kern County Earthquake
Magnitude 5.5 - 6.4	1952	Bakersfield Earthquake

Under Magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Name
Magnitude 5.5 - 6.4	1954	San Jacinto Fault Earthquake
Under magnitude 4.5	1966	Imperial Fault Earthquake
Magnitude 5.5 - 6.4	1966	Parkfield Earthquake
Magnitude 6.5 to 7.4	1968	Borrego Mountain Earthquake
Magnitude 4.5 - 5.4	1970	Lytle Creek Earthquake
Magnitude 6.5 to 7.4	1971	San Fernando (Sylmar) Earthquake
Magnitude 4.5 - 5.4	1973	Point Mugu Earthquake
Magnitude 4.5 - 5.4	1975	Galway Lake Earthquake
Magnitude 4.5 - 5.4	1978	Santa Barbara Earthquake
Magnitude 4.5 - 5.4	1979	Malibu Earthquake
Magnitude 5.5 - 6.4	1979	Imperial Valley Earthquake
Magnitude 5.5 - 6.4	1980	White Wash Earthquake
Magnitude 4.5 - 5.4	1982	"Anza Gap" Earthquake
Magnitude 5.5 - 6.4	1986	North Palm Springs Earthquake
Magnitude 4.5 - 5.4	1986	Oceanside Earthquake
Magnitude 6.5 to 7.4	1987	Elmore Ranch/Superstition Hills Earthquakes
Magnitude 5.5 - 6.4	1987	Whittier Narrows Earthquake

Under Magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Name
Magnitude 4.5 - 5.4	1988	Tejon Ranch Earthquake
Magnitude 4.5 - 5.4	1988	Upland Earthquake
Magnitude 4.5 - 5.4	1988	Pasadena Earthquake
Magnitude 4.5 - 5.4	1989	Malibu Earthquake
Magnitude 4.5 - 5.4	1989	Newport Beach Earthquake
Magnitude 4.5 - 5.4	1989	Montebello Earthquake
Magnitude 4.5 - 5.4	1990	Upland Earthquake
Magnitude 5.5 - 6.4	1991	Sierra Madre Earthquake
Magnitude 5.5 - 6.4	1992	Joshua Tree Earthquake
Magnitude 6.5 to 7.4	1992	Landers Earthquake
Magnitude 5.5 - 6.4	1992	Big Bear Earthquake
Magnitude 5.5 - 6.4	1992	Mojave (Garlock) Earthquake
Magnitude 4.5 - 5.4	1993	Wheeler Ridge Earthquake
Magnitude 6.5 to 7.4	1994	Northridge Earthquake
Magnitude 5.5 - 6.4	1995	Ridgecrest Earthquakes
Magnitude 4.5 - 5.4	1996	Coso Earthquake
Magnitude 4.5 - 5.4	1997	Calico Earthquake

Under Magnitude 4.5 | Magnitude 4.5 - 5.4 | Magnitude 5.5 - 6.4

Magnitude 6.5 to 7.4 | Magnitude > 7.5

Magnitude	Year	Earthquake Name
Magnitude 4.5 - 5.4	1998	Coso Earthquake
Magnitude 4.5 - 5.4	1998	Crafton Hills (Redlands) Earthquake
Magnitude 4.5 - 5.4	1998	San Bernardino Earthquake
Magnitude 4.5 - 5.4	1998	Whiskey Springs (Big Bear City) Earthquake
Magnitude 6.5 to 7.4	1999	Hector Mine Earthquake
Under magnitude 4.5	2001	West Hollywood Earthquake
Magnitude 4.5 - 5.4	2001	Anza Earthquake
Magnitude 5.5 - 6.4	2002	Laguna Salada Earthquake
Magnitude 6.5 to 7.4	2003	San Simeon Earthquake
Magnitude 4.5 - 5.4	2005	Mettler Earthquake
Magnitude 4.5 - 5.4	2008	Chino Hills Earthquake
Magnitude 4.5 - 5.4	2009	Inglewood Earthquake
Magnitude 5.5 - 6.4	2009	Baja California Earthquake
Magnitude 6.5 to 7.4	2010	Sierra El Mayor Earthquake
Magnitude 4.5 - 5.4	2011	Calexico Earthquake
Magnitude 4.5 - 5.4	2012	Brawley Earthquake
Magnitude 4.5 - 5.4	2012	Westmoreland Earthquake

Under Magnitude 4.5	Magnitude 4.5 - 5.4	Magnitude 5.5 - 6.4
Magnitude 6.5 to 7.4	Magnitude > 7.5	

Magnitude	Year	Earthquake Name
Magnitude 4.5 - 5.4	2013	Isla Vista Earthquake
Magnitude 4.5 - 5.4	2014	Brea Earthquake
Magnitude 4.5 - 5.4	2015	Stovepipe Wells Earthquake
Magnitude 4.5 - 5.4	2016	San Jacinto Earthquake
Magnitude 4.5 - 5.4	2016	Borrego Springs Earthquake
Magnitude 4.5 - 5.4	2018	Santa Cruz Island Earthquake
Magnitude 5.5 - 6.4	2019	Ridgecrest Earthquake
Magnitude 6.5 - 7.4	2019	Ridgecrest Earthquake
Magnitude 5.5 - 6.4	2020	Lone Pine Earthquake[39]

Southern California Historic Earthquakes

One of the best indicators of earthquake potential is learning the earthquake history of the area. The following is a discussion on large earthquakes that affected the City and Southern California in general, which were also included in Table 3.21.

1857 Fort Tejon Earthquake

On January 9, 1857, one of the greatest recorded earthquakes in the U.S. occurred in Southern California. The Fort Tejon earthquake measured 7.9 on the Richter scale and left a surface rupture scare of over 350 kilometers (225 miles) along the San Andreas

[39] Southern California Earthquake Data Center. (2023). Earthquake Information – Chronological Earthquake Index. Retrieved from https://scedc.caltech.edu/earthquake/chronological.html

Fault. Strong shaking was said to have lasted for over a minute, and water from the Los Angeles River was reportedly thrown out of its bed. The damage was not nearly as serious as it would be today since Southern California was sparsely populated at the time. Were the Fort Tejon earthquake to occur today, the damage could easily run into billions of dollars, and the loss of life could be substantial. The present-day communities of Wrightwood and Palmdale lie upon or near the 1857 rupture area.

1933 Long Beach Earthquake

In 1933, the Long Beach 6.4 magnitude earthquake struck the Los Angeles Basin on March 10. The earthquake occurred on the Newport-Inglewood Fault, causing serious damage in Long Beach and other communities. The earthquake resulted in 120 deaths and over $50 million in property damage. Most of the damaged buildings were of unreinforced masonry construction.

1971 Sylmar Earthquake (San Fernando)

On February 9, 1971, the Los Angeles Basin shook for over one minute. There were 65 deaths and a financial cost of over $500 million. The earthquake resulted in a crack in the Van Norman Dam where an 80-square mile area had to be evacuated due to fear the dam would break. Numerous people were trapped in buildings and fires were started from natural gas line breaks. Two hospitals collapsed killing nine people. The Veterans Administration Hospital had seven deaths and the Olive View Hospital had two deaths. Following this earthquake, the Alquist Hospital Seismic Act was passed establishing structural and non-structure classifications for hospital building seismic –safety levels.

1987 Whittier Narrows Earthquake

In October 1987, the Whittier Narrows Earthquake struck the Los Angeles area with a 5.9 magnitude earthquake. This earthquake occurred on a fault system not previously known for seismic activity. There were 8 deaths and 200 injuries. The earthquake damage was estimated at $358 million.

1994 Northridge Earthquake

Thousands of homes and businesses were without electricity for days following the event; tens of thousands had no gas; and nearly 50,000 had little or no water. According to NASA Ames Research Center, building officials inspected over 66,500 structures and determined 4,000 were severely damaged and deemed uninhabitable. An additional

11,000 buildings were moderately damaged and authorized only for limited occupancy. Several collapsed bridges and overpasses created commuter havoc on the freeway system. In addition, ground shaking caused extensive damage and triggered liquefaction. This ignited dozens of fires throughout the area resulting in further damage.

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

2019 Ridgecrest Earthquake Sequence

In July of 2019 there were two earthquakes in Searles Valley, Southern California, a magnitude 6.4 on July 4 and a magnitude 7.1 on July 6. The July 4th earthquake was felt by more than 47,000 people, even as far away as northern California and Phoenix, Arizona felt shaking. There were several aftershocks until about 34 hours later when there was a M7.1 on the fault orthogonal (rotated 90 degrees) from the M6.4, The July 6th earthquake was the largest earthquake in southern California since the Hector Mine Earthquake in 1999. Over the past 40 years, eight other earthquakes have occurred within 31 miles of the July 4th earthquake.[40]

Even when the epicenter of a major earthquake is not located directly within the City, the aftershocks associated with that earthquake can result in significant damage. The hazards associated with aftershock earthquakes are the same as mainshock earthquakes and may cause significant damage and disruption. The primary difference between the two types of earthquakes is that aftershock earthquakes are categorized by the following two guidelines. First, it must occur within one rupture length of the mainshock rupture surface, or alternatively, within an "aftershock zone" based upon early aftershock activity and defined by seismologists. Second, it must occur within that designated area before the seismicity rate in that area returns to its "background", pre-mainshock level. Figure 3.14 from the Southern California Earthquake Data Center details the locations and magnitudes for historic Southern California earthquakes.[41]

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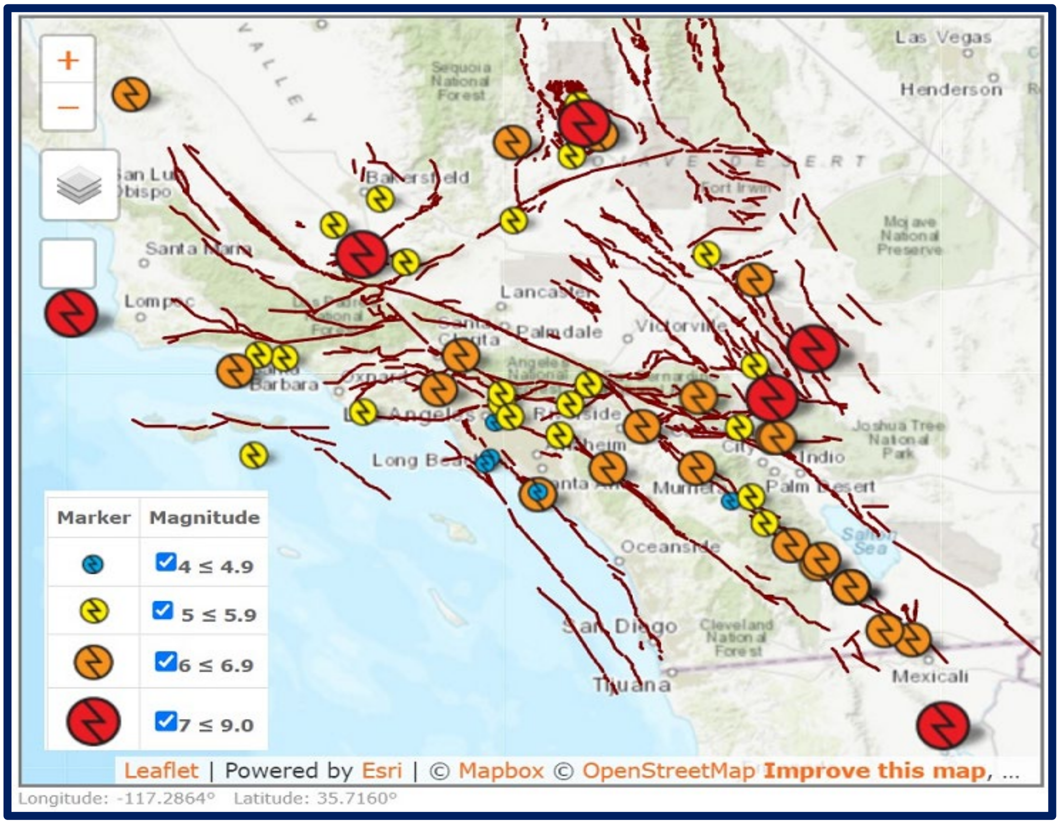
[40] USGS. (2019). The 2019 Ridgecrest, California Earthquake Sequence. Retrieved from https://earthquake.usgs.gov/storymap/index-ridgecrest.html
[41] Southern California Earthquake Data Center. (1994-Present). Historical Earthquakes and Significant Faults in Southern California. Retrieved from https://scedc.caltech.edu/earthquake/significant.html

Figure 3.14: Southern California Historic Earthquakes Map[42]



3.10.3 Earthquake Hazard Probability, Frequency, and Magnitude

The Steering Committee ranked earthquake as the greatest threat to the City as the County of Los Angeles is in a seismic fault zone near the Newport-Inglewood Fault according to a Preliminary Alquist-Priolo Earthquake Fault Zone map provided by the California Department of Conservation website and is located in a liquefaction zone. Due to the presence of nearby seismic fault zones and numerous past earthquakes in or near the City, the entirety of the City of Downey should be considered at risk for an earthquake.

Fault Zones

42 Ibid.

There are many faults and fault zones throughout Southern California. After reviewing maps of the U.S., California and specifically the Southern California area, the research showed potential earthquake areas that could impact the City. Faults that were reviewed include: the San Andreas, Newport-Inglewood, Rose Canyon, Cristianos, San Joaquin Hills, Rose Canyon, Coronado Bank, Whittier-Elsinore, Palos Verdes, San Diego Trough, and San Clemente Faults. These faults, all considered, can produce earthquakes in the 4.5 – 8+ magnitude range. This report focused on the four faults that could most seriously impact the area:

1. San Andreas Fault
2. Newport-Inglewood Fault
3. Whittier-Fault
4. Palos Verdes Fault

A major earthquake along any of these four faults could result in substantial casualties and damage resulting from collapsed buildings, damaged roads and bridges, fires, flooding, and other threats to life and property. There may still be unmapped earthquake faults throughout Southern California that could also affect the City. The figures below provide the local earthquake faults in the City and Southern California areas.

The San Andreas Fault

Table 3.23: San Andreas Fault Information

Type of fault:	Right-lateral strike-slip
Length:	1200 kilometers (km)
Nearby Communities:	Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning, Indio
Last Major Rupture:	January 9, 1857 (Mojave segment); April 18, 1906 (Northern segment)
Slip rate:	20-35 millimeters/year (mm/yr.)
Interval Between Major Ruptures:	Average of about 140 years on the Mojave segment; recurrence interval varies greatly from under 20 years (at Parkfield only) to over 300 years
Probable Magnitudes:	6.8 to 8.0

This fault marks the boundary between the North American and Pacific tectonic plates and can produce earthquakes in the magnitude 8+ range. It has been scientifically determined through a carbon dating process that a major earthquake on this fault has occurred approximately every 145 years plus or minus 20 years. The last major earthquake on the Mojave segment of the fault occurred in 1857 (159 years ago as of 2016). The San Andreas Fault is considered one of the most active faults in the world today, and a major earthquake up to an 8.3 magnitude is expected to occur again within the next 20 years. The ground shaking of an 8.3 magnitude earthquake on the Southern San Andreas Fault would result in serious damage in Southern California, including the City.

The Newport-Inglewood Fault

Table 3.24: Newport-Inglewood Fault Information

Type of fault:	Right lateral; local reverse slip associated with fault steps
Length:	75 km
Nearby Communities:	Culver City, Inglewood, Gardena, Compton, Signal Hill, Long Beach, Seal Beach, Huntington Beach, Newport Beach, Costa Mesa
Last Major Rupture	March 10, 1933, M_W 6.4
Slip rate:	0.6 mm/yr.
Probable Magnitudes:	6.0-7.4

The Newport-Inglewood Fault is considered the second most active fault in California. It runs from the City of Inglewood through the City of Huntington Beach and out into the Pacific Ocean in the Newport Beach area. This fault can produce earthquakes in the range of 6.3 to 7.5 magnitude. The 6.5 magnitude, 1933 Long Beach earthquake, occurred on the Newport-Inglewood fault causing 120 deaths and severe damage. Unreinforced masonry buildings collapsed leaving people trapped beneath the rubble.

Earthquakes are to be considered a major threat to the City. When scientists refer to the San Andreas Fault, they often call it “The Big One.” In 1990, the Los Angeles Times newspaper did a series of articles on the Newport-Inglewood Fault and described it as “The Bigger One.” Both faults would cause considerable damage; however, a 7.4 magnitude Newport-Inglewood earthquake could be more severe to the City than an 8.0 on the San Andreas due to the fault’s proximity to the City. The cost estimates of damage are much greater for the Newport-Inglewood worst-case scenario than the San Andreas worst-case scenario.

Whittier-Elsinore Fault

Table 3.25: Whittier Fault Information

Type of fault:	Right-lateral strike-slip with some reverse slip
Length:	40 km
Nearby Communities:	Yorba Linda, Hacienda Heights, Whittier
Most Recent Surface Rupture	Holocene
Slip rate:	Between 2.5 and 3.0 mm/yr.
Probable Magnitudes:	6.0-7.2

The Whittier Fault runs along the Chino Hills range between Chino Hills and Whittier. Earthquakes with surface rupture on the Whittier Fault are estimated to have return intervals for a M6.5 and M7.5 of 100 and 1,200 years, respectively. An unpublished paleo seismic investigation suggests that the Whittier segment has not moved for 2,000 years. Since the average interval between major characteristic (extreme) events on the Whittier segment is estimated to be on the order of 1,200 years, the fault is considered long overdue. The Whittier fault joins the Chino Fault near Prado Dam where they merge into the Elsinore Fault.

Table 3.26: Elsinore Fault Information

Type of fault:	Right-lateral strike-slip
Length:	180 km
Nearby Communities:	Temecula, Lake Elsinore, Julian
Last Major Rupture	May 15, 1910; Magnitude 6.0
Slip rate:	Roughly 4.0 mm/yr.
Probable Magnitudes:	6.5-7.5

The Elsinore Fault lies along the eastern base of the Santa Ana Mountains. It is one of the largest in Southern California and, historically, has been one of the quietest. The fault has only seen one historical event greater than magnitude 5.2, which was the M6.0 Elsinore Earthquake of 1910.

At the northern end, the fault splays into several faults, creating the Whittier-Elsinore Fault Zone. A "characteristic" Magnitude M6.9 on the northwest segment of the Whittier-Elsinore Fault Zone has been estimated to have a return period of 450 years. This "characteristic" earthquake would be expected to cause ground movement on the order of 3 to 6 feet, with peak horizontal ground accelerations up to one multiplier of gravity (1 g). Most structures built prior to 1997 were designed to withstand peak ground accelerations, described in further detail below, of up to 0.4 g, so a "characteristic" earthquake along this fault zone would have devastating consequences.

Palos Verdes Fault

Table 3.27: Palos Verdes Fault Information

Type of fault:	Right reverse
Length:	Roughly 80 km
Nearby Communities:	San Pedro, Palos Verdes Estates, Torrance, Redondo Beach
Most recent surface rupture:	Holocene offshore; Late Quaternary onshore
Slip rate:	Between 0.1 and 3.0 mm/yr.
Probable magnitudes:	6.0 – 7.0 (or greater); fault geometries may allow only partial rupture at any one time.

The Palos Verdes Hills Fault is capable of a 6.0 to 7.0 magnitude earthquake. It has two main branches and continues southward as the Palos Verdes-Coronado Bank Fault Zone.

This fault is located off the coast of Redondo Beach and Torrance, and continues southward through the Palos Verdes peninsula and offshore, outside the San Pedro Bay. The closest point lies southwest of the City raising the issue of the fault causing shaking and liquefaction.

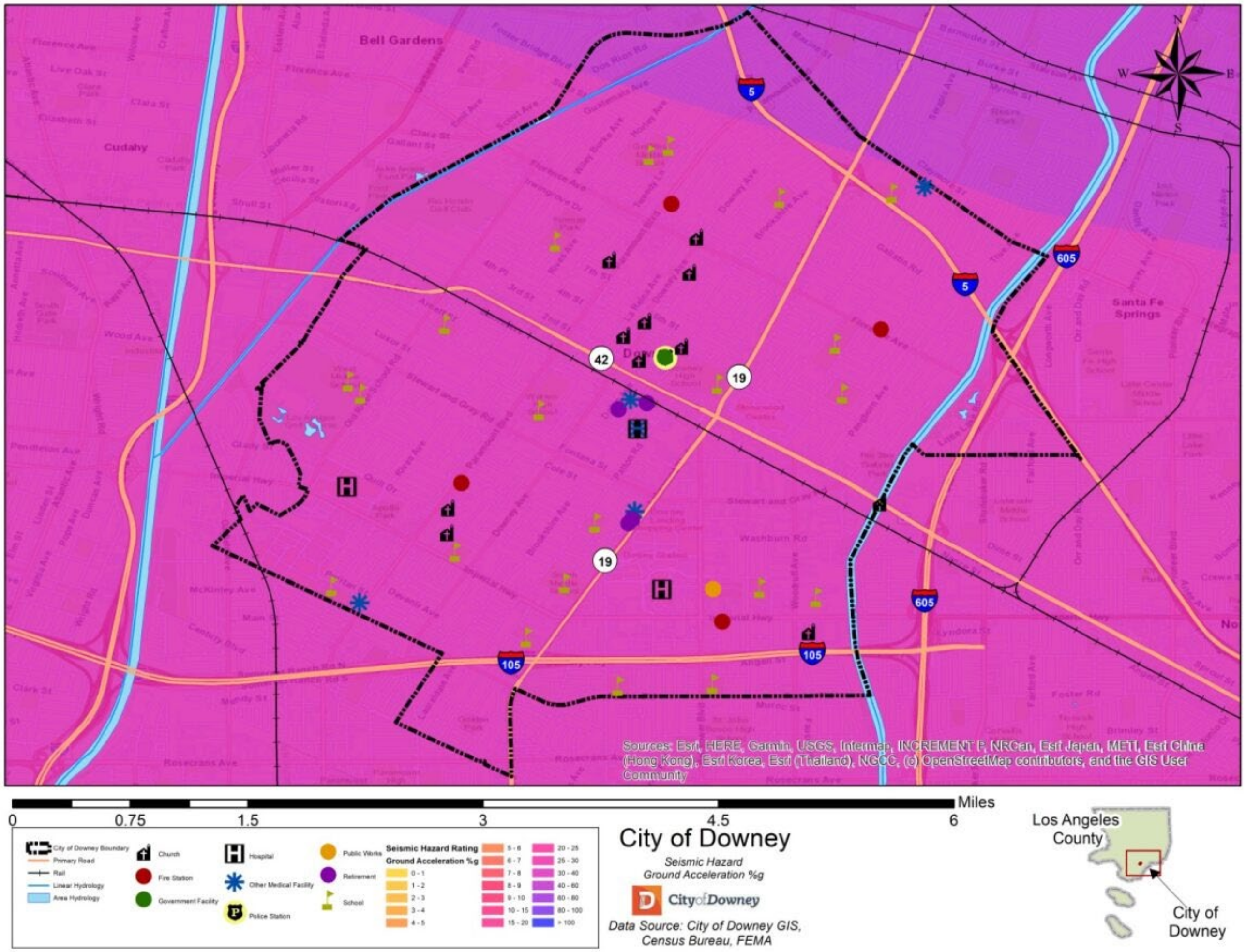
Peak Ground Acceleration

Peak Ground Acceleration (PGA) mapping represents peak horizontal acceleration of the ground on firm-rock conditions. The approach of representing peak horizontal ground acceleration on firm-rock is a common and widely used method of showing ground accelerations. The development of probabilistic acceleration maps is a result of three types of basic input parameters:

1) Attenuation of ground shaking with distance from the earthquake source.
2) Frequency of earthquakes within an area or region, termed recurrence; and
3) The character and extent of regions and faults that generate earthquakes.

According to the following Peak Ground Acceleration Map and the Department of Conservation Division of Mines and Geology 1998 Seismic Hazard Zone Report for Los Angeles County, the City is located in an area that will experience a PGA ranging from 0.37 g to 0.38 g with 10% exceedance in 50 years (0.0021 annual probability).

Figure 3.15: Ground Acceleration Map (as of April 2023)



Earthquakes are measured both in terms of their inherent magnitude and in terms of their local intensity. There are several standard measures of earthquakes, including the Richter Scale and the Modified Mercalli Intensity (MMI) scale. The Richter Scale measures the magnitude or amount of energy an earthquake releases. Magnitude is measured by seismographs. The MMI scale is an observed measurement of the earthquake's intensity felt at the earth's surface and it varies depending on the observer's location at the earthquake's epicenter. The MMI Scale is comprised of 12 increasing levels, designated by Roman numerals, that range from imperceptible shaking to catastrophic destruction. Furthermore, the MMI can be used to map earthquake impacts.[43] The table below correlates the MMI Scale with the Richter Scale and effects of ground shaking.

Table 3.28: Mercalli Intensity vs. Richter Scale

Intensity	Effects	Richter Scale *(approximate)*
I. Instrumental	Not felt.	1 – 2
II. Just Perceptible	Felt by only a few people, especially on upper floors of tall buildings.	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings.	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle.	4
V. Rather Strong	Generally felt by everyone; sleeping people may be awakened.	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling object.	5
VII. Very Strong	General alarm; walls and plaster crack.	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged.	6
IX. Ruinous	Some houses collapse; pipes break.	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides.	7
XI. Very Disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad; severe landslides.	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered.	8

Earthquakes can trigger other types of ground failures, which could contribute to the damage. These include flow failures, landslides, and liquefaction. Liquefaction is not a type of ground failure; however, it is a physical process that occurs when shaking can mix groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is a

[43] Pacific Northwest Seismic Network. (n.d.). Magnitude/Intensity. Retrieved from https://pnsn.org/outreach/about-earthquakes/magnitude-intensity.

problem in floodplains where the water table is relatively high, and the soil is more susceptible to liquefaction.[44]

Earthquakes occur with little to no warning. Scientists cannot predict or forecast earthquakes. An earthquake early warning system uses earthquake science and technology of monitoring systems to alert devices and people when shaking waves generated by an earthquake are expected to arrive at a location. Although it may not sound like a lot of time (compared to other natural hazards), seconds to tens of seconds of advance warning can allow people and systems to take action and protect life and property from destructive shaking.[45]

In partnership with University of California Berkeley and USGS ShakeAlert, California OES developed the Earthquake Warning California system. The system uses ground-motion sensors to detect earthquakes that have already started and estimate their size, location, and impact. Once it detects a significant magnitude, the MyShake App (registration is required), Wireless Emergency Alerts, or Android Alerts sends a warning to mobile phone users when shaking is about to occur in the user's area. The speed of the alert varies depending on the individual's distance from the origin of the earthquake. Therefore, if the individual is closer to the earthquake's epicenter the warning will arrive faster than someone that is further away. The table below outlines the alerting thresholds for the Earthquake Warning California system.[46]

Table 3.29: Earthquake Warning California Alerting Thresholds

Warning System	Threshold
Wireless Emergency Alerts	The Wireless Emergency Alerts is used in response to magnitude 5.0 or greater earthquakes and will alert people who will experience a shaking level of MMI IV (light) or greater.
MyShake App	The MyShake App is used in response to magnitude 4.5 or greater earthquakes and will alert people who will experience a shaking level of MMI III (weak) or greater.
Android Alerts	The Android Alerts are used in response to magnitude 4.5 or greater earthquakes and will alert people who will experience a shaking level of MMI III (weak) or greater.

[44] United States Geological Survey. (n.d.). What are the Effects of Earthquakes? Retrieved from: https://www.usgs.gov/programs/earthquake-hazards/what-are-effects-earthquakes.
[45] United States Geological Survey. (n.d.). What is the difference between earthquake early warning, earthquake forecasts, earthquake probabilities, and earthquake prediction? Retrieved from https://www.usgs.gov/faqs/what-difference-between-earthquake-early-warning-earthquake-forecasts-earthquake-probabilities.
[46] California Governor's Office of Emergency Services. (n.d.). Earthquake Warning California: Types of Alerts. Retrieved from https://earthquake.ca.gov/get-alerts/.

HAZUS Probabilistic Magnitude 5.0

The total economic loss estimated for the earthquake is 1,927.99 Million, which includes building and lifeline related losses based on the region's available inventory. HAZUS estimates that about 5,108 buildings will be at least moderately damaged. This is over 11 percent of the buildings in the region. There are an estimated 97 buildings that will be damaged beyond repair. The table below summarizes the expected damage by general occupancy for the buildings in the City of Downey planning area.

Table 3.30: HAZUS Earthquake Expected Building Damage by Occupancy

Damage Level[47]	None		Slight		Moderate		Extensive		Complete	
Occupancy	***Count***	***%***	***Count***	***%***	***Count***	***%***	***Count***	***%***	***Count***	***%***
Agriculture	10.09	0.04	5.31	0.04	3.43	0.08	0.98	0.17	0.19	0.19
Commercial	1504.24	5.78	763.22	5.45	603.54	13.65	175.99	29.78	26.00	26.71
Education	44.95	0.17	20.66	0.15	12.02	0.27	3.01	0.51	0.36	0.37
Government	30.63	0.12	14.26	0.10	11.11	0.25	3.47	0.59	0.53	0.54
Industrial	635.48	2.44	326.05	2.33	298.37	6.75	95.10	16.09	15.01	15.42
Other Residential	4165.83	16.01	2252.60	16.08	850.71	19.25	176.89	29.93	24.97	25.65
Religion	84.03	0.32	40.93	0.29	27.60	0.62	8.16	1.38	1.27	1.31
Single Family	19552.65	75.12	10589.70	75.57	2613.30	59.12	127.33	21.55	29.02	29.81
TOTAL	**26,028**		**14,013**		**4,420**		**591**		**97**	

The table below summarizes the expected damage to essential facilities in the City of Downey planning area.

[47] Hazus Earthquake Model Technical Manual, Hazus 4.2 SP3. (2020). 5.3.3.1 Strutucal Damage descriptions. Retrieved from https://www.fema.gov/sites/default/files/2020-10/fema_hazus_earthquake_technical_manual_4-2.pdf

Table 3.31: HAZUS Earthquake Expected Damage to Essential Facilities

Facility[48]	Total	At Least Moderate (Greater than 50% damage)	Complete (Greater than 50% damage)	With Functionality (Greater than 50% on day 1)
Medical	4	1	0	3
Schools and related assets	53	30	0	23
Emergency Operations Center	2	1	0	1
Law Enforcement	2	0	0	2
Fire Assets	9	4	0	3
TOTAL	**70**	**36**	**0**	**32**

**Includes all assets within city boundaries and not just those from the city.*

The total building-related losses were 1,875.34 Million, 17 percent of the estimated losses were related to the business interruption of the City of Downey. The residential occupancies made up 28 percent of the total loss. See ***Appendix A*** – *Additional Hazard Analysis Information* for building related economic loss estimates, Table 11.

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodation in temporary public shelters. Of these, 346 people (out of a total population of 187,417) will seek temporary shelter in public shelters.

For the transportation and utility lifeline systems, HAZUS computes the expected damage to transportation systems and the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. See ***Appendix A*** – *Additional Hazard Analysis Information* for transportation system economic losses, Table 12.

Earthquake probabilities are calculated by projecting earthquake rates based on earthquake history and fault slip rates and the result is expressed as the probability that an earthquake of a specified magnitude will occur on a fault or within an area.[49] According to USGS, there is 75% probability of at least one (1) earthquake before 2043 with a magnitude of 7.0 that could cause widespread damage in Southern California (based on a 30-year period, beginning in 2014.[50] The

[48] Hazus Earthquake Model Technical Manual, Hazus 4.2 SP3. (2020). 6.1 Essential Facility Classification Retrieved from https://www.fema.gov/sites/default/files/2020-10/fema_hazus_earthquake_technical_manual_4-2.pdf

[49] California Department of Conservation. (n.d.). Earthquakes. Retrieved from https://www.conservation.ca.gov/cgs/earthquakes.

[50] California Earthquake Authority. (2014). California Earthquake Risk Map and faults by County. Retrieved from https://www.earthquakeauthority.com/california-earthquake-risk/faults-by-county

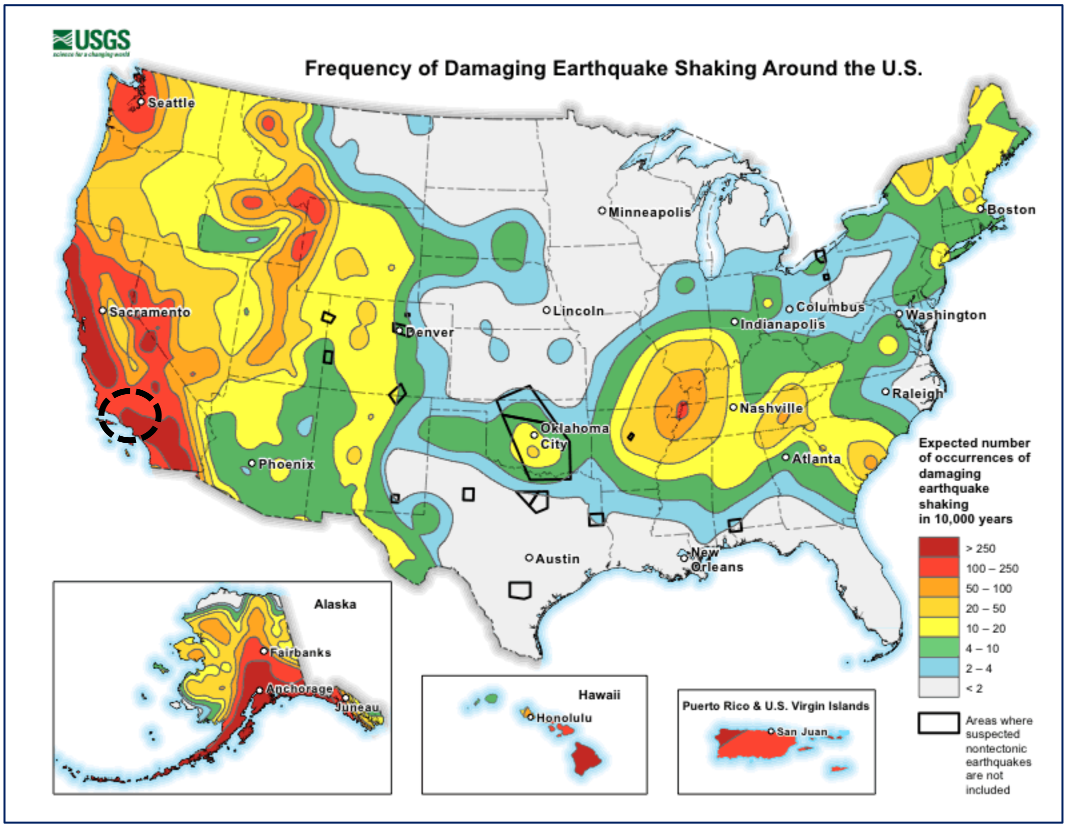
2014, Working Group on California Earthquake Probabilities (WGCEP) issued its third earthquake forecast, referred to as the Uniform California Earthquake Rupture Forecast (UCERF3), which determined the likelihood of magnitude 7.0 earthquakes by 2043. In the Los Angeles area, the probabilities are:[51][52]

- 60% that an earthquake measuring magnitude 6.7 or greater.
- 46% that an earthquake measuring magnitude 7.0 or greater.
- 31% that an earthquake measuring magnitude 7.5 or greater.

The USGS National Seismic Hazard Maps reflect the best and most current understanding of earthquake hazard in an area, the distribution of damaging earthquake shaking across the United States and compares earthquake shaking hazard areas with other areas across the United States. The figure below illustrates the most recent USGS National Seismic Hazard Map which represents the expected number of occurrences of damaging earthquake shaking in 10,000 years. A "damaging earthquake shaking" in this map is that of MMI level VI or higher.[53]

[51] United States Geological Survey. (2015). UCERF3: A New Earthquake Forecast for California's Complex Fault System. Retrieved from https://pubs.usgs.gov/fs/2015/3009/pdf/fs2015-3009.pdf.
[52] United States Geological Survey. (2015). What is the probability that an earthquake will occur in the Los Angeles Area? Retrieved from https://www.usgs.gov/faqs/what-probability-earthquake-will-occur-los-angeles-area-san-francisco-bay-area
[53] United States Geological Survey, Earthquake Hazards Program. (2022). Introduction to the National Seismic Hazard Maps. Retrieved from https://www.usgs.gov/programs/earthquake-hazards/science/introduction-national-seismic-hazard-maps.

Figure 3.16: USGS National Seismic Hazard Map



The earthquake annualized frequency value represents the modeled frequency of an earthquake hazard occurrence per year. A higher annualized frequency value results in higher EAL and Risk Index scores. The table below outlines the annualized frequency for earthquakes, based on FEMA NRI data, for the City.

Table 3.32: Earthquake Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(2021 Dataset)*	Annualized Frequency
550501	n/a	0.964% chance per year
550502	n/a	0.964% chance per year
550601	n/a	0.964% chance per year
550602	n/a	0.964% chance per year
550700	n/a	0.964% chance per year
550801	n/a	0.964% chance per year

City of Downey Census Tracts	Events on Record *(2021 Dataset)*	Annualized Frequency
550802	n/a	0.964% chance per year
550901	n/a	0.964% chance per year
550902	n/a	0.964% chance per year
551001	n/a	0.964% chance per year
551002	n/a	0.964% chance per year
551101	n/a	0.961% chance per year
551102	n/a	0.963% chance per year
551201	n/a	0.963% chance per year
551203	n/a	0.960% chance per year
551204	n/a	0.964% chance per year
551300	n/a	0.964% chance per year
551401	n/a	0.964% chance per year
551402	n/a	0.964% chance per year
551501	n/a	0.964% chance per year
551502	n/a	0.962% chance per year
551700	n/a	0.960% chance per year
551801	n/a	0.960% chance per year
551802	n/a	0.961% chance per year
553400	n/a	0.960% chance per year
980012	n/a	0.962% chance per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Vulnerability and Impacts

Population: An earthquake impacts the life safety and health of the city by potentially causing injury or death to the public due to debris, failed infrastructure, and other hazards. The entire population of Downey falls within areas with the potential for either violent or extreme level of ground shaking. Some populations in the Planning Area may be more vulnerable to an earthquake event than others. For example, those with mobility issues as well as the elderly may have challenges with evacuating or traveling to a shelter without assistance if they cannot stay in their homes.

In Downey, 12,419 residents (11.3 percent) are living with a disability. Among the disability types tallied (a resident can have more than one disability type) the most prevalent were ambulatory (serious difficulty walking or climbing stairs) and independent living difficulties (difficulty doing errands alone such as visiting a doctor's office or shopping). One quarter of residents with a disability indicated an ambulatory difficulty and 21 percent indicated an independent living difficulty. The remaining disabilities tallied include cognitive difficulties (18 percent), self-care difficulties (14 percent), hearing difficulties (12 percent), and vision difficulties (11 percent).

As age increases, so does the percentage of each age group that has disability; for residents who are 75 years and over, more than half have a disability. The 65 to 74 years age group constitutes the second-highest number of disabilities. Disability and poverty are closely tied due to employment limitations. For residents with disabilities, more than 13 percent live in poverty.

Many senior-headed households have special needs due to their relatively low incomes, disabilities or limitations, and dependency needs. Specifically, many people aged 65 years and older live alone. In Downey, 12,552 residents are 65 years and older, representing 11.4 percent of the population. For residents 65 years and older, 9.5 percent live in poverty.

Along with an aging population, Downey is becoming more diverse racially and ethnically. Hispanic residents make up most of the City's population. Over 60% of residents speak a language other than English in the home, with 55.4% of residents speaking Spanish. 20.6% of residents speak English less than very well. Response and recovery efforts may be more challenging for those who do not speak English well even though the city has made continued efforts to provide resources to ensure all population needs are met.

Extremely low-income (ELI) is defined as households with income less than 30 percent of area median income (AMI). 13.8 percent of the City's total households (4,525 households) are classified as extremely low income, and may have greater difficulty recovering from a major earthquake.

Table 3.33: Vulnerability and At-Risk Populations: Earthquake

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents

Vulnerability and At-Risk/Underserved Category	Count	Percent
Language other than English	70,341	64% of residents
Spanish Spoken at Home	60,889	55.4% of residents
Speak English less than very well	22,641	20.6% of residents
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count
Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services		

Property:

An earthquake impacts property damage and critical infrastructure of the city by potentially damaging or destroying buildings, infrastructure, power transmission lines, and more. All of Downey, including all critical facilities, and residential building units fall within areas with the potential for violent ground shaking. The northern tip of the city is prone to the highest potential for shaking.

The greatest potential danger is the collapse of older residential units constructed from unreinforced masonry and explosions of petroleum and fuel lines. The State Division of Mines and Geology has designated the entire city as a liquefaction zone; the city requires geotechnical reports for construction projects.

Based upon observations and experiences of the Code Enforcement Division, the City estimates that in 2020, fewer than 25 housing units were in severe need of replacement or substantial rehabilitation due to housing conditions. These units, for example, may be suffering from neglect and these buildings may be structurally unsound. These structures may be at greater risk of a seismic event. This does not include homes or structures that need more traditional rehabilitation such as repairs to maintain a safe and healthy living environment.

Earthquakes pose numerous risks to critical facilities and infrastructure. Risks, or the harm or losses, that are likely to result from exposure to earthquakes and liquefaction include:

- Damage to property, especially older buildings that predate improvements to building codes that occurred in the 1970s. The 2014 earthquake that impacted Napa demonstrated that structures built before 1950 sustained the most damages.
- Fire from broken gas lines and power lines
- Flooding from damaged levees, of which the majority of the city is in a levee protected area
- Casualties (fatalities and injuries) from falling debris or secondary hazards

- Utility outages
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.
- Indirect economic losses, such as income lost during the downtime that results from damage to private property or public infrastructure
- Roads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs

Table 3.34: Property Vulnerability to Earthquake

Vulnerable Category	Count	Percent
Structures Built before 1960	17,847	More than 50% of occupied housing units
Source: US Census Bureau 2022 ACS		

Table 3.35: Assets/Structures Vulnerability and Impact Summary: Earthquake

Note: No major assets reside in the northern tip of the city susceptible to the highest risk of ground shaking.

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Airport* (No major airports in Downey)	0	0	There are no major airports in Downey
Bridges	31	100%	Based on National Bridge Inventory and a Place Code designating Downey as the location
Government (City Hall and Public Works)	2	100%	
Columbia Memorial Space Center	1	100%	
Hospitals	3	100%	
Major Shopping Centers	5	100%	
National Register of Historic Places	2	100%	
Library	1	100%	

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Schools	28	100%	The Downey Unified School District is comprised of 13 elementary schools, 4 middle schools, 3 high schools, and an adult school. Other private institutions and academies also exist in the city.
Fire Stations	4	100%	
Police Stations	1	100%	
Wells	20	100%	
Lift Stations	2	100%	
Source: Los Angeles County Assessors, National Bridge Inventory, City of Downey			

Economic: An earthquake impacts the economy of the city by either disrupting or destroying various businesses and/or services for the duration of, and after the event. Earthquakes can have a severe impact on local and regional economies. Another economic impact of an earthquake is the economic losses as a result of transportation and utility lifeline losses and the direct repair cost for each component. The debris removal required following an earthquake may also generate economic effects on the city.

Changes in Development and Future Development:

An earthquake impacts the changes in development and impact of future development for the city by potentially damaging current, in-progress developments, and reducing the prospect of future developments in terms of potential investors.

Downey is located within the Southern California region which is experiencing significant change. Addressing these changes is a challenge for any community, but more so for Downey since most of this city was primarily developed during the time period of the 1950s and 1960s. Buildings and infrastructure have also matured. The mature status of the city creates opportunities for reinvestment and revitalization. It may also be an opportunity to save and renovate structures that are important to the history of the city. The current development standards contained in the Downey municipal code were adopted in 1977. Although some sections have been amended since then, most sections are in the need of updating to reflect changes in zoning and planning trends over the past 25 years.

Growth over the past decade has been modest. Between 2010 and 2020, as reported by the U.S. Census, the population of Downey grew approximately 0.9 percent, from 111,922 to 112,901 residents. The Southern California Association of Governments (SCAG) growth forecasts predict a steady increase in population through 2045. From 2020 to 2045, SCAG projects that the City's population will grow by 5.6 percent. The projected growth largely is tied to anticipated increases in housing production, which has not been a factor for the last decade. This projected population growth and increase in homes increases the City's exposure to earthquakes.

Climate Change: Current research does not indicate a reliable connection between climate change and earthquakes.[54]

FEMA NRI Expected Annual Loss Estimates

An earthquake NRI Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to earthquakes when compared to the rest of the United States. The Expected Annual Loss score is positively associated to a community's risk; therefore, a higher Expected Annual Loss score results in a higher Risk Index score. The table below outlines the earthquake Expected Annual Loss for the City of Downey planning area.

Table 3.36: Earthquake Expected Annual Loss

Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$221.9K	$454.6K	N/A	$676.4K	89.21	Relatively High
550502	$213.1K	$851.3K	N/A	$1.1M	93.14	Relatively High
550601	$305.6K	$618.5K	N/A	$924.1K	91.88	Relatively High
550602	$399.7K	$909.9K	N/A	$1.3M	94.75	Relatively High
550700	$530.6K	$1.1M	N/A	$1.6M	96.18	Relatively High
550801	$427.1K	$997.2K	N/A	$1.4M	95.39	Relatively High
550802	$235.9K	$494.4K	N/A	$730.3K	89.84	Relatively High
550901	$1.1K	$1.8M	N/A	$2.8M	98.65	Very High
550902	$393.0K	$935.0K	N/A	$1.3M	94.85	Relatively High
551001	$336.5K	$1.1M	N/A	$1.4M	95.27	Relatively High
551002	$267.9K	$460.7K	N/A	$728.5K	89.82	Relatively High

[54] NASA. Global Climate Change. (2019). Can Climate Affect Earthquakes, Or Are the Connections Shaky? Retrieved from https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/

Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
551101	$804.4K	$3.0M	N/A	$3.8M	99.27	Very High
551102	$1.0M	$2.8M	N/A	$3.8M	99.28	Very High
551201	$339.9K	$679.1K	N/A	$1.0M	92.78	Relatively High
551203	$314.2k	$396.8K	N/A	$711.1K	89.63	Relatively High
551204	$315.4K	$470.2K	N/A	$785.6K	90.48	Relatively High
551300	$1.3M	$3.0M	N/A	$4.3M	99.43	Very High
551401	$247.6K	$566.0K	N/A	$813.6K	90.77	Relatively High
551402	$335.4K	$788.9K	N/A	$1.1M	93.58	Relatively High
551501	$423.6K	$759.2K	N/A	$1.2M	94.02	Relatively High
551502	$305.7K	$662.9K	N/A	$968.6K	92.30	Relatively High
551700	$323.9K	$594.1K	N/A	$918.0K	91.83	Relatively High
551801	$510.4K	$887.9K	N/A	$1.4M	95.27	Relatively High
551802	$389.3K	$638.5K	N/A	$1.0M	92.84	Relatively High
553400	$210.5K	$407.1K	N/A	$617.6K	88.46	Relatively High
980012	$277.3K	$1.3M	N/A	$1.6M	96.08	Relatively High
Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)						

3.11 Hazardous Materials Release Hazard Profile

Table 3.37: Hazardous Materials Release Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Hazardous Materials Release	2	8	10	32	50	**53**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.11.1 Hazardous Material Release Hazard Description

Per 49 CFR, a hazardous materials release incident can be defined as one (1) of the following:

- An unintentional release of a hazardous material or the discharge of any quantity of hazardous waste.
- A specific cargo tank with a capacity of 1,000 gallons or greater containing any hazardous materials suffers structural damage to the landing retention system or damage that requires repair to a system intended to protect the landing retention system, even if there is not a hazardous materials release.
- An undeclared hazardous material is discovered.
- A fire, violent rupture, explosion, or dangerous evolution of heat occurs as a direct result of battery or battery-powered device.

Hazardous material is defined by the National Fire Protection Association (NFPA) 472 (Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents), as a matter (solid, liquid, or gas) or energy that when released is capable of creating harm to people, the environment, and property, including weapons of mass destruction, as defined in 18 United States Code (USC), Section 2332(a), as well as any other criminal use of hazardous materials, such as illicit labs, environmental crimes, or industrial sabotage. There are several ways in which hazardous materials are categorized. The Department of Transportation (DOT) organizes substances in nine (9) categories, outlined in the table below. The NFPA categorizes hazards by the severity of the hazards in three (3) principal categories – health, flammability, and instability.[55]

Table 3.38: US Department of Transportation Hazard Classification System

Class	Substance
1	Explosives
2	Gases
3	Flammable Liquids (and combustible liquids)
4	Flammable solids, substances liable to spontaneous combustion, substances which, on contact with water, emit flammable gases
5	Oxidizing substances and organic peroxides
6	Toxic (poisonous) substances
7	Radioactive Materials
8	Corrosive Substances
9	Miscellaneous dangerous goods/hazardous materials and articles

The U.S. Environmental Protection Agency is responsible for regulating hazardous materials, but when transported in commerce, it is regulated by DOT. EPA regulations address hazardous substances and extremely hazardous substances. EPA chooses to specifically list hazardous substances and extremely hazardous substances rather than providing objective definitions. Hazardous substances, as listed, are generally materials that, if released into the environment, tend to persist for long periods and pose long-term health hazards for living organisms. They are primarily chronic, rather than acute health hazards.[56] Regulations require that spills of these materials into the environment in amounts at or above their individual reportable quantities must be reported to the EPA. Extremely hazardous substances, on the other hand, while also generally

[55] Federal Emergency Management Agency. (2019). Hazardous Materials Incidents: Guidance for State, Local, Tribal, Territorial, and Private Sector Partners. Retrieved from https://www.fema.gov/sites/default/files/2020-07/hazardous-materials-incidents.pdf.
[56] City of Stillwater, Oklahoma. (n.d.). Hazardous Material Hazard. Retrieved from https://storymaps.arcgis.com/stories/c413b8e41bd34a6fb82ecad4efa45b73

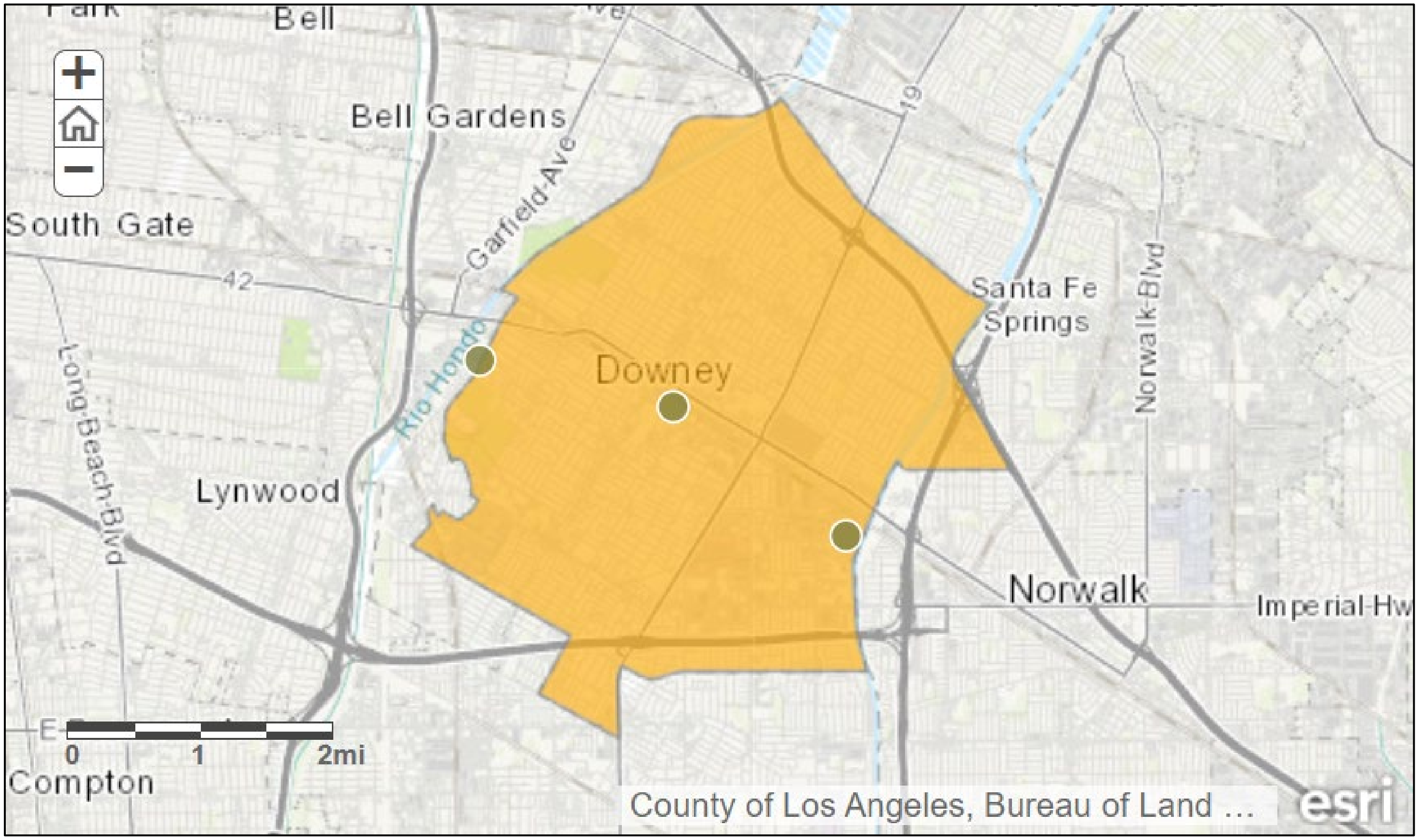
toxic materials, are acute health hazards that, when released, are immediately dangerous to the life of humans and animals as well as causing serious damage to the environment. There are currently 355 specifically listed extremely hazardous substances listed along with their individual Threshold Planning Quantities (TPQ).[57] When facilities have these materials in quantities at or above the TPQ, they must submit Tier II information to appropriate state and/or local agencies to facilitate emergency planning.[58]

According to reports obtained through the Toxic Release Inventory (TRI) Program, there are thousands of hazardous material release events annually that contaminate air, soil, and groundwater resources. These events can potentially trigger millions of dollars in clean-up costs, human and wildlife injuries, and in some cases human deaths.

[57] Texas Commission on Environmental Quality. (n.d.). Chemical Reporting for Tier II. Retrieved from https://www.tceq.texas.gov/permitting/tier2/hazardous-chemical-information

[58] National Archives. (n.d.). Code of Federal Regulations, Part 370 – Hazardous Chemical Reporting: Community Right-To-Know. Retrieved from https://www.ecfr.gov/current/title-40/chapter-I/subchapter-J/part-370.

Figure 3.17: Map of Toxic Release Inventory[59] Facilities in the City of Downey



[59] US EPA (n.d.) 2021 TRI Factsheet City of Downey, CA. Retrieved from https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet?pYear=2021&pstate=CA&pcity=downey&pParent=NAT.

Accidents which result in chemical clouds or release of hazardous materials into public water or sewer systems may affect outlying neighborhoods or the community at large. Depending upon the scale of the release, large segments of the residential and business populations may need to be evacuated quickly for extended periods of time. Effective emergency planning with regard to hazardous materials, therefore, requires the concerted efforts of the Fire and Police Departments as well as other public safety officials and Non-Government Organizations (NGOs) such as American Red Cross. Hazardous material releases may occur from any of the following:

Table 3.39: Types of Hazardous Material Incidents

Fixed-Site	Includes all releases involving the production, manufacturing, handling, and storage of hazardous products at a facility and releases that occur at designated hazardous waste disposal sites.
Transportation	Includes releases that occur while products are in transit from one facility to another or enroute to a designated hazardous waste disposal site. Main concerns for the City include the U.S. Interstates 5, 605, and 105 highways.
Intentional Spills and Releases	Includes all criminal acts and acts of terrorism in which a hazardous material is used to intentionally cause injuries and/or fatalities, damage the environment and/or property, or advance a political or social agenda. Further detail on acts of terrorism can be found in the Adversarial/ Human-Caused Events section of this document.

In response to concerns over the environmental and safety hazards posed by the storage and handling of toxic chemicals, Congress passed the Emergency Planning and Community Right to Know Act (EPCRA) in 1986. To reduce the likelihood of hazardous material releases, EPCRA established specific requirements on federal, state, and local governments, Indian tribes, and industry to plan for hazardous materials emergencies. EPCRA's Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities working with facilities can use the information to improve chemical safety and protect public health and the environment. Under EPCRA, hazardous materials must be reported to the EPA, even if they do not result in human exposure.

Recognizing the inherent dangers associated with the utilization of hazardous substances, the California State Legislature has enacted several laws regulating the use and transport of identified hazardous materials. In particular, Chapter 6.95 of the Health and Safety Code requires all businesses using these materials to inform local government agencies of the types and quantities of materials stored on site. This disclosure enables emergency response agencies to respond quickly and appropriately to accidents involving dangerous substances. Chapter 6.95 of the

California Health and Safety Code and Title 19 of the California Code of Regulations describe the requirements for chemical disclosure, business emergency plans, and community right-to-know programs. According to these State requirements, a business that uses or handles hazardous materials in amounts equal to or greater than 55 gallons, 500 pounds or 200 cubic feet at any time must prepare a business emergency plan and chemical inventory. Inventories must be updated annually, and business plans must be updated every two years. The chapter also incorporated certain requirements from Federal Superfund Amendments and Reauthorization Act (SARA) Title III for chemicals designated as acutely hazardous. These regulations also apply to industrial accidents, refinery explosions and incidences of high-volume releases.

Critical Assets (Road)

Critical assets that would be impacted by a hazmat road incident are listed in the following table and corresponding map. A ½ mile zone extending outside of the roadways is outlined alongside primary road routes (impact area). This indicates what assets/locations are potentially at risk if a hazmat incident occurs along the roadway. Critical assets include but are not limited to fire stations, government facilities, hospitals, other medical facilities, police stations, retirement homes, and schools. These and additional assets are listed in the following table.

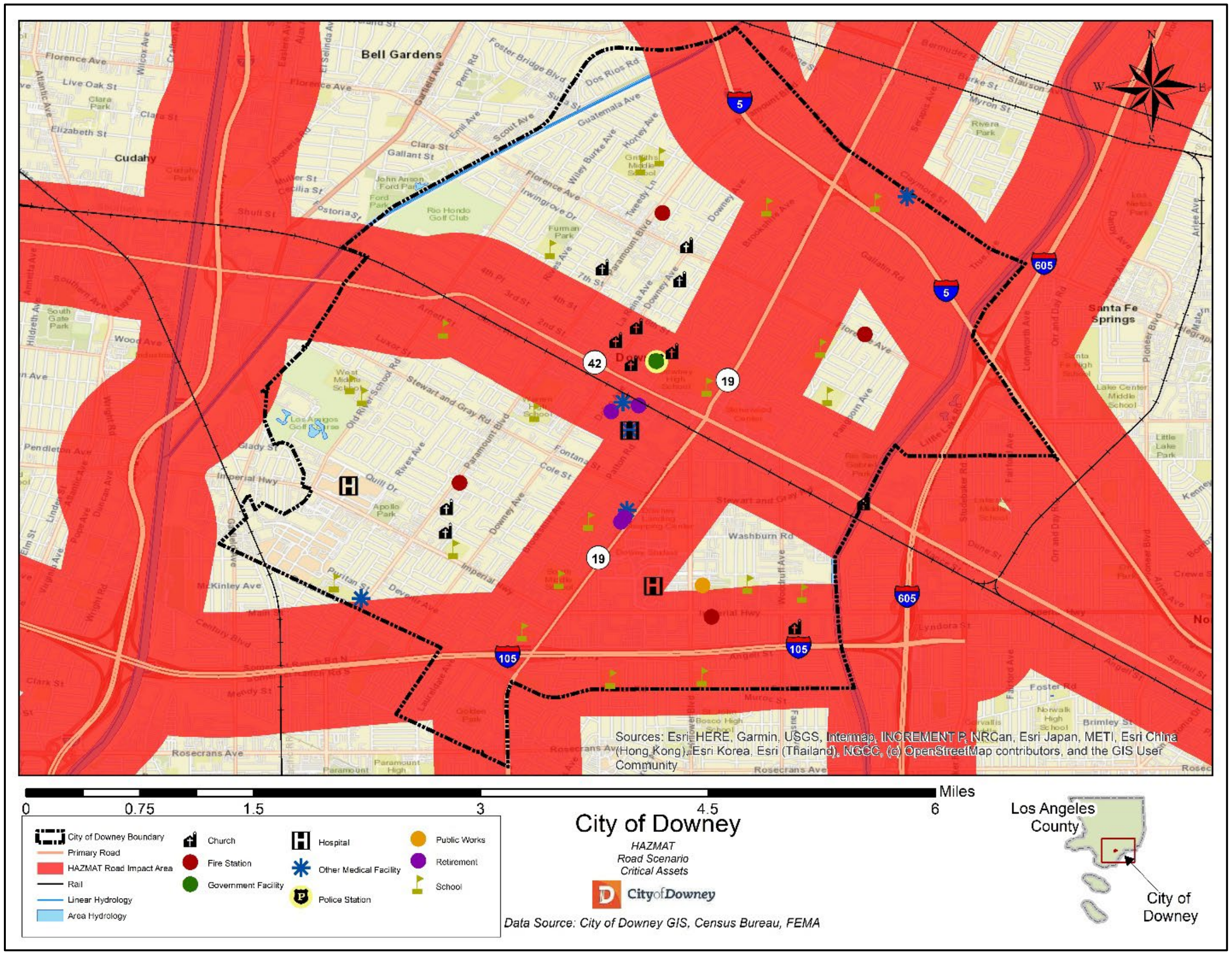
Table 3.40: Critical Assets within Road Impact Zone

Category	Facility	Address	Districts
Apartment	Regency Terrace	11410 Dolan	District 61
Apartment	Park Regency	10000 Imperial Hwy	District 62
Bridge	San Gabriel River bridge at Firestone	San Gabriel River bridge at Firestone	District 64
Church	Calvary Chapel	12808 Woodruff Ave	District 62
Church	Our Lady of Perpetual Help	10727 Downey Ave.	District 63
Church	Legacy Church	8348 3rd St.	District 63
Church	Downey First Christian Church	10909 New St.	District 63
Church	First Church of Christ Downey	8454 5th St.	District 63
Church	Downey Memorial Christian church	8841 Florence Ave.	District 64
Fire Station	Fire Station 2	9556 Imperial Hwy	District 62
Government Facility	City Hall	11111 Brookshire Ave.	District 63
Hospital	Kaiser Hospital / Medical Center	9333 Imperial Hwy.	District 62

Category	Facility	Address	Districts
Hospital	PIH Downey	11500 Brookshire Ave.	District 61
Hotel	Embassy Suites	8425 Firestone Blvd.	District 63
Hotel	Country Inn	11111 Myrtle	District 63
Library	Library	11121 Brookshire Ave.	District 63
Metro Green Line	Metro Green Line at Lakewood (Check down tracks in both directions)	Metro Green Line at Lakewood (Check down tracks in both directions)	District 62
Other Medical Facility	Downey Community Health Center	8425 Iowa	District 61
Other Medical Facility	Downey Regional Medical Center	11500 Brookshire	District 62
Other Medical Facility	Lakewood Park Health	12023 Lakewood Blvd.	District 62
Other Medical Facility	Sunbridge Care Center	9300 Telegraph	District 64
Overpass	105 Fwy overpass at Lakewood	105 Fwy overpass at Lakewood	District 62
Overpass	105 Fwy overpass at Columbia	105 Fwy overpass at Columbia	District 62
Overpass	105 Fwy overpass at Bellflower	105 Fwy overpass at Bellflower	District 62
Overpass	105 Fwy overpass at Dunrobin	105 Fwy overpass at Dunrobin	District 62
Overpass	105 Fwy overpass at Woodruff	105 Fwy overpass at Woodruff	District 62
Overpass	5 Fwy overpass at Paramount	5 Fwy overpass at Paramount	District 63
Overpass	5 Fwy overpass at Lakewood	5 Fwy overpass at Lakewood	District 64
Overpass	Pedestrian overpass at Buhman	Pedestrian overpass at Buhman	District 64
Overpass	605 Fwy overpass at Florence	605 Fwy overpass at Florence	District 64
Parking Garage	Parking structure	8201 2nd St.	District 63
Police Station	Police Station	10911 Brookshire Ave.	District 63
PRIORITY 1	All American	7201 Firestone Blvd.	District 63
Retirement	Downey Retirement	11500 Dolan	District 61
Retirement	Brookshire Manor	11410 Brookshire	District 62
Retirement	Lakewood Manor	12045 Lakewood Blvd.	District 62
Retirement	Lakewood Gardens	12055 Lakewood Blvd.	District 62

Category	Facility	Address	Districts
School	Williams Elementary School	7530 Arnette	District 61
School	Alameda School	8613 Alameda	District 62
School	Sussman Middle School	12500 Birchdale	District 62
School	Downey Adult School	12330 Woodruff	District 62
School	Carpenter Elementary School	9439 Foster	District 62
School	Lewis Elementary School	13220 Bellflower Blvd.	District 62
School	Ward Elementary School	8851 Adoree	District 62
School	Gallatin Elementary School	9513 Brookshire	District 63
School	Unsworth Elementary School	9001 Lindsey	District 64
School	East Middle School	10301 Woodruff	District 64
School	Downey High School	11040 Brookshire Ave.	District 64
Store	Downey Landing	12020 Lakewood Blvd.	District 62
Store	Home Depot	7121 Firestone Blvd.	District 63
Store	Stonewood Mall	251 Stonewood	District 64
Theater	Downey Civic Theater	8435 Firestone Blvd.	District 63
Theater	Old Downey Theater (URM)	11028 Downey Ave.	District 63
Theater	Kirkorian Theater	8200 3rd St.	District 63
Tunnel	Pedestrian tunnel at Bangle	Pedestrian tunnel at Bangle	District 63

Figure 3.18: Hazmat Road Review Critical Assets



Critical Assets (Rail)

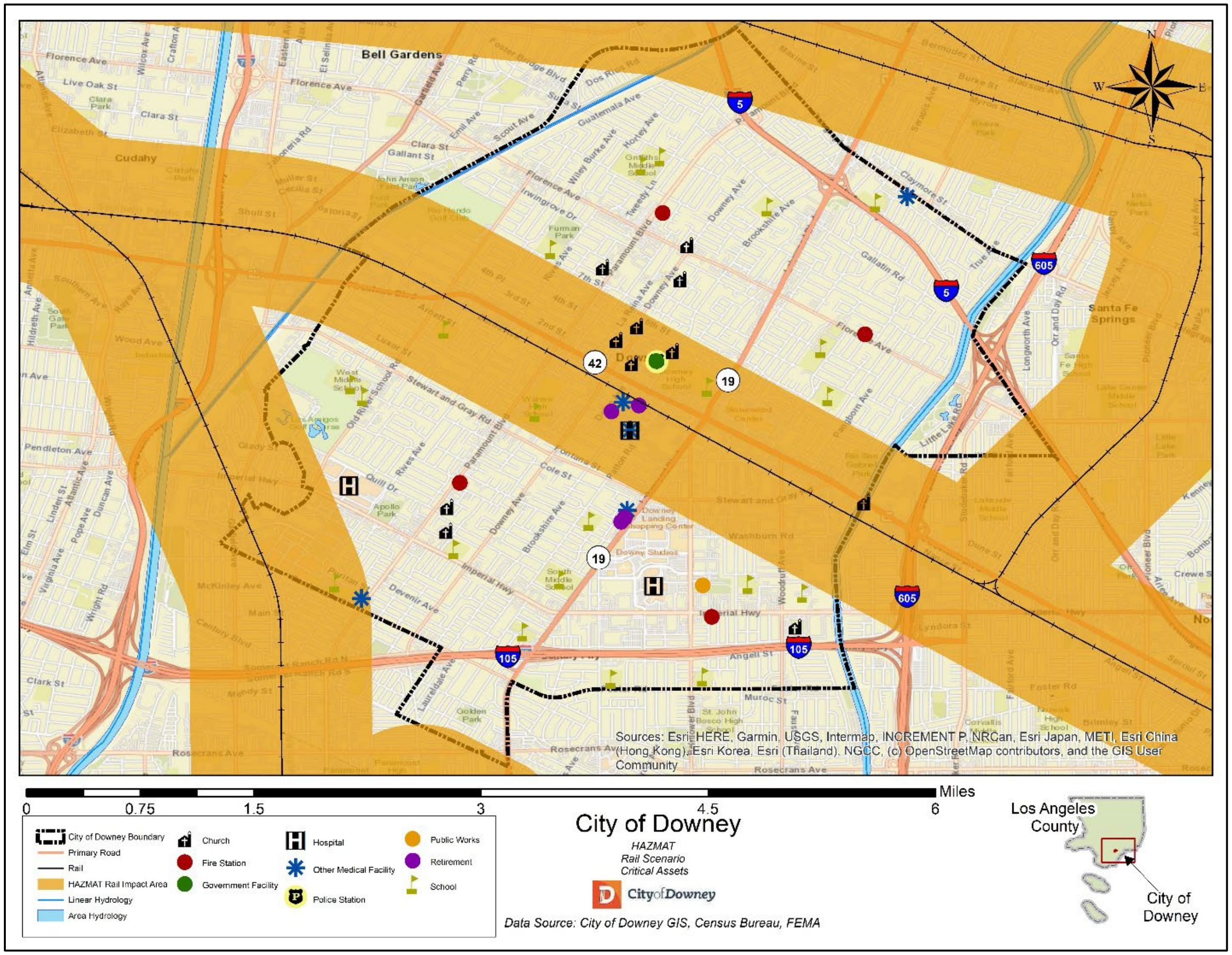
Critical assets that would be impacted by a hazmat rail incident are listed in the following table and corresponding map. A ½ mile area extending outside of the railways is outlined alongside primary rail routes (impact area). This indicates what assets/locations are potentially at risk if a hazmat incident occurs along the railway. Critical assets include but are not limited to fire stations, government facilities, hospitals, other medical facilities, police stations, retirement homes, and schools. These and additional assets are listed in the following table.

Table 3.41: Critical Assets Within Rail Impact Zone

Category	Facility	Address	Districts
Apartment	Regency Terrace	11410 Dolan	District 61
Church	Our Lady of Perpetual Help	10727 Downey Ave.	District 63
Church	Legacy Church	8348 3rd St.	District 63
Church	Downey First Christian Church	10909 New St.	District 63
Church	First Church of Christ Downey	8454 5th St.	District 63
Church	Downey Memorial Christian church	8841 Florence Ave.	District 64
Government Facility	City Hall	11111 Brookshire Ave.	District 63
Hospital	PIH Downey	11500 Brookshire Ave.	District 61
Hotel	Embassy Suites	8425 Firestone Blvd.	District 63
Hotel	Country Inn	11111 Myrtle	District 63
Library	Library	11121 Brookshire Ave.	District 63
Other Medical Facility	Downey Community Health Center	8425 Iowa	District 61
Other Medical Facility	Downey Regional Medical Center	11500 Brookshire	District 62
Other Medical Facility	Downey Care Center	13007 Paramount	District 61
Overpass	605 Fwy overpass at Florence	605 Fwy overpass at Florence	District 64
Parking Garage	Parking structure	8201 2nd St.	District 63
Police Station	Police Station	10911 Brookshire Ave.	District 63
PRIORITY 1	All American	7201 Firestone Blvd.	District 63
Retirement	Downey Retirement	11500 Dolan	District 61
Retirement	Brookshire Manor	11410 Brookshire	District 62
School	Warren High School	8141 DePalma	District 61

Category	Facility	Address	Districts
School	Williams Elementary School	7530 Arnette	District 61
School	St Matthias High School	7851 Gardendale.	District 61
School	Downey High School	11040 Brookshire Ave.	District 64
Store	Downey Landing	12020 Lakewood Blvd.	District 62
Store	Home Depot	7121 Firestone Blvd.	District 63
Store	Stonewood Mall	251 Stonewood	District 64
Theater	Downey Civic Theater	8435 Firestone Blvd.	District 63
Theater	Old Downey Theater (URM)	11028 Downey Ave.	District 63
Theater	Kirkorian Theater	8200 3rd St.	District 63
Tunnel	Pedestrian tunnel at Bangle	Pedestrian tunnel at Bangle	District 63

Figure 3.19: Hazmat Rail Review Critical Assets



3.11.2 Hazardous Material Release Hazard History

From January 2016 until May 7, 2023, in the City of Downey, there were 19 hazardous materials incident reports filed with the U.S. Department of Transportation (DOT). Both incidents involved a forklift puncturing drum. On October 12, 2018, the clean-up cost of 40 liquid gallons of tetrachloroethylene was $3,300 while on November 8, 2018, there was not a clean-up cost, but the response to the spill of 10 gallons of UN1263 Acetone 192 was $5,500.

2012 Richmond Refinery Fire

On August 6, 2012, a piping segment at the Number 4 Crude Unit at a Chevron refinery in Richmond, California, failed, resulting in the release of hydrocarbons. The hydrocarbon vapor cloud then ignited, resulting in a large, uncontrolled fire. The fire burned for several hours before being contained later that night. The picture below illustrates the smoke plume from the fire.

Although no fatalities resulted from the fire, according to the final investigation report completed by the U. S. Chemical Safety Board (CSB), more than 15,000 residents in the vicinity of the refinery sought medical treatment for respiratory irritation. The incident inundated local emergency response agencies and interrupted local operation of the Bay Area Rapid Transit (BART). Although the 2012 Richmond Refinery Fire did not impact the City, the incident illustrated the potential major impacts to residential area that a release of this magnitude could have on the City.

2016 Maywood Fire

On June 14, 2016, a fire erupted from a plastics facility in Maywood, California in the 3700 block of Fruitland Avenue, the location of Gemini Film & Bag. The fire spread to Panda International Trading Company (PITC), a nearby metal recycling yard, which resulted in an explosion. The explosion sent smoke and fine metal particles into the air causing the evacuation of hundreds of nearby homes and businesses. The fire, fueled by magnesium from PITC, burned for more than 30 hours. In the ensuing days after the fire, firefighters washed down homes, sidewalks, and cars to remove residue from the facility which posed potential health risks to residents. The EPA tested indoor samples from 43 homes and apartments nearest the fire. Preliminary test results indicated the presence of chromium, zine, copper, and magnesium, with some metals turning up at high levels.

3.11.3 Hazardous Material Release Hazard Probability, Frequency, and Magnitude

While the City has never experienced a large-scale release, hazardous material emergencies are possible during transportation on all routes and from the release of toxic or flammable chemicals.

Highways

Although vehicles transporting hazardous materials in commerce are subject to the strict guidelines of the Department of Transportation's Hazardous Material Regulation (HMR), U.S. Interstates 5, 605, and 105 remain vulnerabilities within the City's limits due to the volume of traffic and the nature of the materials transported. According to the City's 2011 Commodity Flow Study, a chemical release is more likely to occur on one of the freeways mentioned above rather than the City streets. In the event of a release on the freeway, the California Highway Patrol (CHP) will have ultimate responsibility with the City Fire Department providing support as necessary.

Rail

In addition, the Union Pacific railroad traverses though the southwest portions of the City. According to the City's 2011 Commodity Flow Study, Union Pacific transports an extensive volume of goods though the Intermodal Container Transfer Facility, which is located approximately five miles from both Port of Los Angeles and the Port of Lon Beach. In utilizing a facility so close to the City of Downey, the rail traffic that traverses the City is frequent, increasing the potential for a release within the City borders. Should a chemical spill occur while the train is in transit, there is a chance it could bisect the City and impede several access routes. Given there are two fire stations on each side of the railroad, this condition is unlikely to adversely affect proper response to a release event.

Pipelines

Numerous petroleum product producers with large storage facilities maintain hundreds of miles of pipelines throughout the county. Figures 3.21 and 3.22 illustrate the major pipelines that run through the City.

Air

There are no airports within the City limits; however, the Los Angeles County airspace is among the busiest in the nation. Hazardous materials may be transported by air over Downey to destinations at Long Beach or Los Angeles Airports. Since air transports fly over Downey the risk of an event occurring as the result of an air accident is possible at any time.

The ongoing use, production, and transportation of hazardous materials throughout the City poses a constant and real threat to the safety of the community. An accidental release of a hazardous substance into the environment has the potential to cause localized or widespread upset.

The City of Downey maintains some direct response capability, but as stated in the City’s 2011 Commodity Flow Study, through the City’s Memorandum of Understanding the City relies on neighboring communities to provide proper hazardous material release response capability. The City of Downey can provide scene management, incident command, and evacuation support in the event of a release.

While there is currently no mechanism to assign a true probability of a fixed-site or transportation hazardous material emergency, it is important to consider a relatively high likelihood of occurrence and conduct planning and training accordingly. Additional information regarding these facilities or other hazardous materials handlers in the City can be obtained by contacting the Downey Fire Department Hazardous Materials Specialist.

Figure 3.20: City of Downey Natural Gas Transmission Pipeline Map

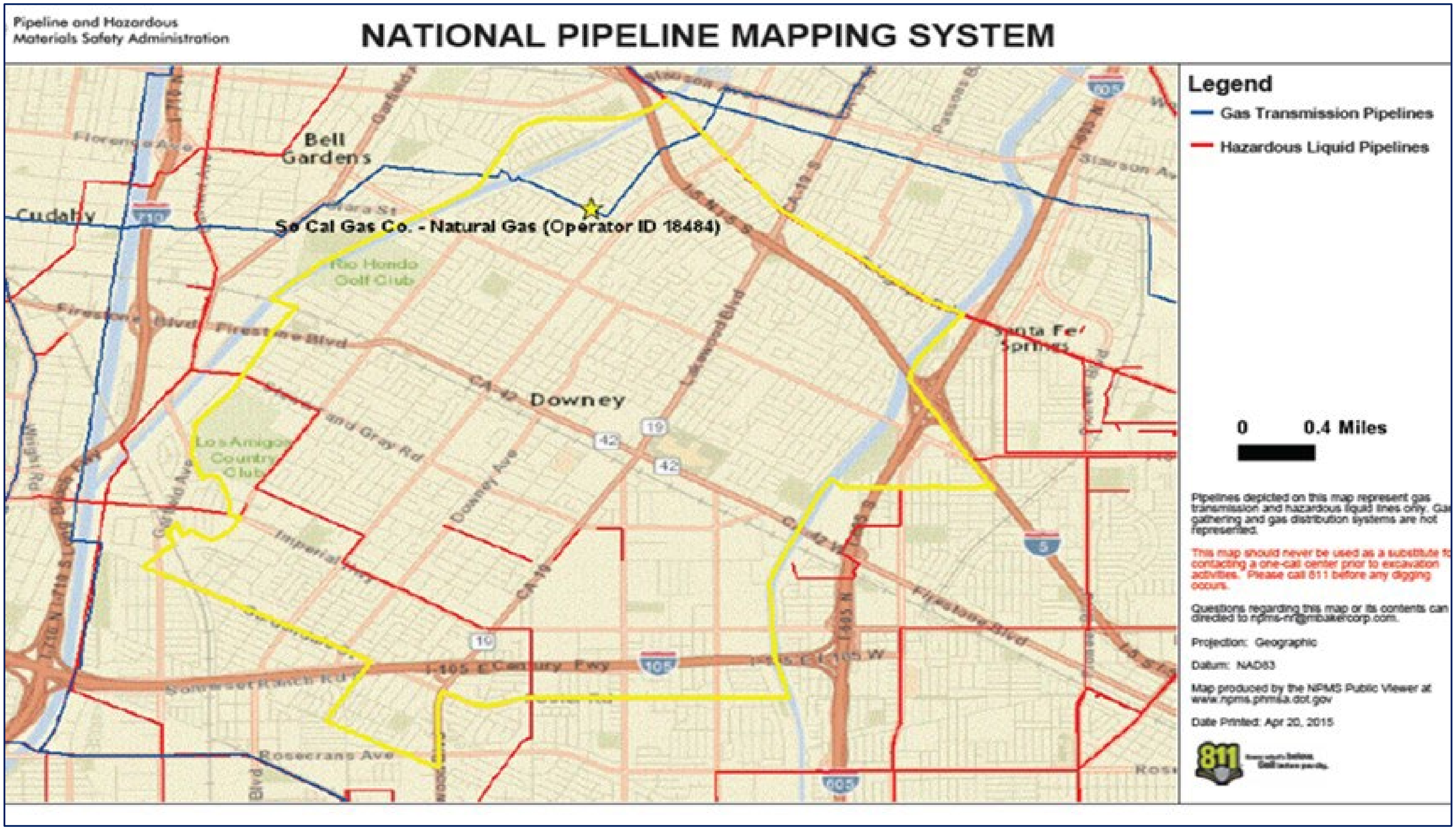
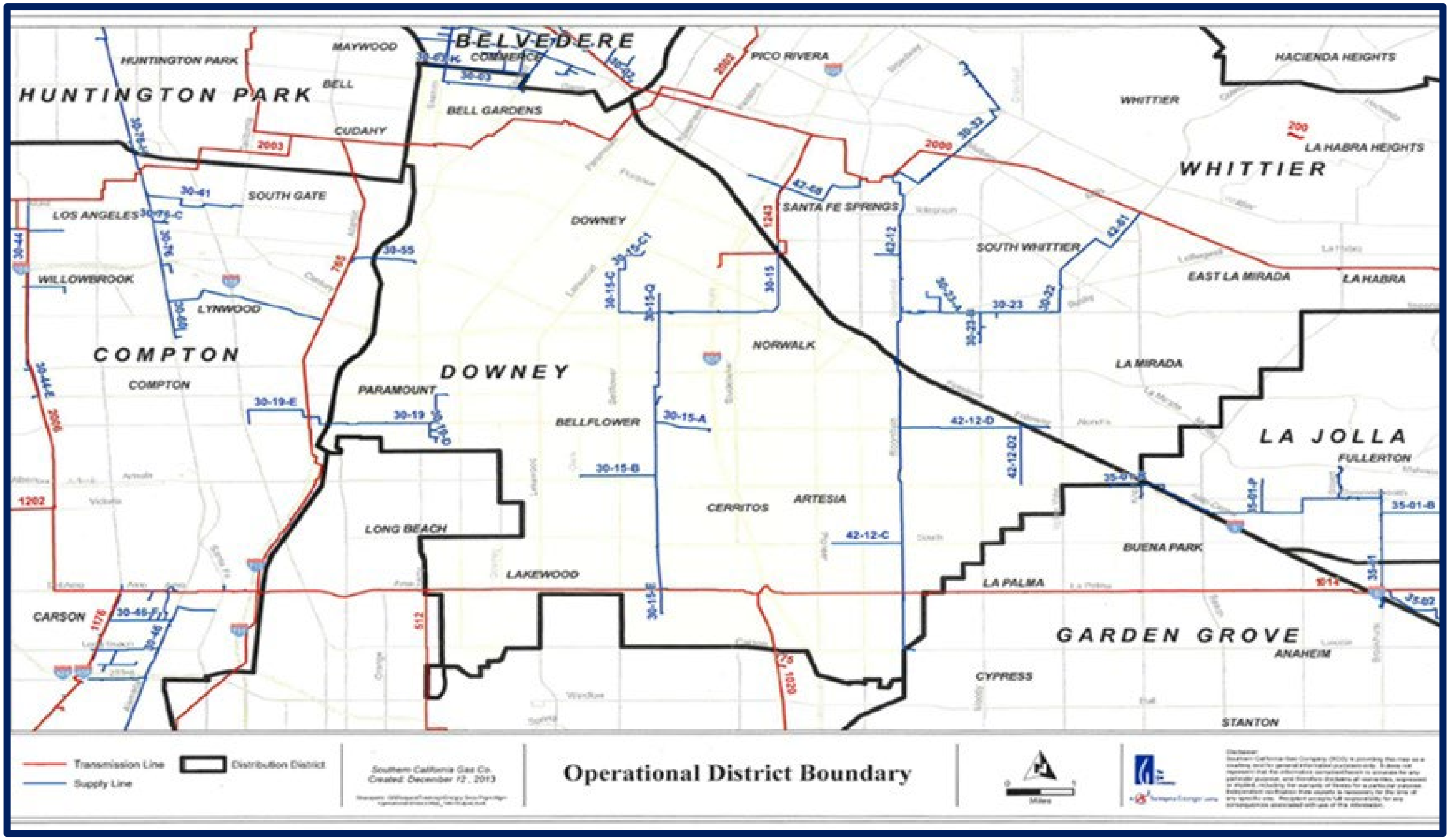


Figure 3.21: City of Downey Natural Gas Transmission/ Supply Pipeline Map



Hazardous materials releases can often have a devastating effect on the local air and land. Although low amounts of radiation are naturally found in nature, excess amounts can be devastating to the environment. Besides human injury caused by these releases, wildlife and their habitat can often be damaged long term. Certain releases can spark fires that damage the landscape. A hazardous substance released onto the land or water can severely contaminate and impact both land and marine-based ecosystems.

Vulnerability and Impacts

A hazardous materials release can impact the life safety and health of the city by directly threatening the public within the event area. Chemicals and substances released during a hazardous materials incident can cause significant injury or death. A hazardous materials release impacts property damage and critical infrastructure of the city by either restricting access to property and infrastructure, or potentially rendering the area unusable until cleanup takes place. A hazardous materials release impacts the economy for the city by shutting down businesses in the affected areas, potentially long-term. A hazardous materials release impacts the changes in development and impact of future development for the city by forcing the cessation of current development within the affected area or causing future developments to be relocated due to contamination. A hazardous materials release impacts underserved and at-risk populations of the city by restricting public transportation routes at or nearby the affected area and causing essential services to not be as readily accessible including water and healthcare. The effects of climate change in severity of impact for a hazardous materials release for the City is increasing the likelihood of a release due to climate-driven floods, storms, and wildfires.[60]

[60] U.S Government Accountability Office. (2022). Chemical Accident Prevention. EPA Should Ensure Regulated Facilities consider Risks from Climate Change. Retrieved from https://www.gao.gov/products/gao-22-104494

3.12 Pandemic Hazard Profile

Table 3.42: Pandemic Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Pandemic	1	12	16	32	60	**34**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.12.1 Pandemic Hazard Description

An outbreak of an infectious disease that spreads across a large region is commonly referred to as a pandemic. For example, a flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. The disease spreads easily from person-to-person, causing serious illness, and sweeps across regions quickly.

As stated in the Los Angeles County Pandemic Influenza Plan, “compared to other natural infectious health threats, pandemic flu has great potential to cause large-scale social disruption.” Also, according to the Department of Health and Human Services, an especially severe influenza pandemic could lead to “high levels of illness, death, social disruption, and economic loss.” Impacts can range from the closure of schools and businesses to interruptions of basic services such as public transportation and food delivery. Additionally, a substantial percentage of the population would require some form of medical treatment.

Health care facilities may be overwhelmed, resulting in shortages of hospital staff, beds, ventilators, and other medical supplies.

In order to define and prepare for an influenza pandemic, the World Health Organization (WHO) has developed a global influenza preparedness plan, which defines the stages of a pandemic, outlines the role of WHO, and makes recommendations for national measures before and during a pandemic. The pandemic phases are detailed below:

Interpandemic period:

- Phase 1: No new influenza virus subtypes have been detected in humans.
- Phase 2: No new influenza virus subtypes have been detected in humans, but an animal variant threatens human disease.

Pandemic alert period:

- Phase 3: Human infection(s) with a new subtype but no human-to-human spread.
- Phase 4: Small cluster(s) with limited localized human-to-human transmission.
- Phase 5: Larger cluster(s) but human-to-human spread still localized.

Pandemic period:

- Phase 6: Pandemic: increased and sustained transmission in general population.

3.12.2 Pandemic Hazard History

There have been several major pandemics that have resulted in many fatalities in the past, including COVID-19. Although the likelihood of a catastrophic outbreak has diminished in 2023, several notable events have posed serious concerns to health care professionals.

COVID-19 Pandemic

COVID-19 is a new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes respiratory illness in humans and can be spread from person to person through respiratory droplets. These droplets are released when someone infected with the disease sneezes, coughs, or talks. Infectious droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. COVID-19 was declared a public health emergency (PHE) nationwide on January 21, 2020. The pandemic began in Wuhan, China in December 2019 and quickly spread around China and the world.

Symptoms may appear 2–14 days after exposure, or there may be no symptoms at all (asymptomatic). Symptoms vary from mild to severe and can include headache, loss of smell and taste, nasal congestion, runny nose, cough, sore throat, muscle pain, fever, fatigue, diarrhea, and breathing difficulties. Complications from more severe symptoms can lead to further life-threatening illnesses, such as pneumonia or hypoxia.

The first instance of the coronavirus outbreak began in December 2019. There are now several variants of the virus throughout the world and the state of California. The most common variant in 2022 was the Omicron variant. Other variants include Alpha, Beta, Delta, Epsilon, Gamma, Iota, and Mu.[61]

The World Health Organization reports that there have been 765,222,932 confirmed cases of COVID-19 (as of May 3,2023) with 6,921,614 deaths worldwide. According to the Center for Disease Control and Prevention (CDC), as of April 2023, more than 104,335 cases of COVID-19 have been reported in the United States with more than 1,129,570 deaths.[62]

According to the California Department of Public Health, as of May 4, 2023, there have been 11,245,575 total cases of COVID-19 statewide with 101,785 deaths. Los Angeles County has 3,516,317 COVID-19 cases with 36,003 resulting in death. According to the County of Los Angeles Department of Public Health as of April 27,2023 there have been 46,687 COVID-19 cases with 432 deaths.[63]

There is no current cure or specific antiviral treatment for COVID-19. However, the first vaccine for COVID-19 was released on December 21, 2020. Since then, more than 13.37 billion doses of the vaccine have been administered in more 190 countries; that's 69.9 percent of the world population who have received at least one does of a COVID-19 vaccine. Most COVID-19 vaccines require at least two doses (series) to reach maximum efficacy. Multiple booster shots in addition to the dose series completion are now recommended and even required in many countries as well. During March of 2023, unvaccinated people were

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[61] Centers for Disease Control and Prevention, CDC. (2023). Retrieved from https://www.cdc.gov/coronavirus/2019-nCoV/

[62] World Health Organization. (2023). WHO Coronavirus (Covid-19) Dashboard. Retrieved from https://covid19.who.int/

[63] California Department of Public Health, California All. (2023). Tracking Covid-19 in California. Retrieved from https://covid19.ca.gov/state-dashboard/

2.9 percent more likely to die from COVID-19 than people who were vaccinated with at least the primary series.[64]

When it comes to California, as of May 2023, more than 88,791,122 vaccines have been administered with 72.8 percent of the population completing the primary series (2 doses).

On May 11, 2023, the federal COVID-19 PHE declaration ended. The declaration ending means the CDC's ability to collect and share certain data changed. The CDC is now updating their guidance to align with data changes. At the time of the declaration, most tools; vaccines, testing, and treatment will continue to remain available. Metrics that will continue to remain include required reporting of hospital admissions for COVID-19 (until April 2024), weekly COVID-19 death reports, emergency room patient admissions with diagnosed COVID-19 will continue to be posted on a weekly basis, wastewater surveillance and genomic surveillance, and the count of COVID-19 vaccines administered will remain for jurisdictions who continue to submit data; however, the frequency will change. Some sources of how and where the above data is collected will change.[65]

Recent Influenza Outbreaks

Influenza (flu) season occurs annually, but the severity varies depending on which strains emerge. Health professionals were concerned in 2006 that the continued spread of a highly pathogenic avian H5N1 virus across eastern Asia and other countries represented a significant threat to human health. The H5N1 virus has raised concerns about a potential human pandemic because:

- It is especially virulent.
- It is spread by migratory birds.
- It can be transmitted from birds to mammals and in some limited circumstances to humans, and
- Like other influenza viruses, it continues to evolve.

Also notable, was the outbreak of H1N1, known as the swine flu, in 2009. Figure 3.23 illustrates how widespread the strain became in 2009.

[64] Centers for Disease Control and Prevention, CDC. (2023). Retrieved from https://www.cdc.gov/coronavirus/2019-nCoV/
[65] ibid

Figure 3.22: Nations with Confirmed Cases H1N1 (August 4, 2009)

West Nile Virus

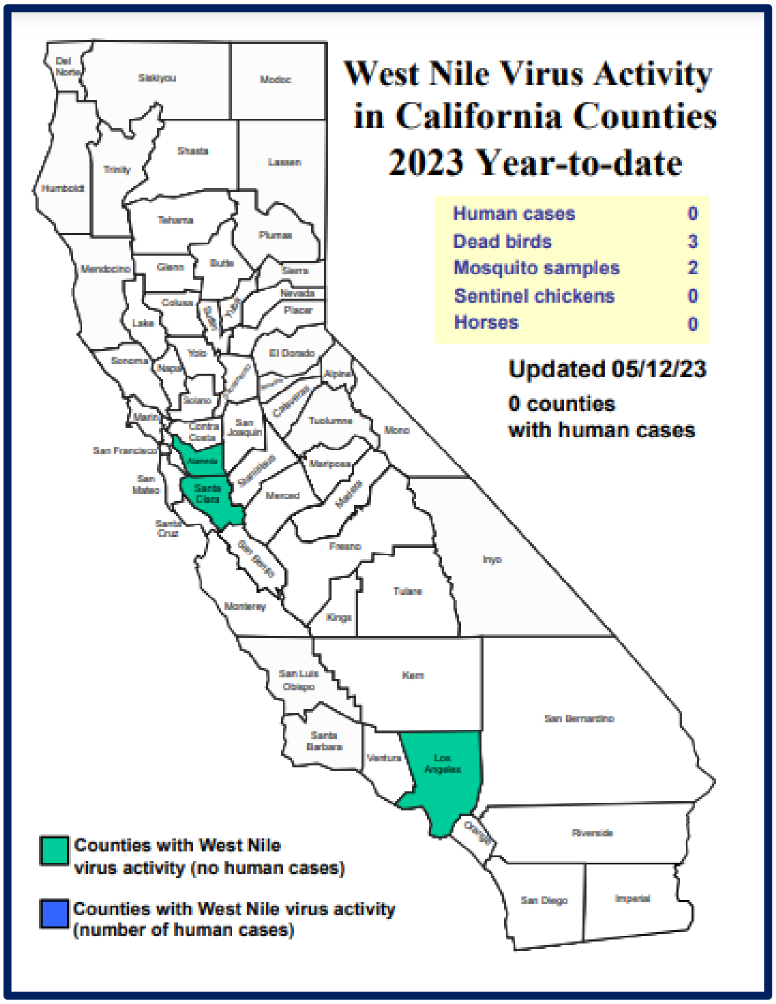
West Nile Virus (WNV) is transmitted to people, birds, and other animals by the bite of an infected mosquito. According to the California Department of Public Health, people over the age of 60 are at the greatest risk of getting sick and are more likely to develop serious symptoms of WNV. People who have received organ transplants or those with certain medical conditions such as cancer, diabetes, hypertension, or kidney disease are at greater risk of developing severe symptoms from WNV.

West Nile Virus was first found in Africa. In 1999, VWN was first detected in the eastern United States. The virus has since spread across the United States. The mosquitoes who spread WNV are found throughout the state of California. In southern states with warmer climates and mosquitoes present year-round, the risk of infection may still be present in the winter months.

The West Nile Virus is the most common and serious vector-born virus in California. There have been more than 7,000 human cases and 300 deaths reported in California since 2003.

80% or 4 out of 5 people who contract WNV don't show any symptoms. Up to 20% (1 in 5 people) may have mild symptoms which include a fever, headache, body aches, and a rash. The symptoms usually develop 3-14 days after being bitten by an infected mosquito. In most cases, the symptoms of West Nile Virus last for a few days, but fatigue and weakness may linger for weeks to a few months. Less than 1% of the population (1 out of 150 people) can get severe symptoms, which include high fever, headache, neck stiffness, vision loss, numbness, confusion, weak muscles, paralysis and coma. In these severe cases, the virus has affected the brain and/or nervous system and can cause encephalitis or meningitis. WNV can be fatal.[66] The figure below shows the counties in California with active WNV cases as of May 12, 2023.

Figure 3.23: Active West Nile Virus Cases as of May 12, 2023



[66] California Department of Public Health. (2023). West Nile Virus. Retrieved from https://westnile.ca.gov/

3.12.3 Pandemic Hazard Probability, Frequency, and Magnitude

It is difficult to predict the probability, location, and severity of the next biological/human disease pandemic. In contrast to many other illnesses, highly contagious diseases spread rapidly and often unexpectedly. As many diseases spread from person to person and the City is a densely populated region, the steering committee determined the entire area to be equally vulnerable to a pandemic scenario. While the City has not experienced an outbreak of pandemic proportions, the City is equipped to respond to a moderately-sized scenario. However, in the event of a large-scale outbreak that overwhelms the City's emergency response capacity, the City will work with the Los Angeles County Department of Health and other outside organizations to obtain the necessary resources for care.

Vulnerability and Impacts

A pandemic impacts the life safety and health of the city by potentially causing injury or death among the population. The effects of infection are highly dependent on the type of pathogen. A pandemic impacts property damage and critical infrastructure of the city by reducing staffing to critical infrastructure facilities. This in turn may lead to an increased rate of accidents due to low staffing and oversight. A pandemic impacts the economy for the city by severely disrupting services in the form of fewer consumers, mandates requiring fewer individuals within businesses, and a general slowdown due to staffing shortages. A pandemic impacts the changes in development and impact of future development for the city by slowing down or halting current or future developments due to staffing and/or materials shortages. A pandemic impact underserved and at-risk populations of the city by lessening the access to healthcare facilities. The effects of climate change in severity of impact for a pandemic for the City is to directly increase the likelihood of occurrence. As global average temperatures continue to increase, the reproduction rate, resilience, and distribution of vector-borne diseases (e.g., malaria, West Nile, Zika, Chikungunya) are likely to increase.[67]

[67] Pan American Health Organization. (n.d.). Climate Change and Health. Retrieved from https://www.paho.org/en/topics/climate-change-and-health.

3.13 Severe Weather/ Storm Hazard Profile

Table 3.43: Severe Weather/Storm Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Severe Weather/Storm	2	4	15	19	38	**42**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.13.1 Severe Weather/ Storm Hazard Description

For the purposes of this Plan, severe weather/storm includes those hazards that are typically produced during severe thunderstorms (i.e., lightning and hail) and heavy rainfall.

Severe Thunderstorms/Lightning

A thunderstorm is a rain shower during which you hear thunder and since thunder includes lightning, then all thunderstorms include lightning. However, a thunderstorm is classified as severe when it contains one (1) or more of the following – hail one (1) inch or greater, winds gusting in excess of 58 mph, and/or a tornado.

Included below are the hazards that comprise a severe thunderstorm – lightning and hail. Although strong winds and tornadoes also comprise of a severe thunderstorm, the City planning team chose to individually profile those hazard profiles. Each hazard is examined independently, but it is recognized that these could occur simultaneously.

Hail

Hail is a form of precipitation that consists of solid ice that forms inside thunderstorm updrafts. During a thunderstorm, hail forms when raindrops are carried upward by the thunderstorm's updrafts into extremely cold air and freeze. As the hailstones continue to be carried upward, they continue to collide with liquid water drops that freeze into the surface of the hailstone. Once the thunderstorm's updraft can no longer hold the weight of the hailstone, which occurs when the updraft weakens or the hailstone is too heavy, then the hail falls. When a hailstone encounters different liquid water content conditions and temperatures within the thunderstorms, it causes hailstone to have layers of clear and cloudy ice. The speed at which hail falls primarily depends on four characteristics – hail size, friction between the hailstone and surrounding air, local wind conditions (horizontal and vertical), and degree of melting of the hailstone. There is much uncertainty in the average speed hail falls; however, NOAA developed the estimates shown in the table below. [68]

Table 3.44: Hail Speed Estimates

Hail Size (inches)	Fall Speed (mph)
Less than 1	9 – 25
1 – 1.75	20 – 40
2 – 4	44 – 72
4 or greater	Over 100

Heavy Rainfall

There is no single definition for heavy (or extreme) rainfall. However, meteorologists consider instances where the amount of precipitation (rain or snow) experienced in a location substantially exceeds normal amounts. The amount of precipitation needed to qualify as heavy rain varies with location and season. Rainfall events share characteristics such as high moisture and an atmospheric disturbance (e.g., atmospheric river) and when these conditions persist over an area the more rainfall an area will receive.[69] Heavy rainfall is most frequently measured by tracking the frequency of events, analyzing the mean return period, and measuring the amount of precipitation in a certain period (most typically inches of rain within

[68] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Hail Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/hail/.
[69] National Oceanic and Atmospheric Administration. (2018). Ask the Scientist: Extreme Rainfall, Why it Happens and How We Predict It. Retrieved from https://www.noaa.gov/stories/ask-scientist-extreme-rainfall-why-it-happens-and-how-we-predict-it.

a 24-hour period)[70]. An atmospheric river is a relatively common weather pattern that brings heavy rainfall and mountain snow to California and is often referred to as an atmospheric river. About 30% to 50% of the annual precipitation in the west coast states occurs during a few atmospheric river events and approximately 80% of the levee breaches in the California's Central Valley are associated with atmospheric rivers.[71] Atmospheric rivers are long, concentrated regions in the atmosphere that transport moist air from the tropics to higher latitudes. The combination of moist air and high wind speeds produce heavy precipitation upon landfall, especially over mountainous terrain. As atmospheric rivers move over land, conditions can be similar to a tropical cyclone leading to flash flooding, mudslides, cyclone force winds, increased wave heights, and catastrophic damage to life and property.[72]

3.13.2 Severe Weather/ Storm Hazard History

To indicate the potential for a severe weather event, Table 3.40 lists severe weather events from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI). The table includes lightning, hail, and heavy rainfall with some of these storm event types resulting in extensive regional damage. This list is not comprehensive since severe weather is an annual event regularly causing minor damage and economic disruption (e.g., closed roads, fallen power lines, etc.).

Table 3.45: Historical Severe Weather Damage in Los Angeles County

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
E Central Sj Valley (Zone)	E Central Sj Valley (Zone)	2/1/2000	0:01	Heavy Rain	0	0	0.00k	0.00k
E Central Sj Valley (Zone)	E Central Sj Valley (Zone)	2/13/2000	0:00	Heavy Rain	0	0	0.00k	0.00k
Downey	Los Angeles Co.	4/18/2000	3:40	Hail	0	0	0.00k	0.00k

[70] United States Environmental Protection Agency. (2023). Climate Change Indicators: Heavy Precipitation. Retrieved from https://www.epa.gov/climate-indicators/climate-change-indicators-heavy-precipitation.
[71] Monroe, R. (2019). New Scale To Characterize Strength And Impacts Of Atmospheric River Storms. Retrieved from https://scripps.ucsd.edu/news/new-scale-characterize-strength-and-impacts-atmospheric-river-storms.
[72] National Oceanic and Atmospheric Administration. (2023). Atmospheric Rivers: What are They and How Does NOAA Study Them? Retrieved from https://research.noaa.gov/2023/01/11/atmospheric-rivers-what-are-they-and-how-does-noaa-study-them/.

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
E Central Sj Valley (Zone)	E Central Sj Valley (Zone)	9/1/2000	3:40	Heavy Rain	0	0	0.00k	250.00k
Countywide	Los Angeles Co.	1/10/2001	11:00	Heavy Rain	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	2/11/2001	6:00	Heavy Rain	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	2/24/2001	10:00	Heavy Rain	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	3/4/2001	14:00	Heavy Rain	0	0	0.00k	0.00k
Mono (Zone)	Mono (Zone)	7/2/2001	19:30	Heavy Rain	0	0	0.00k	0.00k
Mono (Zone)	Mono (Zone)	7/5/2001	14:30	Heavy Rain	0	0	0.00k	0.00k
Sw Sj Valley (Zone)	Sw Sj Valley (Zone)	9/3/2001	7:42	Heavy Rain	0	0	0.00k	0.00k
E Central Sj Valley (Zone)	E Central Sj Valley (Zone)	9/3/2001	7:42	Heavy Rain	0	0	0.00k	0.00k
Kern Cty Mtns (Zone)	Kern Cty Mtns (Zone)	9/3/2001	12:35	Heavy Rain	0	0	0.00k	0.00k
Se Kern Cty Desert (Zone)	Se Kern Cty Desert (Zone)	9/3/2001	12:35	Heavy Rain	0	0	0.00k	0.00k
Indian Wells Vly (Zone)	Indian Wells Vly (Zone)	9/3/2001	12:35	Heavy Rain	0	0	0.00k	0.00k
Duarte	Los Angeles Co.	7/28/2003	21:45	Lightning	0	1	0.00k	0.00k
Lancaster	Los Angeles Co.	7/29/2003	16:05	Hail	0	0	0.00k	0.00k
Compton	Los Angeles Co.	11/12/2003	17:00	Hail	0	0	3.500m	0.00k
South Pasadena	Los Angeles Co.	2/20/2004	13:15	Lightning	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	12/27/2004	17:00	Heavy Rain	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	12/31/2004	7:30	Heavy Rain	0	0	0.00k	0.00k
Countywide	Los Angeles Co.	1/7/2005	2:00	Heavy Rain	0	0	5.000m	0.00k
Van Nuys	Los Angeles Co.	2/25/2005	14:35	Hail	0	0	0.00k	0.00k
Newhall	Los Angeles Co.	2/25/2005	14:55	Hail	0	0	0.00k	0.00k
La Crescenta	Los Angeles Co.	8/15/2005	1:40	Hail	0	0	0.00k	0.00k
Pasadena	Los Angeles Co.	10/17/2005	12:45	Hail	0	0	0.00k	0.00k
El Monte	Los Angeles Co.	10/17/2005	13:11	Hail	0	0	0.00k	0.00k
Sherman Oaks	Los Angeles Co.	12/27/2006	2:43	Hail	0	0	0.00k	0.00k
Duarte	Los Angeles Co.	5/22/2008	13:30	Hail	0	0	0.00k	0.00k
Fairmont	Los Angeles Co.	7/4/2011	15:15	Hail	0	0	0.00k	0.00k
Desert View Highland	Los Angeles Co.	9/10/2011	15:30	Hail	0	0	0.00k	0.00k
Walnut	Los Angeles Co.	3/1/2014	3:20	Hail	0	0	0.00k	0.00k
(Sxc)Santa Catalina	Los Angeles Co.	7/27/2014	11:30	Lightning	0	1	0.00k	0.00k

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
Marina Del Ray	Los Angeles Co.	7/27/2014	13:20	Lightning	1	8	0.00k	0.00k
Leona Vly	Los Angeles Co.	10/15/2015	14:35	Hail	0	0	0.00k	0.00k
Palmdale	Los Angeles Co.	10/15/2015	15:45	Hail	0	0	0.00k	0.00k
Desert View Highland	Los Angeles Co.	10/15/2015	15:52	Hail	0	0	0.00k	0.00k
Acton	Los Angeles Co.	8/3/2017	15:45	Hail	0	0	0.00k	0.00k
South Whittier	Los Angeles Co.	6/22/2022	7:45	Lightning	1	0	0.00k	0.00k
Total					**2**	**10**	**8.500M**	**250.00K**

In another example reported by NOAA, on January 31, 2016, a weather spotter in Monterey Park, about 9 miles north of the City, reported severe thunderstorms reaching approximately 60 MPH. Rainfall totals that day ranged from .5 to 1.5 inches in the area. Local damage reports included some roof damage and a knocked down power pole.

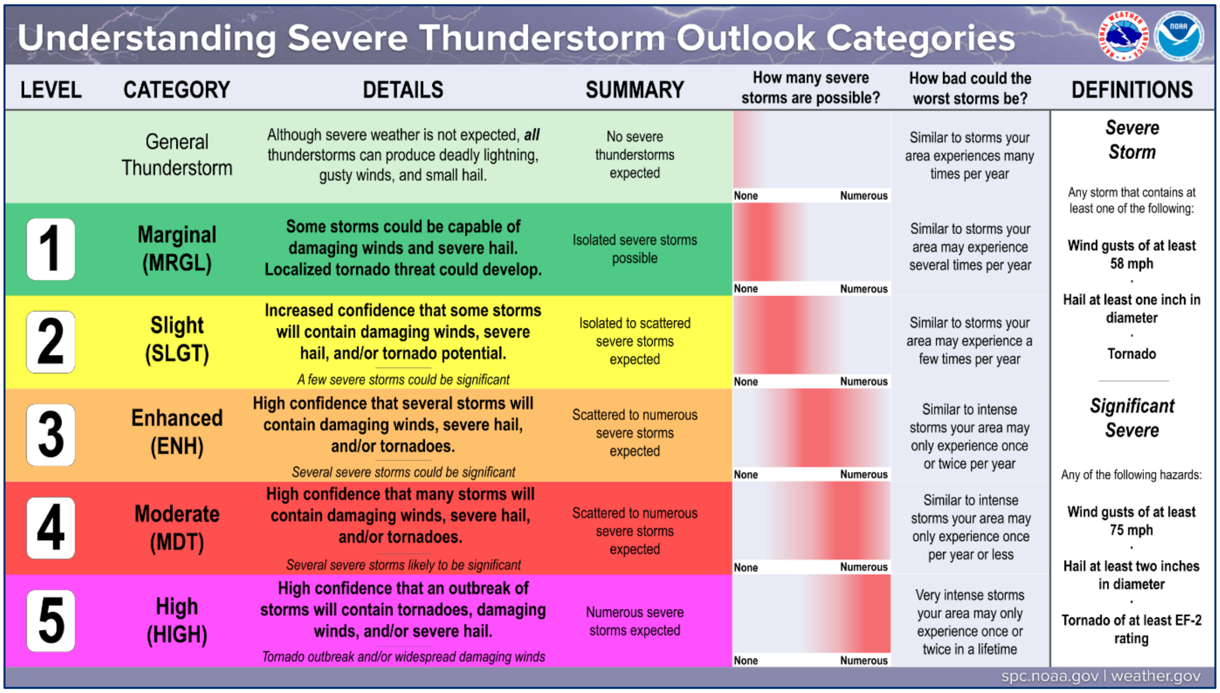
3.13.3 Severe Weather/ Storm Hazard Probability, Frequency, and Magnitude

Severe weather (i.e., severe thunderstorms, lightning, and hail) and heavy rainfall can occur anywhere in the City of Downey.

Severe weather can be life threatening and can cause substantial damage to infrastructure and property. The extent of damage caused by severe weather depends on the type of severe weather, strength, and location.

The figure below illustrates the severe thunderstorm outlook categories used by the NWS Storm Prediction Center (SPC) when issuing Severe Thunderstorm Outlooks.

Figure 3. 24: SPC Severe Thunderstorm Outlook Categories



The NWS SPC is responsible for issuing severe thunderstorms and tornado advisories, as conditions warrant. The table below outlines the severe thunderstorm[73] *Refer to the Tornado section of this Plan for more advisory information during tornado activity.*

Table 3.46: NWS Severe Weather Advisories

Type	Description
Severe Thunderstorm Watch	Issued by the NOAA SPC when conditions are favorable for the development of severe thunderstorms in and close to the watch area. The size of the watch can vary depending on the weather situation. Severe thunderstorm watches are usually issued for a duration of four (4) to eight (8) hours. They are normally issued well in advance of the actual occurrence of severe weather.
Severe Thunderstorm Warning	Issued by the local NWS Forecast Office when either a severe thunderstorm is indicated by radar, or a spotter reports a thunderstorm producing hail one (1) inch or larger in diameter and/or winds equal or exceed 58 mph. Severe thunderstorm warnings are usually issued for a duration of one (1) hour. They can be issued without a Severe Thunderstorm Watch being already in effect. Severe thunderstorms can produce tornadoes with little or no advance warning.

[73] National Weather Service. (n.d.). National Weather Service Glossary. Retrieved from https://w1.weather.gov/glossary/.

Hail can vary in shape and size, and only the exceptionally large hailstones pose a serious risk to life safety. NWS reports hail size by comparing the hailstone with traditional object to size conversion for assessment and translation of severe hail reports. The table below lists the traditional conversion of hail size descriptions.[74]

Table 3.47: Converting Traditional Hail Size Descriptions

Hail Size *(inches)*	**Object Analog Reported**
0.25	Pea
0.50	Mothball
0.75	Penny
0.88	Nickel
1.00	Quarter
1.50	Walnut, ping pong
1.75	Golf ball
2.50	Tennis ball
2.75	Baseball
3.00	Teacup

Heavy rainfall can lead to flooding which can be unexpected and leave a small window of time for evacuation, if it is required. The NWS Los Angeles/Oxnard Forecast Office is responsible for issuing flood advisories and Flash Flood Warnings Impact-Based Warnings for events that occur within approximately six (6) hours of heavy rainfall in the City. *Refer to the Urban Flood section of this Plan for more information during a heavy rainfall event that leads to flooding.*

The Atmospheric River Scale was developed in collaboration with the Center for Western Water and Weather Extremes at Scripps Institution of Oceanography at University of California San Diego and National Weather Service. The scale uses the amount of water vapor within the atmospheric river as its basis and a period of 24 to 48 hours as its standard measurement of duration. For example, if an atmospheric river remains over an area for over 48 hours the category is increased one and if it is less than 24 hours it is decreased by a category. The Atmospheric River Scale has five (5) categories outlined below.[75]

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[74] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Hail Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/hail/.

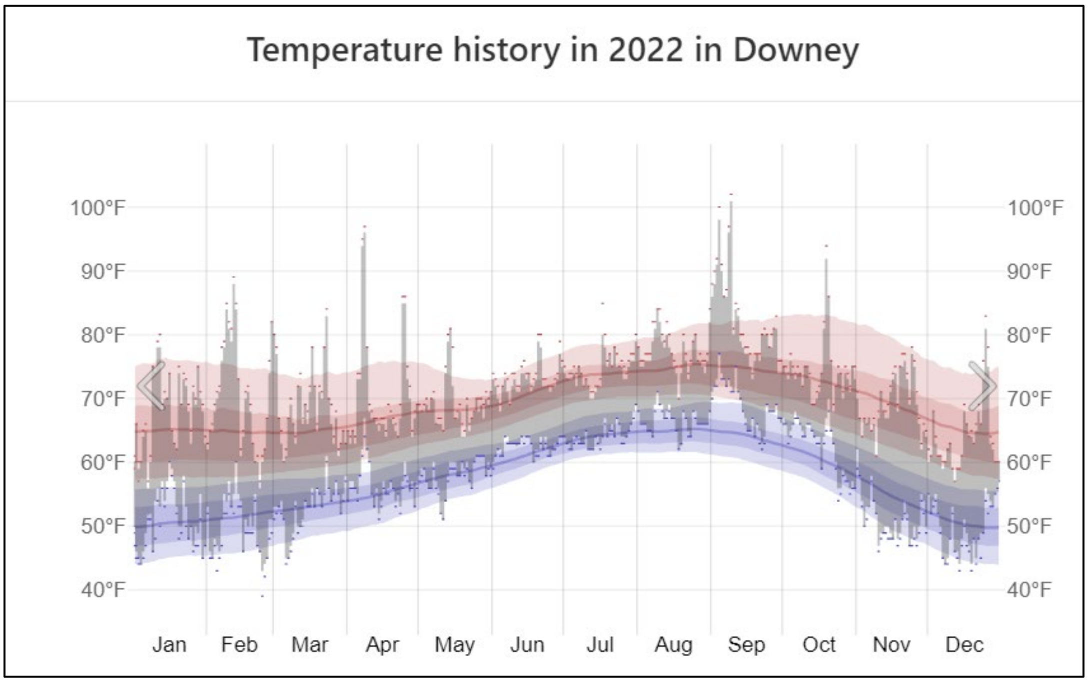
[75] Monroe, R. (2019). New Scale To Characterize Strength And Impacts Of Atmospheric River Storms. Retrieved from https://scripps.ucsd.edu/news/new-scale-characterize-strength-and-impacts-atmospheric-river-storms.

Table 3.48: Atmospheric River Scale

Category		Description
1	Weak	Primarily beneficial.
2	Moderate	Mostly beneficial, but also hazardous.
3	Strong	Balance of beneficial and hazardous.
4	Extreme	Mostly hazardous, but also beneficial.
5	Exceptional	Primarily hazardous.

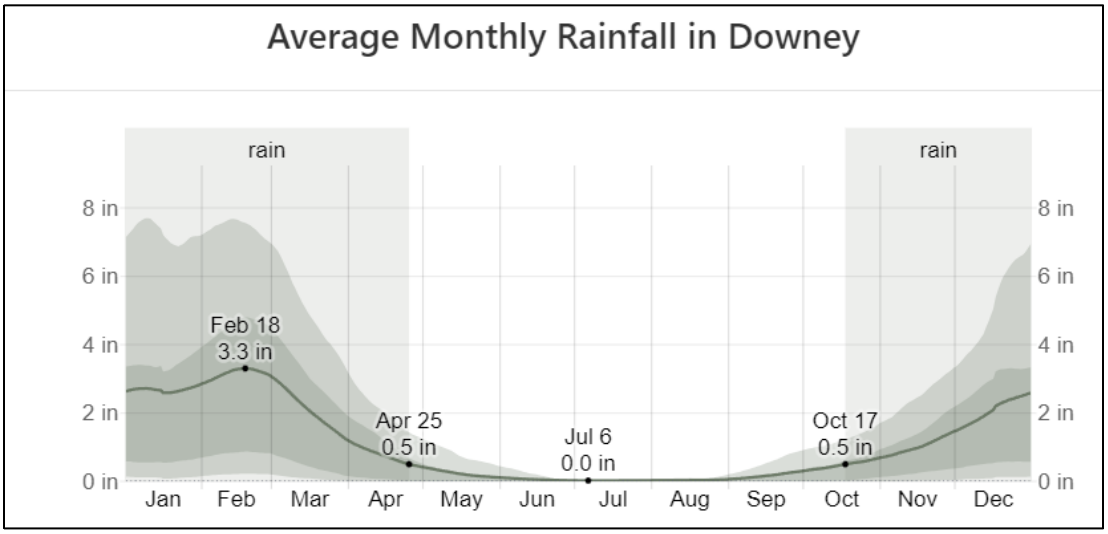
Upcoming tables on the following pages provide information and trends for the aforementioned hazards, including average climate information for the City.

Figure 3.25: City of Downey Average Monthly Temperature[76]



[76] ibid

Figure 3.26: City of Downey Average Monthly Precipitation with Daily Maximum[77]



The hail annualized frequency value represents the average number of recorded hail hazard occurrences, in event days, per year over the period of record (34 years). The table below outlines the annualized frequency for hail, based on FEMA NRI data, for the City.

Table 3.49: Hail Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(1986 – 2021) 34 years*	Annualized Frequency
550501	3	0.1 events per year
550502	3	0.1 events per year
550601	3	0.1 events per year
550602	3	0.1 events per year
550700	3	0.1 events per year
550801	3	0.1 events per year
550802	3	0.1 events per year
550901	3	0.1 events per year
550902	3	0.1 events per year
551001	3	0.1 events per year
551002	3	0.1 events per year
551101	3	0.1 events per year
551102	3	0.1 events per year
551201	3	0.1 events per year
551203	3	0.1 events per year
551204	3	0.1 events per year

[77] ibid

City of Downey Census Tracts	Events on Record *(1986 – 2021) 34 years*	Annualized Frequency
551300	3	0.1 events per year
551401	3	0.1 events per year
551402	3	0.1 events per year
551501	3	0.1 events per year
551502	3	0.1 events per year
551700	3	0.1 events per year
551801	3	0.1 events per year
551802	3	0.1 events per year
553400	3	0.1 events per year
980012	3	0.1 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

The lightning annualized frequency value represents the average number of recorded strike occurrences, in event days, per year over the period of record (22 years). The table below outlines the annualized frequency for lightning, based on FEMA NRI data, for the City.

Table 3. 50: Lightning Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(1991-2012) 22 years*	Annualized Frequency
550501	22	1 event per year
550502	22	1 event per year
550601	22	1 event per year
550602	22	1 event per year
550700	24	1.1 events per year
550801	25	1.1 events per year
550802	31	1.4 events per year
550901	22	1 event per year
550902	22	1 event per year
551001	21	1 event per year
551002	21	1 event per year
551101	21	0.9 events per year
551102	21	0.9 events per year
551201	21	1 event per year
551203	21	1 event per year
551204	21	1 event per year
551300	22	1 event per year
551401	21	1 event per year
551402	21	1 event per year

City of Downey Census Tracts	Events on Record *(1991-2012) 22 years*	Annualized Frequency
551501	21	1 event per year
551502	21	1 event per year
551700	20	0.9 events per year
551801	14	0.6 events per year
551802	11	0.5 events per year
553400	14	0.6 events per year
980012	21	1 event per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

A heavy rainfall NRI annualized frequency is not available as FEMA does not include this hazard as one of the eighteen natural hazards in the National Risk Index.

Vulnerability and Impacts

Population: Severe weather impacts the life safety and health of the city by potentially causing injury or death to the public in extreme cases. Exposure is the greatest danger to people from thunderstorms. People can be hit by lightning, pelted by hail, and caught in rising waters. However, serious injury and loss of human life is rarely associated with hailstorms. While national data shows that lightning causes more injuries and deaths than any other natural hazard except extreme heat, there does not seem to be any trend in the data to indicate that one segment of the population is at a disproportionately high risk of being directly affected. Anyone who is outside during a thunderstorm is at risk of being struck by lightning. Aspects of the population who rely on constant, uninterrupted electrical supplies may have a greater, indirect vulnerability to lightning. As a group, the elderly or disabled, especially those with home health care services rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged. Thunderstorms have the potential energy and strong winds to topple dead trees and injure people. As a result, power outages that occur from severe weather can be life threatening and these populations could face more exposure and could experience greater secondary effects of the hazard.

In Downey, 12,419 residents (11.3 percent) are living with a disability. As age increases, so does the percentage of each age group that has disability; for residents who are 75 years and over, more than half have a disability. The 65 to 74 years age group constitutes the second-highest number of disabilities.

Along with an aging population, Downey is becoming more diverse racially and ethnically. Hispanic residents make up most of the City's population. Over 60% of residents speak a language other than English in the home, with 55.4% of residents speaking Spanish. 20.6% of residents speak English less than very well. Although the city has made efforts to ensure emergency warnings and notifications are conducted to reach all population groups, generally this segment of the population may be more vulnerable during a severe weather event.

Table 3.51: Vulnerability and At-Risk Populations: Severe Weather/Storm

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents
Language other than English	70,341	64% of residents
Spanish Spoken at Home	60,889	55.4% of residents
Speak English less than very well	22,641	20.6% of residents
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count
Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services		

Property: While the primary effects may not result in significant injury or property damage, all property is vulnerable during severe weather events. Mobile homes and properties in poor condition or closer to overhead power lines and large trees may be more vulnerable to damage. Due to the unpredictability of thunderstorm strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. According to historical data, the city has experienced power outages in the past due to severe storms, but due to the random nature of these hazards, a more specific risk assessment was not conducted for this plan. Heavy rain and thunderstorms, particularly those that result in hail, could significantly impact motorists travelling along major roadways. Depending on the severity of the storm, these events could slow traffic, reduce visibility, and increase the likelihood of vehicle accidents, which may result in greater traffic delays.

Table 3.52: Property Vulnerability: Severe Weather/Storm

Vulnerable Category	Count	Percent
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units
Source: US Census Bureau 2022 ACS		

Table 3.53: Assets/Structures Vulnerability and Impact Summary: Severe Weather/Storm

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Hospitals	3	100%	Reliance on electrical grid and sustained power.
Parks	11	100%	Open areas vulnerable to damage and exposure of residents
Wells	20	100%	Reliance on electrical grid and sustained power.
Lift Stations	2	100%	Reliance on electrical grid and sustained power.
Trees	15,600	100%	Vulnerable to damage and cause cascading damages to property, utilities, and roads
Streetlights	5,200	100%	Vulnerable to damage
Source: Los Angeles County Assessors, National Bridge Inventory, City of Downey			

Economic: The economic impacts of storms are typically short term. Lightning can cause power outages and fires. Hail can destroy exposed property; an example is car lots, where entire inventories can be damaged. Generally, long-term economic impacts center around hazards that cascade from a thunderstorm, including flooding due to heavy rain. Thunderstorms can have devastating effects on transportation corridors in the city. Thunderstorms may increase the potential for transportation accidents along major roadways which could in turn cause longer traffic delays and timely movement of goods and services. Other disruptions from thunderstorms include delayed emergency response vehicles and school closures.

Changes in Development and Future Development: Recent development has been constructed based on the latest building code and construction standards and is less likely to be severely impacted by severe weather and storms. However, based upon observations and experiences of the Code Enforcement Division, the city estimates that in 2020, fewer than 25 housing units were in severe need of replacement or substantial rehabilitation due to housing conditions. These units, for example, may be suffering from neglect and these buildings may be structurally unsound and more vulnerable to severe weather and storms.

Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Stormwater master planning and site plan review should account for building to withstand severe weather events and be considered for all new development. Future development in the city is not expected to be vulnerable to the hazard, but all development will be affected by severe weather and storm events.

Climate Change: The effects of climate change in severity of impact for severe weather for the city is fairly well connected. As the climate warms, it is anticipated for severe weather events to increase in both severity and frequency.[78] It is anticipated that the atmospheric rivers that deliver storms to Southern California may intensify because of climate change. While the average number of storms in Southern California will remain the same, storms are expected to increase in intensity by 10 to 20 percent. This increase in storm intensity may also bring more intense winds.[79] Climate change is expected to alter rainfall patterns in Southern California. As the climate warms, rain events are predicted to become more intense. Downey will likely experience more rain inundation events that lead to localized flooding.

FEMA NRI Expected Annual Loss Estimates

A hail NRI Expected Annual Loss (EAL) score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to hail when compared to the rest of the United States. The EAL score is positively associated with a community’s risk; therefore, a higher EAL score results in a higher Risk Index score. The table below outlines the hail EAL for the City of Downey planning area.

[78] NASA. Global Climate Change. (n.d.). Extreme Weather and Climate Change. Retrieved from https://climate.nasa.gov/extreme-weather/

[79] Atmospheric Rivers' to Soak California as Climate Warms. Retrieved from https://www.livescience.com/49225-atmospheric-rivers-double-climate-change.html

Table 3.54: Hail Expected Annual Loss

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$15	$4	$0	$18	3.30	Very Low
550502	$17	$8	$0	$25	5.47	Very Low
550601	$23	$6	$0	$29	6.62	Very Low
550602	$18	$7	$0	$25	5.36	Very Low
550700	$29	$9	$0	$38	8.88	Very Low
550801	$19	$7	$0	$26	5.81	Very Low
550802	$11	$3	$0	$14	2.19	Very Low
550901	$18	$10	$0	$28	6.23	Very Low
550902	$23	$7	$0	$30	6.89	Very Low
551001	$16	$7	$0	$23	4.74	Very Low
551002	$15	$5	$0	$20	3.82	Very Low
551101	$16	$13	$0	$29	6.55	Very Low
551102	$22	$14	$0	$36	8.34	Very Low
551201	$15	$5	$0	$20	3.74	Very Low
551203	$15	$4	$0	$19	3.40	Very Low
551204	$17	$4	$0	$20	3.98	Very Low
551300	$22	$14	$0	$36	8.31	Very Low
551401	$18	$4	$0	$22	4.58	Very Low
551402	$19	$6	$0	$24	5.16	Very Low
551501	$20	$6	$0	$26	5.67	Very Low
551502	$17	$5	$0	$22	4.54	Very Low
551700	$26	$5	$0	$31	7.02	Very Low
551801	$13	$6	$0	$19	3.54	Very Low
551802	$18	$5	$0	$23	4.75	Very Low
553400	$16	$3	$0	$19	3.56	Very Low
980012	$0	$5	$0	$6	1.14	Very Low
Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)						

A lightning NRI EAL score, and rating represent a community's relative level of expected building and population loss each year due to lightning when compared to the rest of the United States. The table below outlines the lightning EAL for the City of Downey planning area.

Table 3.55: Lightning Expected Annual Loss

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$256	$3	N/A	$259	6.57	Very Low
550502	$299	$6	N/A	$305	7.59	Very Low
550601	$431	$4	N/A	$435	10.03	Very Low
550602	$322	$5	N/A	$327	8.10	Very Low
550700	$577	$8	N/A	$584	12.19	Very Low
550801	$383	$7	N/A	$390	9.29	Very Low
550802	$264	$3	N/A	$267	6.77	Very Low
550901	$316	$7	N/A	$323	8.01	Very Low
550902	$398	$6	N/A	$404	9.54	Very Low
551001	$275	$5	N/A	$281	7.08	Very Low
551002	$264	$3	N/A	$268	6.79	Very Low
551101	$265	$10	N/A	$274	6.95	Very Low
551102	$375	$10	N/A	$386	9.21	Very Low
551201	$258	$4	N/A	$261	6.63	Very Low
551203	$262	$3	N/A	$265	6.73	Very Low
551204	$286	$3	N/A	$289	7.27	Very Low
551300	$382	$10	N/A	$393	9.33	Very Low
551401	$311	$3	N/A	$314	7.79	Very Low
551402	$321	$4	N/A	$325	8.04	Very Low
551501	$346	$5	N/A	$350	8.54	Very Low
551502	$298	$4	N/A	$301	7.53	Very Low
551700	$428	$4	N/A	$432	9.98	Very Low
551801	$150	$3	N/A	$153	3.73	Very Low
551802	$146	$2	N/A	$148	3.62	Very Low
553400	$171	$1	N/A	$172	4.23	Very Low

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
980012	$0	$4	N/A	$4	0.22	Very Low
Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)						

A heavy rainfall NRI Expected Annual Loss calculation is not available as FEMA does not include this hazard as one of the eighteen natural hazards in the National Risk Index.

3.14 Tornado Hazard Profile

Table 3.56: Tornado Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Tornado	1	8	7	23	38	**23**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.14.1 Tornado Hazard Description

A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground. A tornado is hard to see unless it forms a condensation funnel made up of water droplets, dust, and debris. Tornadoes are among the most violent phenomena of all atmospheric storms and atmospheric scientists continue to conduct research to better understand how tornadoes form. Tornadoes come from mainly two (2) types of thunderstorms – supercell and non-supercell. [80] The table below outlines the types of tornadoes.

[80] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Tornado Basics. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/.

Table 3.57: Types of Tornadoes[81]

Type	Description
Supercell	The most common and destructive tornadoes occur from supercells. A supercell is a rotating thunderstorm with a well-defined radar circulation called a mesocyclone. *Supercells can also produce damaging hail, severe non-tornadic winds, frequent lightning, and flash floods.* The rotating updraft from a supercell is the key development for a tornado. One way a column of air can begin to rotate is from wind shear when winds at two (2) different levels above the ground blow at different speeds or in different directions. Once the updraft is rotating and fed with warm moist air flowing in the ground level, a tornado can form.
Non-Supercell	Nearly 20% of all tornadoes are associated with lines of strong thunderstorms called quasi-linear convective systems (QLCS). QLCS tornadoes frequently occur during the late night and early morning hours. These tornadoes, however, tend to be weaker and shorter-lived on average than those associated with supercell thunderstorms. NOAA's National Severe Storms Laboratory (NSSL) researchers are looking for ways to detect QLCS tornadoes more effectively.
Another type of non-supercell tornado is a landspout. A landspout is a tornado with a narrow, rope-like condensation funnel that forms while the thunderstorm cloud is still growing and there is no rotating updraft - the spinning motion originates near the ground.	

Tornadoes can be life threatening and can cause substantial damage to infrastructure and property. The extent of damage caused by a tornado depends on the type of severe weather, strength, and location. The table below outlines the tornado advisories issued by the NWS and the Storm Prediction Center (SPC) as conditions warrant.

Table 3.58: National Weather Service Tornado Advisories[82]

Type	Description
Tornado Watch	Issued by the SPC when conditions are favorable for the development of tornadoes in and close to the watch area. The size of the watch can vary depending on the weather situation. Tornado watches are usually issued for a duration of four (4) to eight (8) hours. They are normally issued well in advance of the actual occurrence of tornadoes.
Tornado Warning	Issued by the local NWS Forecast Office when either a tornado is indicated by radar or sighted by spotters. Tornado warnings are usually issued for a duration of around 30 minutes. They can be issued without a Tornado Watch being already in effect

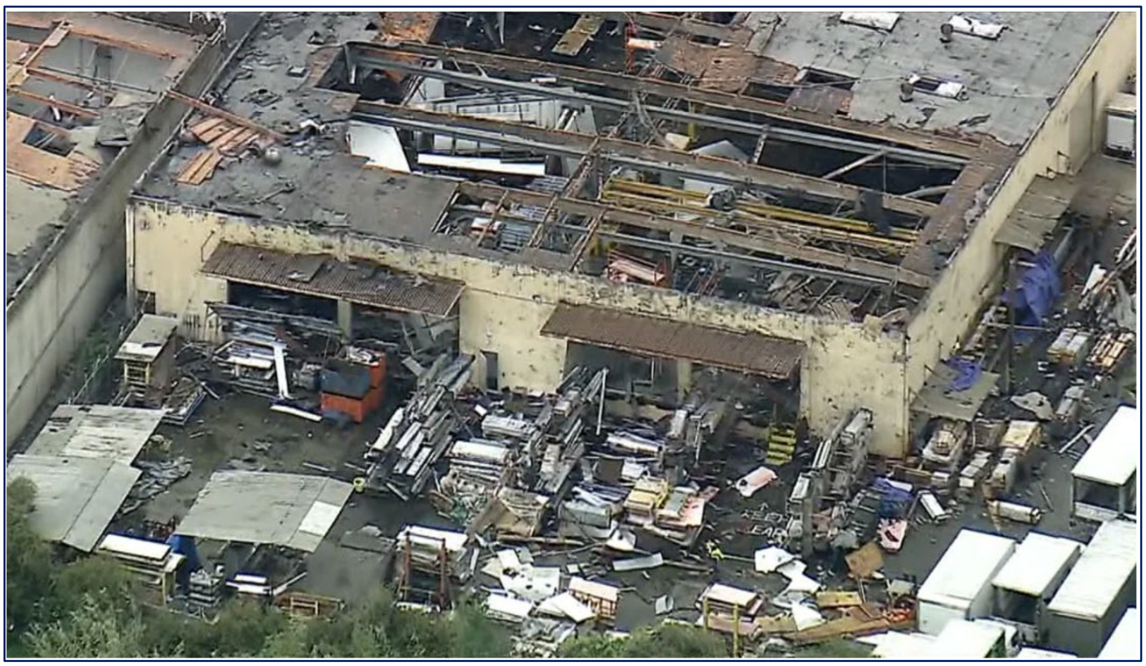
[81] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Types of Tornadoes. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/tornadoes/types/.
[82] National Weather Service. (n.d.). National Weather Service Glossary. Retrieved from https://w1.weather.gov/glossary/.

3.14.2 Tornado Hazard History

Tornadoes are rare in California, with less than 10 per year occurring in the state each year. Most of those tornadoes are small and short lived.

- An EF0 tornado developed near the community of Lake Los Angeles in September of 2021. No damage was reported.
- On March 22, 2023, the strongest tornado to hit Los Angeles County in 40 years hit Montebello. The EF-1 rated tornado had winds which peaked at 110 mph. At least seventeen buildings were damaged, with eleven of those being deemed unsafe by the fire department. Damage included caved in roofs, snapped power poles.[83]

Figure 3.27: EF1 Tornado rips off Roof of a building in Montebello, March 22, 2023



- In early June 2023, a pair of tornadoes touched down, lasting only minutes. Both were EF0's with minimal damage.

[83] CNN. (2023). Los Angeles Area Hit by Rare Tornado – The Strongest One to Hit the County Since 1983. Retrieved from https://www.cnn.com/2023/03/22/weather/california-montebello-possible-tornado/index.html.

NCEI Tornado Events

NCEI has reported five Tornado events from 2018 to 2023 in Los Angeles County. Most notably on March 22, 2023, in East Los Angeles County, an EF1 Tornado spawned off a strong winter storm which had recorded gusts in excess of 80 MPH. One-person sustained injuries, but no deaths were recorded. Additionally, an industrial warehouse and commercial business district was substantially damaged.[84]

Table 3.59: NCEI Tornado Events in Los Angeles County (2018 - 2023)[85]

Location	County/ Zone	Date	Time	Death	Injury	Property Damage	Crop Damage
LLANO	LOS ANGELES CO.	09/09/2021	15:58	0	0	0.00K	0.00K
CERRITOS	LOS ANGELES CO.	02/23/2023	11:30	0	0	0.00K	0.00K
EAST LOS ANGELES	LOS ANGELES CO.	03/22/2023	10:14	0	1	0.00K	0.00K
COMPTON MUNI ARPT	LOS ANGELES CO.	05/04/2023	07:45	0	0	0.00K	0.00K
COMPTON	LOS ANGELES CO.	05/04/2023	07:56	0	0	0.00K	0.00K
			Totals	**0**	**1**	**0.00K**	**0.00K**

3.14.3 Tornado Hazard Probability, Frequency and Magnitude

The probability of tornados in the City planning area is low. However, the entire city of the City of Downey is at risk of a tornado if the right weather conditions are present.

Climate change impacts on tornadoes in the State of California requires further analysis. Future updates to this plan will consider new research on this topic.

Tornado "rating", based on the Enhance Fujita Scale (EF Scale), is assigned after tornado-related damage is surveyed. The EF Scale is based on the estimated wind speeds and related

[84] National Oceanic and Atmospheric Administration, National Centers for Environmental Information. (n.d.). Storm Events Database. Retrieved from https://www.ncdc.noaa.gov/stormevents/.
[85] National Oceanic and Atmospheric Administration, National Centers for Environmental Information. (n.d.). Storm Events Database. Retrieved from https://www.ncdc.noaa.gov/stormevents/.

damage. The table below outlines the EF Scale. When tornado damages are surveyed, they are compared to a list of Damage Indicators and Degrees of Damage which help to better estimate the range of wind speeds the tornado likely produced. The EF Scale was revised from the original Fujita Scale and became operational in February 2007. [86]

Table 3.60: Enhance Fujita Scale

EF Rating	Class	Wind Speed (mph)	Wind Speed (km/h)	Description
F0	Weak	65-85	105-137	Gale
F1	Weak	86-110	138-177	Weak
F2	Strong	111-135	178-217	Strong
F3	Strong	136-165	218-266	Severe
F4	Violent	166-200	267-322	Devastating
F5	Violent	>200	>322	Incredible

The NWS SPC is responsible for issuing severe thunderstorms and tornado advisories, as conditions warrant. The Table below outlines the tornado advisories.[87] *Refer to the Severe Weather/Storm section of this Plan for more advisory information during severe thunderstorms.*

Table 3.61:NWS Severe Weather Advisories

Type	Description
Tornado Watch	Issued by the SPC when conditions are favorable for the development of tornadoes in and close to the watch area. The size of the watch can vary depending on the weather situation. Tornado watches are usually issued for a duration of four (4) to eight (8) hours. They are normally issued well in advance of the actual occurrence of tornadoes.
Tornado Warning	Issued by the local NWS Forecast Office when either a tornado is indicated by radar or sighted by spotters. Tornado warnings are usually issued for a duration of around 30 minutes. They can be issued without a Tornado Watch being already in effect

[86] National Weather Service. (n.d.). The Enhance Fujita Scale (EF Scale). Retrieved from https://www.weather.gov/oun/efscale.
[87] National Weather Service. (n.d.). National Weather Service Glossary. Retrieved from https://w1.weather.gov/glossary/.

The tornado annualized frequency value represents the average number of recorded tornado hazard occurrences, in event days, per year over the period of record (72 years). Upon review, no data is available for the annualized frequency for tornadoes, based on FEMA NRI data, for the City, consisting of twenty-six census tracts.

Vulnerability and Impacts

Population:

Tornadoes can cause injuries and fatalities due to flying debris, collapsing buildings, and the sheer force of the winds. These injuries and casualties can occur to people caught in the tornado's path or those in poorly constructed or unprotected buildings. Tornadoes can disrupt power lines and electrical infrastructure, causing widespread power outages. This can impact medical facilities, emergency services, and the ability to communicate during and after the tornado. Tornadoes can block roads with debris, making it challenging for emergency responders to reach affected areas quickly. Tornadoes can render homes uninhabitable, leading to the displacement of residents. Finding temporary shelter for those affected becomes a critical concern for local authorities. Disadvantaged residents may have substandard housing or lack access to safe and sturdy buildings. This can lead to a higher risk of injury or death during tornadoes, as inadequate shelter may not provide adequate protection from the storm's path. Some residents may have limited mobility due to disabilities, lack of transportation, or other factors. This can make it more challenging for them to seek shelter or evacuate quickly when tornado warnings are issued. Individuals with pre-existing health conditions or those who rely on medical equipment that requires electricity may face greater risks during tornadoes, especially if power outages occur. Non-English-speaking population or cultural differences may face challenges in receiving and understanding emergency alerts and instructions, which can hinder their ability to respond effectively.

In Downey, 12,419 residents (11.3 percent) are living with a disability. Among the disability types tallied (a resident can have more than one disability type) the most prevalent were ambulatory (serious difficulty walking or climbing stairs) and independent living difficulties (difficulty doing errands alone such as visiting a doctor’s office or shopping). One quarter of residents with a disability indicated an ambulatory difficulty and 21 percent indicated an independent living difficulty. The remaining disabilities tallied include cognitive difficulties (18 percent), self-care difficulties (14 percent), hearing difficulties (12 percent), and vision difficulties (11 percent).

As age increases, so does the percentage of each age group that has disability; for residents who are 75 years and over, more than half have a disability. The 65 to 74 years age group constitutes the second-highest number of disabilities. Disability and poverty are closely tied due to employment limitations. For residents with disabilities, more than 13 percent live in poverty.

Many senior-headed households have special needs due to their relatively low incomes, disabilities or limitations, and dependency needs. Specifically, many people aged 65 years and older live alone. In Downey, 12,552 residents are 65 years and older, representing 11.4 percent of the population. For residents 65 years and older, 9.5 percent live in poverty.

Along with an aging population, Downey is becoming more diverse racially and ethnically. Hispanic residents make up most of the City's population. Over 60% of residents speak a language other than English in the home, with 55.4% of residents speaking Spanish. 20.6% of residents speak English less than very well.

Extremely low-income (ELI) is defined as households with income less than 30 percent of area median income (AMI). 13.8 percent of the City's total households (4,525 households) are classified as extremely low income.

Table 3.62: Vulnerability and At-Risk Populations: Tornado

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents
Language other than English	70,341	64% of residents
Spanish Spoken at Home	60,889	55.4% of residents
Speak English less than very well	22,641	20.6% of residents
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count
Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services		

Property:

There are 23,194 buildings within the census tracts that define the planning area. Most of these buildings are residential. All of these buildings are considered to be exposed to the adverse impacts of a tornado. The frequency and degree of damage will depend on specific locations and the path of the tornado. Mobile homes, older buildings, and structures in poor condition are more prone to damages. The city estimates that in 2020, fewer than 25 housing units were in severe need of replacement or substantial rehabilitation due to housing conditions. These units, for example, may be suffering from neglect and these buildings may be structurally unsound.

Table 3.63: Property Vulnerability: Tornado

Vulnerable Category	Count	Percent
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units
Structures Built before 1960	17,847	More than 50% of occupied housing units
Source: US Census Bureau 2022 ACS		

Table 3.64: Assets/Structures Vulnerability and Impact Summary: Tornado

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Government (City Hall and Public Works)	2	100%	
Columbia Memorial Space Center	1	100%	
Hospitals	3	100%	
Major Shopping Centers	5	100%	
National Register of Historic Places	2	100%	
Library	1	100%	
Parks	11	100%	
Schools	28	100%	
Fire Stations	4	100%	
Police Stations	1	100%	
Trees	15,600	100%	
Source: Los Angeles County Assessors, National Bridge Inventory, City of Downey			

Economic: The economic impacts of a tornado are typically geographically isolated and short term. Impacted property may be damaged and affected businesses may be closed due to needed repairs. Tornadoes can devastate local economies, and disadvantaged individuals may have fewer resources to recover and rebuild. This can result in prolonged hardships and displacement for residents.

Changes in Development and Future Development: Due to the low probability and intensity of tornadoes, recent development that has been constructed based on the latest building code and construction standards should be more resilient to this hazard. Future development projects should consider tornadoes and severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability.

Growth over the past decade has been modest. Between 2010 and 2020, as reported by the U.S. Census, the population of Downey grew approximately 0.9 percent, from 111,922 to 112,901 residents. The Southern California Association of Governments (SCAG) growth forecasts predict a steady increase in population through 2045. From 2020 to 2045, SCAG projects that the City’s population will grow by 5.6 percent. This projected population growth and increase in homes increases the City’s exposure to tornadoes. New residents may also be less informed about this hazard.

Climate Change: To date, there is not enough evidence to show a direct correlation between tornadoes and climate change. Changes in smaller-scale, short-lived severe weather such as tornadoes and thunderstorms are more difficult to assess, and direct observations of those events and the conditions associated with them are incomplete. While the average annual number of tornadoes appears to have remained relatively constant, there is evidence nationally that tornado outbreaks have become more frequent, that tornado power has increased, that tornado activity is increasing in the fall. According to the 2023 Fifth National Climate Assessment, tornadoes are exhibiting changes that may be related to climate change, but scientific understanding is not confident enough to project the likelihood of future conditions.[88]

FEMA NRI Expected Annual Loss Estimates

A tornado NRI Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to tornadoes when compared to the

[88] Fifth National Climate Assessment (2023). Climate Trends. Retrieved from https://nca2023.globalchange.gov/chapter/2/

rest of the United States The table below outlines the tornado EAL for the City of Downey planning area.

Table 3.65: Tornado Expected Annual Loss for the City of Downey Planning Area

Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$1688	$2509	$0	$4197	12.50	Very Low
550502	$1989	$5597	$0	$7587	21.85	Very Low
550601	$2745	$3840	$0	$6585	19.65	Very Low
550602	$2081	$4783	$0	$6864	20.32	Very Low
550700	$3369	$6351	$0	$9720	25.42	Very Low
550801	$2194	$5121	$0	$7314	21.28	Very Low
550802	$1233	$2195	$0	$3427	9.97	Very Low
550901	$2106	$6618	$0	$8724	23.94	Very Low
550902	$2653	$5024	$0	$7677	22.02	Very Low
551001	$1836	$4764	$0	$6600	19.69	Very Low
551002	$1763	$3151	$0	$4914	14.85	Very Low
551101	$1857	$8929	$0	$10.7K	26.80	Very Low
551102	$2548	$9572	$0	$12.1K	28.07	Very Low
551201	$1720	$3202	$0	$4923	14.88	Very Low
551203	$1750	$2349	$0	$4100	12.17	Very Low
551204	$1905	$2641	$0	$4546	13.60	Very Low
551300	$2549	$9521	$0	$12.1K	28.03	Very Low
551401	$2072	$2974	$0	$5046	15.28	Very Low
551402	$2139	$3919	$0	$6057	18.29	Very Low
551501	$2304	$4134	$0	$6438	19.28	Very Low
551502	$1986	$3398	$0	$5384	16.34	Very Low
551700	$2960	$3538	$0	$6498	19.42	Very Low
551801	$1510	$4030	$0	$5541	16.82	Very Low
551802	$2048	$3517	$0	$5565	16.89	Very Low
553400	$1839	$2141	$0	$3979	11.79	Very Low
980012	$0	$3779	$0	$3779	11.14	Very Low

Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)

3.15 Mass Transportation Accident/ Incident Hazard Profile

Table 3.66: Mass Transportation Accident/Incident Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Mass Transportation Accident/Incident	1	12	16	32	60	**34**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.15.1 Mass Transportation Accident/ Incident Hazard Description

Roadway Incident

Freeway accidents occur very frequently in the Los Angeles County region. In recent years, California has averaged about 3,000 freeway accident-related deaths annually, according to the California Highway Patrol. The major local transportation routes that traverse the City include Interstates 5, and 605, and 105, creating local traffic congestion and increasing the potential for transportation accidents in the City.

Railway Incident

Freight trains travel near the northeast border of the City hauling various types of hazardous materials. A major train derailment that occurs in a heavily populated industrial area could result in significant damage and potential loss of life. Both freeway and rail accidents can be a further hazard if the impacted vehicles are transporting hazardous materials. As noted in the hazardous material release hazard profile, accidents in these cases can result in hazardous materials releases.

Airborne Incident

Daily air traffic creates the potential for hazard events to occur in the skies over the City. The City is located on the flight path to the Los Angeles International Airport (LAX), the second busiest airport in the United States. With a high volume of flights over the City, there is the potential for airborne accidents.

3.15.2 Transportation Accident/ Incident Hazard History

In August 1986, the City of Cerritos, less than 10 miles away from Downey, experienced a deadly plane crash where more than eighty people were killed when Aeromexico DC-9 Flight 498 collided with a single-engine Piper Archer 6,500 feet above a residential area. The pilot and two passengers aboard the Piper were killed while the sixty-four people aboard the DC-9 flight were killed. The Piper crashed onto the playground of Cerritos Elementary School. The pilots of the DC-9 had no way to control their plane and it crashed into a neighborhood. Fifteen people on the ground were killed and eight were left injured. Five homes were destroyed and another seven were damaged.[89]

September of 2008 marked the deadliest train accident in California history when a Metrolink train collided head-on with a Union Pacific freight train. The passenger train's locomotive and lead passenger car derailed while the two locomotives and ten cars of the freight train derailed. There were twenty-five fatalities, including the engineer of the passenger train. More than one hundred people were injured. Physical damage was more than $12 million. The Chatsworth accident was just forty-five miles from the City of Downey.[90]

In February of 2015, there was a deadly accident with dozens of injuries when a Metrolink train hit a produce truck left on the tracks by the driver in Oxnard, seventy-five miles from the

[89] This Day in Aviation. (2018). Aeromexico Flight 498. Retrieved from https://www.thisdayinaviation.com/tag/aeromexico-flight-498/
[90] U.S. Department of Transportation, Federal Railroad Administration. (2019). Metrolink 111 Collision with UP. Chatsworth. Sept 2008. Retrieved from https://railroads.dot.gov/human-factors/elearning-attention/metrolink-111-collision-chatsworth-sept-2008

City of Downey. More than two dozen passengers were injured, and the train's engineer later died.[91]

In the past five years, there have been 764 airborne incidents in the state of California. Of those, 167 have resulted in fatalities. The table below details the twenty-nine fatal National Transportation Safety Board (NTSB) investigations within 50 miles of the City of Downey.

Table 3.67: Fatal Airborne Incidents within 50 Miles of the City of Downey (2017-2023)

Date	City	Distance from Downey	# of Fatalities	# of Injuries
1/4/17	San Pedro	22	2	0
1/17/17	Corona	39	1	1
7/14/17	El Monte	16	1	0
1/30/18	Newport Beach	35	3	1
8/5/18	Santa Ana	23	5	0
8/12/18	Sylmar	36	1	0
9/3/18	Pacoima	35	1	1
9/29/18	La Verne	29	1	1
10/1/18	La Verne	29	1	0
2/3/19	Yorba Linda	26	5	2
3/13/19	Compton	8	1	1
4/22/19	Norco	44	1	0
6/15/19	Porter Ranch	40	1	0
6/17/19	Two Harbors	40	1	0
9/19/19	Torrance	17	1	1
11/7/19	Upland	36	1	0
1/4/20	Santa Clarita	45	1	0
1/22/20	Corona	39	4	0
1/26/20	Calabasas	44	9	0
3/13/20	Sylmar	36	2	0
9/11/20	Van Nuys	32	2	0
10/4/20-	Hawthorne	15	1	0
11/12/20	Los Angeles	13	1	0
2/19/20	Los Angeles	13	1	0
2/19/22	Newport Beach	32	1	0
4/20/22	Sylmar	36	1	0
8/20/22	Pacific Ocean	22	1	0

[91] ABC News. (2015). Metrolink Crash: Truck Driver Arrested on Felony Hit and Run Charge. Retrieved from https://abcnews.go.com/US/metrolink-crash-truck-driver-arrested-felony-hit-run/story?id=29183024

Date	City	Distance from Downey	# of Fatalities	# of Injuries
9/8/22	Santa Monica	27	2	0
11/30/22	Torrance	17	2	0
12/22/22	Santa Monica	27	1	0
4/29/23	Los Angeles	13	1	0

The most severe airborne incident within the last five years occurred in January of 2020 in Calabasas, forty-four miles from Downey. A well-known basketball player, his daughter, and others were all killed when the Sikorsky S-76B helicopter they were flying in crashed into the hillside. National Transportation Safety Board (NTSB) findings show that the pilot made a series of poor decisions causing him to fly blindly into the clouds, causing him to become disoriented to the point where he thought he was climbing into the clouds when he instead plunged into the Southern California hillside. The NTSB said the pilot ignored his training, violated flight rules by flying into conditions where he could not see, and failed to take alternative measures like slowing down, landing, or switching to auto-pilot. This came on a day when all LAPD helicopters were grounded because of the weather conditions.[92]

3.15.3 Transportation Accident/ Incident Hazard Probability, Frequency, and Magnitude

While the City has never experienced a large-scale transportation incident, due to the high volume of commuter traffic traveling through the streets, freight transportation on the railways, and air traffic in the skies above the City, there is a high potential for a transportation accident. In the event of a major incident, roadways could be populated by vehicles carrying hazardous chemicals and flammable materials, which could create the potential for fire, hazardous material releases, and other harmful events. In 2011, the Downey Fire Department conducted a Hazardous Materials Commodity Flow Study which analyzed the flow of hazardous materials throughout the City. The study produced valuable information for emergency response planning.

Vulnerability and Impacts

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[92]Associated Press. (2021). US Officials: Pilot error caused Kobe Bryant chopper crash. Retrieved from https://apnews.com/article/kobe-bryant-helicopter-crash-cause-2c87b04d28961fd277927eea8e8e5564

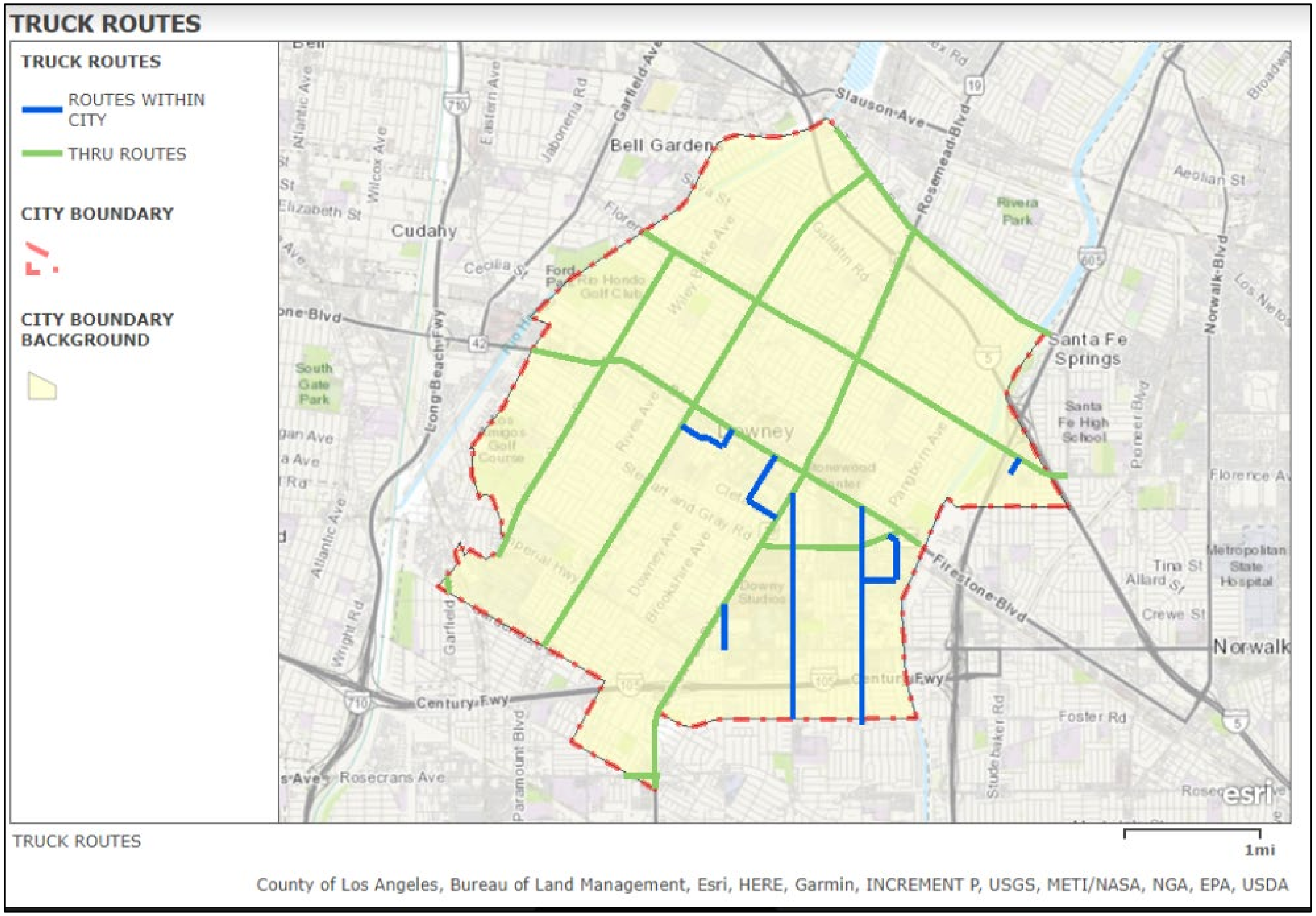
A transportation accident impacts the life safety and health of the City by potentially causing injury or death to those involved in the accident or who are nearby. A transportation accident impacts property damage and critical infrastructure of the City by potentially damaging or destroying buildings or infrastructure at the accident site. A transportation accident impacts the economy for the City by hindering ongoing traffic flow, thereby reducing income in relation to public transportation and cargo. A transportation accident impacts the changes in development and impact of future development for the City by potentially slowing down current developments and causing existing developments to be relocated. A transportation accident impacts underserved and at-risk populations of the City by impacting essential services such as mass transportation. The effects of climate change in severity of impact for a transportation accident for the City is the overall increase in lethal car wrecks due to hotter weather.[93]

Figure 3.28 below depicts the transportation routes for the City and the potential areas for freeway-related accidents while Figure 3.29 depicts the truck routes throughout the City.

[93] Syris Valentine. Scientific American. (2023). Hotter Days Are Increasing Car Crashes and Fatalities. Retrieved from https://www.scientificamerican.com/article/hotter-days-are-increasing-car-crashes-and-fatalities/

Figure 3.28: City of Downey Transportation Routes Map

Figure 3.29: City of Downey Truck Routes Map



3.16 Urban Fires Hazard Profile

Table 3.68: Urban Fires Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Urban Fires	1	5	10	23	38	**23**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.16.1 Urban Fires Hazard Description

The uncontrolled combustion or burning of an item, structure, or landscape is a fire. Fires constitute a much larger problem than is generally known. Deaths and injuries from all natural disasters combined—floods, hurricanes, tornados, earthquakes, etc.—are just a fraction of the annual casualties from fire. Deaths from natural disasters average just under 200 per year, versus approximately 4,000 deaths from fires. This section will describe the following fire categories: tire/scrap fires, structural fires, and arson. Wildfire Smoke / Air Quality will be covered in a separate section.

Tire Fires

California is faced with the significant challenge of diverting or safely managing more than 51 million[94] reusable and waste tires generated each year. Many of those scrap tires end up in approved storage sites that are carefully regulated and controlled by the California

[94] CalRecycle (n.d.). Tire Management. Retrieved from https://calrecycle.ca.gov/Tires/.

Department of Resources Recycling and Recovery (CalRecycle). The Legislature recognized the need for waste tire management and passed the California Tire Recycling Act in 1989. To further strengthen waste tire management, the Legislature passed Senate Bill (SB) 876 in 2000 to augment the California Tire Recycling Act. However, some scrap tires are dumped intentionally in unapproved locations throughout the state.

Tire disposal sites can be fire hazards, in large part, because of the enormous number of scrap tires typically present at one site. This large amount of fuel renders standard firefighting practices nearly useless. Flowing and burning oil released by the scrap tires can spread the fire to adjacent areas. Tire fires differ from conventional fires in the following ways:

- Relatively small tire fires can require significant fire resources to control and extinguish.
- Those resources often cost much more than standard fire responses.
- There may be significant environmental consequences of a major tire fire. Extreme heat can convert a standard vehicle tire into approximately 2 gallons of oily residue that may leak into the soil or migrate to streams and waterways.

Urban Fires

Lightning strikes, poor building construction, and building condition are the main causes for most urban fires in California. The City of Downey has structural fires each year citywide. According to the National Fire Protection Association (NFPA), a fire occurs in a structure at the rate of one every 65 seconds, and a home fire occurs every 93 seconds. In 2021, the United States had 486,500 structural fires which resulted in, 3,010 civilian fatalities, 12,600 civilian injuries, and $12.8 in property damage. [95]

Arson

It is important to note that arson is a contributing factor to fire-related incidents within the City. According to the NFPA, between 2014 and 2018 an estimated average of 52 fires, 260

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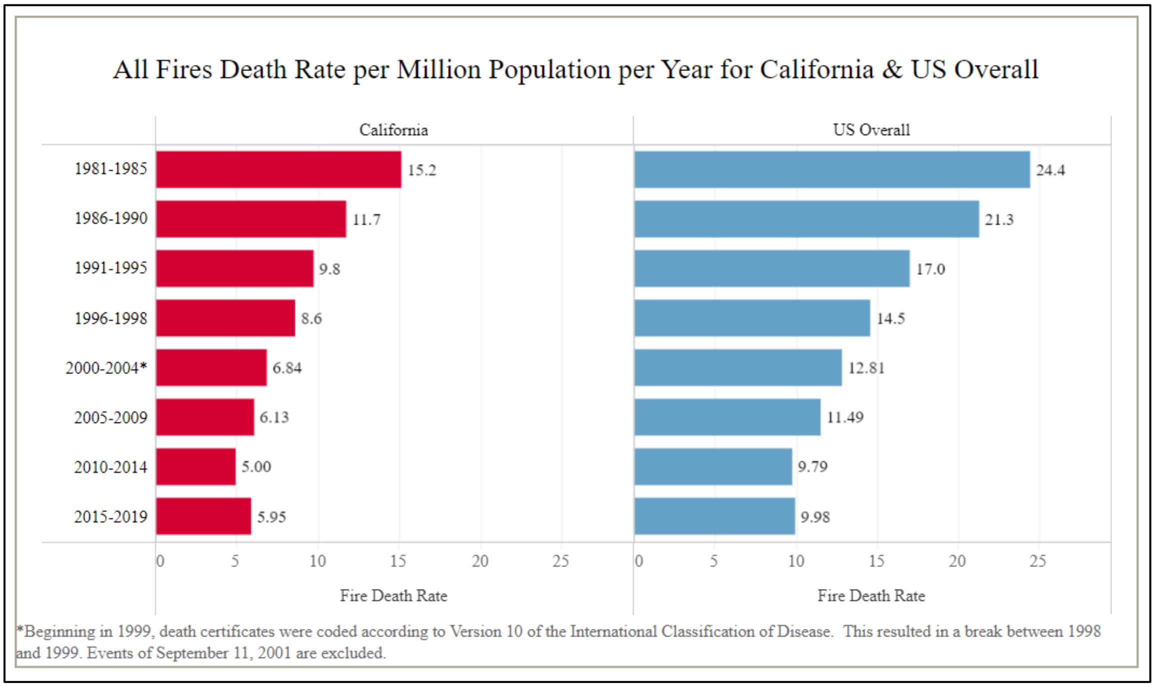
[95] National Fire Protection Association. (2022). Fire Loss in the United States: Trend Tables. Retrieved from: Fire Loss in the United States: Trend Tables (nfpa.org).

intentional fires are reported to fire departments in the United States each year, causing no civilian deaths, 950 injuries, and $815 million in direct property damage.[96]

Figure 3.30: Fire Deaths per Million Population, US vs. California



3.16.2 Urban Fires Hazard History

Urban fires create a devastating loss to property and even human life. Table 3.59 details the urban fires in the City of Downey for CY 2018-2023. City of Downey Fire Department officials say these are rough estimates, based off investigation narrative, narrative of event, and/or local knowledge of the building or incident. More detailed information does not appear to be immediately available. The below table and figures do not include structures considered vacant. Officials say if these figures were included, a significantly higher number would be obtained. This is due to the considerable number of fires on the Rancho Los Amigos grounds where multiple total loss fires occurred.

[96] National Fire Protection Association. (2022). Fire death rates by State. Retrieved from https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Fire-deaths-by-state.

Table 3.69: Urban Fires Losses and Financial Damages

Date	Cost	Date	Cost
1/8/2018	$90,000	3/15/2021	$900,000
2/14/2018	$65,000	4/1/2021	$60,000
5/29/2018	$125,000	6/21/2021	$75,000
6/17/2018	$50,000	6/25/2021	$60,000
8/19/2018	$2,000	6/27/2021	$15,000
9/25/2018	$2,100	6/30/2021	$25,000
12/28/2018	$25,000	9/15/2021	$50,000
2/11/2019	$75,000	10/16/2021	$75,000
3/25/2019	$10,000	11/9/2021	$250,000
5/8/2019	$20,000	11/15/2021	$75,000
6/13/2019	$20,000	12/13/2021	$20,000
8/11/2019	$15,000	1/14/2022	$25,000
10/13/2019	$37,500	2/25/2022	$150,000
10/21/2019	$25,000	3/14/2022	$50,000
10/25/2019	$120,000	3/17/2022	$125,000
10/25/2019	$20,000	4/6/2022	$80,000
11/23/2019	$25,000	4/27/2022	$7,500
12/1/2019	$20,000	5/16/2022	$30,000
12/14/2019	$5,000	6/3/2022	$150,000
12/16/2019	$30,000	6/15/2022	$10,000
12/24/2019	$20,000	6/29/2022	$40,000
2/8/2020	$100,000	7/22/2022	$25,000
4/16/2020	$50,000	7/24/2022	$85,000
4/18/2020	$75,000	8/15/2022	$60,000
4/26/2020	$7,500	10/7/2022	$75,000
5/31/2020	$10,500	10/12/2022	$80,000
6/12/2020	$1,250	10/17/2022	$125,000
7/4/2020	$1,500	10/27/2022	$30,000
7/10/2020	$60,000	11/1/2022	$7,500
10/21/2020	$75,000	12/1/2022	$10,000
12/10/2020	$655,000	12/19/2022	$50,000
12/25/2020	$75,000	12/20/2022	$175,000
12/28/2020	$50,000		
1/7/2021	$15,000		
2/5/2021	$75,000		
2/20/2021	$10,000		

3.16.3 Urban Fires Hazard Probability, Frequency and Magnitude

This hazard is considered to have a low risk because infrequent occurrences of this hazard have seldom occurred in the City but can likely occur in the future. Isolated incidents causing minimal impact may, of course, occur on a more frequent basis.

Urban Fire hazards occur citywide in the built environment. Communities with older wooden structures or structures near one another are more vulnerable to structural fires.

Fire-hazard events may occur anywhere within the county; because of this, future development will be impacted.

No significant or notable developmental (construction, climate variability, population changes, and other conditions) changes have occurred that would change the vulnerability of the City to this hazard. While new housing developments have been built since the last iteration of the plan, the trends have not been unique or reflective of an increased vulnerability to this hazard.

This hazard impacts the entire City equally; therefore, the entire population and all buildings within the City are vulnerable to fires and can expect the same impacts within the affected area. Because of the difficulty predicting which communities are at risk, the entire population and all buildings have been identified as risk facilities. All facilities are vulnerable to fire hazards. An essential or critical facility will encounter many of the same impacts as any other building within the City. These impacts include structural damage from fire and water damage from efforts extinguishing fire. A structural fire has the potential to cause enormous property damage and threaten the lives of City residents. Direct burns and smoke inhalation can both seriously injure residents and their pets, not to mention the significant financial loss that would likely accompany any such event.

Burning of certain property or urban structures has the potential to release hazardous fumes and smoke into the air, potentially threatening the health of the community and of the environment nearby. It is also possible for fires to spread amongst nearby trees and vegetation, potentially causing a great deal of damage to the surrounding flora and fauna.

Vulnerability and Impacts

Urban fire impacts the life safety and health of the City by posing a direct threat to the Public through smoke inhalation, and burns. Urban fire impacts property damage and critical infrastructure of the City by threatening existing structures beyond the initial point of ignition. Urban fire impacts the economy for the City by damaging or destroying buildings such as businesses. Urban fire impacts the changes in development and impact of future development for the City by potentially halting current development due to damage or causing future development to account for high-risk fire zones. Urban fire impacts underserved and at risk populations of the City by causing increased financial strain due to healthcare costs and property damage. The effects of climate change in severity of impact for urban fire for the City is an increased risk. Wildfires are burning more often, hotter, and are larger due to increasing temperatures. This increases the risk of an urban fire where the wildland-urban fire interface is more extensive.[97]

[97] U.S Fire Administration. (n.d.). Wildland Urban Interface. Retrieved from https://www.usfa.fema.gov/stories/wildland-urban-interface/

3.17 Urban Flood Hazard Profile

Table 3.70: Urban Flood Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Urban Flood	1	8	12	22	42	**25**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.17.1 Urban Flood Hazard Description

According to the National Flood Insurance Program (NFIP), flood is the most common type of disaster including both man-made and naturally occurring incidents in the U.S. Areas along rivers, streams, lakeshores, and coastlines are particularly susceptible to flooding.

The primary responsibility of the local governments during widespread flooding is to protect public safety. The second responsibility is protection of the environment followed by property including highways, streets, bridges, and other structures.

The types and causes of flooding that can occur within the City are the result of:

- Heavy rains,
- Dam release, (described in Section 3.5)
- Flood control channel overflow,
- Wastewater flooding within residences as a result of lift station failures,
- Coastal, tropical, and/or hurricane storms, and

- Accidents such as reservoir leaks and water main breaks.

Due to light annual rain fall and the City's location on the flood plain protecting it from channel overflow, dam release is the most probable cause of flooding with the City.

A flood occurs any time a body of water rises to cover what is usually dry land. Floods have many causes, including heavy rains, spring snowmelt, coastal storms, and dam or levee release. When flooding occurs, affected areas may sustain damage to structures and personal property, as well as severe damage to the environment in the form of soil erosion, deforestation and damage to utilities and transportation systems.

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

- **Flood Watch** – Issued when forecasters have between 50% and 80% confidence that a particular forecast point on a river will rise above flood stage.– Flood Watches will typically be issued 6 to 48 hours before a river is forecast to rise above flood stage.
- **Flood Warning** – Flooding is expected to occur more than 6 hours after the causative event. Issued when flooding is imminent or occurring.
- **Flash Flood Watch** – Issued when conditions are favorable for flash flooding.— It does not mean that flash flooding will occur, but it is possible.
- **Flash Flood Warning** – Issued when a flash flood is imminent or occurring. People in flood prone areas should move to high ground immediately. A flash flood is a sudden violent flood that can take from minutes to hours to develop. It is possible to experience a flash flood in areas not immediately receiving rain.

Alluvial Fan Flooding

Alluvial fan flooding occurs in the steep arid or semiarid mountains found throughout California. Alluvial fans are fan-shaped deposits of eroded rock and soil carried out of mountains and into valley floors by landslides, mudslides, mudflows, and surface runoff. At the beginning of the valley, alluvial fans are steep and narrow with boulders and other course material. The deposited material becomes increasingly fine as the gradient decreases and the material, mainly gravel, sand and mud, spreads.

When rain falls, runoff from the canyon walls flows as a high-velocity sheet that channels into rivulets, and then to natural drainage courses. The rapidly moving water often carries large boulders and other material from the watershed depositing them into runoff channels, blocking the flow of water. Floodwater then spills out onto the fan, with each event finding a new channel that soon fills up with deposits and overflows. Flooding in alluvial fans often can cause greater damage than clear-water flooding.

Flash Flooding

A flash flood is a rapid flooding of low-lying areas, rivers and streams that is caused by the intense rainfall associated with a thunderstorm or multiple thunderstorms. Flash floods also occur when a man-made structure, such as a dam, collapses. Flash flooding occurs when the ground under a storm becomes saturated with water so quickly that it cannot be absorbed. The runoff collects in low-lying areas and flows rapidly downhill. As a result, anything in its path is suddenly in rising water. Typically, flash floods begin with a slow-moving thunderstorm. A slow-moving thunderstorm usually takes longer to move out of the affected areas and causes the area to endure a greater amount of rainfall for a longer period of time. In addition, a thunderstorm may pass over an affected area repeatedly, dumping even more rainfall.

The heavy rainfall associated with these storm systems contributes to urban flooding in a number of ways. Primarily, heavy rainfall will often overwhelm the capacity of the conventional drainage system made up of storm drains, catch basins, sewers, and additional natural mechanisms for storm-water management. These systems typically cannot handle more than one or two inches of rainfall per hour before they begin to back up and overflow. This amount is further diminished if the storm drains, and other components of the storm-water management system, have not been adequately maintained, are clogged with debris such as trash or natural waste, or are old and in a state of disrepair. Heavy rainfall, combined with storm-water runoff, can cause local waterways to rise and overflow their banks.

3.17.2 Urban Flood Hazard History

A flood event in Los Angeles County can range from a few isolated areas where a number of streets are flooded preventing temporary access to homes and businesses, to numerous homes inundated with several feet of water causing millions of dollars of damage. Floods in the City area can cause extensive damage to residential and business properties, parks and recreational facilities, road and highway infrastructure, and critical utility facilities.

The City is adjacent to two major rivers: the San Gabriel River to the east and the Rio Hondo River to the west. These rivers both serve as flood control channels in times of heavy rains. Specific low-lying regions of the City are more susceptible to urban flooding including Rancho Los Amigos Hospital Grounds, Firestone and Lakewood Boulevard, Firestone Boulevard and between Paramount Boulevard and Brookshire Avenue, areas south of Telegraph Road and north of the Santa Ana Freeway.

The National Center of Environmental Information (NCEI) has reported 24 flash fflood events between 2017 until May 2023 in Los Angeles County. None of those incidents have resulted in loss of life or financial damages.58F[98] Between 2019 and February 2024, four emergencies and disasters have been declared for flooding (EM-3591, EM-3592, DR-4434, DR-4431). The table below lists the flood events that have occurred in Los Angeles County between 2017 and 2023 according to the NCEI.

Table 3.71: Flood Events in Los Angeles County (2017 - 2023)

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
LAS LOMAS	LOS ANGELES CO.	01/12/2017	14:41	Flash Flood	0	0	0.00K	0.00K
LANG	LOS ANGELES CO.	01/20/2017	12:59	Flash Flood	0	0	0.00K	0.00K

[98] National Centers for Environmental Information NCEI. (2023). Storm Events Database – Los Angeles County Flood & Flash Flood. Retrieved from https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Flash+Flood&eventType=%28Z%29+Flood&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2017&endDate_mm=05&endDate_dd=26&endDate_yyyy=2023&county=LOS%2BANGELES%3A37&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
LAS LOMAS	LOS ANGELES CO.	01/20/2017	13:15	Flash Flood	0	0	0.00K	0.00K
CARSON	LOS ANGELES CO.	01/22/2017	14:39	Flash Flood	0	0	0.00K	0.00K
HUMPHREYS	LOS ANGELES CO.	02/11/2017	15:04	Flash Flood	0	0	0.00K	0.00K
HUMPHREYS	LOS ANGELES CO.	02/17/2017	17:00	Flash Flood	0	0	0.00K	0.00K
ACTON	LOS ANGELES CO.	08/03/2017	15:47	Flash Flood	0	0	0.00K	0.00K
LLANO CRYSTAL ARPT	LOS ANGELES CO.	08/15/2020	14:50	Flash Flood	0	0	0.00K	0.00K
GORMAN	LOS ANGELES CO.	08/18/2020	17:15	Flash Flood	0	0	0.00K	0.00K
LAKE HUGHES	LOS ANGELES CO.	09/11/2022	13:43	Flash Flood	0	0	0.00K	0.00K
CLAREMONT	LOS ANGELES CO.	09/11/2022	18:20	Flash Flood	0	0	0.00K	0.00K
DESERT VIEW HIGHLAND	LOS ANGELES CO.	09/11/2022	18:20	Flash Flood	0	0	0.00K	0.00K
LAKE HUGHES	LOS ANGELES CO.	09/11/2022	18:39	Flash Flood	0	0	0.00K	0.00K
THREE PT	LOS ANGELES CO.	09/11/2022	19:38	Flash Flood	0	0	0.00K	0.00K
(SDB)SANDBERG	LOS ANGELES CO.	09/11/2022	20:01	Flash Flood	0	0	0.00K	0.00K
ELIZABETH LAKE	LOS ANGELES CO.	01/09/2023	15:49	Flash Flood	0	0	0.00K	0.00K
SANTA SUSANA	LOS ANGELES CO.	01/09/2023	19:17	Flash Flood	0	0	0.00K	0.00K
VAL VERDE PARK	LOS ANGELES CO.	01/09/2023	19:56	Flash Flood	0	0	0.00K	0.00K

Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
HEWITT	LOS ANGELES CO.	02/24/2023	14:44	Flash Flood	0	0	0.00K	0.00K
HONBY	LOS ANGELES CO.	02/24/2023	22:39	Flash Flood	0	0	0.00K	0.00K
NORTH HOLLYWOOD	LOS ANGELES CO.	02/25/2023	00:23	Flash Flood	0	0	0.00K	0.00K
UNIVERSAL CITY	LOS ANGELES CO.	02/25/2023	01:22	Flash Flood	0	0	0.00K	0.00K
SAN FERNANDO	LOS ANGELES CO.	02/25/2023	04:03	Flash Flood	0	0	0.00K	0.00K
WAVE	LOS ANGELES CO.	02/25/2023	05:21	Flash Flood	0	0	0.00K	0.00K
				Total	**0**	**0**	**0.00K**	**0.00K**

The City has experienced large flooding events in the past. For example, in the winter of 1952 when Firestone Blvd. was overwhelmed with rainwater. On a smaller scale, the City has experienced local flooding which has inhibited traffic flow and resulted in minor property damage.

Repetitive Loss Properties

FEMA defines a repetitive loss structure as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.

Severe Repetitive Loss Building

Defined by FEMA as any building that: (1) Is covered under a Standard Flood Insurance Policy made available under this title. (2) Has incurred flood damage for which: (a) Four or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or (b) At least two separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss.

Severe Repetitive Loss Property

Either a severe repetitive loss building or the contents within a severe repetitive loss building, or both. The figure below summarizes FEMA repetitive loss and severe repetitive loss properties in the City.

Figure 3.31: Repetitive loss & Severe Repetitive loss Summary[99]

Community Repetitive Loss

COMMUNITY : DOWNEY, CITY OF

Community | State | Regional | National

	AE, A1-30, AO, AH, A	VE, V1-30, V	B, C, X	TOTAL
RL Buildings (Total)	1	0	1	2
RL Buildings (Insured)	0	0	1	1
RL Losses (Total)	1	0	1	2
RL Losses (Insured)	0	0	1	1
RL Payments (Total)	$71,999.16	$.00	$59,733.70	$131,732.86
Building	$71,999.16	$.00	$59,733.70	$131,732.86
Contents	$.00	$.00	$.00	$.00
RL Payments (Insured)	$.00	$.00	$59,733.70	$59,733.70
Building	$.00	$.00	$59,733.70	$59,733.70
Contents	$.00	$.00	$.00	$.00

Post - FIRM SFHA RL Buildings:	0
Insured Buildings with 4 or More Losses:	0
Insured Buildings with 2-3 Losses > Building Value:	0
Total Target RL Buildings:	0

The figure below summarizes the number of policies enforced and the total monetary amount of closed paid losses.

Figure 3.32: Insurance Occupancy[100]

Insurance Occupancy

As of 04/02/2023

Community:	DOWNEY, CITY OF	State:	CALIFORNIA
County:	LOS ANGELES COUNTY	CID:	060645

Overview | Occupancy | Zone | Pre/Post FIRM

	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family	65	$35,072	$20,993,000	12	$4,916.47	$1,915.00
2-4 Family	0	$0	$0	0	$0.00	$0.00
All Other Residential	5	$2,694	$2,034,000	1	$0.00	$125.00
Non Residential	5	$7,360	$2,556,000	3	$131,732.86	$15,172.95
Total	75	$45,126	$25,583,000	16	$136,649.33	$17,212.95

	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Condo	3	$1,413	$596,000	0	$0.00	$0.00
Non Condo	72	$43,713	$24,987,000	16	$136,649.33	$17,212.95
Total	75	$45,126	$25,583,000	16	$136,649.33	$17,212.95

99 California Department of Water Resources (2023). Data provided by Division of Regional Assistance-Southern Region Office.
100 Ibid.

3.17.3 Urban Flood Hazard Probability, Frequency, and Magnitude

Figures 3.33, 3.34, and 3.35 on the following pages provide FEMA Flood Insurance Rate Maps (FIRM) for the City, as well as Southern California. According to the maps, the City is in 500-year flood plains. The 500-year recurrence intervals indicate a 0.002 annual probability of a flooding event. Although unlikely, flooding remains a possibility due to the potential for release of nearby Prado Dam. Refer to section 3.8 for additional information on dam failure.

As of September 2022, more than 89,500 single-family homes had flood insurance policies. There are only 40 policies in place in in the City of Downey.[101]

[101] FEMA (2022). FEMA Risk Rating, Flood Insurance Policies. Retrieved from https://www.insurancejournal.com/app/uploads/2023/05/fema_risk-rating-2.0_exhibits-2-3-4.xlsx

Figure 3.33: City of Downey FEMA Insurance Rate Map (FIRM)

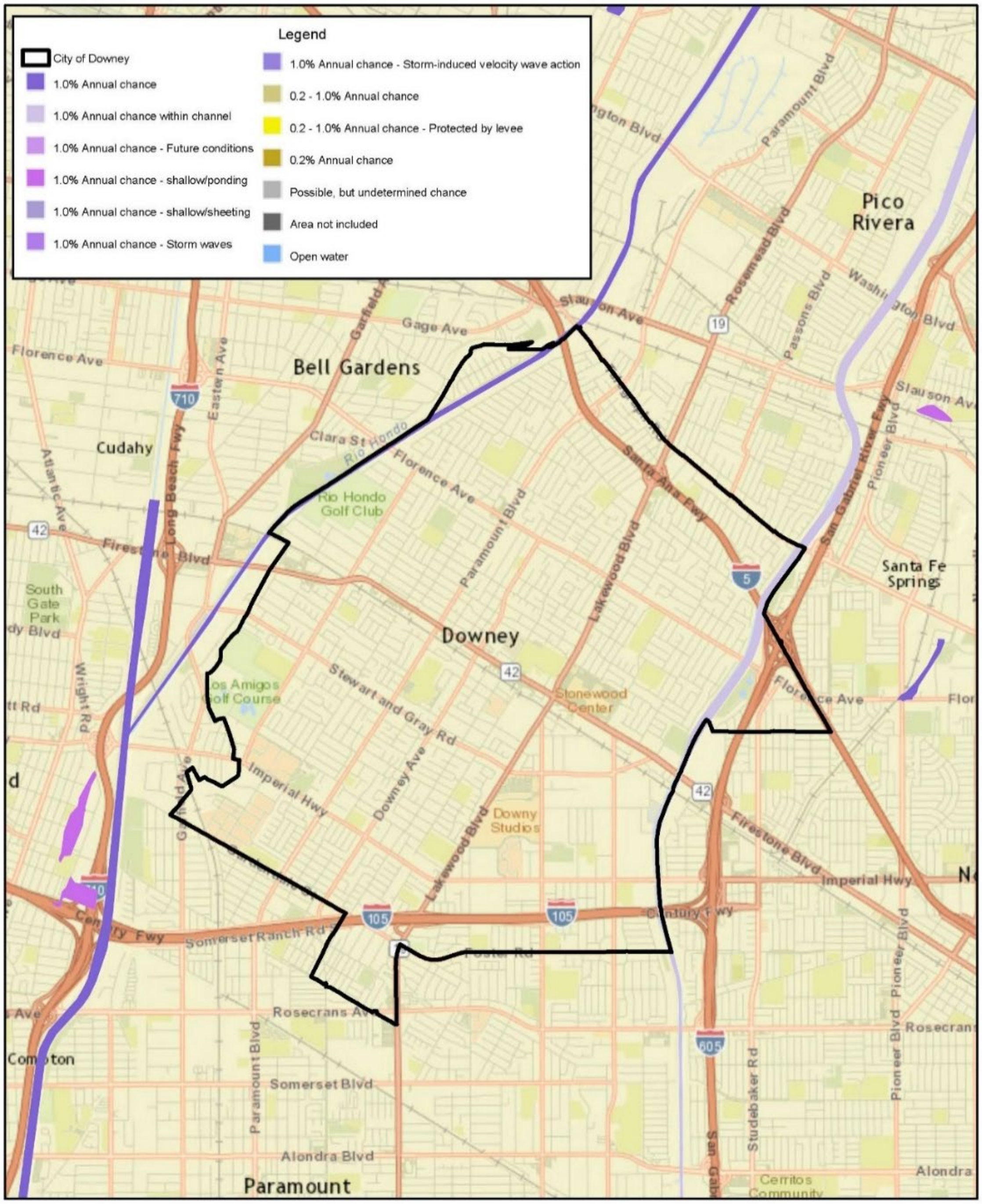


Figure 3.34: City of Downey 100-year Flood Study

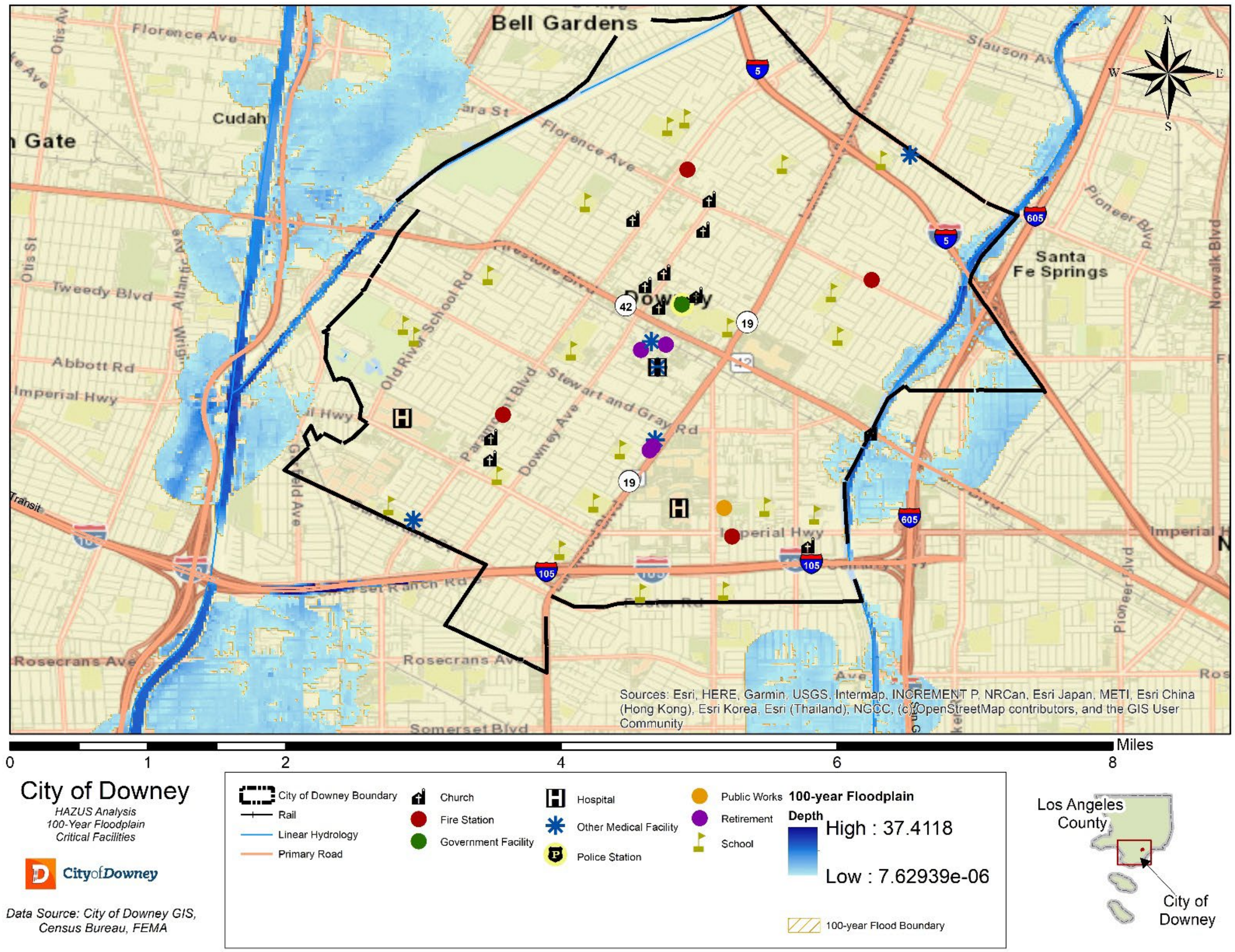
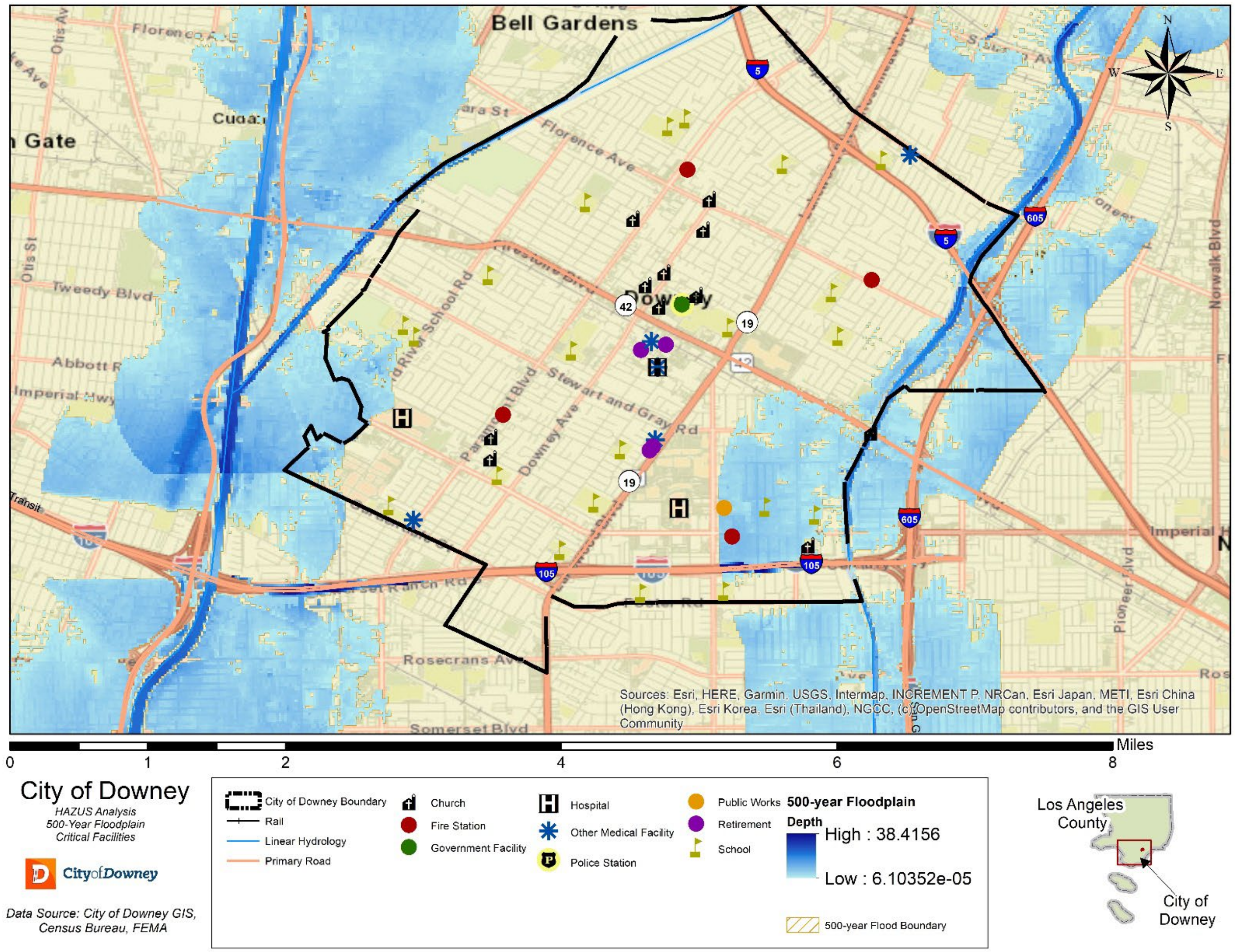


Figure 3.35: City of Downey 500-year Flood Study



Due to Climate Change, more frequent and intense rains are leading to more severe flooding. Heavy rain can trigger flash flooding and make rivers overflow. Saturated soil also creates ideal conditions for landslides and mudslides.

HAZUS

A HAZUS analysis was conducted for a 100-year and 500-year flood to examine the exposure and damages of buildings to flooding.

100-Year Flood Analysis

The total economic loss estimated for the flood is 1,209.09 Million, which represents 10.19 percent of total replacement value of the scenario buildings. HAZUS estimates that about 804 buildings will be at least moderately damaged. This is over 67 percent of the buildings in the City. There are an estimated 3 buildings that will be completely destroyed. The table below summarizes the expected damage by general occupancy for the buildings in the City of Downey planning area.

Table 3.72: HAZUS 100-Year Flood Expected Building Damage by Occupancy

Damage Level	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	43	80	11	20	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	40	60	24	36	3	4	0	0	0	0	0	0
Other Residential	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**638**		**599**		**145**		**53**		**4**		**3**	

The table below summarizes the expected damage to essential facilities in the City of Downey planning area. As you will see, the damage is not significant (less than moderate).

Table 3.73: HAZUS 100-Year Flood Expected Damage to Essential Facilities

Facility	Total	At Least Moderate *(Greater than 50% damage)*	At Least Substantial *(Greater than 50% damage)*	Loss of Use *(Greater than 50% on day 1)*
Emergency Operations Center	2	0	0	0
Fire Assets	9	0	0	0
Medical	4	0	0	0
Law Enforcement	2	0	0	0
Schools and related assets	53	0	0	0
TOTAL	**70**	0	0	0

**Includes all assets within city boundaries and not just those from the city.*

The total building-related losses were $568.77 Million. 53 percent of the estimated losses were related to the business interruption of the City of Downey. The residential occupancies made up 11.54 percent of the total loss. See ***Appendix A*** – *Additional Hazard Analysis Information* for building related economic loss estimates, Table 6.

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood incident and associated potential evacuation. HAZUS also estimates the number of displaced individuals that will require accommodation in temporary public shelters. The model estimates 3,126 households (or 9,378 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 621 people (out of a total population of 187,241) will seek temporary shelter in public shelters.

500-Year Flood Analysis

The total economic loss estimated for the flood is $5,184.91 Million, which represents 43.72 percent of total replacement value of the scenario buildings. HAZUS estimates that about 4,130 buildings will be at least moderately damaged. This is over 70 percent of the buildings in the City. There are an estimated 66 buildings that will be completely destroyed. The table below summarizes the expected damage by general occupancy for the buildings in the City of Downey planning area.

Table 3.74: HAZUS 500-Year Flood Expected Building Damage by Occupancy

Damage Level	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	90	44	108	53	6	3	1	0	0	0	0	0
Education	1	100	0	0	0	0	0	0	0	0	0	0
Government	6	67	3	33	0	0	0	0	0	0	0	0
Industrial	87	36	120	49	30	12	5	2	2	1	0	0
Other Residential	1	100	0	0	0	0	0	0	0	0	0	0
TOTAL	**1,451**		**2,403**		**875**		**613**		**173**		**66**	

**Includes all assets within city boundaries and not just those from the city.*

The table below summarizes the expected damage to essential facilities in the City of Downey planning area. As you will see, the damage is not significant (less than moderate).

Table 3.75: HAZUS 500-Year Flood Expected Damage to Essential Facilities

Facility	Total	At Least Moderate *(Greater than 50% damage)*	At Least Substantial *(Greater than 50% damage)*	Loss of Use *(Greater than 50% on day 1)*
Emergency Operations Center	2	0	0	0
Fire Assets	9	0	0	0
Medical	4	0	0	0
Law Enforcement	2	0	0	0
Schools and related assets	53	0	0	0
TOTAL	**70**	0	0	0

**Includes all assets within city boundaries and not just those from the city.*

The total building-related losses were $2,922.01 Million, 44 percent of the estimated losses were related to the business interruption of the City of Downey. The residential occupancies made up 14.11 percent of the total loss. See ***Appendix A*** – *Additional Hazard Analysis Information* Section 500-Year flood for building related economic loss estimates, Table 6.

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood incident and associated potential evacuation. HAZUS also estimates the number of displaced individuals that will require accommodation in temporary public shelters. The model estimates 11,941 households (or 35,854 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2,065 people (out of a total population of 187,241) will seek temporary shelter in public shelters.

An Urban Flood NRI annualized frequency is not available as FEMA does not include this hazard as one of the eighteen natural hazards in the National Risk Index. However, Riverine Flooding annualized frequency data for the City is available and represents the average number of recorded Riverine Flooding hazard occurrences (event-days) per year over the period of record (24 years). Per the County of Los Angeles Hazard Mitigation Plan "Floods can occur at any time but are most common with annual winter storms packed with subtropical moisture. Severe flooding is most likely to occur during strong El Niño events, generally ranging from 2 to 7 years and lasting from as little as 6 months to as long as 4 years."[102]

The table below outlines the annualized frequency for riverine flooding, based on FEMA NRI data, for the City.

Table 3.76: Riverine Flooding Annualized Frequency (FEMA National Risk Index)

City of Downey Census Tracts	Events on Record *(1996 – 2019) 24 years*	Annualized Frequency
550501	106	4.4 events per year
550502	106	4.4 events per year
550601	106	0 events per year
550602	106	0 events per year
550700	106	4.4 events per year
550801	106	0 events per year
550802	106	4.4 events per year
550901	106	0 events per year
550902	106	0 events per year
551001	106	4.4 events per year
551002	106	0 events per year
551101	106	0 events per year
551102	106	0 events per year
551201	106	0 events per year
551203	106	0 events per year
551204	106	0 events per year

[102] Chief Executive Office, OEM. (2020). County Los Angeles All Hazard Mitigation Plan. Retrieved from County-of-Los-Angeles-All-Hazards-Mitigation-Plan-APPROVED-05-2020.pdf (lacounty.gov)

City of Downey Census Tracts	Events on Record *(1996 – 2019) 24 years*	Annualized Frequency
551300	106	0 events per year
551401	106	0 events per year
551402	106	0 events per year
551501	106	0 events per year
551502	106	0 events per year
551700	106	0 events per year
551801	106	0 events per year
551802	106	0 events per year
553400	106	0 events per year
980012	106	0 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Vulnerability and Impacts

Population: Of greatest concern in the event of a flooding event is the potential for injury or loss of life. Seniors, persons with disabilities, and low-income persons are likely to be impacted during these events. Persons experiencing homelessness who are outside during flood conditions may experience property damage or be unable to access shelter. Possessions such as sleeping bags or electronic devices may be damaged or swept away by these floodwaters.

No properties within Downey are considered by FEMA to be within a 100-year flood zone. A small segment of the southeast portion of the city is located within the 500-year flood zone (0.2% Annual Chance of Flooding). Localized flooding in Downey is a concern and more study is needed to determine specific populations that may be vulnerable to urban/flash flooding.

Table 3.77: Vulnerability and At-Risk Populations in 500-year Flood Zone

Vulnerability and At-Risk/Underserved Category	Count	Percent of Total
Persons with Disabilities	1,140	9% (12,419)
Elderly (65+ years)	746	6% (12,552)
Elderly (75-84 years)	226	7% (3,373)
Elderly (85 years and over)	43	3% (1,701)
Language other than English	5,831	8% (70,341)
Speak English less than very well	1,703	8% (22,641)

Vulnerability and At-Risk/Underserved Category	Count	Percent of Total
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count. Due to the transient nature of this at-risk group, location-specific analyses were not possible.
Note: This analysis was based on the census tracts that reside within the 500-year flood zone. *Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services*		

Property:

A small segment of the southeast portion of the city is located within the 500-year flood zone (0.2% Annual Chance of Flooding). Any physical assets within these mapped boundaries can potentially be inundated if enough precipitation falls, exceeding the storm drain infrastructure design capacity in these areas. Since the Army Corp of Engineers completed raising the channel levees in 2000, no properties within Downey are considered by FEMA to be within a 100-year flood zone (a flood of such intensity that it has a one percent chance of occurring in any given year). More study and analysis are needed to determine exposure and damage estimates to flash flooding due to localized flooding, which results from deficiencies in the existing storm drain system.

Localized flooding in Downey may result from deficiencies in the existing storm drain system. Intensified development of properties over time has increased the amount of impermeable surfaces thereby reducing the watersheds ability to infiltrate storm water. This increase in impermeable surfaces has increased the quantity of water runoff, which is the amount of water directed toward drains from properties. This storm drain system consists of a network of reinforced concrete boxes along city streets that direct storm water toward flood control channels via reinforced concrete pipes. The system is typically designed to handle 10-year floods. However, there are parts of Downey where the amount of surface runoff now exceeds the design of this system and periodic flooding may occur. These areas include the arterial streets which may produce traffic delays and possible service interruptions during rainfall events. More study is needed to determine specific and repetitive loss areas.

The deficiencies in the storm drain system may be addressed by increasing the capacity of the storm drain system. However, upgrading the storm drain system involves capital outlays and coordination among government agencies. Downey has considered measures that reduce the volume of stormwater and the best method to reduce any further strain on the storm drain system. These measures may include the following:

- Require hydrology studies that address the impact by developments on downstream stormwater capacity.
- Maximize the amount of landscape planting areas and other pervious surfaces on properties to decrease runoff volumes.
- Encourage the use of pervious materials that allow for stormwater infiltration and retention in areas used as driveways, walkways, courtyards, plazas, and other areas that are typically paved with impervious surfaces.
- Minimize the surface areas of rooftops, parking lots, driveways, walkways, and other impervious surfaces.
- Encourage building roof designs which direct rooftop runoff to pervious surfaces for stormwater infiltration and retention.
- Preserve existing natural vegetated areas and encourage vegetation and soil restoration where feasible.
- Incorporate stormwater runoff systems into site design to provide areas for infiltration and retention of stormwater runoff on site.

Table 3.78: Assets/Structures Vulnerability and Impact Summary: 100-year and 500-year Flood per FEMA Flood Zone areas

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Airport* (No major airports in Downey)	0	0%	There are no major airports in Downey
Government (City Hall and Public Works)	0	0%	
Columbia Memorial Space Center	0	0%	
Hospitals	0	0%	
Major Shopping Centers	0	0%	
National Register of Historic Places	0	0%	
Library	0	0%	
Parks	1 (500-year flood only)	9%	
Schools	1 (500-year flood only)	3%	
Fire Stations	0	0%	
Police Stations	0	0%	

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Source: Los Angeles County Assessors, National Bridge Inventory, City of Downey			

Economic: Impacts to the local economy could include business interruptions, lost or reduced wages from potential relocation of populations, infrastructure and resource downtime costs. Other secondary hazard impacts such as reduced water quality or resource availability, which could in turn raise costs of water processing and distribution, are also possible results from a severe flooding event. Data is limited for economic loss due to the isolated and urban nature of flooding in Downey.

Changes in Development and Future Development: The Federal Emergency Management Agency (FEMA) publishes maps that identify areas of Downey subject to flooding in the event of a major storm. These Flood Insurance Rate Maps (FIRMs) indicate areas that may be inundated in the event of a 100-year or a 500-year storm. Since the Army Corp of Engineers completed raising the channel levees in 2000, no properties within Downey are considered by FEMA to be within a 100-year flood zone (a flood of such intensity that it has a one percent chance of occurring in any given year). Areas that are designated for future residential development do not fall within the 100-year floodplain and are not subject to specialized flood construction requirements.

Climate Change: The effects of climate change in severity of impact for urban flood for the City is increasing the likelihood of it occurring. As global average temperatures increase, evaporation increases adding moisture into the atmosphere which results in more precipitation.[103] Heavy precipitation events are expected to increase as much as three (3) times the historical average by the end of the century. Although heavy precipitation does not necessarily result in flooding, the potential increases and in some location moderate amounts of precipitation can lead to serious damage.

[103] Environmental Protection Agency. (n.d.). Climate Change Indicators: U.S. and Global Precipitation. Retrieved from https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-precipitation.

FEMA NRI Expected Annual Loss Estimates

An Urban Flood NRI Expected Annual Loss calculation is not available as FEMA does not include this hazard as one of the eighteen natural hazards in the National Risk Index. However, a riverine flood NRI Expected Annual Loss score is available for the City. This rating represents the community's relative level of expected building, population, and agriculture loss each year due to riverine flood when compared to the rest of the United States. The table below outlines the riverine flood Expected Annual Loss for the City of Downey planning area.

Table 3.79: Riverine Flood Expected Annual Loss

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$480	$10	$0	$490	30.8	Very Low
550502	$142	$4	$0	$146	28.1	Very Low
550601	$0	$0	$0	$0	0.0	No Expected Annual Losses
550602	$0	$0	$0	$0	0.0	No Expected Annual Losses
550700	$862	$55	$0	$917	33.2	Very low
550801	$0	$0	$0	$0	0.0	No Expected Annual Losses
550802	$264	$3	n/a	$267	29.3	Very Low
550901	$0	$0	$0	$0	0.0	No Expected Annual Losses
550902	$0	$0	$0	$0	0.0	No Expected Annual Losses
551001	$1,047	$19	$0	$1,066	33.9	Very Low
551002	$0	$0	$0	$0	0.0	No Expected Annual Losses
551101	$0	$0	$0	$0	0.0	No Expected Annual Losses
551102	$0	$0	$0	$0	0.0	No Expected Annual Losses
551201	$0	$0	$0	$0	0.0	No Expected Annual Losses
551203	$0	$0	$0	$0	0.0	No Expected Annual Losses
551204	$0	$0	$0	$0	0.0	No Expected Annual Losses
551300	$0	$0	$0	$0	0.0	No Expected Annual Losses
551401	$0	$0	$0	$0	0.0	No Expected Annual Losses
551402	$0	$0	$0	$0	0.0	No Expected Annual Losses
551501	$0	$0	$0	$0	0.0	No Expected Annual Losses
551502	$0	$0	$0	$0	0.0	No Expected Annual Losses
551700	$0	$0	$0	$0	0.0	No Expected Annual Losses
551801	$0	$0	$0	$0	0.0	No Expected Annual Losses
551802	$0	$0	$0	$0	0.0	No Expected Annual Losses

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
553400	$0	$0	$0	$0	0.0	No Expected Annual Losses
980012	$0	$0	$0	$0	0.0	No Expected Annual Losses
Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)						

3.18 Utility Loss Hazard Profile

Table 3.80: Utility Loss Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Utility Loss	2	7	12	26	45	**49**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.18.1 Utility Loss Hazard Description

Utility loss includes losses of power, water, sewer, and other critical services. A power outage is the loss of the electricity supply to an area. In addition to natural hazards, power failure can result from a defect in a power station, damage to a power line or other part of the distribution system, a short circuit, or overloading of electricity mains.

A power outage may be referred to as a blackout if power is lost completely, or as a brownout if some power supply is retained, but the voltage level is below the minimum level specified for the system, and a short circuit indicates a loss of power for a short amount of time (usually seconds). Some brownouts, called voltage reductions, are made intentionally to prevent a full power outage.

The absence of electrical power at City facilities for extended periods can, in some areas, preclude water deliveries where pumping is necessary. This will result in a loss of water and sewer services to the local area. In and of themselves, these short duration utility losses typically do not generate large hazards that can dramatically impact the City. However, utility losses in conjunction with other hazards can make response efforts much more difficult. For example, since water is typically pumped from a source, a loss of water during a fire will decrease the effectiveness of firefighting systems, or a sewer system failure in conjunction with a flood will result in increased localized flooding in residences and the streets. Since water and sewer systems usually require power sources for the pumps, adequate backup power should be available for critical systems in the event of a power failure.

3.18.2 Utility Loss Hazard History

California Energy Crisis 2000 and 2001 Blackouts

In 2000 and 2001, blackouts occurred in Southern California due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption. The crisis brought to light many critical issues surrounding the state's power generation and distribution system, including its dependency on out-of-state resources. Although California has implemented effective energy conservation programs, the State continues to experience both population growth and weather cycles that contribute to a heavy demand for power.

2011 Southwest Blackout

In September of 2011, five separate power grids serving nearly 7 million people in southern California, western Arizona, and parts of Mexico went out in the span of 11 minutes. The power outage, termed the 2011 Southwest Blackout, was the largest power failure in California history and lasted over twelve hours.

Affected metropolitan areas were crippled from the loss of traffic signals; as a result, trains stopped running and freeways experienced extreme congestion. Public gas stations were also unable to pump fuel, leaving many vehicles stranded. The power outage also caused several sewer pumping stations to fail, resulting in contaminated beaches and potentially unsafe water supplies. Restaurants and grocery stores also suffered large losses from spoiled food.

2020 Rolling Blackouts

Prolonged heat waves strain the state's energy grid. August of 2020 marked the first time in 20 years when a blackout was ordered due to insufficient energy supplies. Hundreds of thousands lost power amid a heat wave. The power grid was already strained with the unprecedented heat wave with temperatures in much of the state reaching triple digits. California buys energy from neighboring states, but during heat waves like this one, those states have less energy to spare leading to rolling blackouts.[104]

The table below shows utility company PSPS, public safety power shutoffs of six days or more as documented by the California Public Utilities Commission

Table 3.81: PSPS Greater than 6 or More Days (2017-2023)

Utility	Outage Start	Full Restoration	Outage Duration	Total Customers Impacted	Residential	Commercial
SDG&E	12/5/17	12/11/17	6 days, 0 hrs., 52 min.	87	61	26
PG&E	10/26/19	11/2/19	6 days, 18 hrs., 46 min.	-	-	-
SCE	1/15/21	1/21/21	6 days, 1 hr., 36 min.	555	470	73
SCE	1/14/21	1/20/21	6 days, 11 hrs., 26 min.	2,709	2,575	34
SCE	1/14/21	1/21/21	7 days, 1 hr., 26 min.	3,395	3,157	137
SCE	1/15/21	1/21/21	6 days, 7 hrs.	299	144	155
SCE	1/14/21	1/21/21	7 days, 7 hrs., 50 min.	714	638	52
PG&E	1/19/21	1/26/21	7 days, 16 hrs., 1 min.	1,363	1,281	79

3.18.3 Utility Loss Hazard Probability, Frequency, and Magnitude

Currently, failure mechanism to calculate the probability of utility losses, without evaluating the failure as a cascade effect from natural hazards (e.g., earthquakes). However, California has implemented numerous conservation measures to ensure an adequate power supply, and the City has worked with its water suppliers to ensure an adequate water supply. As utilities lines and assets run through the entire City, the steering committee has assumed equal vulnerability for all portions of the City.

Vulnerability and Impacts

Utility loss impacts the life safety and health of the city by impairing essential services including water, power, and healthcare access. This may lead to injury, illness, or death to the Public. Utility loss impacts property damage and critical infrastructure of the city by significantly impairing the function of critical infrastructure. Depending on the cause of the utility loss (such as a storm,)

[104] ABC News. (2022). Why California Has Blackouts: A Look at the Power Grid. Retrieved from https://abcnews.go.com/US/california-blackouts-power-grid/story?id=89460998

damage to buildings or infrastructure may be damaged. Utility loss impacts the economy for the city by halting a significant portion of economic income for various businesses depending on the sector. Utility loss impacts the changes in development and impact of future development for the city by potentially pausing current developments and highlighting potential mitigation measures for future development. Utility loss impacts underserved and at-risk populations of the city by

The effects of climate change in severity of impact for utility loss for the City is a general likelihood of increased utility interruptions. This is due to more frequent and intense severe weather due to climate change.[105]

[105] NASA. Global Climate Change. (n.d.). Extreme Weather and Climate Change. Retrieved from https://climate.nasa.gov/extreme-weather/

3.19 Wildfire Smoke/Air Quality Hazard Profile

Table 3.82: Wildfire Smoke/Air Quality Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Wildfire Smoke/Air Quality	3	7	15	23	45	**69**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.19.1 Wildfire Smoke/Air Quality Description

Wildfire Smoke

The Southern California peak wildfire season (and therefore heightened risk of poor air quality) spans from late spring (May/June) to October. While the length of wildfire season depends on summer temperature, rainfall, wind, and historic data showing that most fires occur from May until October, rising temperatures and decreased rainfall that come with climate change have the season beginning earlier and ending later each year.[106]

When wind is paired with the hot, dry weather, it is a perfect combination for the spread of wildfire and the smoke that comes with them. Santa Ana winds in Southern California are strong, dry downslope that blow from the mountains toward the coast, causing wildfires to ignite and spread

[106] Western Fire Chiefs Association. (2022). California Fire Season; In-Depth Guide. Retrieved from https://wfca.com/articles/california-fire-season-in-depth-guide/

rapidly. These winds reach up to forty miles per hour and sometimes top hurricane strength winds of 74 mph and above.

Due to the frequent massive sizes of wildfires, there's a potential for air pollution to reach far outside the initial burn zone. Winds also move smoke away from the fire contributing to atmospheric mixing, which means that smoke impacts to the public around the fire may be lessened while winds move the smoke plume long distances into communities far from where the wildfire is burning.[107] Due to this movement of wildfire smoke, the entirety of the City of Downey is at risk to poor air quality.

The composition of wildfire smoke is a complex mixture of particulate matter, carbon monoxide, hydrocarbons and other organic chemicals, nitrogen oxides and trace minerals. The Clean Air Act requires the Environmental Protection Agency (EPA), to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The EPA has set NAAQS for six principal pollutants, three of which may be of concern during wildfire smoke events: particulate matter, ground level ozone and carbon monoxide. The following table elaborates on the specific details of each of the three pollutants.

Table 3.83: Wildfire Smoke Event Pollutants

Particulate Matter (PM)	A mixture of solids and aerosols which vary greatly in size, shape, and chemical composition. Particles are classified by their diameter by the measure of microns. Particles with a diameter of 10 microns or less (PM10) can be inhaled by the lungs and may impact the individual's health. Fine Particulate Matter refers to particles with a diameter of 2.5 microns or less (PM2.5).[108]
Ground-Level Ozone (O_3)	Ozone is a highly reactive and unstable gas which is part of smog. This pollutant forms due to complex reactions between chemicals present in the emissions from industrial plants, vehicles, consumer products, and other sources. At higher concentrations, its effects are comparable to household bleach in terms of killing living cells. It forms in greater amounts on hot, sunny, and calm days. In urban areas of California, ozone concentrations regularly surpass existing health standards in the summertime.[109]

[107] Air Now. (2019). Wildfire Smoke, A Guide for Public Health Officials. Retrieved from https://www.airnow.gov/sites/default/files/2021-09/wildfire-smoke-guide_0.pdf
[108] California Air Resources Board. (n.d.). Inhalable particulate Matter and Health (PM2.5 and PM10). Retrieved from https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health
[109] California Air Resources Board. (n.d.). Ozone & Health. Retrieved from https://ww2.arb.ca.gov/resources/ozone-and-health

Carbon Monoxide (CO)	A colorless, odorless gas forms from the incomplete combustion of carbon fuels. These fuels include natural gas, gasoline, or wood. The source of this reaction includes vehicles, power plants, and incinerators.[110]

Air Pollution

General air pollution can be caused by both manmade and natural sources. Natural sources include windblown or kicked-up dust, dirt and sand, volcanic smoke and burning materials, such as wildfires. When the sources are manmade, that means that the actions of humans created the pollution. Humans tend to be the leading causes of air pollution in cities. Manmade sources primarily include combustion, largely referring to the exhausts of planes, trains, automobiles, and industrial businesses. The latter may include power plants, factories and refineries, biomass burning; the burning of coal or plant matter for energy, heating or cooking, and agriculture.[111]

California leads the charts for the cities in the United States with the worst air pollution. The top five cities with the worst (PM2.5) include Los Angeles-Long Beach and Bakersfield. The top five U.S, cities with the worst ozone, also include Los Angeles-Long Beach and Bakersfield.

California's unhealthy air quality, relative to other U.S. states, is due to several factors including a population of thirty-nine million people, major port industry and a growing economy that creates significant emissions from traffic, diesel trucks, construction, agriculture, and domestic emissions.

In any given year, California's most polluted cities also tend to be most affected by wildfires. Human-driven climate change is expected to further aggravate the intensity of wildfires in the future by creating warmer and drier conditions, which will worsen the air quality in the state.[112]

In addition to wildfires, increased levels of pollution from automobiles are usually more common during the wintertime in western states due to nitrite particles.[113] Wildfire smoke and other pollutants can therefore overlap and further decrease the overall air quality.

[110] California Air Resources Board. (n.d.). Carbon Monoxide & Health. Retrieved from https://ww2.arb.ca.gov/resources/carbon-monoxide-and-health
[111] IQAir. (2023). What Causes Bad Air Quality? Retrieved from https://www.iqair.com/us/world-air-quality
[112] ibid
[113] American Lung Association. (n.d.). Particle Pollution. Retrieved from https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/particle-pollution

3.19.2 Wildfire Smoke/Air Quality Hazard History

Poor air quality within California has been a long-standing health hazard. The California Air Resources Board was created in 1967 as a merger of the Bureau of Air Sanitation and the California Motor Vehicle Pollution Control Board to address the severe air pollution. Since then, additional efforts have been made to regulate and control air pollution (smog,) such as addressing automobile emissions, factory discharge, and other emission sources. California was the first state to establish tailpipe emission standards in an effort to reduce air pollution.[114]

Over the past four decades, the average air quality in Los Angeles County has generally decreased in lower Air Quality Index (AQI) levels. (See Section 3.17.3 for details on AQI.) While the number of days with unhealthy or hazardous air has decreased, the number of days with moderate air quality has steadily increased. While moderate air quality is considered to be acceptable, individuals with pre-existing health conditions may be impacted by this level of pollution. The following table outlines the detailed historic air quality data of Los Angeles County, considering all criteria air pollutants.[115]

Table 3.84: Los Angeles County Annual Air Quality

Year	Good Quality Air Days	Moderate Quality Air Days	Unhealthy Air for Sensitive Groups	Unhealthy Air Days	Very Unhealthy or Hazardous Air Days	Total Unhealthy/ Hazardous Air Days
2022	40	231	65	28	1	94
2021	41	228	70	26	-	96
2020†	60	169	77	44	16	137
2019	66	213	57	28	1	86
2018	35	222	89	18	1	108
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Very Unhealthy or Hazardous Air Days**	**Very Unhealthy Air Days**	**Total Unhealthy/ Hazardous Air Days**
2017	38	207	74	38	8	120
2016†	32	230	81	19	4	104
2015	26	207	95	36	1	132
2014	23	234	80	26	2	108
2013	22	243	75	25	0	100
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
2012†	33	203	93	35	2	130
2011	17	227	82	36	3	121

[114] California Air Resource Board. (n.d.). History. Retrieved from https://ww2.arb.ca.gov/about/history
[115] Los Angeles Almanac. (n.d.). Annual Air Quality Los Angeles County. Air Quality Days by Year, 1989-2022. Retrieved from https://www.laalmanac.com/environment/ev01b.php

2010	32	219	99	15	0	114
2009	34	213	71	43	4	118
2008†	31	213	68	46	8	122
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
2007	45	193	91	30	6	127
2006	64	172	79	39	11	129
2005	57	170	77	49	12	138
2004†	29	179	87	67	4	158
2003	41	154	83	57	30	170
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
2002	34	152	104	53	22	179
2001	20	159	127	48	11	186
2000†	27	164	114	51	10	175
1999	17	180	140	27	1	168
1998	54	193	72	22	24	118
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
1997	33	171	116	32	13	161
1996†	42	154	91	47	32	170
1995	43	108	109	45	60	214
1994	22	124	96	41	82	219
1993	29	108	111	45	72	228
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
1992†	22	104	92	59	89	240
1991	16	117	96	51	85	232
1990	17	118	84	57	89	230
1989	10	69	110	63	113	286
1988†	9	65	84	63	145	292
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
1987	6	91	87	52	129	268
1986	7	72	92	54	140	286
1985	10	82	91	43	139	273
1984†	5	71	101	52	137	290
1983	11	102	80	37	135	252
Year	**Good Quality Air Days**	**Moderate Quality Air Days**	**Unhealthy Air for Sensitive Groups**	**Unhealthy Air Days**	**Very Unhealthy or Hazardous Air Days**	**Total Unhealthy/ Hazardous Air Days**
1982	8	83	91	54	129	274
1981	4	56	99	46	160	305
1980†	6	74	80	47	159	28

3.19.3 Wildfire Smoke/Air Quality Hazard Probability, Frequency, and Magnitude

Wildfire Smoke and poor Air Quality is a frequent and repeatable hazard within both California and the City of Downey planning area. Air monitoring indicates that 9/10 Californians breathe unhealthy levels of one or more pollutants at some point during the year.[116] Table 3.60 elaborates on how there will be multiple days throughout the year in the planning area where air quality is poor. When the air quality reaches unhealthy levels, an alert is sent out to the affected areas recommending people stay indoors and avoid outdoor activities.

The magnitude of poor air quality is highly dependent on a few factors such as time of day, temperature, ongoing industrial pollutants, wildfires, and more. Air quality generally is the worst during the summer. However, as smoke from wildfires can travel hundreds of miles, a severe wildfire in a different state (or country) can impact the air quality in the City of Downey planning area both during wildfire season and at any other time during the year. The long travel distance of smoke was demonstrated in June of 2023 when Canadian wildfires caused New York City to experience record-setting air pollution, turning the skies orange with contaminants.[117]

The Air Quality Index is the EPA's measure for reporting air quality. The AQI is divided into six categories with each category having increasing levels of risk, especially for immunocompromised individuals and those with pre-existing health conditions. This scale dictates when air quality alerts are sent out to the affected locations.

[116] California Air Resources Board. (n.d.). Health & Air Pollution. Retrieved from https://ww2.arb.ca.gov/resources/health-air-pollution
[117] Columbia climate School. Climate, Earth, and Society. (2023). State of the Planet, How Wildfire Smoke Can Travel Thousands of Miles, and How to Protect Yourself. Retrieved from https://news.climate.columbia.edu/2023/06/08/how-wildfire-smoke-can-travel-thousands-of-miles-and-how-to-protect-yourself/

The figure below shows the six categories and the corresponding recommendations for each.

Table 3.85: Air Quality Index – Basics for Ozone & Particle Pollution[118]

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
Orange	Unhealthy for Sensitive Groups	101 to 150	Although general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.
Red	Unhealthy	151 to 200	Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
Purple	Very Unhealthy	201 to 300	This would trigger a health alert signifying that everyone may experience more serious health effects.
Maroon	Hazardous	301 or higher	This would trigger health warnings of emergency conditions. The entire population is more likely to be affected.
EPA establishes an AQI for five (5) major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health - ground-level ozone, particle pollution (also known as particulate matter, including PM2.5 and PM10), carbon monoxide, sulfur dioxide, and nitrogen dioxide.			

When weather conditions are conducive to wildfire ignition, the NWS local Forecast Office issues a series of advisories. The table below outlines the fire advisories issued by NWS as conditions warrant.[119]

[118] United States Environmental Protection Agency. (n.d.). Air Data Basic Information. Retrieved from https://www.epa.gov/outdoor-air-quality-data/air-data-basic-information

[119] National Weather Service. (n.d.). Understanding Wildfire Warnings, Watches and Behavior. Retrieved from https://www.weather.gov/safety/wildfire-ww.

Table 3.86: National Weather Service Fire Advisories

Type	Definition
Fire Weather Watch	Issued to alert land managers and the public that upcoming weather conditions (e.g., combination of strong winds and low humidity, dry and unstable air mass, and/or lightning) could result in extensive wildland fire occurrence or extreme fire behavior. It is issued when critical fire weather conditions are possible but not imminent or occurring.
Red Flag Warning	Issued by NWS, in conjunction with land management agencies, to alert land managers to an ongoing or imminent critical fire weather pattern (e.g., combination of strong winds and low humidity, dry and unstable air mass, and/or lightning). It is issued when fire conditions are ongoing or expected to occur shortly.
Extreme Fire Behavior	Issued when a wildfire is likely to run out of control. It is often hard to predict because fires tend to behave erratically and sometimes dangerously. To issue this alert, one (1) or more of the following criteria must be met – moving fast (i.e., high rate of spread), prolific crowning and/or spotting, presence of fire whirls, and/or strong convection column.

The Figure below shows the Air Quality in Downey on a map while Figure 3.37 shows the AQI over the course of a week in September of 2023.

Figure 3.36: Air Quality in and around Downey

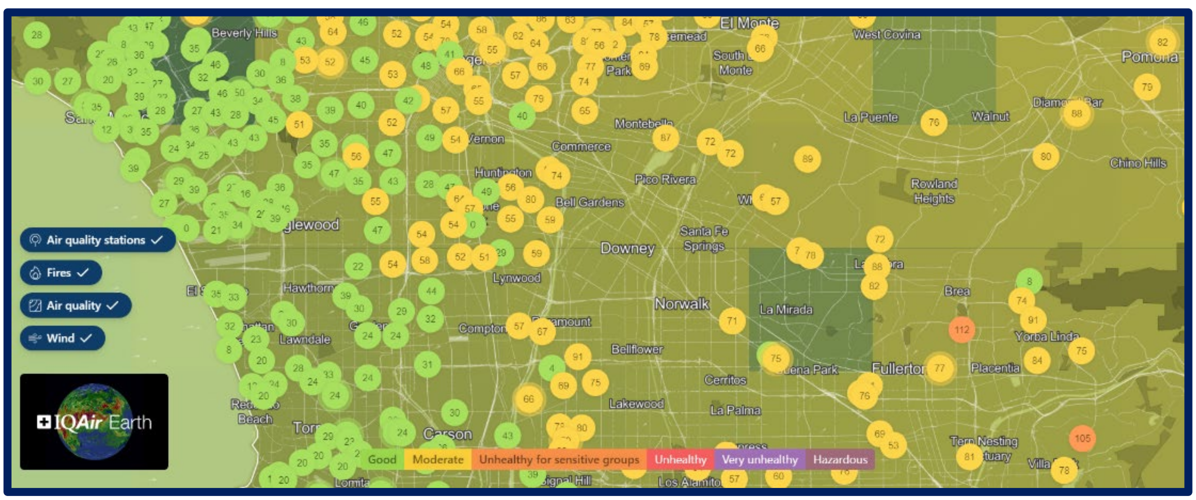
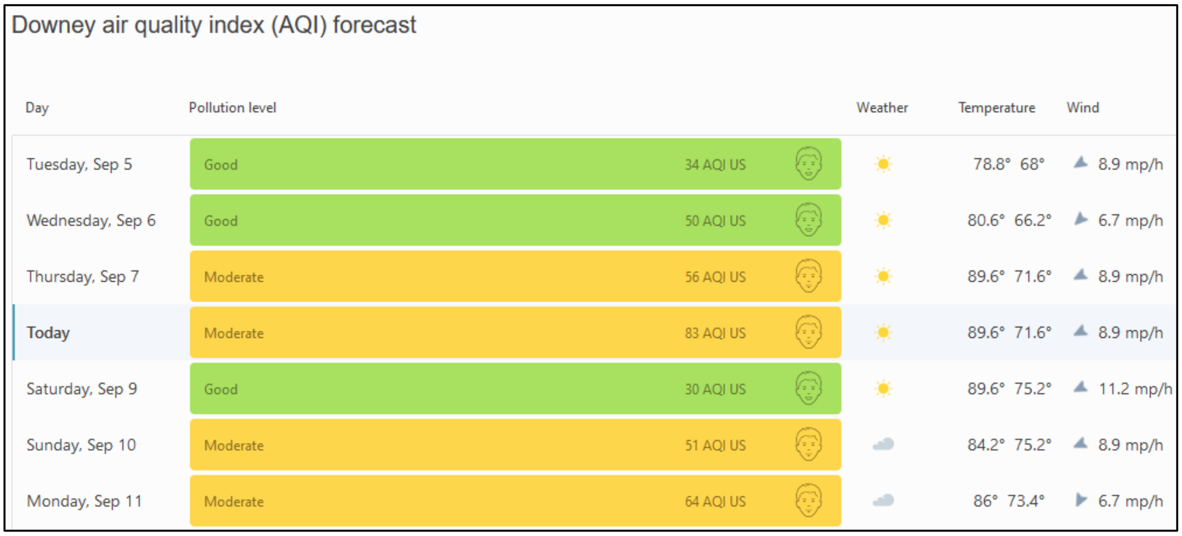


Figure 3.37: Downey AQI (September 8 – September 11, 2023)[120]



Downey air quality index (AQI) forecast

Day	Pollution level		Weather	Temperature	Wind
Tuesday, Sep 5	Good	34 AQI US		78.8° 68°	8.9 mp/h
Wednesday, Sep 6	Good	50 AQI US		80.6° 66.2°	6.7 mp/h
Thursday, Sep 7	Moderate	56 AQI US		89.6° 71.6°	8.9 mp/h
Today	Moderate	83 AQI US		89.6° 71.6°	8.9 mp/h
Saturday, Sep 9	Good	30 AQI US		89.6° 75.2°	11.2 mp/h
Sunday, Sep 10	Moderate	51 AQI US		84.2° 75.2°	8.9 mp/h
Monday, Sep 11	Moderate	64 AQI US		86° 73.4°	6.7 mp/h

Poor Air Quality Impacts and Precautions

When the AQI is at a heightened level, being outside is of particular concern for individuals with pre-existing health conditions. If exposed to poor air quality conditions (specifically ozone), physical symptoms may include difficulty breathing, coughing, inflammation, and reduced lung function.[121] Exposure to wildfire smoke induces similar irritation to the eyes, nose, and throat.[122] These symptoms may be more severe for those with pre-existing conditions.

As poor air quality due to either local pollution or wildfire smoke can linger over an area for an extended period, remaining at home for the entire duration isn't a viable option for many individuals. Utilizing an N95 mask can help filter out the larger particles associated with wildfire smoke and other particulates when outside.[123] Additionally, installing a High Efficiency particulate Air filter (HEPA) filter is extremely valuable tool to have running at home or workplace. While effective, HEPA filters may require monitoring and frequent replacement due to the intensity of wildfire smoke and other pollutants clogging up the filtration medium.

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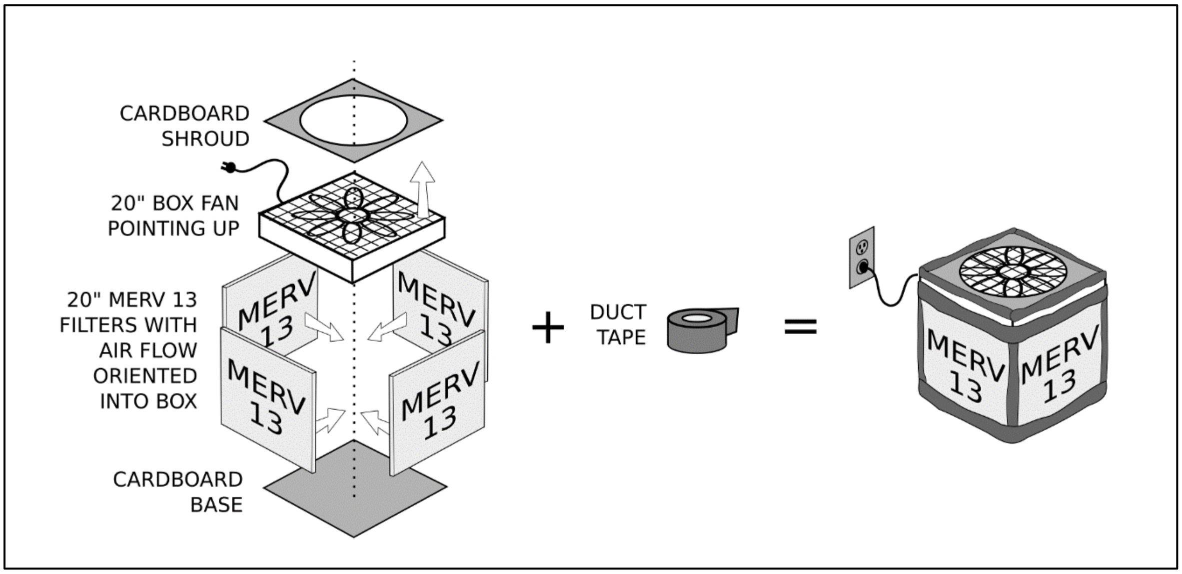
[120] IQAir. (n.d.). Air quality in Downey. Retrieved from https://www.iqair.com/us/usa/california/downey
[121] National Institutes of Health. (2011). Bad Air Day. Air Quality and Your Health. Retrieved from https://newsinhealth.nih.gov/2011/07/bad-air-day
[122] New York State Department of Health. (n.d.). Exposure to Smoke from Fires. Retrieved from https://health.ny.gov/environmental/outdoors/air/smoke_from_fire.htm
[123] Washington State Department of health. (2019) Wildfire Smoke and Face Masks. Retrieved from https://clark.wa.gov/sites/default/files/dept/files/public-health/wildfire%20smoke/DOH_Wildfire_Smoke_Face_Masks_Factsheet.pdf

A cost-effective option for individuals may be either buying or building a Corsi-Rosenthal box (originally utilized during COVID-19,) which uses Minimum Efficiency Reporting Values (MERV) filters and a common box fan to filter out particulates in large quantities of air in a short period of time.[124] Higher MERV values are equivalent to a HEPA filter, and therefore can target similar pollutants such as both wildfire smoke and viral particles and effectively reduce particulates in a room.[125],[126] The following graphic demonstrates the basic construction of the Box, using a box fan, 4 MERV-13 filters, some cardboard, and tape. The overall cost is well under $100.[127]

Figure 3.38: Corsi-Rosenthal Box[128]



The wildfire annualized frequency value represents the modeled frequency of wildfire hazard occurrences, in event days, per year. The table below outlines the annualized frequency for wildfire, based on FEMA NRI data, for the City.

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[124] UC Davis College of Engineering. R. Corsi. (2022). Science in Action: How to Build a Corsi-Rosenthal Box. Retrieved from https://engineering.ucdavis.edu/news/science-action-how-build-corsi-rosenthal-box

[125] Characterizing the performance of a DIY air filter. (2022). Rachael Dal Porto, Monet N. Kunz, Theresa Pistochini, Richard L. Corsi, Christopher D. Cappa. Aerosol Science and Technology. Retrieved from https://www.medrxiv.org/content/10.1101/2022.01.09.22268972v1.full

[126] Yale Climate connections. Samantha Harrington. (2023). Wildfire smoke getting into your home? Build a DIY Corsi-Rosenthal air filter. Retrieved from https://yaleclimateconnections.org/2023/01/wildfire-smoke-getting-into-your-home-build-a-diy-corsi-rosenthal-air-filter/

[127] Corsi_header image (n.d.). Edge Collective. Retrieved from https://cleanaircrew.org/corsi_header/

[128] Ibid.

Table 3.87: Wildfire Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(2021 Dataset)*	Annualized Frequency
550501	n/a	0% chance per year
550502	n/a	0% chance per year
550601	n/a	0% chance per year
550602	n/a	0% chance per year
550700	n/a	0% chance per year
550801	n/a	Less than 0.001% chance per year
550802	n/a	0% chance per year
550901	n/a	0% chance per year
550902	n/a	0% chance per year
551001	n/a	0% chance per year
551002	n/a	0% chance per year
551101	n/a	0% chance per year
551102	n/a	0% chance per year
551201	n/a	0% chance per year
551203	n/a	0% chance per year
551204	n/a	0% chance per year
551300	n/a	0% chance per year
551401	n/a	0% chance per year
551402	n/a	0% chance per year
551501	n/a	0% chance per year
551502	n/a	0% chance per year
551700	n/a	0% chance per year
551801	n/a	0% chance per year
551802	n/a	0% chance per year
553400	n/a	0% chance per year
980012	n/a	0% chance per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Vulnerability and Impacts

Population: There are no recorded incidents of loss of life from wildfires in the city. Smoke and air pollution from wildfires can be a severe health hazard and pose a greater threat to residents, especially for sensitive populations, including the elderly and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (e.g., soot, tar, water vapor, and minerals), gases (e.g., carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (e.g., formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

The California Environmental Protection Agency created the online map CalEnviroScreen 3.0 that generates a score based on a community's vulnerability to pollution and its population characteristics. The scale for vulnerability is shown in percentage ranges, from 1% to 10% (least vulnerable) to 91% to 100% (most vulnerable). 33% of residents live in a census tract with a score of 75% or higher. Smoke from wildfires may exacerbate these conditions and vulnerabilities.

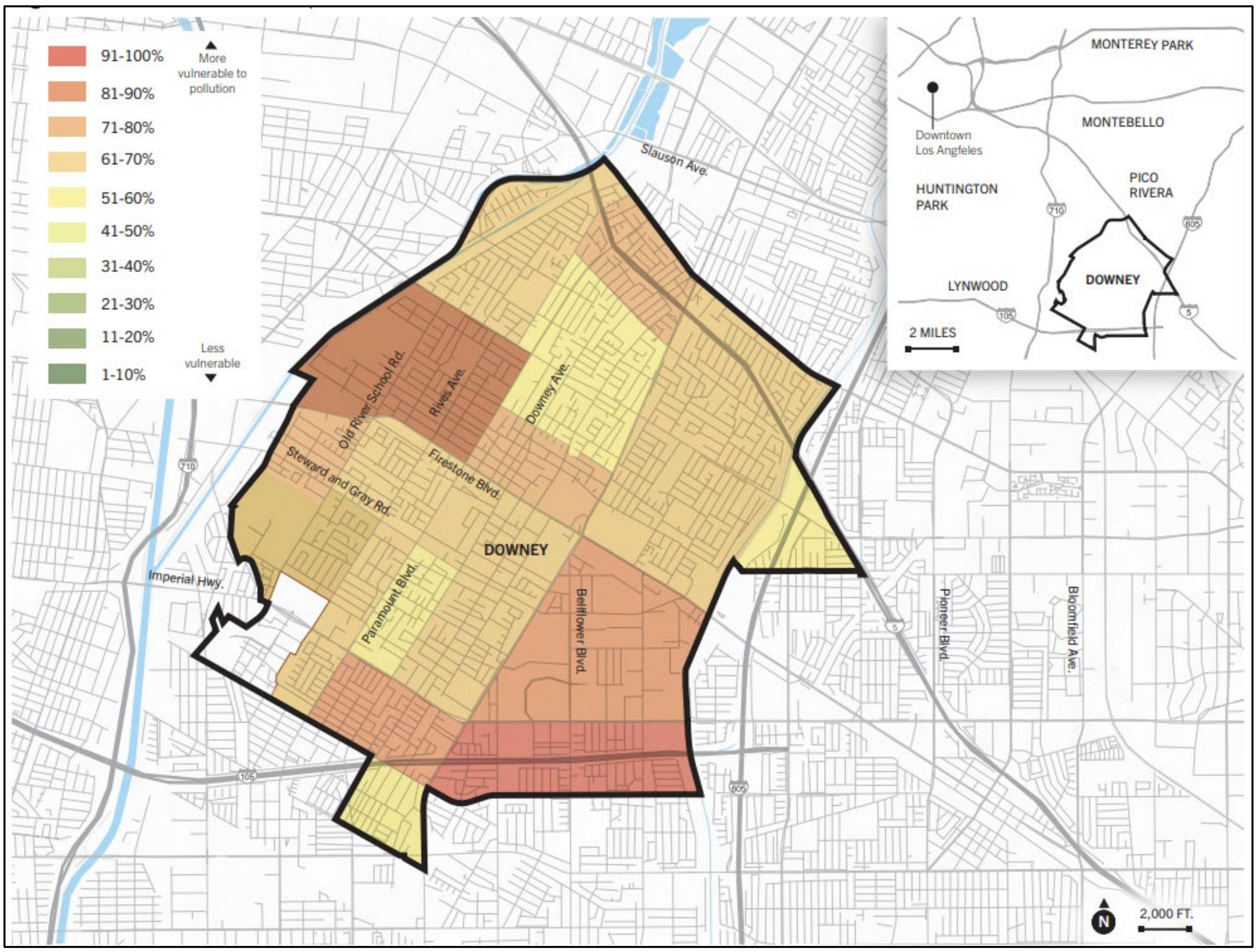


Table 3.88: Vulnerability and At-Risk Populations: Wildfire/Smoke

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents
Source: US Census Bureau 2022 ACS		

Property: Wildfire severity is categorized into three zones: moderate, high, and very high. Downey has no areas located in any of the zones.

Table 3.89: Assets/Structures Vulnerability and Impact Summary: Wildfire/Smoke

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Airport* (No major airports in Downey)	0	0%	There are no major airports in Downey
Government (City Hall and Public Works)	0	0%	
Columbia Memorial Space Center	0	0%	
Hospitals	0	0%	
Major Shopping Centers	0	0%	
National Register of Historic Places	0	0%	
Library	0	0%	
Parks	0	0%	
Schools	0	0%	
Fire Stations	0	0%	
Police Stations	0	0%	
Trees	0	0%	
Source: Los Angeles County Assessors, City of Downey			

Economic: Air quality issues related to wildfires could adversely impact the economy and way of life for residents in Downey. People may be less reluctant to go outside thereby impacting commerce.

Changes in Development and Future Development: Growth over the past decade has been modest. Between 2010 and 2020, as reported by the U.S. Census, the population of Downey grew approximately 0.9 percent, from 111,922 to 112,901 residents. The Southern California Association of Governments (SCAG) growth forecasts predict a steady increase in population through 2045. This projected population growth will increase the City's exposure to air quality issues from wildfires.

Climate Change: Although Downey is not anticipated to be directly affected by wildfire, more frequent and intense wildfires are likely to occur in the region. The region's risk of wildfire is likely to continue to rise due to increased dryness of vegetation, compounded by productivity of plants in the spring (which creates more fuel for dry season wildfires). Air quality issues in Downey are likely to increase due to wildfires burning hotter, longer, and more frequently, thus producing more smoke.[129] Changes in climate are creating warmer and drier conditions which are leading to longer and more active wildfire seasons. Studies have shown that the number of large wildfires has more than doubled in the western United States. Furthermore, projections show that a one (1) degree Fahrenheit increase in the average annual temperature could increase the average burned area per year by as much as 600% (in some types of forests) in the western United States.[130]

FEMA NRI Expected Annual Loss Estimates

A wildfire NRI EAL score, and rating represent a community's relative level of expected building, population, and agriculture loss each year due to wildfires when compared to the rest of the United States. The EAL score is positively associated to a community's risk; therefore, a higher EAL score results in a higher Risk Index score. The table below outlines the wildfire EAL for the City.

Table 3.90: Wildfire Expected Annual Loss Estimates

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$0	$0	$0	$0	0.0	No Expected Annual Losses
550502	$0	$0	$0	$0	0.0	No Expected Annual Losses
550601	$0	$0	$0	$0	0.0	No Expected Annual Losses
550602	$0	$0	$0	$0	0.0	No Expected Annual Losses

[129] U.S Fire Administration. (n.d.). Wildland Urban Interface. Retrieved from https://www.usfa.fema.gov/stories/wildland-urban-interface/

[130] NOAA. (2023). Wildfire Climate Connection. Retrieved from https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection.

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550700	$0	$0	$0	$0	0.0	No Expected Annual Losses
550801	$0	$64	$0	$64	33.4	Very Low
550802	$0	$0	$0	$0	0.0	No Expected Annual Losses
550901	$0	$0	$0	$0	0.0	No Expected Annual Losses
550902	$0	$0	$0	$0	0.0	No Expected Annual Losses
551001	$0	$0	$0	$0	0.0	No Expected Annual Losses
551002	$0	$0	$0	$0	0.0	No Expected Annual Losses
551101	$0	$0	$0	$0	0.0	No Expected Annual Losses
551102	$0	$0	$0	$0	0.0	No Expected Annual Losses
551201	$0	$0	$0	$0	0.0	No Expected Annual Losses
551203	$0	$0	$0	$0	0.0	No Expected Annual Losses
551204	$0	$0	$0	$0	0.0	No Expected Annual Losses
551300	$0	$0	$0	$0	0.0	No Expected Annual Losses
551401	$0	$0	$0	$0	0.0	No Expected Annual Losses
551402	$0	$0	$0	$0	0.0	No Expected Annual Losses
551501	$0	$0	$0	$0	0.0	No Expected Annual Losses
551502	$0	$0	$0	$0	0.0	No Expected Annual Losses
551700	$0	$0	$0	$0	0.0	No Expected Annual Losses
551801	$0	$0	$0	$0	0.0	No Expected Annual Losses
551802	$0	$0	$0	$0	0.0	No Expected Annual Losses
553400	$0	$0	$0	$0	0.0	No Expected Annual Losses
980012	$0	$0	$0	$0	0.0	No Expected Annual Losses

Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)

3.20 Windstorm Hazard Profile

Table 3.91: Windstorm Total Risk Score

Hazard	Probability	Consequence				Total Risk
	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Windstorm	1	4	12	19	35	**22**
Classification						
Low (L)	1	0–4	0–6	0–13	0–23	0–33
Medium (M)	2	5–8	7–12	14–26	24–46	34–66
High (H)	3	9–12	13–18	27–39	47–69	67–100

This legend—specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.
The Consequence Score represents the sum of the Extent, Vulnerability, and Impact Factors.
The Total Risk Score is a product of Probability and Consequence.

3.20.1 Windstorm Hazard Description

Strong Winds

Strong winds, also known as damaging winds, are classified as exceeding 58 mph and often originate from thunderstorms.[131] Most severe thunderstorm winds that cause damage at the ground are a result of outflow generated by the downdraft of a thunderstorm. The Table below outlines the different types of strong winds.[132] In coastal regions a strong wind is called a gale. Gale winds are sustained surface winds between 34 and 47 knots (39 to 54 mph).

[131] Federal Emergency Management Agency. (n.d.). Strong Wind. Retrieved from https://hazards.fema.gov/nri/strong-wind.
[132] NOAA, National Severe Storms Laboratory. (n.d.). Severe Weather 101: Types of Damaging Winds. Retrieved from https://www.nssl.noaa.gov/education/svrwx101/wind/types/.

Table 3.92: Types of Strong Winds

Type	Description
Straight-line Wind	Term used to define any thunderstorm wind that is not associated with a rotation and is used mainly to differentiate from tornadic winds.
Downdraft	A small-scale column of air that rapidly winds towards the ground.
Macroburst	An outward burst of strong winds at or near the surface with horizontal dimensions larger than 2.5 miles and occurs when a strong downdraft reaches the surface. Macroburst winds may begin over a smaller area and then spread out over a wider area, sometimes producing damage similar to a tornado. Although usually associated with thunderstorms, macrobursts can occur with showers too weak to produce thunder.
Microburst	A small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small (less than 2.5 miles across) and short-lived (five (5) to 10 minutes) with maximum windspeeds sometimes exceeding 100 mph. There are two (2) kinds of microbursts – wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
Gust Front	The leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
Derecho	A widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous downbursts and downburst clusters. By definition, if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.
Haboob	A wall of dust that is pushed out along the ground from a thunderstorm downdraft at high speeds.
Santa Ana Winds	A seasonal phenomenon in Southern California occurs between October and March. These dry winds occur when cold air moves southward into the Great Basin between the Sierra Nevada Mountain Range and the Southern California Coastal Range. The cold air mass is characterized by unusually high pressure near the land surface. As the wind moves through canyons and passes, the wind accelerates to speeds of 40 mph (35 knots) with gusts up to about 70 mph (60 knots).
A **downburst is the general term used to broadly describe macro and microbursts.*	

3.20.2 Windstorm Hazard History

The National Centers for Environmental Information (NCEI) has reported two strong wind events between 2000 and 2023. There have been no declared emergencies or disasters for strong winds in the State. To indicate the potential for a destructive windstorm, Table 3.78 lists the two NCEI strong wind events in the vicinity of the City.

Table 3.93: Strong Wind Events for Los Angeles (2000-2023)

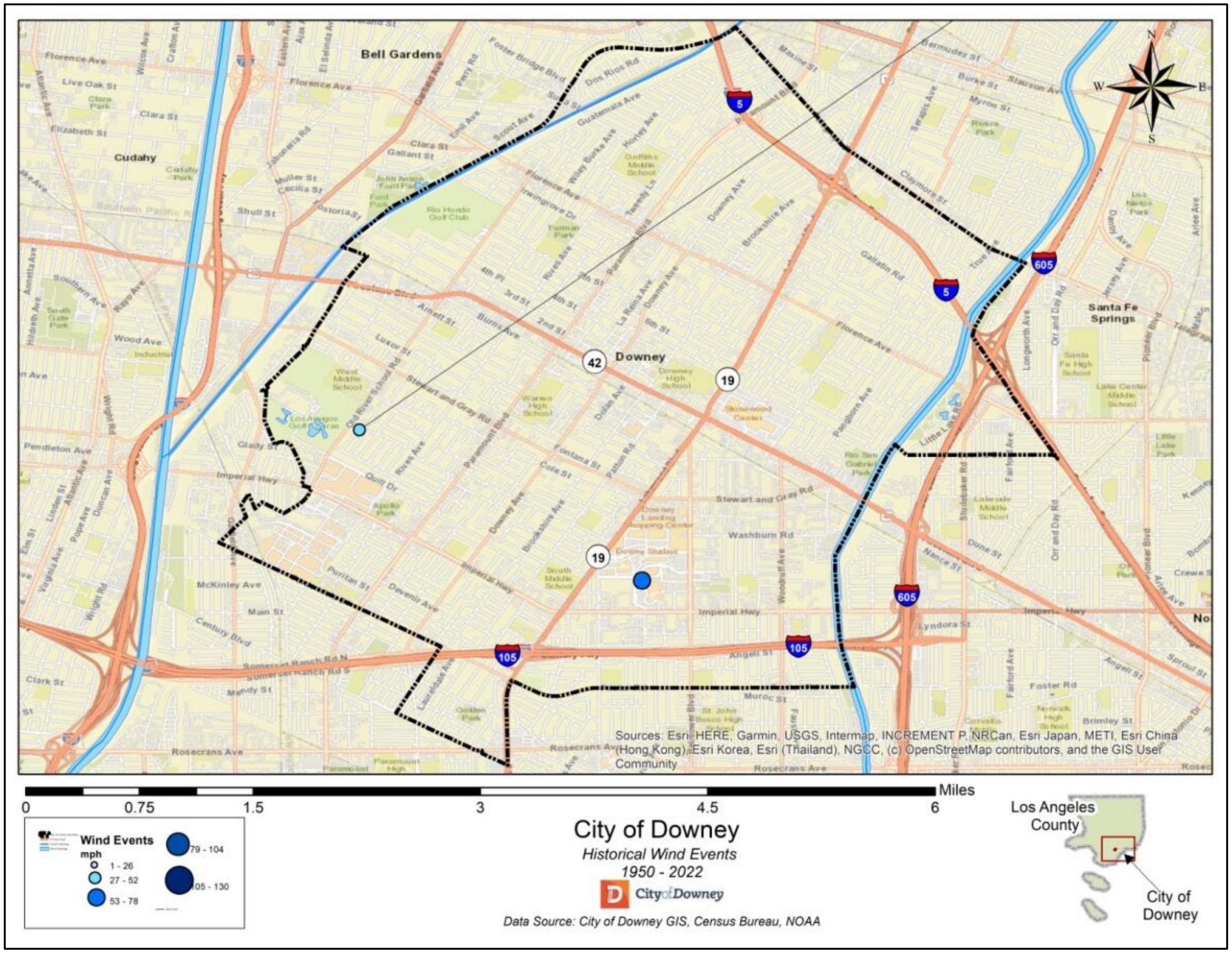
Location	County / Zone	Date	Time	Type	Death	Injury	Property Damage	Crop Damage
X N Los Angeles (Zone)	X N Los Angeles (Zone)	11/27/2004	12:20	Strong Wind	1	1	0.00K	0.00K
Catalina Island (Zone)	Catalina Island (Zone)	12/30/2014	23:00	Strong Wind	1	0	0.00K	0.00K
				Total	**2**	**1**	**0.00K**	**0.00K**

Table 3.94: Major Windstorms in the Vicinity of the City of Downey

Date	Location and Damage
November 5-6, 1961	Santa Ana winds: Fire in Topanga Canyon
February 10-11, 1973	Strong storm winds: 57 mph at Riverside, 46 Newport Beach. Some 200 trees uprooted in Pacific Beach alone
October 26-27, 1993	Santa Ana winds: Fire in Laguna Hills
October 14, 1997	Santa Ana winds: 87mph gusts in central Orange County - secondary impact: large fire in Orange County
December 29, 1997	60+ mph gusts in Santa Ana
March 28-29, 1998	Strong storm winds in Orange County: sustained 30-40 mph. 70mph gusts in Newport Beach, gust up to 60mph in Huntington Beach. Trees down, power out, and damage across Orange and San Diego Counties - 1 person dead in Jamul
September 2, 1998	Strong winds from thunderstorms in Orange County with gusts to 40mph. Large fires in Orange County
December 6, 1998	Thunderstorm in Los Alamitos and Garden Grove: gust of 50-60 mph called “almost a tornado”
December 21-22, 1999	Santa Ana winds: 68mph gusts in Campo, 53mph gusts in Huntington Beach, and 44mph winds in Orange - home and tree damage in Hemet
March 5-6, 2000	Strong thunderstorm winds at the coast: gust 60 mph at Huntington Beach. Property damage and trees downed along the coast.
April 1, 2000	Santa Ana winds: gust 93 mph at Mission Viejo, 67 mph in Anaheim Hills.
December 25-26, 2000	Santa Ana winds: gust 87 mph at Fremont Canyon. Damage and injuries in Mira Loma, Orange and Riverside Counties.
February 13, 2001	Thunderstorm gust to 89 mph in east Orange.

Date	Location and Damage
February 19, 2005	¾" hail reported in Anaheim. In Laguna Hills thunderstorm winds had estimated gusts of 81 mph.
March 27, 2007	A microburst hit Fullerton Airport. The top recorded winds were only 30 mph, but spotters estimated winds of at least 45 mph. Another thunderstorm hit Encinitas.
March 22, 2023	The strongest tornado to hit the county since 1983 happened in Montebello. The EF-1 tornado had estimated peaked winds at 110 mph.

Figure 3.39: City of Downey Historic Wind Event



3.20.3 Windstorm Hazard Probability, Frequency, and Magnitude

The Beaufort Wind Scale was developed to estimate and report wind speeds when a measuring apparatus is not available (e.g., open sea). It was invented in the 1805 by Sir Francis Beaufort of the British Navy as a way to interpret wind conditions at sea. Since then, the scale has been modified to include the effects on land. The Table below outlines the 13-force classification that comprise the Beaufort Wind Scale.[133]

Table 3.95: Beaufort Wind Scale

Force	Wind *(knots)*	Classification	Appearance of Wind Effects	
			On the Water	On Land
0	< 1	Calm	Sea surface smooth and mirror-like.	Calm, smoke rises vertically.
1	1 – 3	Light Air	Scaly ripples and no foam crests.	Smoke drift indicates wind direction and still wind vanes.
2	4 – 6	Light Breeze	Small wavelets, crests glassy, and no breaking.	Wind felt on face, leaves rustle, and vanes begin to move.
3	7 – 10	Gentle Breeze	Large wavelets, crests begin to break, and scattered whitecaps.	Leaves and small twigs constantly moving, and light flags extended.
4	11 – 16	Moderate Breeze	Small waves of one (1) to four (4) feet becoming longer with numerous whitecaps.	Dust, leaves, and loose paper lifted, and small tree branches move.
5	17 – 21	Fresh Breeze	Moderate waves of four (4) to eight (8) feet taking longer form, many whitecaps, and some spray.	Small trees and leaves begin to sway.
6	22 – 27	Strong Breeze	Larger waves of eight (8) to 13 feet, whitecaps are common, and more spray.	Larger tree branches moving and whistling in wires.
7	28 – 33	Near Gale	Sea heaps up, waves are 13 to 19 feet, white foam streaks off breakers.	Whole trees moving and resistance felt walking against wind.
8	34 – 40	Gale	Moderately high waves (18 to 25 feet) of greater length, edges of crests begin to break into spindrift, and foam blown in streaks.	Twigs breaking off trees and generally impedes progress.

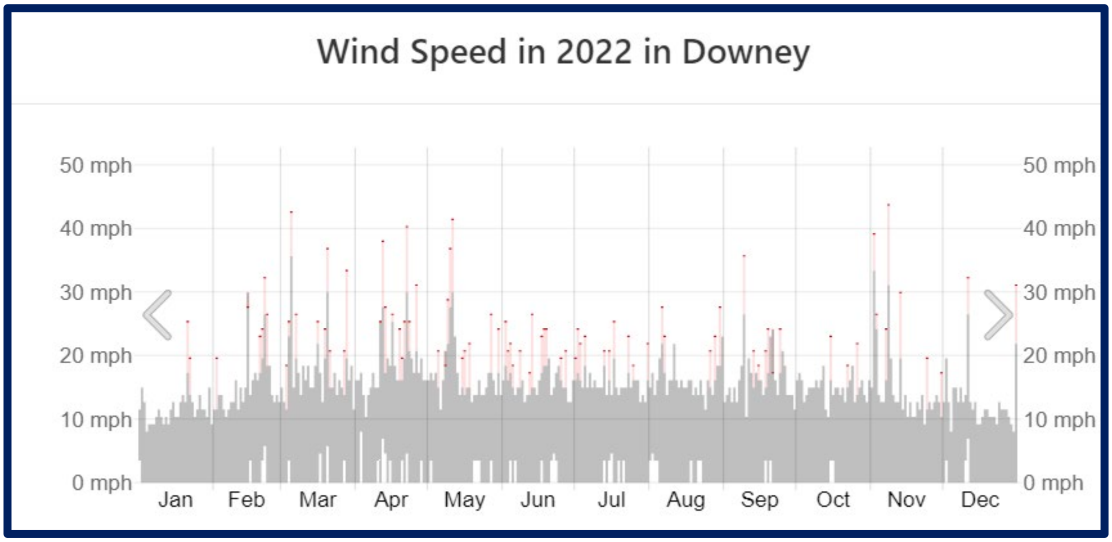
[133] National Weather Service. (n.d.). Beaufort Wind Scale. Retrieved from https://www.spc.noaa.gov/faq/tornado/beaufort.html.

Force	Wind *(knots)*	Classification	Appearance of Wind Effects	
			On the Water	**On Land**
9	41 – 47	Strong Gale	High waves (23 to 32 feet), sea begins to roll, dense streaks of foam, and spray may reduce visibility.	Slight structural damage occurs, and slate blows off roofs.
10	48 – 55	Storm	Very high waves (29 to 41 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, and lowered visibility.	Seldom experienced on land, trees broken or uprooted, and considerable structural damage.
11	56 – 63	Violent Storm	Exceptionally high waves (37 to 52 feet), foam patches cover sea, and visibility more reduced.	--
12	> 63	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, and visibility greatly reduced.	See Saffir-Simpson Hurricane Wind Scale.

Winds of this speed and greater have been known to cause tornado-like conditions, damaging property and potentially inhibiting utilities, telecommunications, and transportation systems in and around the City.

Considering that Santa Ana Winds are a regular occurrence in Southern California, strong winds are likely to continue to occur, although infrequently, in the City. It should be noted that the Steering Committee did not identify any specific parts of the City which tend to be adversely affected by windstorms. It is, therefore, assumed the entire City is equally vulnerable to windstorm events. The extent and intensity of windstorms is highly variable and may change depending on a wide array of factors. In the past, high winds have toppled trees, damaged traffic signals, and in rare cases, caused minor injuries to residents. In response, the City determined windstorm was still a threat to the City and warranted inclusion in the Plan update. Figure 3.40 below provides information on the average wind speeds for the City of Downey in 2022. Please note, the Santa Ana winds typically occur in short bursts which can last a few days running into weeks, therefore, the winds patterns in the table below may not adequately portray the spikes in wind speeds which accompany the Santa Ana Winds.

Figure 3.40: City of Downey Average Wind Speeds



Climate change impacts on high wind events in the State requires further analysis. Future updates to this plan will consider new research on this topic.

The probability of occurrence for strong winds in the City is high because severe weather events occur annually. The strong wind annualized frequency value represents the average number of recorded strong wind hazard occurrences, in event days, per year over the period of record (34 years). The Table below outlines the annualized frequency for strong winds, based on FEMA NRI data, for the City.

Table 3.96: Strong Wind Annualized Frequency *(FEMA National Risk Index)*

City of Downey Census Tracts	Events on Record *(1986 – 2021) 34 years*	Annualized Frequency
550501	6	0.2 events per year
550502	6	0.2 events per year
550601	6	0.2 events per year
550602	6	0.2 events per year
550700	6	0.2 events per year
550801	6	0.2 events per year
550802	6	0.2 events per year
550901	6	0.2 events per year
550902	6	0.2 events per year
551001	6	0.2 events per year
551002	6	0.2 events per year

City of Downey Census Tracts	Events on Record *(1986 – 2021) 34 years*	Annualized Frequency
551101	6	0.2 events per year
551102	6	0.2 events per year
551201	6	0.2 events per year
551203	6	0.2 events per year
551204	6	0.2 events per year
551300	6	0.2 events per year
551401	6	0.2 events per year
551402	6	0.2 events per year
551501	6	0.2 events per year
551502	6	0.2 events per year
551700	6	0.2 events per year
551801	6	0.2 events per year
551802	6	0.2 events per year
553400	6	0.2 events per year
980012	6	0.2 events per year
Annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year.		

Vulnerability and Impacts

Population: Community members are the most vulnerable to high wind events. However, there are also segments of the population that are especially exposed to the indirect impacts of high winds, particularly the loss of electrical power. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity.

Severe wind events can harm all people throughout Downey but may have a greater effect on the safety of people experiencing homelessness and those working outdoors. Populations that work outside or have respiratory illnesses may be impacted by severe wind events as they can generate dust and other contaminants that can affect the health of residents and workers.

Table 3.97: Vulnerability and At-Risk Populations: Strong Winds

Vulnerability and At-Risk/Underserved Category	Count	Percent
Persons with Disabilities	12,419	11.3% of residents
Elderly (65+ years)	12,552	11.4% of residents
Elderly (75-84 years)	3,373	3.1% of residents
Elderly (85 years and over)	1,701	1.5% of residents
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units

Vulnerability and At-Risk/Underserved Category	Count	Percent
People Experiencing Homelessness	82 persons	Less than 1% of Los Angeles County Homeless Count
Source: US Census Bureau 2022 ACS, 2024 Los Angeles Homeless Services Authority Greater Los Angeles Homeless Count, CA Department of Developmental Services		

Property: There are 23,194 buildings within the census tracts that define the planning area. Most of these buildings are residential. All of these buildings are considered to be exposed to the adverse impacts of severe wind. The frequency and degree of damage will depend on specific locations and intensity of the wind event. Mobile homes, older buildings, and structures in poor condition are more prone to damage. The city estimates that in 2020, fewer than 25 housing units were in severe need of replacement or substantial rehabilitation due to housing conditions. These units, for example, may be suffering from neglect and these buildings may be structurally unsound.

General damage from high wind events can be both direct and indirect. Direct impacts refer to what the wind physically destroys, while indirect impacts include additional costs, damages and losses attributed to secondary hazards spawned by the event. Construction practices and building codes can help maximize the resistance of the structures to damage. Secondary impacts of damage caused by wind events often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a wind event put tremendous strain on a community. Public gathering places such as schools and parks may have increased impacts at certain times of the day. Due to the random nature of the hazard, a more specific risk assessment was not conducted for this plan.

Table 3.98: Property Vulnerability: Strong Winds

Vulnerable Category	Count	Percent
Occupied Housing Unit: Mobile Home	96	0.3% of occupied housing units
Source: US Census Bureau 2022 ACS		

Table 3.99: Assets/Structures Vulnerability and Impact Summary: Strong Winds

Vulnerable Categories Applicable to this Hazard	Number of Assets of Concern	% of Total Number of Assets	Additional Considerations, if applicable
Government (City Hall and Public Works)	2	100%	
Columbia Memorial Space Center	1	100%	
Hospitals	3	100%	
Major Shopping Centers	5	100%	
National Register of Historic Places	2	100%	
Library	1	100%	
Parks	11	100%	
Schools	28	100%	
Fire Stations	4	100%	
Police Stations	1	100%	
Trees	15,600	100%	
Source: Los Angeles County Assessors, National Bridge Inventory, City of Downey			

Economic: Winds typically don't have long-term impacts on the economy. The most common problems associated with high winds are loss of utilities. Downed power lines can cause power outages, leaving large parts of the city isolated, and without electricity, water, and communication. Damage may also limit timely emergency response and the number of evacuation routes.

Changes in Development and Future Development: Recent development that has been constructed based on the latest building code and construction standards should be more resilient to this hazard. Future development projects should consider wind and severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability.

Severe winds occur periodically and generally do not affect populations to the degree that they would need to migrate in and out of the city. It is unlikely that severe wind will affect land use and development because the development review process will take steps to mitigate or minimize the impacts of severe wind. Continued efforts to bury utilities will help to make the city more resilient to wind.

Climate Change: The effects of climate change in severity of impact for strong winds for the City is expected to increase in frequency and severity. Climate change has been linked to an increase in straight-line wind events.[134]

FEMA NRI Expected Annual Loss Estimates

A strong wind NRI Expected Annual Loss score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to strong winds when compared to the rest of the United States. The table below outlines the strong wind Expected Annual Loss for the City of Downey planning area.

Table 3.100: Strong Wind Expected Annual Loss

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
550501	$189	$0	$0	$189	9.12	Very Low
550502	$222	$1	$0	$223	10.47	Very Low
550601	$307	$1	$0	$307	13.14	Very Low
550602	$233	$1	$0	$233	10.80	Very Low
550700	$376	$1	$0	$377	14.85	Very Low
550801	$245	$1	$0	$246	11.26	Very Low
550802	$138	$0	$0	$138	7.22	Very Low
550901	$235	$1	$0	$236	10.92	Very Low
550902	$296	$1	$0	$297	12.84	Very Low
551001	$205	$1	$0	$206	9.77	Very Low
551002	$197	$0	$0	$197	9.45	Very Low
551101	$207	$1	$0	$209	9.89	Very Low
551102	$285	$1	$0	$286	12.50	Very Low
551201	$192	$0	$0	$193	9.26	Very Low
551203	$196	$0	$0	$196	9.38	Very Low
551204	$213	$0	$0	$213	10.07	Very Low
551300	$285	$1	$0	$286	12.50	Very Low
551401	$232	$0	$0	$232	10.75	Very Low
551402	$239	$1	$0	$240	11.03	Very Low
551501	$257	$1	$0	$258	11.65	Very Low
551502	$222	$1	$0	$222	10.43	Very Low

[134] Rebecca Owen. Eos. (2023.) Climate Change May Be Causing Stronger Thunderstorm Wind Gusts. Retrieved from https://eos.org/articles/climate-change-may-be-causing-stronger-thunderstorm-wind-gusts

City of Downey Census Tracts	Population Equivalence	Building Value	Agriculture Value	Total Expected Annual Loss	Expected Annual Loss Score	Rating
551700	$331	$1	$0	$331	13.76	Very Low
551801	$169	$1	$0	$169	8.37	Very Low
551802	$229	$1	$0	$229	10.68	Very Low
553400	$205	$0	$0	$206	9.77	Very Low
980012	$0	$1	$0	$1	0.45	Very Low
Expected Annual Loss is calculated utilizing an equation that includes exposure, annualized frequency, and historic loss ratios. (Expected Annual Loss = Exposure x Annualized Frequency x Historic Loss Ratio)						

3.21 Climate Change

With the release of the California Adaptation Planning Guide[135] (APG) in June 2020, the City aimed to include the effects of climate change into the Hazard Mitigation Plan update. Climate change is already impacting California and will continue to affect it for the foreseeable future.[136] For example, the average temperature in most areas of California is already 1°F higher than historical levels, and some areas have seen average increases in excess of 2°F. Similarly, sea levels along the coast of central and southern California increased over 15 centimeters (5.9 inches) during the 20th century.19 Over the long term, reducing GHG emissions can help make climate change less severe.

Differences in exposure, sensitivity, and adaptive capacity affect an individual's or community's vulnerability to climate change. Both sensitivity and exposure are directly affected by population growth, development patterns, and success in addressing underlying vulnerabilities, including equity and social vulnerability.

Primary climate change effects can exacerbate hazards seen at local and regional levels, such as wildfires and associated smoke, drought, landslides, flooding, and human health hazards.

[135] California Adaptation Planning Guide (2020). Governor's Office of Emergency Services. Retrieved from Californ https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf#search=adaptation%20planning%20guideia Adaptation Planning Guide
[136] Office of Environmental Health Hazard Assessment, "Indicators of Climate Change in California," California Environmental Protection Agency, 2019, accessed August 2019, https://oehha.ca.gov/climate-change/document/indicators-climate-change-california.

As identified in the "Understanding Regional Characteristics" portion of the APG, the City is located in the South Coastal Region of California. As a result, the City considered the following climate change impacts as recommended by the APG:

- Increased Temperatures
- Reduced Precipitation
- Reduced Tourism
- Reduced Water Supply
- Wildfire Risk
- Public Health – Heat and Air Quality

Climate change has fundamentally altered the state's hydrologic system – intensifying severe weather as it shifts from extreme dry to extreme wet situations.

According to the California Water Watch, many rural areas are still experiencing water supply challenges, especially communities that rely on groundwater supplies which have been depleted due to prolonged drought. While March 2023 has brought promising rain and snow, it will take more than a single wet year for California to fully recover from the last three years – the driest ever recorded in state history.[137]

[137] California Water Watch (n.d.) Tracking Current Weather Conditions. Retrieved from https://cww.water.ca.gov/

4 MITIGATION STRATEGIES

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4.1 Mitigation Strategy

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In this section, mitigation goals and objectives were reevaluated and updated; and mitigation actions/projects were updated/amended, identified, evaluated, and prioritized.

4.1.1 Mitigation Goals and Objectives

In this section of the Plan, the risk assessment identified the City of Downey as prone to 16 hazards. See *Chapter 1* section 1.1.2 Identify Hazards. The Steering Committee and community stakeholders understand that although hazards cannot be eliminated altogether, stakeholders can work together toward building a disaster-resilient community. The following is a table of goals and objectives. The five goals represent the City's long-term and strategic vision to accomplish and achieve successful mitigation efforts. The associated objectives are specific strategies and steps identified to assist City personnel and local government representatives in attaining the listed goals.

The mitigation goals provide guidelines for developing mitigation projects to provide prioritized hazard reduction. The goals are based on the goals from the 2018 Hazard Mitigation Plan, the findings of the Risk Assessment, and input from the Steering Committee and characterize long-term hazard reduction targets as well as the enhancement of current mitigation capabilities.

Table 4.1 includes the Plan goals and corresponding mitigation objectives. These strategies were developed and reviewed by the Steering Committee using knowledge of the local area (including high-hazard areas and sensitive populations), review of past efforts, findings of the Risk Assessment, and identification of mitigation projects.

Table 4. 1: Overall Plan Goals and Objectives

1. Protect Life and Property
• *Strategy 1a:* Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other properties more resistant to losses from natural and man-made hazards • *Strategy 1b:* Improve hazard assessment information to make recommendations for encouraging preventative measures for existing and new developments in areas vulnerable to natural and man-made hazards • *Strategy 1c:* Protect lives by creating and implementing mitigation activities to reduce the potential impact hazard events may have on the general population • *Strategy 1d:* Promote business continuity planning for local businesses
2. Promote Public Awareness of the Vulnerability to Hazardous Events and Ongoing Mitigation Strategies
• *Strategy 2a:* Develop and implement educational and outreach programs to increase public awareness of the risks associated with natural and man-made hazards • *Strategy 2b:* Provide information on tools; partnership opportunities, financial assistance, and other resources to assist in implementing hazard mitigation activities
3. Preserve The Environment
• *Strategy 3a:* Protect, rehabilitate, and enhance natural systems to serve natural and man-made hazard mitigation functions • *Strategy 3b:* Improve hazard assessment information to make recommendations for encouraging preventative measures to reduce the effects of climate change within the City

4. Promote Community-wide Involvement with Hazard Mitigation.

- *Strategy 4a:* Strengthen coordination and encourage participation among public agencies, citizens, non-profit organizations, businesses, and industry to gain a vested interest in hazard mitigation
- *Strategy 4b:* Encourage leadership within public and private organizations to prioritize and implement local hazard mitigation activities

5. Increase the Capacity of Emergency Operations Functionality

- *Strategy 5a:* Develop and maintain policies to ensure the development and continuation of hazard mitigation initiatives
- *Strategy 5b:* Strengthen emergency operational functionality by increasing collaboration and coordination among public agencies, non-profit organizations, businesses, and industry
- *Strategy 5c:* Coordinate and integrate natural and man-made hazard mitigation activities, where appropriate, with Emergency Operations Plans and procedures

It should be noted that the overall priorities for mitigation planning did not change much during the update. However, the current plan goals were revised to be clearer and more direct. Table 4.2 and Table 4.3 in Chapter 4.1.7 provides the mitigation actions.

4.1.2 Mitigation Strategies and Actions

Plan participants assessed 61 hazard mitigation strategies/actions, including strategies from FEMA guidance documents, strategies from the 2018 Hazard Mitigation Plan and suggestions from steering committee members and stakeholder engagement during the planning workshop and steering committee meetings. See ***Appendix B*** – Stakeholder Engagement for engagement supporting documentation.

These mitigation strategies/projects resulted in 18 new strategies/actions, 14 ongoing mitigation strategies/actions and 20 completed strategies/actions. A total of 3 strategies/actions were deferred and 6 strategies/actions were deleted. The new and ongoing mitigation strategies and actions are included in Chapter 4, Table 4.2 and Table 4.3 depict the complete, deferred, and deleted mitigation strategies. Each entities' Mitigation Strategies & Actions are organized as follows:

- **New Mitigation Actions**- New actions identified during this 2023 update process.
- **Ongoing Mitigation Actions**- These ongoing actions were included in the previous update and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation strategies/actions were modified and/or amended, as needed, to better define the strategy/action.
- **Completed Mitigation Actions**- Completed actions since 2018. Completed actions also included a brief description of the *Status, r*esulting reduction or limitation of hazard impact(s) achieved, to show the resulting benefits of implementing the mitigation initiative.
- **Deferred Mitigation Actions**– Actions are deferred when risk can't be validated, or additional time is needed to validate the potential impacts and benefits of the action.
- **Deleted Mitigation Actions**– These actions are no longer relevant or applicable because other mitigation actions addressed the mitigating need, or the hazard vulnerability changed resulting in reduced risk.

4.1.3 Mitigation Action Plan

The Action Plan for each mitigation project is presented in Table 4.1. The table is designed to capture important details intended to support the implementation of the strategy/action.

4.1.4 Mitigation Strategy/Action Timeline Parameters

While the preference is to provide definitive project completion dates, this is not possible for every mitigation strategy/action. Therefore, the parameters for the timeline (Timeframe Completion) are as follows:

- **Short Term** = to be completed in 1 to 2 years
- **Medium Term** = to be completed in 3-5 years
- **Long Term** = to be completed after the 5-year planning period

4.1.5 Mitigation Strategy/Action Estimated Cost

While the preference is to provide definitive costs (dollar figures) for each mitigation strategy/action, this is not possible for every mitigation strategy/action. Therefore, the estimated costs for the mitigation initiatives identified in this Plan were identified as high, medium, or low, using the following ranges:

- **Low** – less than $10,000
- **Medium** – from $10,000 to $100,000
- **High** – greater than $100,000

4.1.6 Mitigation Strategy/Action Prioritization Process

The mitigation strategy/action must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs[1]. The City is utilizing a different method of prioritizing actions compared to the previous plan. The mitigation strategies/actions were prioritized and evaluated using the STAPLEE+E method which uses eight criteria for evaluating a mitigation action: Social, Technical, Administrative, Political, Legal, Economic, Environmental, and Equity. Within each of those criteria are additional

[1] Code of Federal Regulation. (2023). 44 CFR, Section 201.6(c)(3)(iii).

considerations. Because equity is essential to reducing risk to the whole community[2], an additional measure was added to the criteria totaling eight barometers. An explanation of how each of the STAPLEE+E criteria may be applied to evaluation of mitigation actions follows:

Social: Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical: Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.

[2] Executive Order 13985. (2021). Advancing Racial Equity and Support for Underserved Communities through the Federal Government. Retrieved from https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/20/executive-order-on-climate-related-financial-risk/.

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolutions in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic: Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be “tabled” for implementation until outside sources of funding are available?

Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community’s environmental goals, have mitigation benefits while being environmentally sound.

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

Equity: Does not create an opportunity for unequal distribution of resources; racism; affect a particular segment of the population, including communities of color, communities that face discrimination based on sex, sexual orientation or gender identity, persons with disabilities, persons who identify with a certain religion, persons with Limited English Proficiency, or rural communities, etc.

- Is the action consistent and systematically fair?

4.1.7 Mitigation Priorities

Priority was assessed by requesting that each new and ongoing mitigation action submitted and or updated by City departments and local stakeholders be ranked by each of the eight criteria factors, this is a different method of prioritizing actions compared to the previous plan. Each STAPLEE+E criterion is evaluated on a scale from 1 to 5, with 1 defined as strongly disagree and 5 as strongly agree.

- In the 2023 plan update, the STAPLEE+E methodology scale included an eighth criteria: equity. Therefore, the highest favorable score would be 40, meaning that said action scored 5 out of all eight categories.
- In the 2018 plan update, a simplified Benefit-Cost Review was applied in order to prioritize the mitigation recommendations for implementation. The priority for implementing mitigation recommendations depended upon the overall cost effectiveness of the recommendation, while considering monetary and non-monetary costs and benefits associated with each action.

Mitigation strategies/actions with the highest scores represent those mitigation initiatives that represent the highest priority since the previous plan. In addition to the STAPLEE+E Method, the Steering Committee identified the strategies/actions that reflected shifts in local resources, City needs and capabilities. It should be noted that, although the STAPLEE+E Method provides a standardized process for assigning priority/importance across all mitigations actions/projects there may be additional factors and considerations that elevate the status of a particular mitigation strategy/action. This is why the Steering Committee's input is also an important consideration in this process.

Table 4.2 depicts the City of Downey's new and ongoing mitigation actions and other relevant information, in alphabetical order by hazard commencing with goals that are applicable to all hazards. The table identifies the hazards mitigated, corresponding goals & objectives, year initiated, responsible department, potential funding sources & monetary amount, and the status of each of the City's mitigation actions. Table 4.3 showcases the City of Downey's completed, deferred, and deleted mitigation actions.

Table 4. 2: New and Ongoing Mitigation Strategies

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
1	Identify and pursue funding opportunities, in addition to the FEMA grant programs, to develop and implement local mitigation activities	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1C	2016, updated in 2018 and 2023	Office of Emergency Management, Community Development	Hazard Mitigation Grant Program (HMGP) & In Kind Matches	Long	Ongoing The Office of Emergency Management will seek funding for mitigation action every 5 years.	
								Priority: Low	STAPLEE+E Prioritization Score: 37/40
2	Identify, implement, and promote new collaborative programs and outreach focusing on residents, city departments, and industry stakeholders to promote active emergency preparedness activities that reduce hazards.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	2A, 4A	2016, updated in 2018 and 2023	Office of Emergency Management	In Kind Matches & $50,000	Long	Ongoing	
								Priority: High	STAPLEE+E Prioritization Score: 35/40
3	Provide or facilitate/participate business continuity workshops for business owners to learn the importance of disaster mitigation and how to create an Emergency Operations Plan for their business	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1D	2016, updated in 2018 and 2023	Office of Emergency Management	Local General Fund & $1,000	Long	Ongoing	
								Priority: Medium	STAPLEE+E Prioritization Score: 37/40
4	Increase public awareness of severe weather mitigation activities to include shelter in place and air quality warnings and appropriate actions taken.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	2B	2016, updated in 2018 and 2023	Office of Emergency Management	Local General Fund & 35,000	Medium	Ongoing The Office of Emergency Management modified the action from being windstorm hazard specific to all hazards.	
								Priority: High	STAPLEE+E Prioritization score: 36/40
5	Coordinate with the Army Corp of Engineers and nearby cities for evacuation planning.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	5C	2023	Office of Emergency Management	Local General Fund & In Kind matches	Medium	New	
								Priority: Medium	STAPLEE+E Prioritization score: 33/40

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
6	Develop and implement a public outreach campaign to increase awareness of the Downey Alerts System and encourage resident opt-in for notifications	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	5B	2016, updated in 2018 and 2023	Office of Emergency Management	Hazard Mitigation Grant Program (HMGP) & $35,000	Long	Ongoing Memorandum of Understandings (MOUs) were developed with FEMA to harness existing platforms to send IPAWs. This provided the capability to send messages to all jurisdictions whether or not have opted in.	
								Priority: Low	STAPLEE+E Prioritization score: 36/40
7	Identify locations and install emergency generators at the City of Downey Emergency Shelter locations and hardwire. Electrical work to modify existing wiring & update lighting or efficiency	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1A, 5B	2024	Public Works, City of Downey	Hazard Mitigation Grant Program (HMGP) & $500,000	Medium	New	
								Priority: High	STAPLEE+E Prioritization Score: 40/40
8	Conduct a full-scale mass care and shelter exercise	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1C, 2A, 2B, 4A,, 5B, 5C	2024	Office of Emergency Management, Parks & Recreation, Public Works Department	Local General Funds & $500	Short	New	
								Priority: Medium	STAPLEE+E Prioritization Score: 38/40
9	Conduct functional active shooter drill for high-hazard areas/departments using a vendor and invite local agencies to participate.	Acts/Threats of Mass Violence	1A, 1B, 1C, 3A, 5A	2023	Kaiser Permanente Safety Department	HPP Grant Funds & $11,500	Short	New Conduct Stop the Bleed Training for staff and STB kits next to AED kits Benefits: Staff response/education Anticipated Completion Date: 2024	
								Priority: Medium	STAPLEE+E Prioritization Score: 35/40
10	Conduct active shooter training with the Fire Department.	Acts/Threats of Mass Violence	1A, 1B, 1C, 3A, 5A, 5B	2023	Police Department, Fire Department	Homeland Security Grant Program (HSGP) & $15,000	Long	New	
								Priority: High	STAPLEE+E Prioritization Score: 36/40

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
11	Encourage public transparency on critical issues to minimize misunderstanding and unrest within the community	Civil Unrest	2B	2016, updated in 2018 and 2023	Police Department	Local General Fund: Outreach budget & In Kind Matches	Long	Ongoing This is an On-GOING activity. The Department actively posts on social media, host townhall meetings and Coffee with a Cop on Tuesday and participate or host city-wide events (Touch- A-Truck, National Night Out).	
								Priority: High	STAPLEE+E Prioritization score: 39/40
12	Conduct a tabletop drill to focus on cyber threat	Cyber Incident	1C	2023	Kaiser Permanente Safety Department, Kaiser Regional	In Kind Matches & $25,000	Short	New	
								Priority: High	STAPLEE+E Prioritization Score: 35/40
13	Conduct a cybersecurity PEN test which involves a third party who tries to break into the network and will provide a report of the results after	Cyber Incident	1B, 1C	2024	Finance-IT Department	Local General Funds & $20,000	Short	New Benefits: More than $500,000	
								Priority: Medium	STAPLEE+E Prioritization Score: 40/40
14	Review partnerships and responsibilities with the Army Corps of Engineers in relation to the Whittier Narrows and Garvey Reservoir dams to enhance effective communications. Explore MOU opportunities and validity.	Dam Failure	4B, 5C	2023	Office of Emergency Management	Local General Fund & In Kind matches	Long	New	
								Priority: High	STAPLEE+E Prioritization Score: 26/40
15	Extend recycled water main to Furman Park to allow for retrofit of existing landscape irrigation system to recycled water thereby reducing demands on potable water supplies.	Drought	1A, 1C, 3A, 5C	2022, updated in 2023	Public Works Department, Utilities, City of Downey, LA County Flood Control District	2022 Urban Community Drought Relief Grant and Water Fund & $1,400,000	Short	New Not only does this conserve water it also, helps drought-proof the landscape irrigation system since recycled water is exempt from water use reductions during droughts Benefits: Reduces reliance on potable water; Drought-proof	
								Priority: High	STAPLEE+E Prioritization Score: 39/40

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
16	Expand City initiative to upgrade public property with drought tolerant landscaping. Recreational areas, building planters and street planters are some examples of property locations that might require updated landscaping	Drought	3A	2016, updated in 2018 and 2023	Public Works Department, Utilities Division	Water Fund & $50,000 - $10,000,000	Long	Ongoing The City made a policy of replacing existing landscaping with drought tolerant native landscaping. Projects are performed along City street right-of-way and at City facilities through implementation of its Capital Improvement Program as funding permits each fiscal year. The city continues to upgrade facilities over the next decade or so, it is possible that this upgrade could come to an end at some point.	
								Priority: Medium	STAPLEE+E Prioritization score: 33/40
17	Design and construction of Furman Park stormwater capture and infiltration project	Drought, Urban Flood	1A, 1C, 2A, 3A,4A, 5A	2022, updated in 2023	Public Works Department, Utilities, LA County Flood Control District	Regional & Municipal City General Fund, Safe Clean Water (SCW) Program Measure W & $20,000,000	Medium	New Stormwater compliance; water conservation/drought; retro to native landscaping. Focuses on both wet weather and dry weather flows; helps present runoff. CEQA and public outreach required for project. Benefits: Stormwater (MS4) Permit Compliance; Flood/Run off control	
								Priority: High	STAPLEE+E Prioritization Score: 37/40
18	Educating and promoting implementation of stormwater measures to developers and residents who are constructing, improving, or residential, commercial and/or industrial building	Drought, Severe Weather/Storm. Utility Loss	1A, 1B, 1C, 3A, 4A, 4B, 5A	2024	Public Works Department	Stormwater Budget & $100,000	Long	New	
								Priority: Medium	STAPLEE+E Prioritization Score: 30/40
19	Promote and continue to provide education about earthquake preparedness while in the hospital and conduct annual drills for earthquake	Earthquake	1C, 2A, 4A, 5C	2023	Presbyterian Intercommunity Hospital (PIH)	In Kind Matches & $1,000	Medium	New Anticipated Completion Date: 2026 Estimated Cost:	
								Priority: Medium	STAPLEE+E Prioritization Score: 33/40

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
20	Perform ongoing assessments of identified seismically vulnerable facilities for inclusion among the list of prioritized assessment locations by Fire Department resources in the event of significant seismic activity.	Earthquake	1B	2023	Fire Department	Local General Fund & In Kind Matches	Long	New DFD Policy 2.14.1 and its appendices shall be updated to reflect the prioritized list according to the relative potential for loss of life, disruption to critical infrastructure, and continuous capacity for effective emergency response. Included in this list are government buildings, transportation corridors, utilities, healthcare facilities, and high hazard occupancies. Benefits: You cannot place a value on a life	
								Priority: Medium	STAPLEE+E Prioritization Score: 40/40
21	Integrate new earthquake hazard mapping data for the City of Downey and improve technical analysis of earthquake hazards	Earthquake	1B	2016, updated in 2023	Department of Public Works – GIS Manager	National Earthquake Hazards Reduction Program (NEHRP) State Assistance Grant & $30,000	Medium	Ongoing	
								Priority: Medium	STAPLEE+E Prioritization score: 32/40
22	In collaboration with elected and appointed officials within the City, to increase capabilities within the Hazardous Materials Division. Internal and external resources will ensure that regulatory compliance inspections are conducted in accordance with state and federal law, thus proactively addressing conditions in the use, storage, and transport of dangerous goods that could be subject to accidental release.	Hazardous Material Release	5B	2016, updated in 2023	Fire Department, Los Angeles County Health Hazmat Division	Local General Fund & $85,000	Medium	Ongoing An adoption of new fee schedule is expected at the beginning of FY23-24. Benefits Loss Avoidance: Reduction in or elimination of accidental release of hazardous materials from improper storage, transport, and/or use of dangerous goods and wastes.	
								Priority: Medium	STAPLEE+E Prioritization score: 34/40
23	Implement traffic control upgrades to mitigate accidents in "trouble intersections" (traffic signals, power, rail controls)	Mass Transportation Accident/ Incident	1C	2016, updated in 2018 and 2023	Public Works Department, Principal Civil Engineer & Maintenance and Facilities	Hazard Mitigation Grant Program (HMGP) & $100,000 - $10,000,000	Medium	Ongoing Engineer has two locations they are reviewing (Lakewood/Firestone and Lakewood/Imperial). There are six intersections on Lakewood Boulevard and are upgrading communication system with WIFI antennas to improve timing Benefits: Traffic congestion for 80,000 vehicles	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status	
								Priority: High	STAPLEE+E Prioritization score: 38/40
24	Implement buffering street improvement projects to protect the public from the impact of a traffic incident (sidewalks, fences, drop off zones, and bridge rails)	Mass Transportation Accident/ Incident	1A	2016, updated in 2023	Public Works Department, Principal Civil Engineer, Maintenance and Facilities	Local General Fund & $100,000 - $5,000,000	Long	Ongoing Bike lanes were added, and schools have more turnouts for drop-offs The City also has a Bike Route Plan. Anticipated Completion Date:	
								Priority: High	STAPLEE+E Prioritization score: 38/40
25	Develop a Continuity of Government Plan and encourage private industry to develop continuity plans in order to reduce the impact of service interruptions and economic loss as the result of a pandemic	Pandemic	1D	2016, updated in 2023	Office of Emergency Management	Hazard Mitigation Grant Program (HMGP) & $50,000	Long	Ongoing	
								Priority: Low	STAPLEE+E Prioritization score: 34/40
26	Propose a monetary set-up/ replacement program for facility roofs and HVAC systems	Severe Weather, Storm	1A, 3B	2024	Public Works, Maintenance	Local General Fund & $300,000	Long	New Benefit: Prevents storm related damage and building climate control reliability Anticipated completion date: 2038 (15-20 years)	
								Priority: Medium	STAPLEE+E Prioritization Score: 30/40
27	Conduct PSA regarding tornados and provide education and awareness media materials via social media.	Tornado	2A	2024	Office of Emergency Management	Local General Funds & $1,000	Short	New Benefits: Life Safety	
								Priority: Low	STAPLEE+E Prioritization Score: 34/40
28	Enhance and harden HVAC System at Barbara J. Riley Community/Senior Center	Severe Weather, Storm	1A, 5C	2023	Public Works, City of Downey	Local General Fund & $300,000	Short	New The BJR Community/Senior Center is an identified cooling center for the public.	
								Priority: High	STAPLEE+E Prioritization Score: 40/40

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status
29	Research best practices for tornado sheltering that best match the school campuses and district facilities. Review structures in relation to current building code standards to determine potential hardening projects i.e. tornado sheltering measures.	Tornado	1C, 2A, 5C	2024-25	Downey USD, DUSD Emergency Operations Team, City of Downey	Office Of Emergency Management & $10,000,000	Short	New Benefits: Reduce or eliminate injuries and the loss of life Priority Medium STAPLEE+E Prioritization Score: 30/40
30	Distribute information and education materials that will help tie this to existing drills already conducted regularly during the school year	Tornado	1C, 2A, 5C	2024-25	Downey USD, DUSD Emergency Operations Team, City of Downey	Office Of Emergency Management & $10,000,000	Short	New Benefits: Reduce or eliminate injuries and the loss of life Priority Medium STAPLEE+E Prioritization Score: 30/40
31	Enhance mapping data to identify flood-prone areas, due to standing water; urban flooding; etc., throughout the city and implement improvement projects to enable efficient drainage within the identified vulnerable locations.	Urban Flood	1B	2018, updated in 2023	Public Works Department	Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Building Resilient Infrastructure and Communities (BRIC) & $2,000,000	Medium	Ongoing A retention basin was created at the Dennis the Menace Park to divert water back in 2017-18. A similar project will be completed at Furman Park. This is grant funded and is an on-going project. Priority: Medium STAPLEE+E Prioritization score: 29/40
32	Enhance debris management strategies for windstorm events	Windstorm	5A	2016, updated in 2023	Public Works Department	In Kind Matches & $30,000	Medium	Ongoing The City of Downey has a dumpsite and equipment for action. The Urban Forest Management Plan also helps make the city more resilient to windstorms. The task is ongoing. Priority: Medium STAPLEE+E Prioritization score: 27/40

Table 4. 3: Completed, Deferred and Deleted Mitigation Strategies

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Establish a standing emergency management coalition that will keep hazard mitigation a priority within the City	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm , Wildfire Smoke/Air Quality	5A	2016	Office of Emergency Management	Complete The Downey Resiliency Group will meet bi-monthly to prioritize hazard mitigation for the city.
Develop public and private partnerships to foster hazard mitigation program coordination and collaboration in the City	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm , Wildfire Smoke/Air Quality	4B, 5B	2016	Office of Emergency Management	Complete
Increase City awareness of how mitigation measures can positively affect the City environment and implement mitigation projects accordingly	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm , Wildfire Smoke/Air Quality	3B	2016	Office of Emergency Management, Public Works Department, Community Development	Deferred

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Work with City departments to encourage the incorporation of Hazard Mitigation Plan goals into departmental operations	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality	1A	2016	Office of Emergency Management	Deleted
Develop and implement an educational outreach campaign to educate the public on maintaining personal safety during workplace incidents	Acts/Threats of Mass Violence	2B	2016	Office of Emergency Management, Fire, Police Department	Deferred Action has been combined with another action
Minimize earthquake damage risk by initiating structural integrity projects for critical facilities	Earthquake	1A	2016	Public Works Department	Complete The 2019 and 2022 California Building Code (CBC) supersedes the 2016 CBC.
Encourage seismic strength evaluations of critical facilities to identify vulnerabilities for schools, public infrastructure, and critical facilities	Earthquake	1B	2016	Department of Public Works – GIS Manager	Deferred
Encourage the reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices	Earthquake	1A	2016	Building Safety	Deleted The building codes have seismic requirements and are adopted by the city.

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Establish a framework to compile and coordinate surface water management plans and data throughout the City	Urban Flood	1B	2016	Public Works Department, Utilities Division	Complete Downey along with other participating cities and agencies located in these watersheds have developed Watershed Management Programs (WMPs) along with Coordinated Integrated Monitoring Programs (CIMPs) for each watershed.
Develop programs to prevent trees from threatening lives, property, and public infrastructure during windstorm events	Windstorm	1A	2016	Public Works Department	Complete Downey will adopt the 2020 – 2021 Urban Forest Management Plan which lays out the type of trees appropriate for the location. It considers the infrastructure of the area. The city has updated the city's Tree Ordinance 2022, which outlines the city's policy on tree care. The trim schedule will be every two years. The task is completed.
Encourage overhead utilities to use underground construction methods where possible to reduce power outages from windstorms	Windstorm	5B	2016	Public Works Department, Engineering	Deleted No funding available.

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Develop a Cal OES-approved evacuation plan, coordinating with the Army Corps of Engineers, and make the plan is publicly available	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm , Wildfire Smoke/Air Quality)	5C	2016	Office of Emergency Management	Deleted Grant monies originally awarded were redirected to support another project.
Coordinate with County and local public health organizations to encourage citywide education on the benefits and availability of vaccinations to improve public health	Pandemic	2B	2016	Office of Emergency Management, Fire Department	Complete Due to the Public Health Emergency, COVID-19, a Medical Point of Distribution (POD) plan was developed to support mass vaccines immunizations sites.
Hire additional staff to monitor and coordinate fire prevention ordinances with regard to hazardous material maintenance	Hazardous Material Release	1A	2016	Fire Department	Complete A part time fire inspector was hired in 2022 to address the action.
Organize and conduct awareness training courses for Police and Public Works personnel	Hazardous Material Release	5	2016	Fire Department	Deleted The action never pursued, thus removed. Not feasible with the number of current staff.
Conduct assessments of City buildings and implement facility upgrades as appropriate to reduce loss due to severe storms	Severe Weather, Storm	1A	2016	Public Works Department	Complete

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Expand City recycled water infrastructure to enhance the City's capability to conserve potable water supplies	Drought	3A	2016	Public Works Department, Utilities Division	Complete The City extended a recycled water main north on Lakewood Boulevard towards the north City limits. This expansion allowed the landscaped medians north of Gallatin Road and the landscaping at Dennis the Menace Park to be retrofitted to recycled water for irrigation thereby reducing potable water demands in the City. The City also requires developments to provide and use recycled water for landscape irrigation and other non-potable water needs. This resulted in the use of recycled water at 8 additional locations/developments for landscape irrigation and dual plumbing purposes further reducing demands on the City's potable water system

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Continue education campaigns to encourage the public to conserve water (Include State and local rebates as well a rain barrel availability)	Drought	2A	2016	Public Works Department, Utilities Division	Complete The City provided water conservation information to its customers regarding useful water conservation practices, identifying leaks, and any updated mandatory water use reductions and restrictions. The City used various means of distributing conservation information depending on whether the State was currently in a declared drought and the time of year including via social media, the Parks and Recreation Guide "Discover Downey" which included advertisements for water conservation tips, and the City's website which includes rebate info, and a link to the LA County Drought Tolerant Landscaping Handbook.
Implement both current City projects that capture storm-water runoff in conjunction with the open Municipal Storm Water Permit issued by the Department of Water Resources for separate storm sewer systems (MS4 permit)	Urban Flood, Drought	3A	2016	Public Works Department, Utilities Division	Complete The City is currently working on design of several additional park stormwater capture and infiltration projects and will continue to pursue funds for implementation of additional future projects. The City constructed both a stormwater capture and infiltration facility at Dennis the Menace Park and vegetated bioswale on the west side of Lakewood Boulevard at the I-5 Freeway. Both of these facilities were constructed to capture both wet and dry weather runoff to help comply with the city's MS4 permit, to help conserve local weather resources, as well as to help alleviate flooding issues in the area.

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Encourage cooperation with third-party stakeholders to promote effective emergency response and to update emergency plans as necessary (Metro, TSA, Downey-link)	Mass Transportation Accident/Incident	5B	2016	Fire Department, Police Department	Deleted The action was incorporated with another action.
Update City commodity flow studies to identify vulnerabilities for HazMat release as a result of commercial chemical transport	Mass Transportation Accident/ Incident	1B	2016	Fire Department	Complete The Hazardous Materials Specialist regularly monitors the presence, tracking, and planning of hazardous materials in our jurisdiction. Release response planning is included in the business plan for each monitored location.
Conduct vulnerability assessments for critical infrastructure and key resource (CIRK) facilities to identify vulnerabilities in security systems and implement upgrades accordingly	Acts/Threats of Mass Violence	1A	2016	Fire Department	Complete For Fire Department-specific buildings, assessments have been conducted by Facilities Program manager. Funding for security cameras has been requested through the budget process. Fire and life safety systems have been implemented in all fire stations as a part of recent facility upgrades.

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Purchase Combat-Casualty kits for each Fire and Police unit to enhance emergency services	Acts/Threats of Mass Violence	5A	2016	Fire Department	Complete Combat casualty kits have been placed on each police vehicle and fire apparatus. Additionally, enhanced and collaborative training has been implemented between fire and police departments to ensure appropriate and efficient unified response to violent incidents.
Revise City policies and procedures that correspond with escalating threat levels for Fire and Police	Acts/Threats of Mass Violence	5C	2016	Office of Emergency Management, Fire, Police Department	Complete Emergency Operations Plans (EOPs) and Event Actions Plans (EAPs) are updated routinely as emerging threats arise and large-scale events occur.
Obtain alternative energy sources for critical infrastructure to maintain continuity of government	Utility Loss	1C	2016	Public Works Department	Complete Solar panels have been purchased and installed in the parking lot.
Coordinate with utility providers to develop prioritization for power restoration to City facilities and assets in order to maximize response efforts	Utility Loss	1C	2016	Public Works Department	Complete
Educate the public on personal safety during an incident and any available evacuation avenues (Shelter in Place)	Civil Unrest	2B	2016	Police Department, Office of Emergency Management, Public Information Officer	Complete The Community Emergency Response Team (CERT) training curriculum includes State Implementation Plan (SIP) guidance.

Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Status
Enhance emergency response capabilities to promote public safety and safety of first responders during an incident (training & resources, communications)	Civil Unrest	5A	2016	Police Department, Fire Department	Complete Downey Alert training is ongoing to notify staff in a timely manner.
Broaden coordination with Los Angeles County Sherriff's Department and neighbor cities to maximize effectiveness in response and strengthen coordination though joint training	Civil Unrest	5B	2016	Police Department	Complete Conducted a training with Whittier Police in 2018-2019 to enhance coordination for civil unrest scenarios with the Special Response Teams.

5 PLAN MAINTENANCE

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5.1 Mitigation Progress Monitoring

To ensure the Plan continues to provide an appropriate path for risk reduction throughout the City, it is necessary to regularly evaluate and update it. The Emergency Manager will be responsible for monitoring the status of the Plan and gathering appropriate parties to report on the status of mitigation actions. The Steering Committee will continue to be an active participant in the next plan update. As the Hazard Mitigation Plan matures, new stakeholders will be identified and encouraged to join the existing Steering Committee.

To thoroughly track hazard mitigation status, the City of Downey (City) must continuously monitor and document the progress of the implementation of mitigation actions. Though mitigation actions may be delegated to different departments within the City, the Emergency Manager will have the responsibility of monitoring overall progress.

To facilitate this monitoring process, Table 5.6: Action Item Implementation (located at the end of this Chapter) was developed to provide a mechanism for monitoring the overall implementation progress. The table is designed to monitor mitigation actions according to project managers, project status, and project milestones.

5.2 Planning Mechanisms

5.2.1 Process to Incorporate the Mitigation Strategy into Other Planning Mechanisms

Hazard mitigation practices must be incorporated within existing plans, projects, and programs. Therefore, the involvement of all departments, private non-profits, private industry, and appropriate jurisdictions is necessary to find mitigation opportunities within existing or planned projects and programs. The City’s 2018 HMP faced challenges in its integration with other planning frameworks due to the unexpected emergence of the global pandemic in 2020. This unforeseen crisis disrupted the normal course of planning activities, causing delays and setbacks in the implementation of the 2018 plan. As a result, the City's efforts to synchronize various planning mechanisms were hindered, leading to a disjointed approach in addressing pressing mitigation action issues. The pandemic's impact on resources, priorities, and decision-making processes further complicated attempts to harmonize planning efforts across different sectors. Despite these obstacles, the City continued to adapt and refine its strategies to navigate the complexities introduced by the pandemic and to foster more cohesive planning practices moving forward.

The City maintains the following processes to incorporate mitigation strategies of the HMP into its planning mechanisms. The following resources were identified by the Steering Committee as being most inherent to City operations and most likely to be avenues for the first steps in hazard mitigation implementation. A full list of identified resources can be found in Tables 5.1 through 5.5 later in this section.

Website

The City's HMP will be posted on the city website to enable citizens to review and provide feedback regarding mitigation objectives and strategies. Feedback from residents can be incorporated during the annual review or five-year update of the HMP. In addition, the website can be used as a vehicle to maintain an ongoing conversation with the public regarding upcoming mitigation projects and provide an avenue for hazard education. Additionally, social media is being leveraged to expand communication awareness and education for an all-hazards approach.

City of Downey City Council

The City Council is responsible for approving projects, plans, and programs on a citywide level. By providing mitigation planning concepts to the City Council, mitigation actions and projects will be incorporated into relevant planning efforts. The Emergency Management Department can work with Council Members to encourage the inclusion of mitigation goals and objectives for any project or planning efforts which are reviewed by the council.

Committees and Commissions

To assist the City Council in reviewing prominent issues, the City has established eleven committees and commissions listed below.

- Emergency Preparedness
- Green Task Force
- Handicap
- Library Advisory
- Personnel Advisory
- Planning
- Public Facilities Corporation
- Public Works Committee
- Recreation and Community Services
- Water Facilities
- Youth Commission

As necessary, each specialized commission can review and implement hazard mitigation activities that affect its goals and objectives. Additionally, each commission can educate and assist the community with relevant safety issues and coordinate local gatherings.

Each of these groups can help raise awareness about hazardous events that can affect the City, educate the public about the actions the City is taking to reduce loss, and supply avenues for the community to provide feedback.

Community Development Department

The Planning Division of The City's Community Development Department works closely with the Planning Commission to ensure that development within the City is consistent with the General Plan goals and policies, as well as in the best interests of the City. This includes development of land use, general planning, zoning requirements, and residential projects. Mitigation measures can be incorporated into potential projects.

The Building and Safety Division (the Division) of the City's Community Development Department is responsible for reviewing construction plans and various building inspection activities. The objective of the Division is to protect the public in regard to building design and construction. Hazard mitigation activities that get incorporated into building codes will be enforced by the Division.

Resource Table

This section serves as a high-level capability assessment of the City's resources through which hazard mitigation objectives may be achieved. The following subsections attempt to document the Regulatory, Administrative/Technical, Fiscal, Grant funding, and Outreach/Partnership resources available to the City. The city has the full capability and authority to expand upon its capabilities.

Planning and Regulatory Capabilities and Resources

Table 5. 1: Planning and Regulatory

Regulatory Resource	Updated	Comments
2030 Downey Forward Strategic Plan	2024	The Downey Strategic Plan serves as a tool to ensure that City initiatives, strategies, and projects are developed to meet Council priorities, and that the overall City government is accountable in meeting community needs.
Downey's "General Plan Vision 2025" (Building Codes, Land Use, Planning regulations, Development Ordinances)	2023	Plan outlines how the City is organized with regards to area such as land use, safety, different conservation efforts, and economic resilience and develop.
Downey Building Code	2022	California Building Code[1] is based upon the 2021 International Building Code and has been adopted by the City and established as the "Downey Building Code.
Downey Green Building Standards Code[2]	2022	Article 8, Building Standards Code.
International Building Code[3] (IBC).	2021	State adopts the 2021 IBC. State strengthens seismic resilience in IBC § 1613.2.5 by setting Seismic Design Category D as the mandatory minimum category for structures under the jurisdiction of the Office of Statewide Health Planning and Development (OSHPD) and by prohibiting the alternative Seismic Design Category determination of § 1613.2.5.1 and the simplified design procedure of § 1613.2.5.2 for structures under the jurisdiction of the Division of the State Architect—Structural Safety and those under the jurisdiction of OSHPD.
International Residential Code[4] (IRC)	2021	State adopts the 2021 IRC. Note that state does not adopt R322.1.9 (containing flood design specifications for manufactured homes) nor R327.1 (requiring, via application of the International Swimming Pool and Spa Code, swimming pools in coastal high-hazard areas to conform to ASCE 24).

[1] California Code of Regulations. (2022) Title 24, Part 2. Retrieved from https://www.dgs.ca.gov/BSC/Codes
[2] Ibid.
[3] FEMA Fact Sheet. (2024) 2024 Building Code Adoption Tracking: FEMA Region 9. Retrieved from https://www.fema.gov/sites/default/files/documents/fema_fy24-bcat-region-9-report.pdf
[4] Ibid.

Regulatory Resource	Updated	Comments
City Ordinance No. 925 Water Conservation Regulations	1991	Ordinance outlines legality and framework for imposing water use restrictions and fines in times of water shortage
Urban Water Management Plan	2015	Plan outlines forecasts for drought probability and magnitude while expanding upon awareness of drought hazard vulnerability.
Security Vulnerability Assessment	2016	Plan outlines potential vulnerabilities for security breaches and makes recommendations for improvement in order to mitigate potential adversarial events.

Opportunity to Expand and Improve Planning and Regulatory Capabilities

- Adherence to building codes, including local codes, regulates growth and controls land use patterns. As codes are updated, consider emerging threats/hazards and future probability and impacts exacerbated by climate change to ensure lowered risk and fewer losses.
- The Hazard Mitigation Plan will be incorporated in the General Plan Safety Element, and specifically the Goals, Policies and Programs section related to each hazard to ensure greater alignment between the two plans.

Administrative and Technical Capabilities and Resources

Table 5. 2: Administrative and Technical

Administrative/Technical Resource	Description and Role in Supporting Mitigation
Emergency Management Division	Emergency Manager is responsible for emergency preparedness and hazard mitigation planning. This is the department ultimately responsible for promoting implementation of hazard mitigation objectives.
Fire Department	The Fire Department is the seat of the emergency management division and will oversee its accomplishments. In addition, the Department has the authority to inspect facilities storing hazardous materials for proper storage, host public education campaigns, and inspect building structures.
Police Department	The Police Department is able to support public outreach and may assist in identifying areas of improvement for resistance to civil unrest and adversarial events.

Administrative/Technical Resource	Description and Role in Supporting Mitigation
City Council	City Council can review and approve mitigation propositions for implementation.
Emergency Preparedness Commissions	The sole purpose of this commission is to keep hazard mitigation a priority. Through this group, all facets of the City will be encouraged to consider and mitigate potential vulnerability to hazards.
Green Task Force	This commission seeks to foster environmental awareness and as such can promote environmentally sustaining mitigation activities.
Handicap Committee	This committee seeks to ensure the disabled population is considered in public planning and projects.
Planning Commission	This commission reviews planning documents for the City and will help promote considerations for hazard mitigation in future planning documents.
Community Development Department	The Community Development Department is response for all developments within the City. This department will be able to include considerations for local hazards in new projects.
Public Works and GIS	The Public Works Department is responsible for street improvements and overall City maintenance. This department can implement hazard mitigation activities as part of planned maintenance and City upgrades. GIS provides spatial analysis and maps for the City.
Administration	Administration is a multi-faceted resource. The City may utilize experts in its many departments to identify priority mitigation strategies, apply for funding, and implement mitigation projects.

Opportunity to Expand and Improve Administrative and Technical Capabilities

- Provide opportunities for continued education to Community Development staff to maintain state-of-the-art knowledge of new code and regulatory requirements that will mitigate hazard risk and ensure greater resilience.
- The HMP and Green Task Force initiative should be closely aligned. The Green Task Force may consider mitigation measures that support sustainability and greater resilience to climate induced hazards.
- Conduct training for GIS technicians on hazard-specific spatial analysis to better determine vulnerability and impacts to the City's key assets. Continue to improve the public-facing GIS platform (https://downeypw.org/xymaps/Map/Map) to articulate risk to residents, businesses and key stakeholders.

Fiscal Capabilities and Resources

Table 5. 3: Fiscal

Fiscal Resource	Available for Use
General Fund	Yes, with approval
Capital Improvement Plan	Yes
Water Fund	Yes,
Authority to impose taxes for specific purposes	Yes, with voter approval

Table 5. 4: Grants

Grant Funding Resource	Agency	Purpose
Pre-Disaster Mitigation Program (PDM)	U.S. Department of Homeland Security, Federal Emergency Management Agency	To provide funding for States, and communities for cost-effective hazard mitigation activities which complement a comprehensive hazard mitigation program and reduce injuries, loss of life, and damage and deconstruction of property.
Hazard Mitigation Grant Program (HMGP)	U.S. Department of Homeland Security, Federal Emergency Management Agency	To prevent future losses of lives property due to disasters; to implement State of local hazard mitigation plans; to enable mitigation measures to be implemented during immediate recovery from a disaster; and to provide funding for previously identified mitigation measures to benefit the disaster area.
Flood Mitigation Assistance (FMA)	U.S. Department of Homeland Security, Federal Emergency Management Agency	To help States and communities plan and carry out activities designed to reduce the risk of flood damage to structures insurable under the NFIP.
Emergency Management Performance Grants (EMPG)	U. S. Department of Homeland Security; Federal Emergency Management Agency	To encourage the development of comprehensive emergency management at the State and local level and to improve emergency management planning, preparedness, mitigation, response and recovery capabilities.

Grant Funding Resource	Agency	Purpose
Community Development Grant Program (CDBG)	U.S. Department of Housing and Urban Development	To develop viable urban communities by providing decent housing and a suitable living environment. Principally for low-to-moderate income individuals.
Public Assistance Program (PA)	U.S. Department of Homeland Security, Federal Emergency Management Agency	To provide supplemental assistance to States, local governments, and certain private nonprofit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President. Under Section 406, Public Assistance funds may be used to mitigate the impact of future disasters.
Emergency Watershed Protection	U.S. Department of Agriculture, Natural Resource Conservation Service	To provide emergency technical and financial assistance to install or repair structures that reduce runoff and prevent soil erosion to safeguard life and property.
Disaster Mitigation and Technical Assistance Grants	U.S. Department of Commerce, Economic Development Administration	To help States and localities to develop and /or implement a variety of disaster mitigation strategies.
Watershed Surveys and Planning	U.S. Department of Agriculture, Natural Resource Conservation Service	To provide planning assistance to Federal, State, and local agencies for the development of coordination water and related land resources programs in watersheds and river basins
National Earthquake Hazards Reduction Program (NEHRP)	U.S. Department of Homeland Security, Federal Emergency Management Agency	To mitigate earthquake losses that can occur in many parts of the nation providing earth science data and assessments essential for warning of imminent damaging earthquakes, land-use planning, engineering design, and emergency preparedness decisions.
Engineering for Natural Hazards	National Science Foundation	Supports fundamental research that advances knowledge for understanding and mitigating the impact of natural hazards on constructed civil infrastructure

Opportunity to Expand and Improve Fiscal Capabilities

- Hazard mitigation projects may be considered during the annual budgeting process for funding from the general fund. Consideration for priority mitigation projects and the cost match needed for BRIC, HMGP, and FMA may be considered.

- Where applicable, CDBG grants should be used to fund mitigation projects that enhance the resiliency of low-income and underserved areas of the City of Downey.
- Train staff on notice of intent (NOI) procedures and track opportunities on the Cal OES mitigation website to initiate applications for grant funding.

Education, Outreach and Partnership Capabilities and Resources

Table 5. 5: Education, Outreach and Partnership Capabilities

Outreach/Partnership Resource	Description and Role in Supporting Mitigation
City Website	The City website is an open forum for providing hazard information and for accepting ongoing comments from the public. The City website will likely be the main avenue for maintaining an open dialogue with the public for hazard mitigation throughout the planning period.
Public Outreach	The City holds several training opportunities throughout the year. Public safety training will be able to be expended to include hazard-specific information to improve hazard awareness. Community engagement opportunities include the annual ShakeOut drill to practice how to be safe during an earthquake while also reviewing and updating emergency preparedness plans and supplies, Touch-A-Truck and routine certified emergency response team (CERT) trainings.
Mutual Aid Agreements	As part of expanding its resilience to the impacts of hazard events, the City intends to review its current mutual aid agreements, identify gaps, and secure new agreements to expand its available mutual resources.
Social Media	The City leverages many social media platforms (Instagram, Facebook[5]) to interact and communicate with the general public regarding any and all hazards information. It continues to be a great tool to engage people through more creative and interactive ways to generate actionable knowledge.
Community Emergency Response Team	The CERT Program is a 20-hour, all-hazard training offered by the City. This valuable course is designed to help citizens protect themselves, their family, their neighbors, and their neighborhood in an emergency.

Opportunity to Expand and Improve Education, Outreach and Partnership Capabilities

[5] City of Downey Government. (n.d.) Facebook. Retrieved from https://www.facebook.com/cityofdowney/

- Strengthen ties with residents, community organizations and businesses to ensure key content and information is timely and relevant. Create additional communications platforms to ensure information and content reaches community members, such as the Downey Discussion platform (https://www.downeyca.org/our-city/downey-discussion).
- Ensure the outreach and education of the City's most vulnerable populations are prioritized. Integrate the mitigation actions and strategies into overall programming for first responders, parks, road maintenance, and youth and senior programs.
- Enhance the Emergency Preparedness webpage (https://www.downeyca.org/our-city/departments/emergency-preparedness) to maintain the HMP for public viewing and feedback. Provide updates on the annual progress of the mitigation action plan.
- Develop a comprehensive program to utilize social media to reach out to communities in the City to provide information on mitigation activities. Conduct an annual survey to solicit input as part of the continuing public participation initiative. Provide information and conduct the survey in English and Spanish.

Implement the Substantial Improvement/Substantial Damage Provisions

Damage Estimates are a part of the National Flood Insurance Program (NFIP). If a community participates in the NFIP, part of the responsibility of the local participating community is to perform damage estimates. These estimates are performed using a FEMA Substantial Damage Estimate (SDE) software program. This program is used to assist local communities in determining damage estimates as it relates to the NFIP. The City is tasked with the training and deployment of the SDE program. Local building officials/Stormwater management and floodplain manager are responsible for ensuring that the substantial improvement/substantial damage provisions are implemented following a flood related event within their respective jurisdiction. The local officials will ensure that all NFIP criteria/requirements are implemented and met following a flood event, local officials will work with FEMA to ensure proper documentation/designations are made and properly recorded for structures deemed substantially damaged during an event. For specific information, see the City's standard floodplain ordinance in Chapter 8 of the Downey California municipal code[6]. For the City of Downey, "Substantial damage" is defined as damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50% of the reasonable replacement value of the structure at the time of its damage based on its assessed valuation. A building or grading permit shall be obtained before new construction or development or substantial improvement begins within any area of special flood hazards, established in Section 8700.05.

Progress for Mitigation Incorporation

The current update is the result of the City's continued dedication to having a FEMA-approved plan. In obtaining FEMA approval and formally adopting the Plan update, the City will take its continued steps to forge a culture which includes considerations for hazard mitigation throughout the City's many facets.

5.2.2 Available Planning Mechanisms to Incorporate Mitigation Requirements

The City uses the following local planning mechanisms for incorporating the mitigation requirements of the HMP.

[6] Downey California municipal code. (2022). Chapter 8 Floodplain ordinance. Retrieved from 8https://library.qcode.us/lib/downey_ca/pub/municipal_code/item/article_viii-chapter_8

General Planning

The City is responsible for updating and incorporating mitigation actions and concepts in the General Plan Vision 2025 (Plan). The Plan is evaluated on a periodic basis, which includes a review of the policies and programs associated with land use and development, among other things. Mitigation actions from the HMP will be reviewed during the next scheduled update of the Plan and incorporated as applicable. As part of this review, ordinances and codes will be reviewed to ensure they are consistent with the mitigation strategies and referred to the appropriate regulatory authority as needed.

Urban Water Management Plan

The City is responsible for updating and incorporating mitigation actions and concepts into the City's Urban Water Management Plan (UWMP). The UWMP is updated every five years, which includes a review of the policies and programs associated with providing adequate water supplies to meet demands under a range of water supply conditions. Mitigation actions from the HMP will be reviewed during the next scheduled update of the plan and incorporated as applicable. As part of this review, ordinances and codes will be reviewed to ensure they are consistent with the mitigation strategies and referred to the appropriate regulatory authority as needed. The UWMP was updated in 2020, with its next revision scheduled in the near future.

Emergency Operations Plan

The City maintains an Emergency Operations Plan (EOP) that includes profiles and specific responses for earthquakes, hazardous materials incidents, flooding and several other hazards mentioned in the HMP. The City will incorporate the Risk Assessment into the EOP in addition to using emergency scenarios outlined in the report to address potential mitigation actions.

Capital Improvements Program

The City maintains a Capital Improvements Program (CIP) with projects that are budgeted for at least a five-year period. Engineering mitigation projects are included within the CIP. Additionally, the projects already included within the CIP are reviewed for mitigation improvements (e.g., areas prone to flooding are configured with mitigation elements, current seismic design criteria is applied to construction, facility locations are reviewed for special hazards, etc.).

5.3 Plan Update

Mitigation planning is an ongoing process, and as such, the HMP should be treated as a living document that must grow and adapt in order to keep pace with changes within the City. The Steering Committee, led by the City's Office of Emergency Management is responsible for ensuring the HMP is updated every five years. An annual assessment will be completed to document any changes in site hazards (e.g., updated FIRM maps, contemporary seismic studies, etc.) or the installation and purchase of new equipment (e.g., back-up generators, emergency response equipment, etc.) to ensure they do not have any major effects on City's hazard vulnerabilities that would impact the conclusions or actions associated with the HMP.

Prior to the fifth year of the revision cycle, these annual observations will be reviewed to determine what changes should be implemented in the required HMP Update. The results of the annual evaluations will be folded back into each phase of the planning process and should yield decisions on how to update each section of the Plan. The Emergency Manager has the responsibility of implementing these annual and five-year requirements. During the annual review, if any updates are deemed minor, then the Emergency Manager or designee will perform the updates. However, if more major updates are required, then the Steering Committee will be reconvened to discuss the effects on the Plan. For the fifth-year revision, the entire Steering Committee will reconvene in order to use their expertise to update the Plan in its entirety.

In addition to these periodic requirements, any significant modification to the City's facilities should be considered with respect to a possible impact on the HMP. All Steering Committee members are responsible for providing updates for the Plan to the Emergency Manager as necessary. As noted in the following section, the completed HMP will be available on the City's website to allow the public to continue to be involved during these periodic reviews.

The Plan will be reviewed on an annual basis by the City's Office of Emergency Management. It will be reviewed and revised every five years by the Steering Committee to determine the effectiveness of programs and to reflect changes that may affect mitigation priorities. The Emergency Manager will be responsible for contacting the Steering Committee members and organizing the review. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. The Steering Committee will review the goals and action items to determine their relevance to changing situations in the City, as well as changes in federal policy, and to ensure they are addressing current and expected conditions. The Steering 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 City departments and organizations responsible for the various action strategies will report on the status of the projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised or removed, on an annual basis. The table delineated below as Table 5.8 will serve as a tool to monitor the yearly progress of implementing action items.

The City's Office of Emergency Management will be responsible for ensuring the Plan is updated. The Emergency Manager and the Steering Committee will also notify all affected stakeholders when changes have been made. The updated Plan will be submitted to the California Governor's Office of Emergency Services (Cal OES) and to the Federal Emergency Management Agency (FEMA) for review and approval.

5.3.1 Continued Public Involvement

To facilitate ongoing public input, the following activities will be conducted.

The Steering Committee, led by the Emergency Manager, will look for opportunities to raise community awareness about the 2024 HMP and the hazards that affect the City. This effort will include attendance and provision of materials at City-sponsored events and social media posts (such as Facebook, X, and NextDoor). Any public comments received regarding the HMP will be collected by the Emergency Manager, addressed as needed, and considered during future HMP updates.

The City will circulate a Hazard Mitigation Questionnaire annually every fall to engage the public and gather data about the City's priorities resilience, hazards of concern, and what mitigation activities should be prioritized. The Hazard Mitigation Questionnaire will be circulated via City Council meetings, shared with key community organizations, and social media. A flyer and hard copies of the questionnaire will also be available to community organizations to ensure underserved and underrepresented population groups have an opportunity to participate. The Hazard Mitigation Questionnaire will be available in both English and Spanish.

The City will hold an annual townhall meeting or equivalent meeting to engage the public and provide them with an opportunity to inform the Emergency Manager and Steering

Committee about hazards of concern and mitigation priorities. The townhall meeting will be advertised via City Council meetings, invitations to community organizations, and social media. An invitation to the annual townhall meeting will be posted at city-owned facilities.

Table 5. 6: Key Community Organizations to Assist with Continued Public Outreach

Community Organization	Target Audience
Arc of Los Angeles & Orange Counties	Individuals with intellectual and developmental disabilities
Assistance League of Downey	Underserved and socioeconomically disadvantaged residents
Clergy Council	Churches and their members
Downey Chamber of Commerce	Business community
Downey Coordinating Council	General public and civic organizations. The Downey Coordinating Council is a monthly gathering of representatives from various civic and service organizations who meet to share information about their events and activities of interest to the public. Its membership reflects a broad range of organizations and volunteers.
Downey Food Helps	Underserved and underrepresented residents
Gangs Out of Downey (G.O.O.D.)	Underserved and underrepresented youth
PTA HELPS	Underserved families whose children attend Downy schools
The Whole Child	Vulnerable and underserved children. The Whole Child strives to improve the lives of more than 8,000 individuals each year through mental health, family housing, parent enrichment and nutrition services.
TLC Family Resource Center	Underserved and vulnerable students and their families in the Downey Unified School District.

Table 5. 7: HMP Continued Public Outreach Tools

Outreach Tool	Purpose and Implementation
City Website	The City website will be utilized to maintain a publicly available copy of the Hazard Mitigation Plan. The website will also host the Annual Hazard Mitigation Questionnaire, and be used to publicize the annual townhall meeting.
Training and Education Events	The City holds several training opportunities throughout the year. Education and training events will be leveraged to discuss hazards and educate residents on how they implement mitigation strategies in their own households. will be able to be expanded to include hazard-specific information to improve hazard awareness. Touch-A-Truck and routine Community Emergency Response Team (CERT) trainings will also be utilized to educate and solicit feedback on the hazards and mitigation opportunities identified in the plan.

Social Media	The City leverages social media platforms (Facebook and Instagram) to interact and communicate with the general public regarding any and all hazard information. These social media platforms will be utilized to invite residents to participate in the Annual Hazard Mitigation Questionnaire and annual townhall meeting. Other events, such as Touch-A-Truck, will also be advertised.

Table 5. 8: Action Item Implementation

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
1	Identify and pursue funding opportunities, in addition to the FEMA grant programs, to develop and implement local mitigation activities	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1C	2016, updated in 2023	Office of Emergency Management, Community Development	Hazard Mitigation Grant Program (HMGP) & In Kind Matches	Long	
2	Identify, implement, and promote new collaborative programs and outreach focusing on residents, city departments, and industry stakeholders to promote active emergency preparedness activities that reduce hazards.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	2A, 4A	2016, updated in 2023	Office of Emergency Management	In Kind Matches & $50,000	Long	
3	Provide or facilitate/participate business continuity workshops for business owners to learn the importance of disaster mitigation and how to create an Emergency Operations Plan for their business	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1D	2016, updated in 2023	Office of Emergency Management	Local General Fund & $1,000	Long	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
4	Increase public awareness of severe weather mitigation activities to include shelter in place and air quality warnings and appropriate actions taken.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	2B	2016, updated in 2023	Office of Emergency Management	Local General Fund & 35,000	Medium	
5	Coordinate with the Army Corp of Engineers and nearby cities for evacuation planning.	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	5C	2023	Office of Emergency Management	Local General Fund & In Kind Matches	Medium	
6	Develop and implement a public outreach campaign to increase awareness of the Downey Alerts System and encourage resident opt-in for notifications	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	5B	2016, updated in 2023	Office of Emergency Management	Hazard Mitigation Grant Program (HMGP) & $35,000	Long	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
7	Identify locations and install emergency generators at the City of Downey Emergency Shelter locations and hardwire. Electrical work to modify existing wiring & update lighting or efficiency	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1A, 5B	2024	Public Works, City of Downey	Hazard Mitigation Grant Program (HMGP) & $500,000	Medium	
8	Conduct a full-scale mass care and shelter exercise	All Hazards (Acts/Threats of Mass Violence, Civil Unrest, Cyber Incident, Dam Failure, Drought, Earthquake, Hazardous Materials Release, Pandemic, Severe Weather/Storm, Tornado, Mass Transportation Accident/Incident, Urban Flood, Utility Loss, Urban Fires, Windstorm, Wildfire Smoke/Air Quality)	1C, 2A, 2B, 4A,, 5B, 5C	2024	Office of Emergency Management, Parks & Recreation, Public Works Department	Local General Funds & $500	Short	
9	Conduct functional active shooter drill for high-hazard areas/departments using a vendor and invite local agencies to participate.	Acts/Threats of Mass Violence	1A, 1B, 1C, 3A, 5A	2023	Kaiser Permanente Safety Department	HPP Grant Funds & $11,500	Short	
10	Conduct active shooter training with the Fire Department.	Acts/Threats of Mass Violence	1A, 1B, 1C, 3A, 5A, 5B	2023	Police Department, Fire Department	Homeland Security Grant Program (HSGP) & $15,000	Long	
11	Encourage public transparency on critical issues to minimize misunderstanding and unrest within the community	Civil Unrest	2B	2016, updated in 2023	Police Department	Local General Fund: Outreach budget & In Kind Matches	Long	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
12	Conduct a tabletop drill to focus on cyber threat	Cyber Incident	1C	2023	Kaiser Permanente Safety Department, Kaiser Regional	In Kind Matches & $25,000	Short	
13	Conduct a cybersecurity PEN test which involves a third party who tries to break into the network and will provide a report of the results after	Cyber Incident	1B, 1C	2024	Finance-IT Department	Local General Fund & $20,000	Short	
14	Review partnerships and responsibilities with the Army Corps of Engineers in relation to the Whittier Narrows and Garvey Reservoir dams to enhance effective communications. Explore MOU opportunities and validity.	Dam Failure	4B, 5C	2023	Office of Emergency Management	Local General Fund & In Kind Matches	Long	
15	Extend recycled water main to Furman Park to allow for retrofit of existing landscape irrigation system to recycled water thereby reducing demands on potable water supplies.	Drought	1A, 1C, 3A, 5C	2022	Public Works Department, Utilities, City of Downey, LA County Flood Control District	2022 Urban Community Drought Relief Grant and Water Fund & $1,400,000	Short	
16	Expand City initiative to upgrade public property with drought tolerant landscaping. Recreational areas, building planters and street planters are some examples of property locations that might require updated landscaping	Drought	3A	2016, updated in 2023	Public Works Department, Utilities Division	Water Fund & $50,000 - $10,000,000	Long	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
17	Design and construction of Furman Park stormwater capture and infiltration project	Drought, Urban Flood	1A, 1C, 2A, 3A,4A, 5A	2022	Public Works Department, Utilities, LA County Flood Control District	Regional & Municipal City General Fund, Safe Clean Water (SCW) Program Measure W & $20,000,000	Medium	
18	Educating and promoting implementation of stormwater measures to developers and residents who are constructing, improving, or residential, commercial and/or industrial building	Drought, Severe Weather/Storm. Utility Loss	1A, 1B, 1C, 3A, 4A, 4B, 5A	2024	Public Works Department	Stormwater Budget & $100,000	Long	
19	Promote and continue to provide education about earthquake preparedness while in the hospital and conduct annual drills for earthquake	Earthquake	1C, 2A, 4A, 5C	2023	Presbyterian Intercommunit y Hospital (PIH)	In Kind Matches & $1,000	Medium	
20	Perform ongoing assessments of identified seismically vulnerable facilities for inclusion among the list of prioritized assessment locations by Fire Department resources in the event of significant seismic activity.	Earthquake	1B	2023	Fire Department	Local General Fund & In Kind Matches	Long	
21	Integrate new earthquake hazard mapping data for the City of Downey and improve technical analysis of earthquake hazards	Earthquake	1B	2016, updated in 2023	Department of Public Works – GIS Manager	National Earthquake Hazards Reduction Program (NEHRP) State Assistance Grant & $30,000	Medium	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
22	In collaboration with elected and appointed officials within the City, to increase capabilities within the Hazardous Materials Division. Internal and external resources will ensure that regulatory compliance inspections are conducted in accordance with state and federal law, thus proactively addressing conditions in the use, storage, and transport of dangerous goods that could be subject to accidental release.	Hazardous Material Release	5B	2016, updated in 2023	Fire Department, Los Angeles County Health Hazmat Division	Local General Fund & $85,000	Medium	
23	Implement traffic control upgrades to mitigate accidents in “trouble intersections” (traffic signals, power, rail controls)	Mass Transportation Accident/ Incident	1C	2016, updated in 2023	Public Works Department, Principal Civil Engineer & Maintenance and Facilities	Hazard Mitigation Grant Program (HMGP) & $100,000 - $10,000,000	Medium	
24	Implement buffering street improvement projects to protect the public from the impact of a traffic incident (sidewalks, fences, drop off zones, and bridge rails)	Mass Transportation Accident/ Incident	1A	2016, updated in 2023	Public Works Department, Principal Civil Engineer, Maintenance and Facilities	Local General Fund & $100,000 - $5,000,000	Long	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
25	Develop a Continuity of Government Plan and encourage private industry to develop continuity plans in order to reduce the impact of service interruptions and economic loss as the result of a pandemic	Pandemic	1D	2016, updated in 2023	Office of Emergency Management	Hazard Mitigation Grant Program (HMGP) & $50,000	Long	
26	Propose a monetary set-up/ replacement program for facility roofs and HVAC systems	Severe Weather, Storm	1A, 3B	2024	Public Works, Maintenance	Local General Fund & $300,000	Long	
27	Conduct PSA regarding tornados and provide education and awareness media materials via social media.	Tornado	2A	2024	Office of Emergency Management	Local General Fund & $1,000	Short	
28	Enhance and harden HVAC System at Barbara J. Riley Community/Senior Center	Severe Weather, Storm	1A, 5C	2023	Public Works, City of Downey	Local General Fund & $300,000	Short	
29	Research best practices for tornado sheltering that best match our school campuses and district facilities. Review structures in relation to current building code standards to determine potential hardening projects i.e. tornado sheltering measures.	Tornado	1C, 2A, 5C	2024-25	Downey USD, DUSD Emergency Operations Team, City of Downey	Office Of Emergency Management & $10,000,000	Short	
30	Distribute information and education materials that will help tie this to existing drills already conducted regularly during the school year	Tornado	1C, 2A, 5C	2024-25	Downey USD, DUSD Emergency Operations Team, City of Downey	Office Of Emergency Management & $10,000,000	Short	

Action Number	Mitigation Action a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment	Hazards Mitigated	Corresponding Goals & Objectives	Year Initiated	Responsible Department	Potential Funding Source & Monetary Amount	Timeframe Completion[1]	Status Summary
31	Enhance mapping data to identify flood-prone areas, due to standing water; urban flooding; etc., throughout the city and implement improvement projects to enable efficient drainage within the identified vulnerable locations.	Urban Flood	1B	2016, updated 2023	Public Works Department	Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Building Resilient Infrastructure and Communities (BRIC) & $2,000,000	Medium	
32	Enhance debris management strategies for windstorm events	Windstorm	5A	2016, updated in 2023	Public Works Department	In Kind Matches & $30,000	Medium	

A Additional Hazard Analysis Documentation

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Earthquake Analysis

Hazus: Earthquake Global Risk Report

Region Name: Downey, CA

Earthquake Scenario: Prob_mag5

Print Date: March 30, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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Section

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 24.82 square miles and contains 44 census tracts. There are over 55 thousand households in the region which has a total population of 187,417 people. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 45 thousand buildings in the region with a total building replacement value (excluding contents) of 29,513 (millions of dollars). Approximately 89.00 % of the buildings (and 48.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 9,576 and 315 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 45 thousand buildings in the region which have an aggregate total replacement value of 29,513 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 86% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 840 beds. There are 53 schools, 9 fire stations, 2 police stations and 2 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 9,891.00 (millions of dollars). This inventory includes over 229.91 miles of highways, 78 bridges, 846.93 miles of pipes.

Table 1: Transportation System Lifeline Inventory

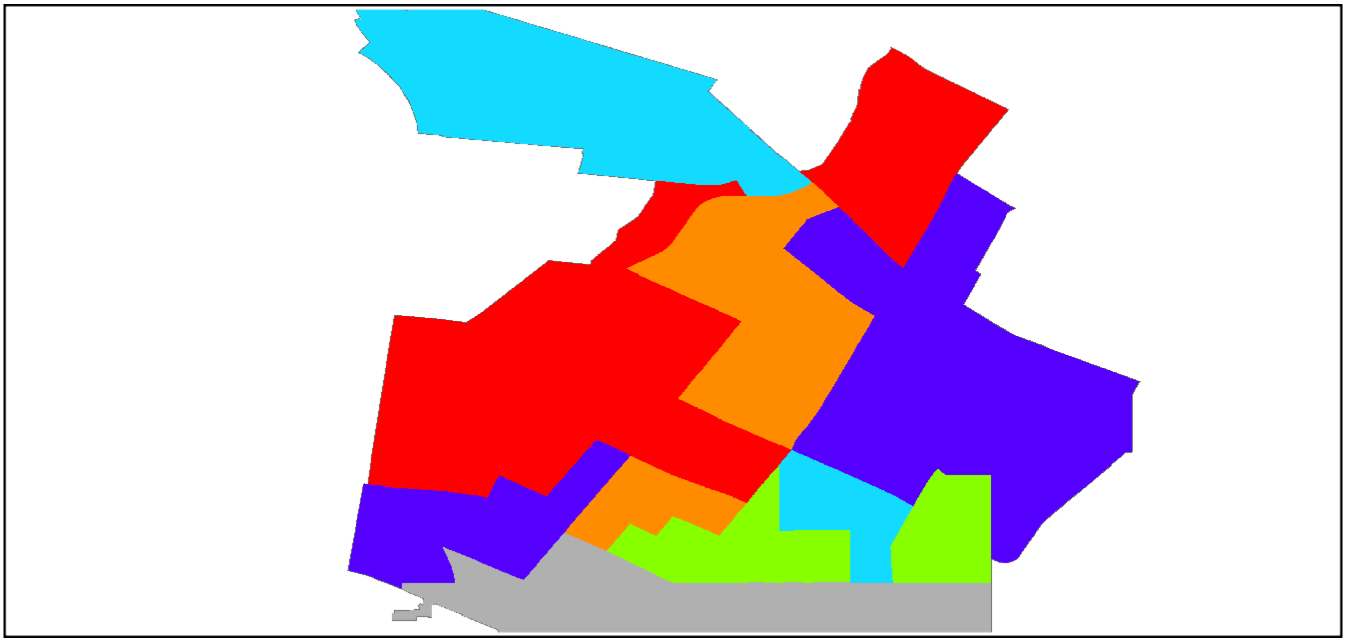
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	78	781.9891
	Segments	417	3011.8752
	Tunnels	0	0.0000
		Subtotal	**3793.8643**
Railways	Bridges	14	79.6600
	Facilities	2	5.3260
	Segments	98	5051.3161
	Tunnels	0	0.0000
		Subtotal	**5136.3021**
Light Rail	Bridges	0	0.0000
	Facilities	2	11.4200
	Segments	1	635.1414
	Tunnels	0	0.0000
		Subtotal	**646.5614**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**9,576.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	16.5706
	Facilities	1	39.2940
	Pipelines	0	0.0000
		Subtotal	**55.8646**
Waste Water	Distribution Lines	NA	9.9424
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**9.9424**
Natural Gas	Distribution Lines	NA	6.6283
	Facilities	0	0.0000
	Pipelines	1	134.5512
		Subtotal	**141.1795**
Oil Systems	Facilities	4	0.4720
	Pipelines	0	0.0000
		Subtotal	**0.4720**
Electrical Power	Facilities	2	107.9334
		Subtotal	**107.9334**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**315.40**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Prob_mag5
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	100.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 5,108 buildings will be at least moderately damaged. This is over 11.00 % of the buildings in the region. There are an estimated 97 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

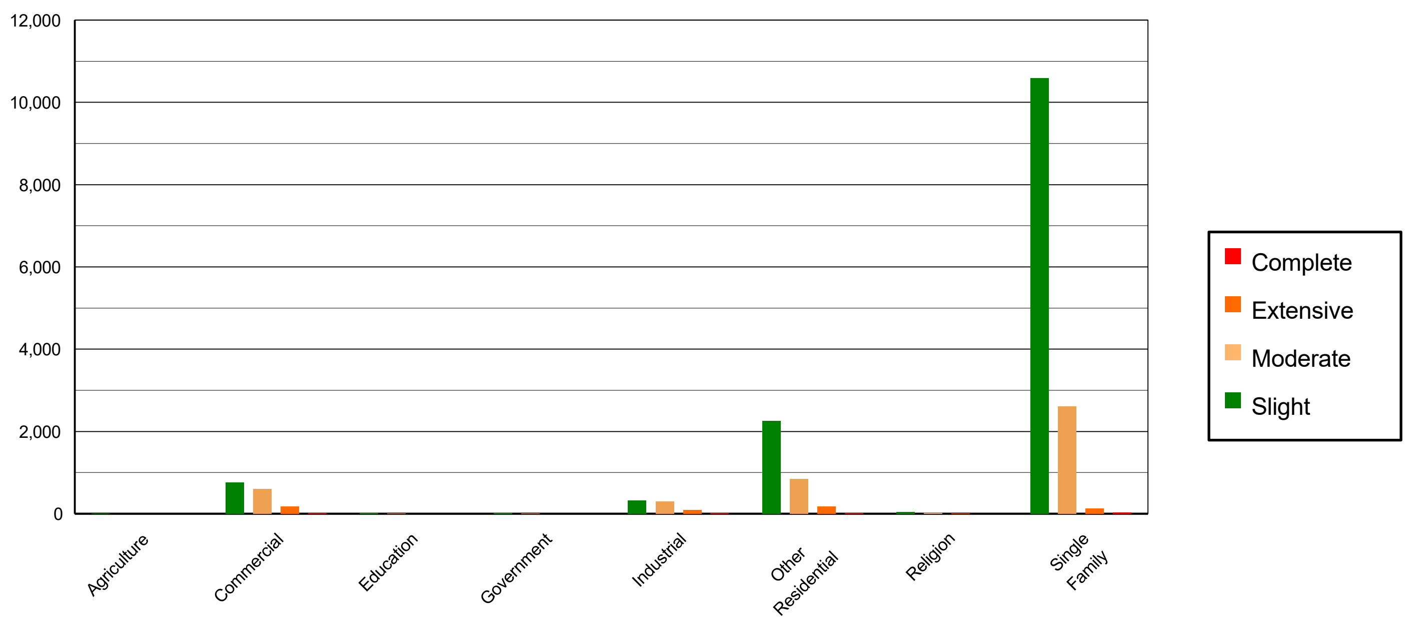


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	10.09	0.04	5.31	0.04	3.43	0.08	0.98	0.17	0.19	0.19
Commercial	1504.24	5.78	763.22	5.45	603.54	13.65	175.99	29.78	26.00	26.71
Education	44.95	0.17	20.66	0.15	12.02	0.27	3.01	0.51	0.36	0.37
Government	30.63	0.12	14.26	0.10	11.11	0.25	3.47	0.59	0.53	0.54
Industrial	635.48	2.44	326.05	2.33	298.37	6.75	95.10	16.09	15.01	15.42
Other Residential	4165.83	16.01	2252.60	16.08	850.71	19.25	176.89	29.93	24.97	25.65
Religion	84.03	0.32	40.93	0.29	27.60	0.62	8.16	1.38	1.27	1.31
Single Family	19552.65	75.12	10589.70	75.57	2613.30	59.12	127.33	21.55	29.02	29.81
Total	**26,028**		**14,013**		**4,420**		**591**		**97**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	23117.90	88.82	12616.96	90.04	3125.92	70.72	149.11	25.23	36.23	37.21
Steel	573.82	2.20	305.59	2.18	324.30	7.34	97.87	16.56	14.09	14.47
Concrete	607.70	2.33	325.26	2.32	222.84	5.04	78.95	13.36	12.48	12.82
Precast	512.79	1.97	268.16	1.91	267.12	6.04	86.92	14.71	11.25	11.56
RM	1007.15	3.87	319.45	2.28	277.73	6.28	92.70	15.69	7.28	7.48
URM	163.78	0.63	106.06	0.76	89.97	2.04	30.37	5.14	9.19	9.44
MH	44.76	0.17	71.27	0.51	112.20	2.54	55.01	9.31	6.83	7.02
Total	**26,028**		**14,013**		**4,420**		**591**		**97**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 840 hospital beds available for use. On the day of the earthquake, the model estimates that only 435 hospital beds (52.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 70.00% of the beds will be back in service. By 30 days, 90.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	4	1	0	3
Schools	53	30	0	23
EOCs	2	1	0	1
PoliceStations	2	0	0	2
Fire Stations	9	4	0	3

Transportation Lifeline Damage

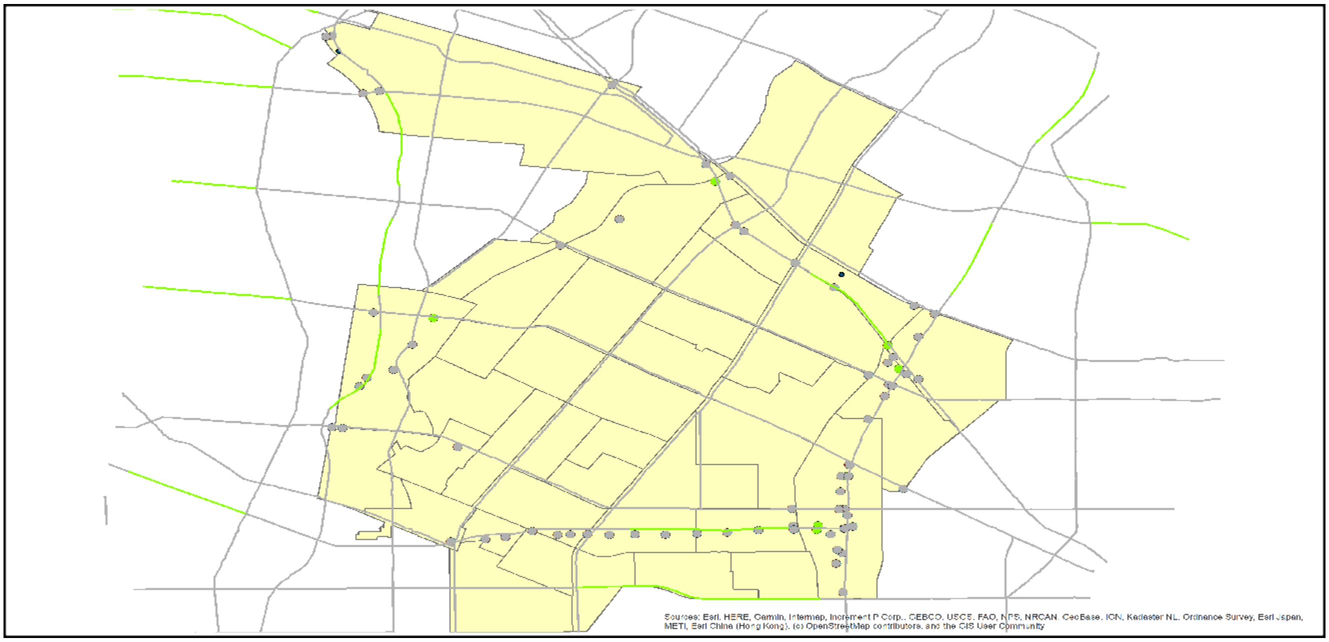


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	417	0	0	409	409
	Bridges	78	0	0	78	78
	Tunnels	0	0	0	0	0
Railways	Segments	98	0	0	98	98
	Bridges	14	0	0	14	14
	Tunnels	0	0	0	0	0
	Facilities	2	0	0	2	2
Light Rail	Segments	1	0	0	1	1
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	2	0	0	2	2
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 % After Day 1	with Functionality > 50 % After Day 7
Potable Water	1	0	0	1	1
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	4	0	0	4	4
Electrical Power	2	2	0	0	2
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	515	66	17
Waste Water	309	33	8
Natural Gas	24	1	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	55,350	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

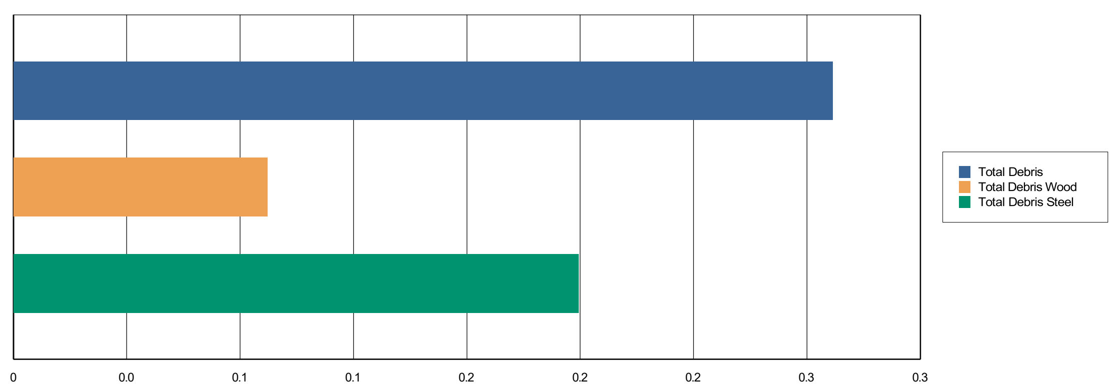
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 2 ignitions that will burn about 0.03 sq. mi 0.12 % of the region's total area.) The model also estimates that the fires will displace about 357 people and burn about 31 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 289,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 31.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 11,560 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



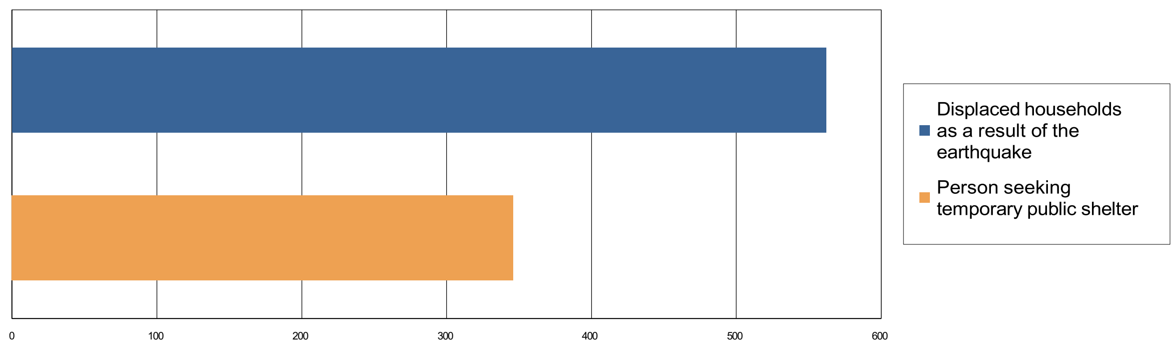
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.09	0.20	0.29	11,560 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 562 households to be displaced due to the earthquake. Of these, 346 people (out of a total population of 187,417) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
562	346

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	2.00	0.39	0.05	0.10
	Commuting	0.01	0.01	0.01	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.03	0.00	0.00	0.00
	Industrial	3.32	0.66	0.08	0.16
	Other-Residential	58.02	9.49	0.99	1.92
	Single Family	55.38	5.23	0.15	0.25
	Total	**119**	**16**	**1**	**2**
2 PM	Commercial	130.31	25.59	3.24	6.32
	Commuting	0.06	0.07	0.12	0.02
	Educational	53.66	10.25	1.29	2.51
	Hotels	0.00	0.00	0.00	0.00
	Industrial	24.42	4.87	0.61	1.19
	Other-Residential	15.87	2.64	0.29	0.53
	Single Family	15.03	1.46	0.05	0.07
	Total	**239**	**45**	**6**	**11**
5 PM	Commercial	93.11	18.32	2.34	4.49
	Commuting	1.18	1.44	2.60	0.49
	Educational	0.44	0.08	0.01	0.02
	Hotels	0.01	0.00	0.00	0.00
	Industrial	15.26	3.04	0.38	0.75
	Other-Residential	22.08	3.67	0.40	0.74
	Single Family	20.87	2.03	0.07	0.10
	Total	**153**	**29**	**6**	**7**

Economic Loss

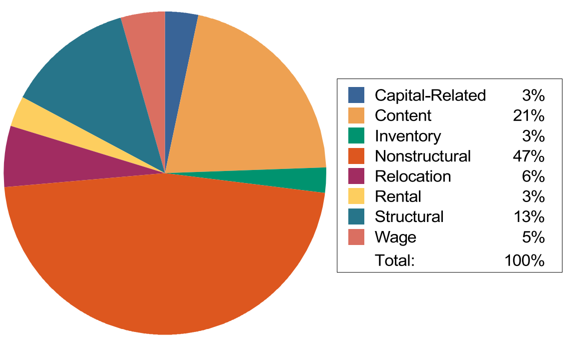
The total economic loss estimated for the earthquake is 1,927.99 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 1,875.34 (millions of dollars); 17 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 28 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

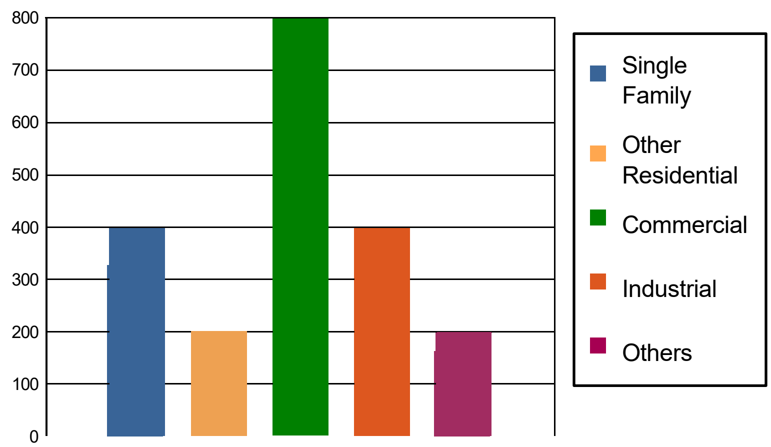


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	4.4912	71.4254	5.5569	3.8617	85.3352
	Capital-Related	0.0000	1.9113	58.3421	3.6757	1.0965	65.0256
	Rental	5.0331	11.1100	34.6079	3.2166	1.7909	55.7585
	Relocation	17.9741	7.7059	56.2170	15.8173	16.7360	114.4503
	Subtotal	**23.0072**	**25.2184**	**220.5924**	**28.2665**	**23.4851**	**320.5696**
Capital Stock Losses							
	Structural	38.4515	19.4306	106.3340	52.2232	21.5047	237.9440
	Nonstructural	203.3306	130.7224	290.4254	170.8951	80.9846	876.3581
	Content	62.2401	32.0431	142.3619	118.4188	36.8291	391.8930
	Inventory	0.0000	0.0000	31.2146	17.2064	0.1494	48.5704
	Subtotal	**304.0222**	**182.1961**	**570.3359**	**358.7435**	**139.4678**	**1554.7655**
	Total	**327.03**	**207.41**	**790.93**	**387.01**	**162.95**	**1875.34**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	3011.8752	0.0000	0.00
	Bridges	781.9891	10.6380	1.36
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**3793.8643**	**10.6380**	
Railways	Segments	5051.3161	0.0000	0.00
	Bridges	79.6600	0.3756	0.47
	Tunnels	0.0000	0.0000	0.00
	Facilities	5.3260	0.9034	16.96
	Subtotal	**5136.3021**	**1.2790**	
Light Rail	Segments	635.1414	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	11.4200	1.9181	16.80
	Subtotal	**646.5614**	**1.9181**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9,576.73**	**13.84**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	39.2940	3.7703	9.60
	Distribution Lines	16.5706	0.2983	1.80
	Subtotal	**55.8646**	**4.0686**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	9.9424	0.1499	1.51
	Subtotal	**9.9424**	**0.1499**	
Natural Gas	Pipelines	134.5512	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	6.6283	0.0513	0.77
	Subtotal	**141.1795**	**0.0513**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.4720	0.0445	9.43
	Subtotal	**0.4720**	**0.0445**	
Electrical Power	Facilities	107.9334	34.5019	31.97
	Subtotal	**107.9334**	**34.5019**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**315.39**	**38.82**	

County Listing for the Region

Los Angeles, CA

Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	187,417	14,063	15,450	29,513
Total Region		**187,417**	**14,063**	**15,450**	**29,513**

Flood Analysis
100-Year Flood

Hazus: Flood Global Risk Report

Region Name:	Downey, CA
Flood Scenario:	Full
Print Date:	Wednesday, March 29, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region .

The geographical size of the region is approximately 18 square miles and contains 1,606 census blocks. The region contains over 55 thousand households and has a total population of 187,241 people. The distribution of population by State and County for the study region is provided in Appendix B .

There are an estimated 45,149 buildings in the region with a total building replacement value (excluding contents) of 29,511 million dollars. Approximately 89.44% of the buildings (and 47.65% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 45,149 buildings in the region which have an aggregate total replacement value of 29,511 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	14,062,053	47.6%
Commercial	8,325,499	28.2%
Industrial	4,696,362	15.9%
Agricultural	9,651	0.0%
Religion	421,210	1.4%
Government	235,576	0.8%
Education	1,760,873	6.0%
Total	**29,511,224**	**100%**

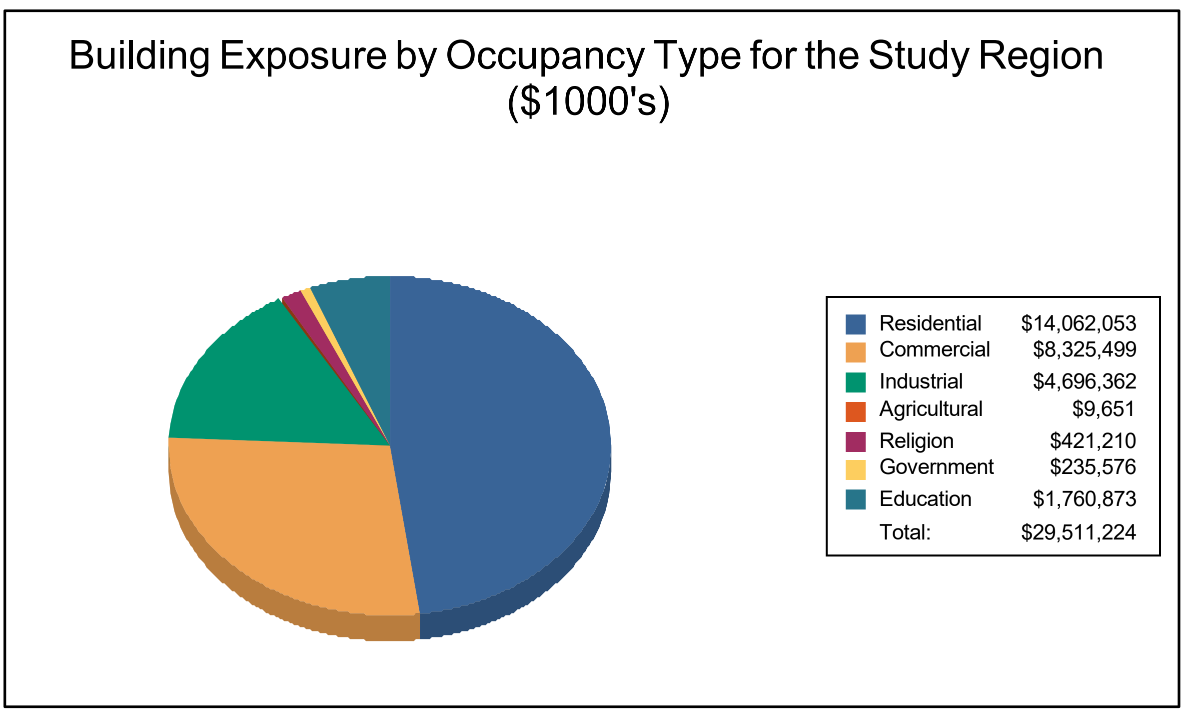
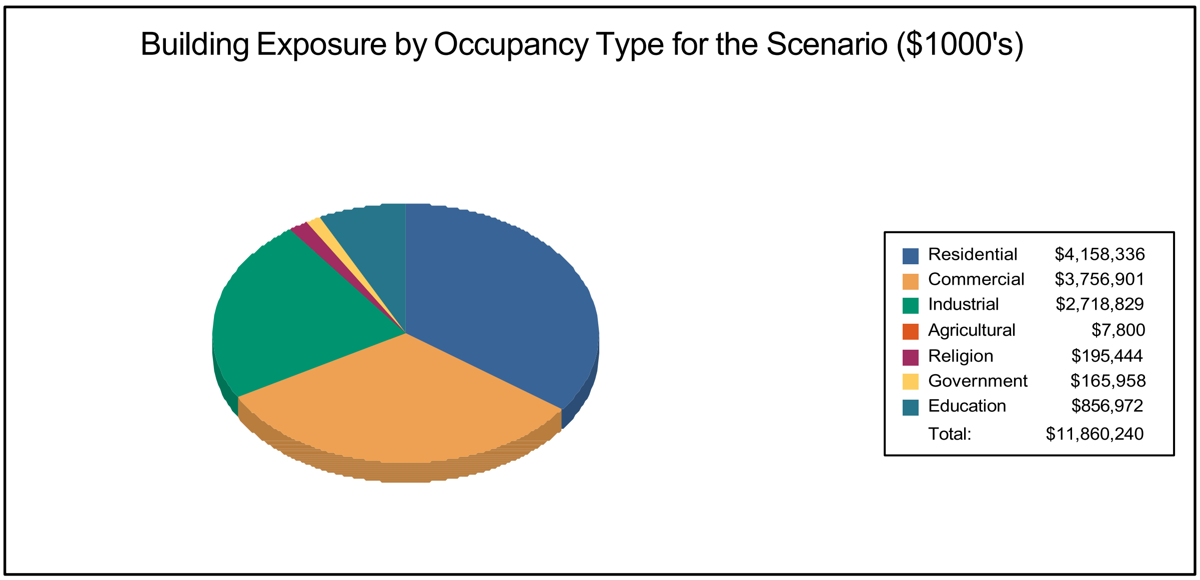


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	4,158,336	35.1%
Commercial	3,756,901	31.7%
Industrial	2,718,829	22.9%
Agricultural	7,800	0.1%
Religion	195,444	1.6%
Government	165,958	1.4%
Education	856,972	7.2%
Total	**11,860,240**	**100%**



Essential Facility Inventory

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 840 beds. There are 53 schools, 9 fire stations, 2 police stations and 2 emergency operation centers.

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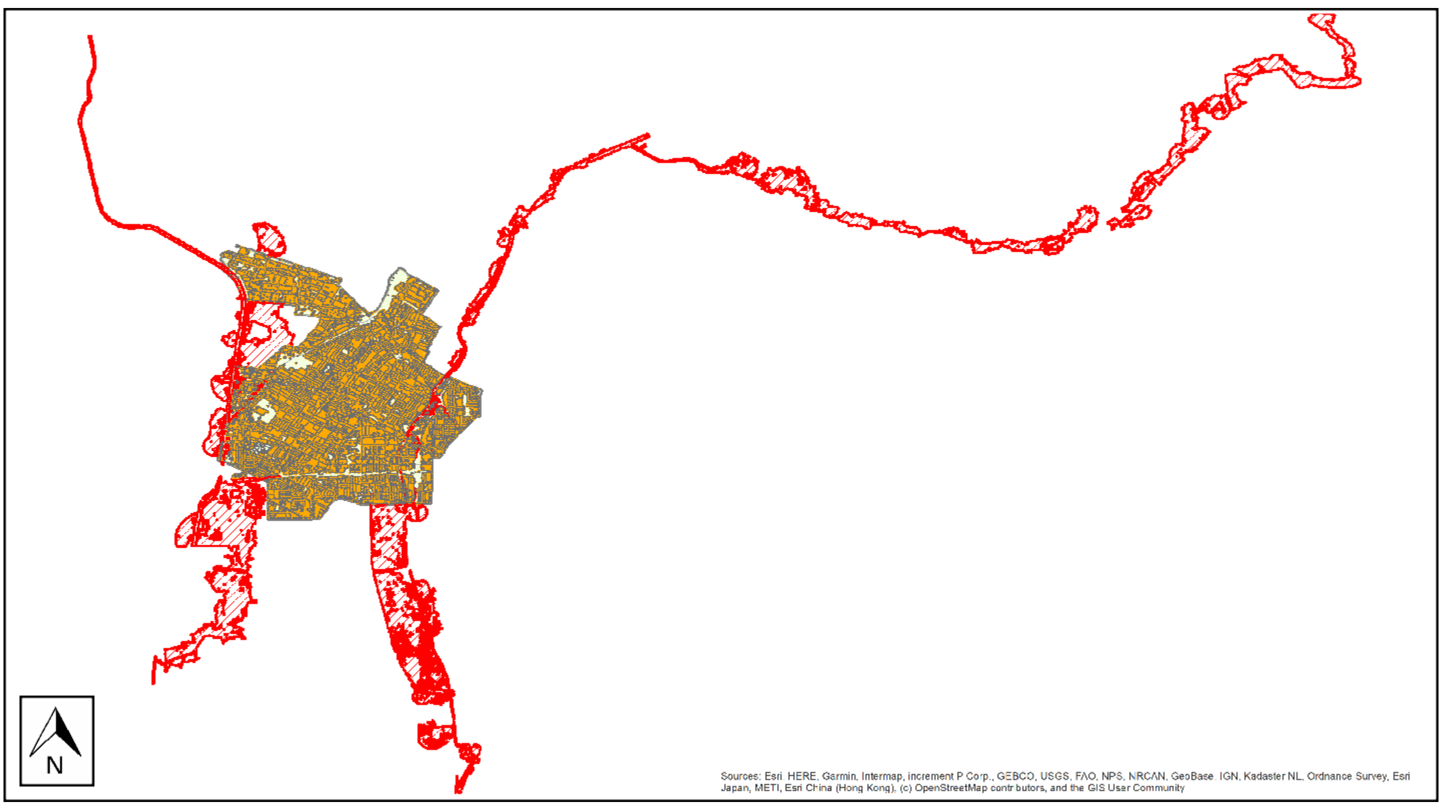
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Downey, CA
Scenario Name:	Full
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



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Building Damage

General Building Stock Damage

Hazus estimates that about 804 buildings will be at least moderately damaged. This is over 67% of the total number of buildings in the scenario. There are an estimated 3 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

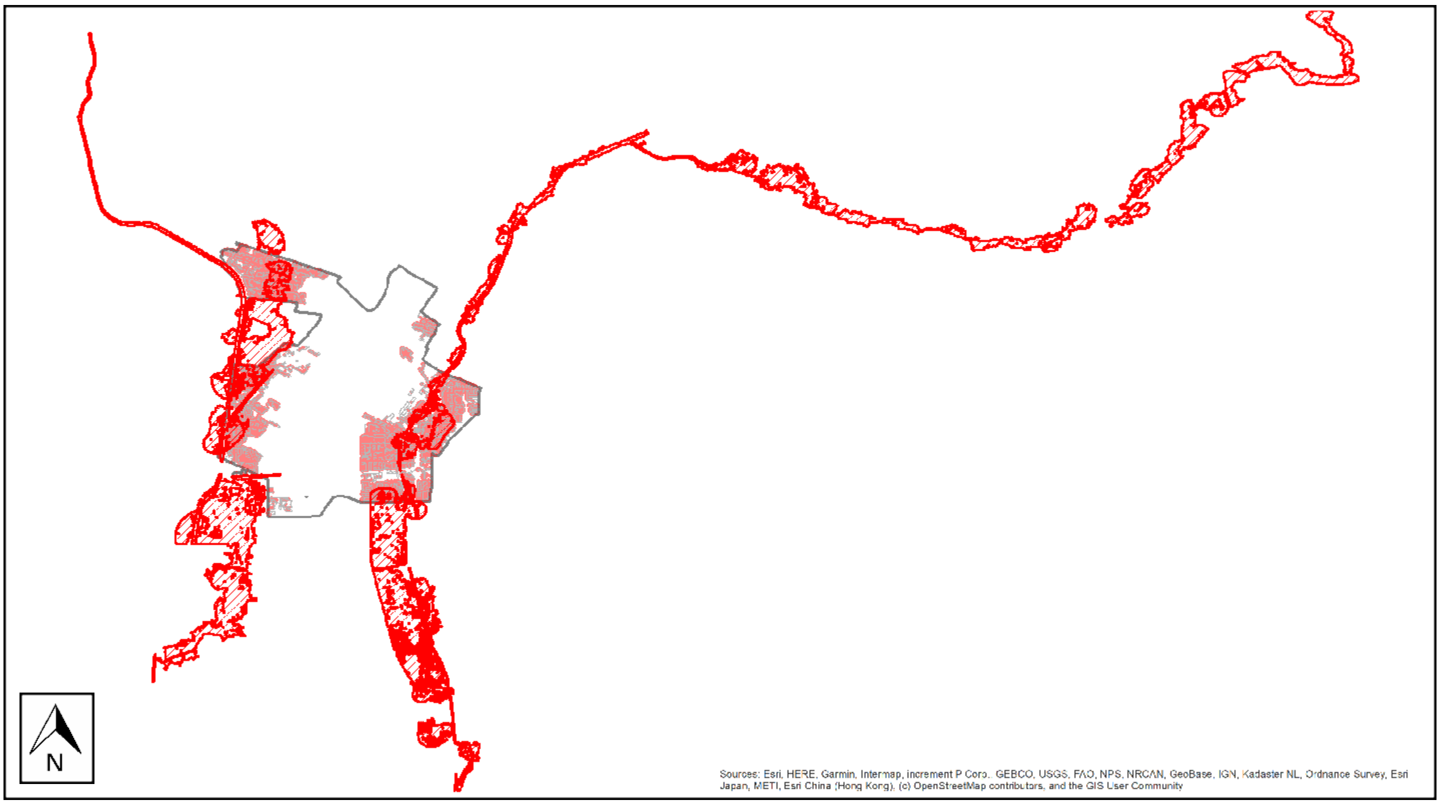

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Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	43	80	11	20	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	40	60	24	36	3	4	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	555	42	564	43	142	11	53	4	4	0	3	0
Total	**638**		**599**		**145**		**53**		**4**		**3**	

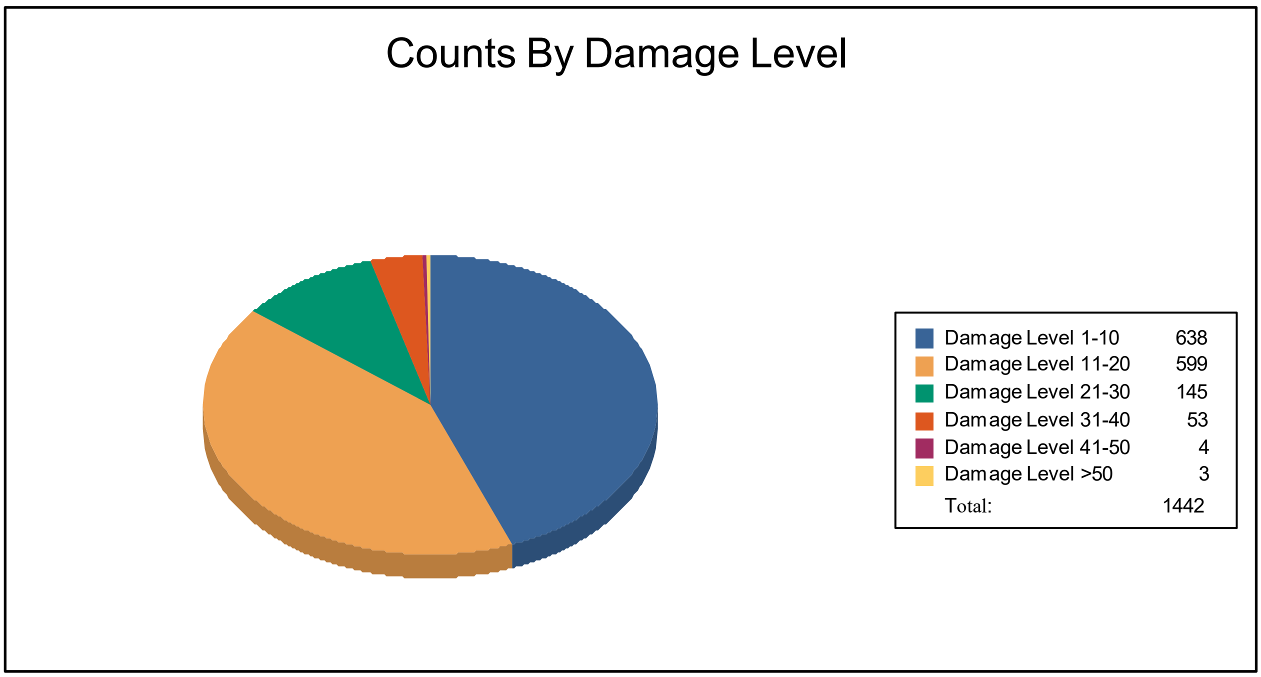


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	35	69	15	29	1	2	0	0	0	0	0	0
Manu Housing	0	0	3	75	1	25	0	0	0	0	0	0
Masonry	15	60	10	40	0	0	0	0	0	0	0	0
Steel	18	58	11	35	2	6	0	0	0	0	0	0
Wood	557	42	554	42	141	11	53	4	4	0	3	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 840 hospital beds available for use. On the day of the scenario flood event, the model estimates that 840 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	L ss of Use
Emergency Operation Centers	2	0	0	0
Fire Stations	9	0	0	0
Hospitals	4	0	0	0
Police Stations	2	0	0	0
Schools	53	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

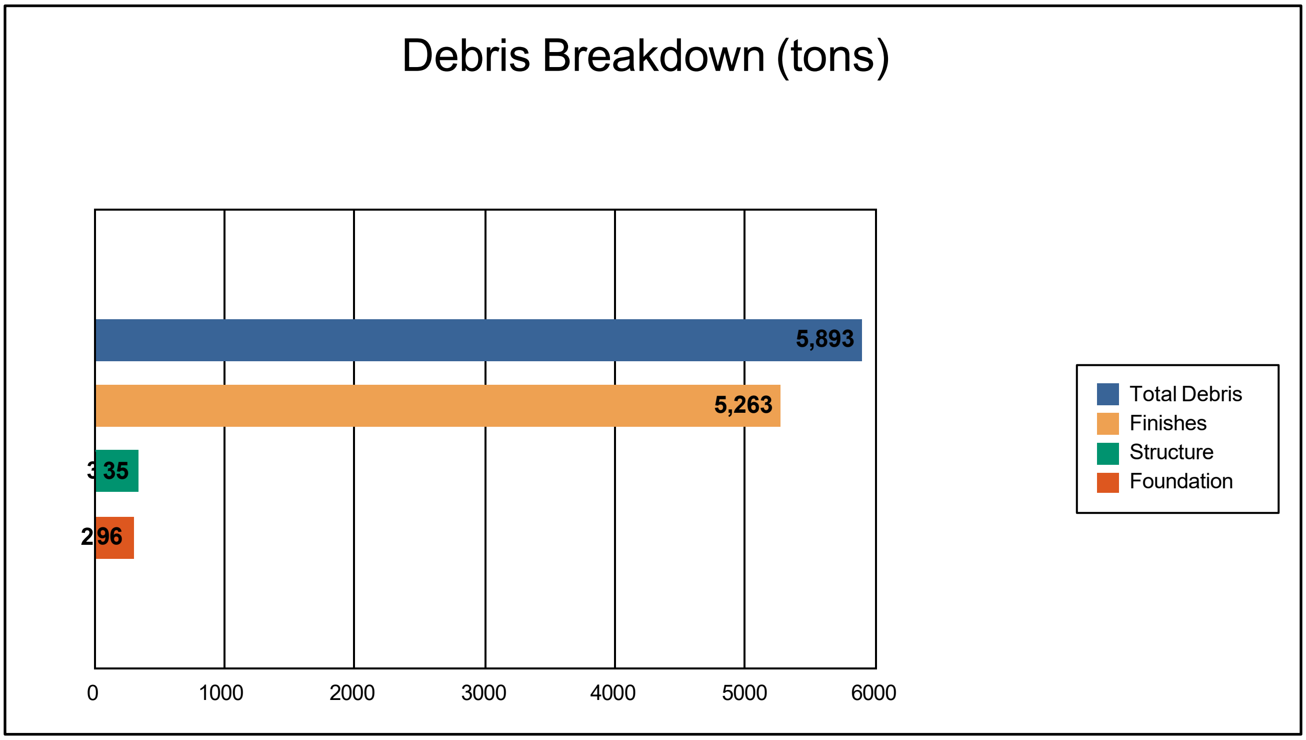
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

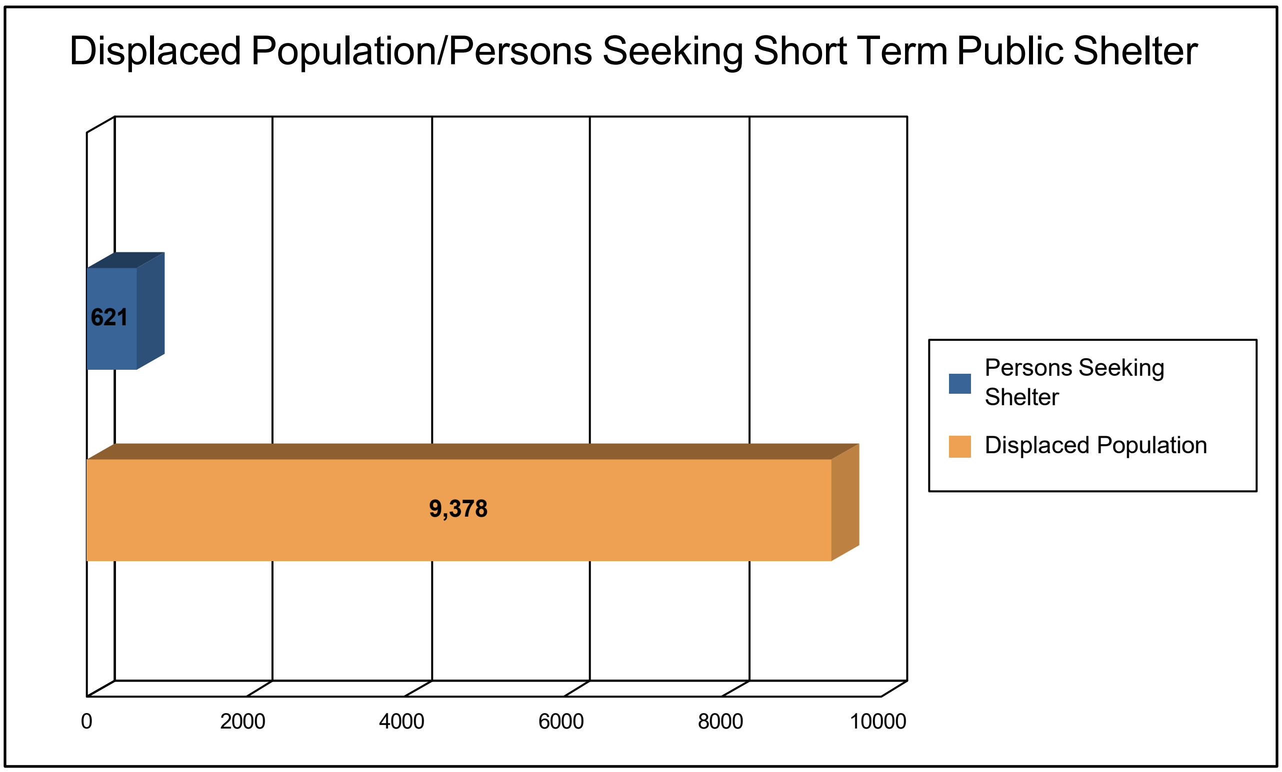


The model estimates that a total of 5,893 tons of debris will be generated. Of the total amount, Finishes comprises 89% of the total, Structure comprises 6% of the total, and Foundation comprises 5%. If the debris tonnage is converted into an estimated number of truckloads, it will require 236 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,126 households (or 9,378 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 621 people (out of a total population of 187,241) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,209.09 million dollars, which represents 10.19 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 568.77 million dollars. 53% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 11 .54% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

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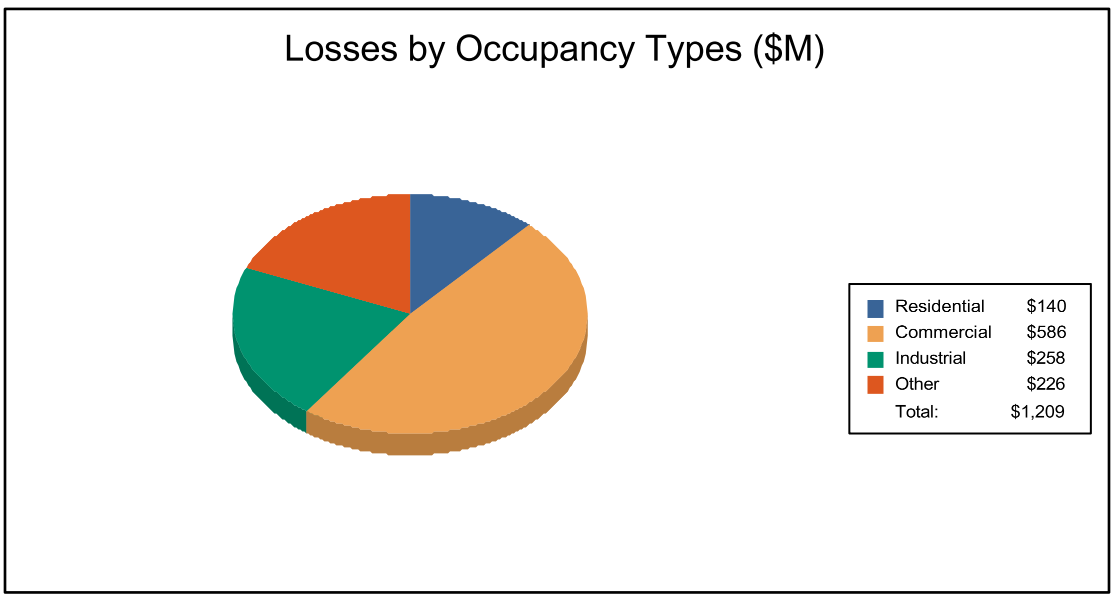
Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	59.78	42.38	58.76	8.36	169.28
	Content	34.38	124.37	143.87	49.24	351.87
	Inventory	0.00	28.19	19.25	0.19	47.62
	Subtotal	**94.17**	**194.94**	**221.88**	**57.80**	**568.77**
Business Interruption						
	Income	1.46	147.46	10.48	23.26	182.66
	Relocation	28.46	50.50	10.78	15.20	104.94
	Rental Income	12.03	36.99	2.72	2.31	54.06
	Wage	3.43	156.01	11.77	127.46	298.66
	Subtotal	**45.38**	**390.97**	**35.75**	**168.23**	**640.32**
ALL	**Total**	**139.54**	**585.90**	**257.62**	**226.03**	**1,209.09**



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County Listing for the Region

California
- Los Angeles

Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
California				
Los Angeles	187,241	14,062,053	15,449,171	29,511,224
Total	**187,241**	**14,062,053**	**15,449,171**	**29,511,224**
Total Study Region	**187,241**	**14,062,053**	**15,449,171**	**29,511,224**

Flood Analysis

500-Year Flood

Hazus: Flood Global Risk Report

Region Name:	Downey, CA
Flood Scenario:	Full
Print Date:	Wednesday, March 29, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

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The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- California

Note:
Appendix A contains a complete listing of the counties contained in the region .

The geographical size of the region is approximately 18 square miles and contains 1,606 census blocks. The region contains over 55 thousand households and has a total population of 187,241 people. The distribution of population by State and County for the study region is provided in Appendix B .

There are an estimated 45,149 buildings in the region with a total building replacement value (excluding contents) of 29,511 million dollars. Approximately 89.44% of the buildings (and 47.65% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 45,149 buildings in the region which have an aggregate total replacement value of 29,511 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	14,062,053	47.6%
Commercial	8,325,499	28.2%
Industrial	4,696,362	15.9%
Agricultural	9,651	0.0%
Religion	421,210	1.4%
Government	235,576	0.8%
Education	1,760,873	6.0%
Total	**29,511,224**	**100%**

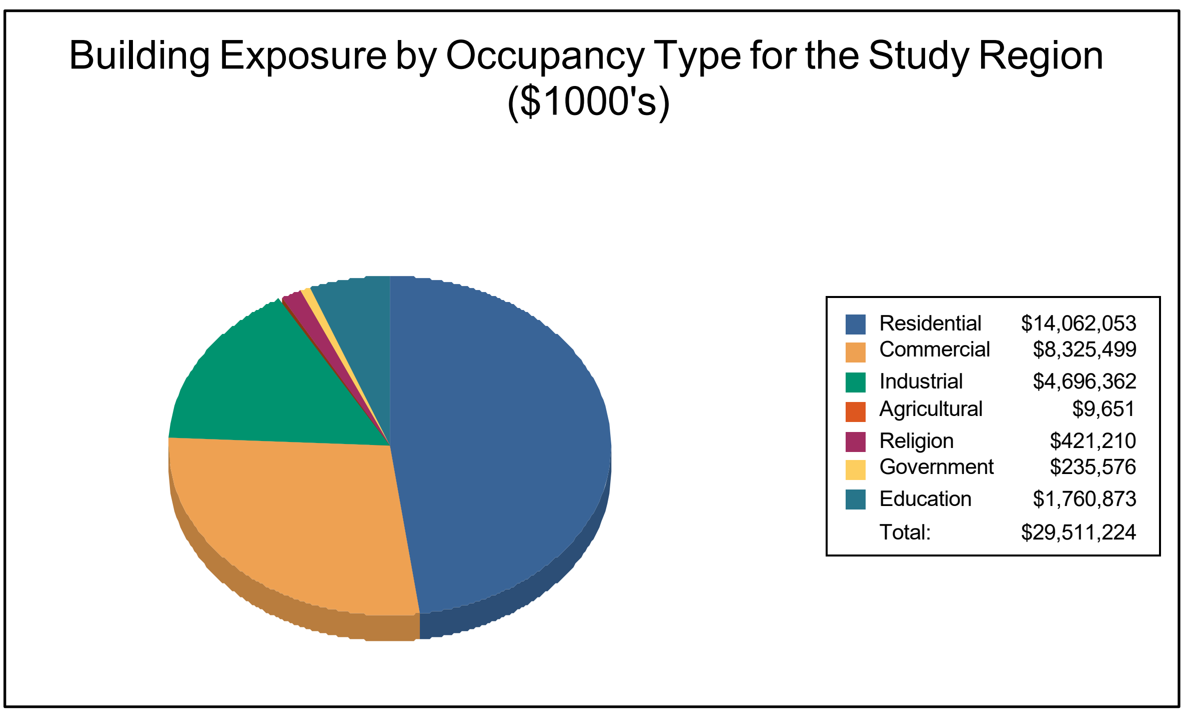

Table 2
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Occupancy	Exposure ($1000)	Percent of Total
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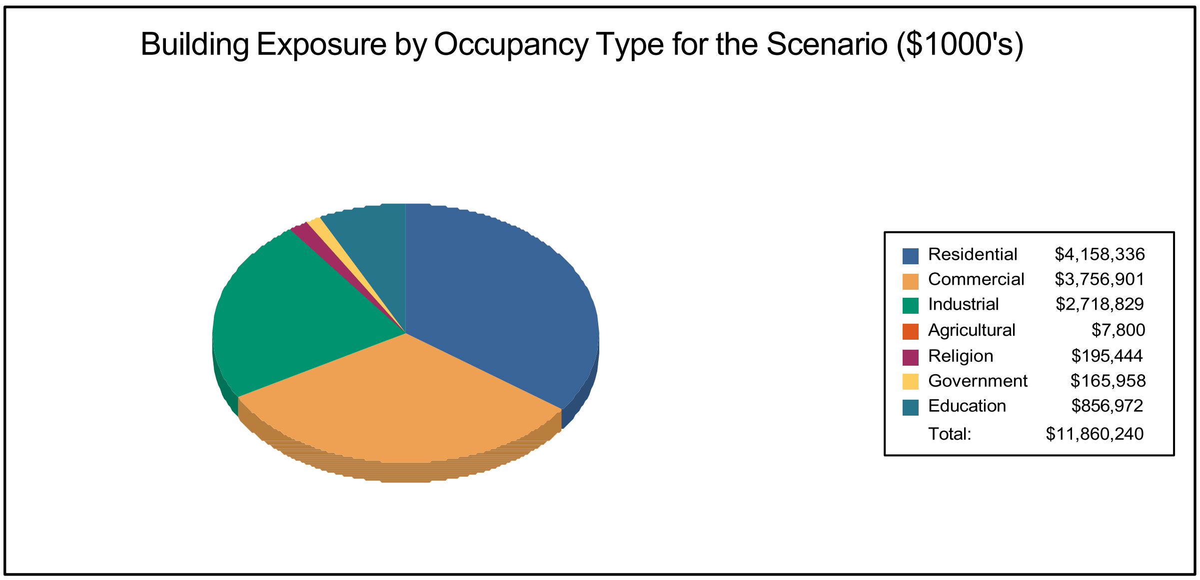
Commercial	3,756,901	31.7%
Industrial	2,718,829	22.9%
Agricultural	7,800	0.1%
Religion	195,444	1.6%
Government	165,958	1.4%
Education	856,972	7.2%
Total	**11,860,240**	**100%**



Essential Facility Inventory

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 840 beds. There are 53 schools, 9 fire stations, 2 police stations and 2 emergency operation centers.

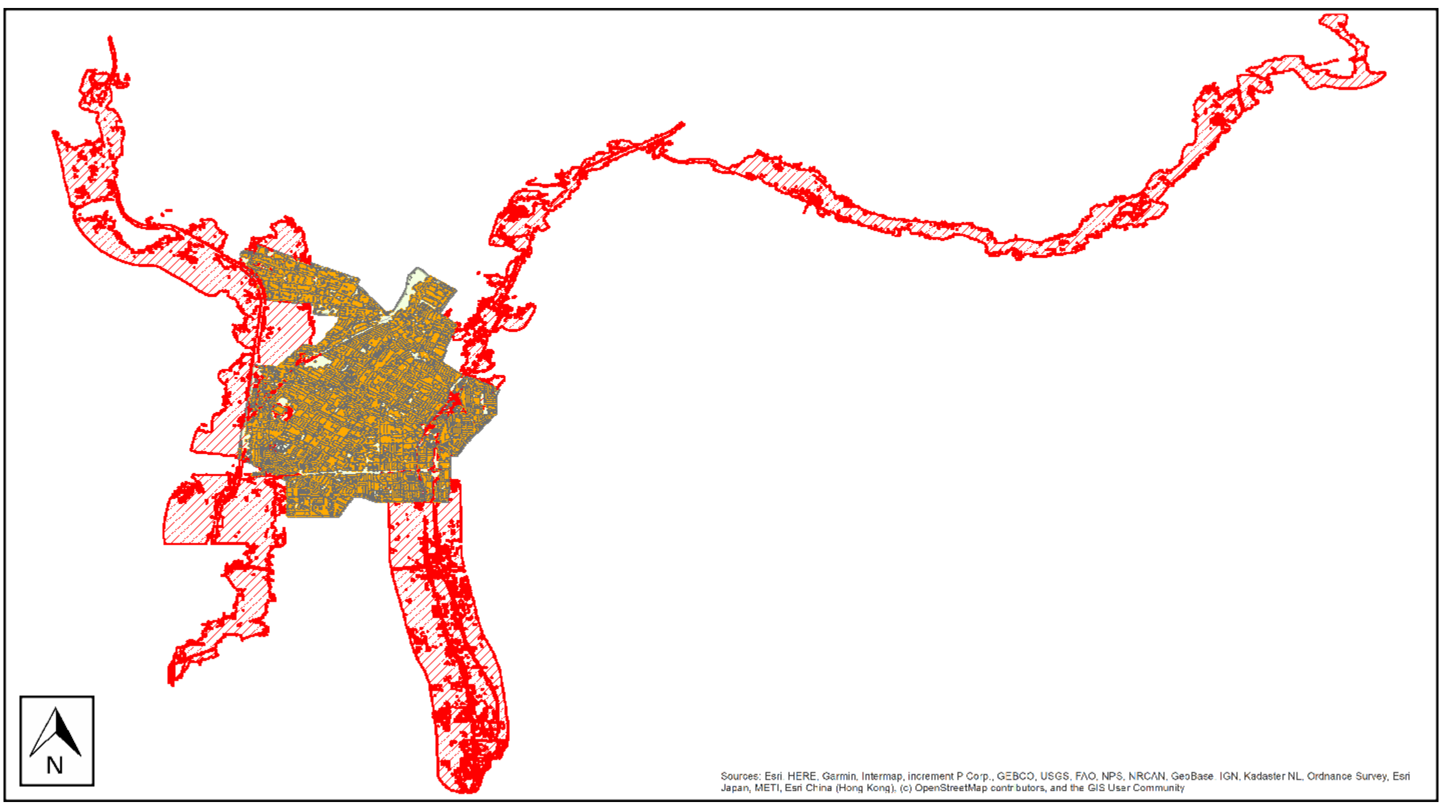
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Downey, CA
Scenario Name:	Full
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 4,130 buildings will be at least moderately damaged. This is over 70% of the total number of buildings in the scenario. There are an estimated 66 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

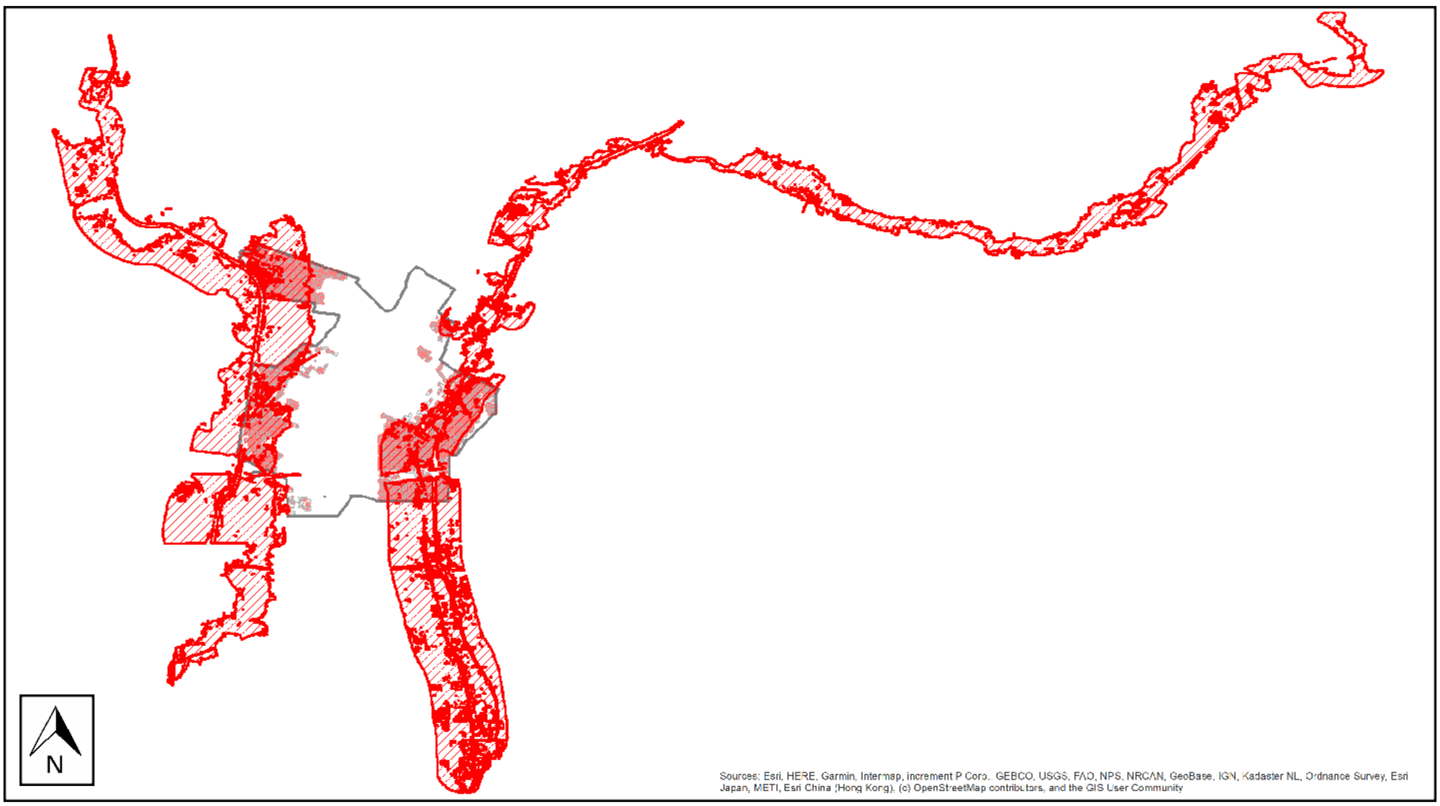


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	90	44	108	53	6	3	1	0	0	0	0	0
Education	1	100	0	0	0	0	0	0	0	0	0	0
Government	6	67	3	33	0	0	0	0	0	0	0	0
Industrial	87	36	120	49	30	12	5	2	2	1	0	0
Religion	1	100	0	0	0	0	0	0	0	0	0	0
Residential	1,266	25	2,172	42	839	16	607	12	171	3	66	1
Total	**1,451**		**2,403**		**875**		**613**		**173**		**66**	

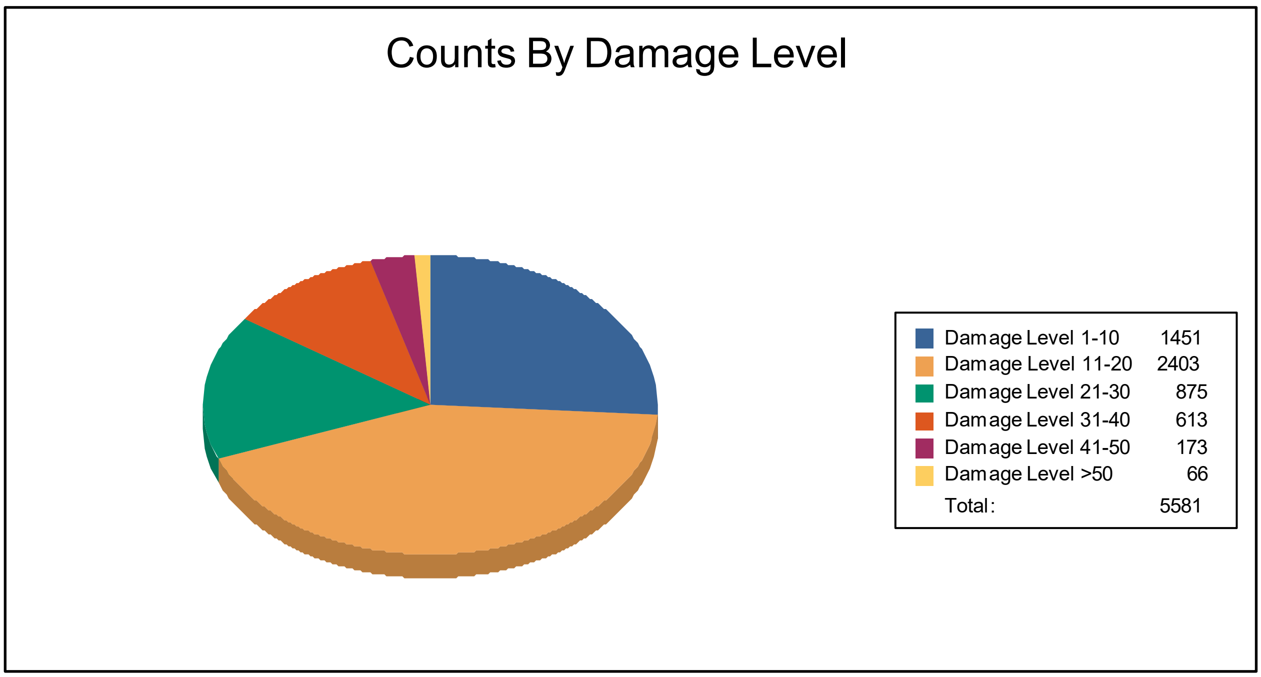


Table 4: Expected Building Damage by Building Type

Building Type	1-10 Count	1-10 (%)	11-20 Count	11-20 (%)	21-30 Count	21-30 (%)	31-40 Count	31-40 (%)	41-50 Count	41-50 (%)	>50 Count	>50 (%)
Concrete	99	43	106	46	21	9	3	1	1	0	0	0
Manu Housing	5	10	9	18	7	14	0	0	6	12	23	46
Masonry	39	35	63	56	11	10	0	0	0	0	0	0
Steel	38	32	65	56	12	10	1	1	1	1	0	0
Wood	1,258	25	2,138	43	814	16	607	12	165	3	43	1

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 840 hospital beds available for use. On the day of the scenario flood event, the model estimates that 840 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	L ss of Use
Emergency Operation Centers	2	0	0	0
Fire Stations	9	0	0	0
Hospitals	4	0	0	0
Police Stations	2	0	0	0
Schools	53	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

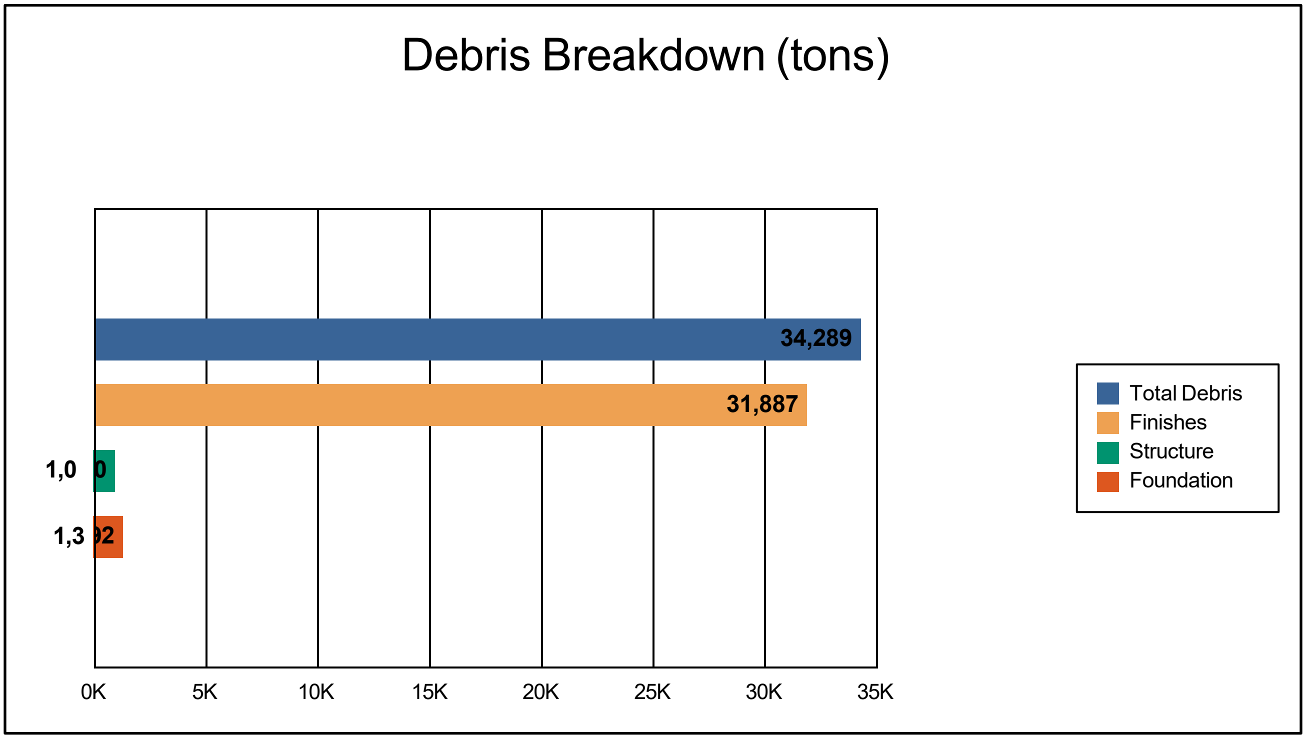
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

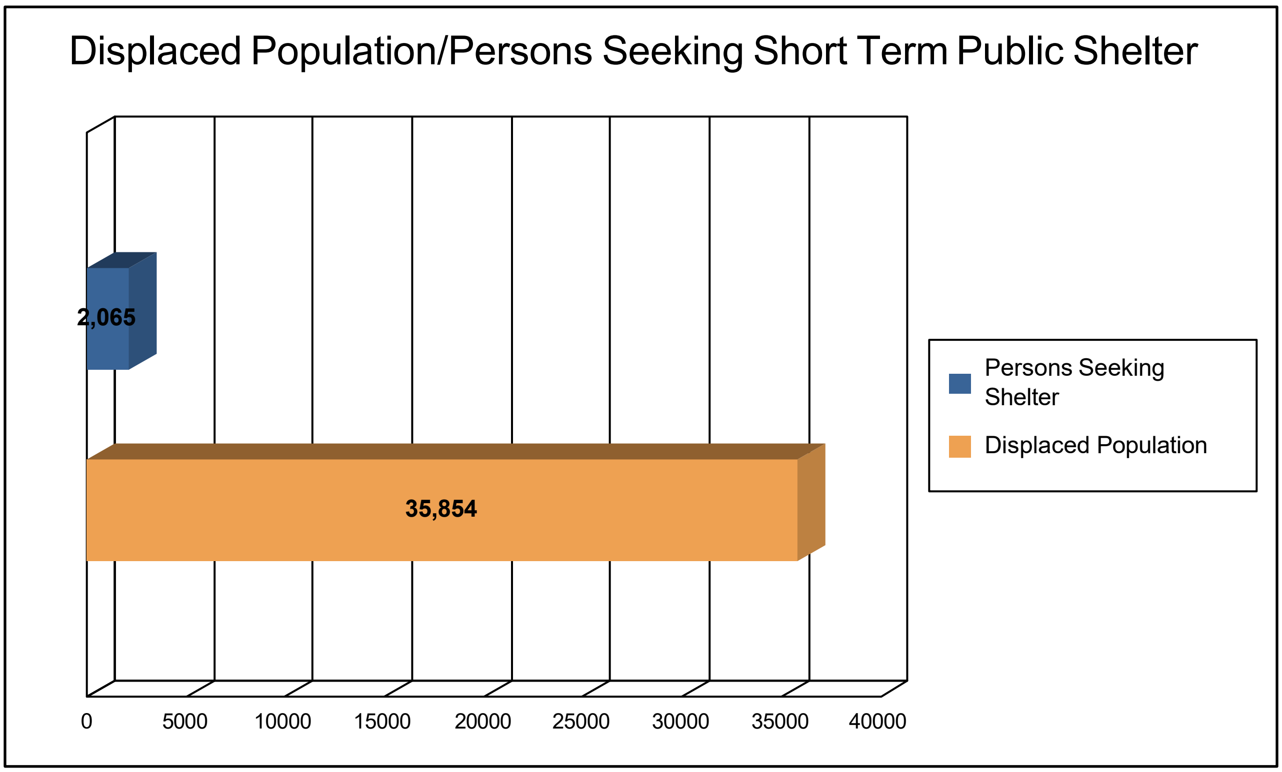


The model estimates that a total of 34,289 tons of debris will be generated. Of the total amount, Finishes comprises 93% of the total, Structure comprises 3% of the total, and Foundation comprises 4%. If the debris tonnage is converted into an estimated number of truckloads, it will require 1372 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 11 ,951 households (or 35,854 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2,065 people (out of a total population of 187,241) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 5,184.91 million dollars, which represents 43.72 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2,922.01 million dollars. 44% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 14.11% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

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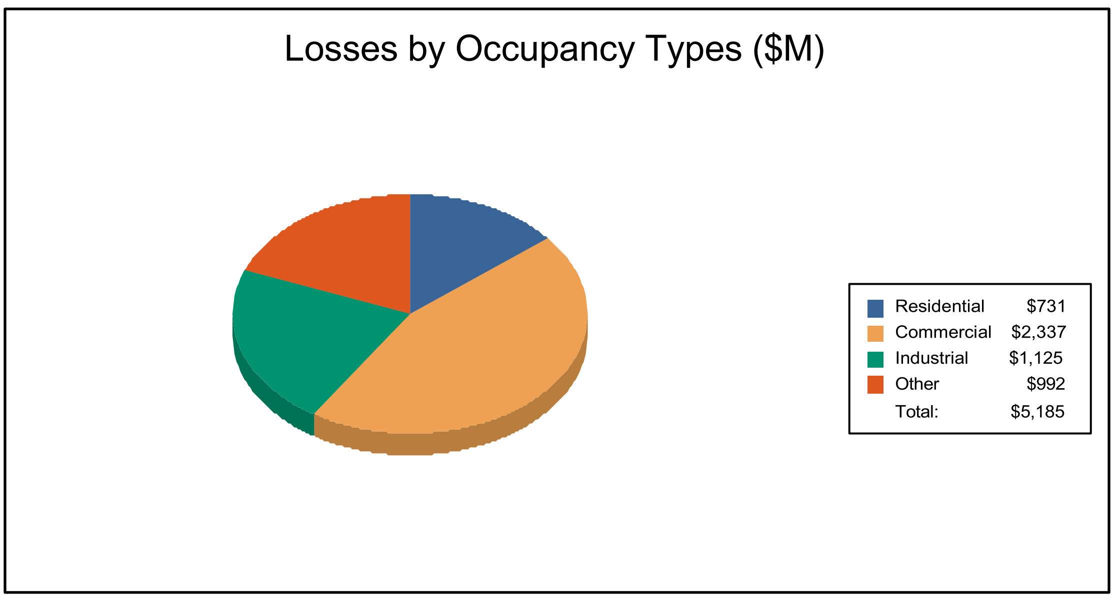
Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	350.79	229.99	260.33	38.33	879.44
	Content	202.84	680.27	679.61	237.94	1,800.66
	Inventory	0.00	150.63	90.64	0.65	241.92
	Subtotal	**553.63**	**1,060.88**	**1,030.58**	**276.93**	**2,922.01**
Business Interruption						
	Income	5.48	473.99	24.96	96.84	601.26
	Relocation	104.88	172.73	29.20	61.69	368.49
	Rental Income	54.50	126.22	7.42	9.14	197.29
	Wage	12.88	502.95	32.92	547.10	1,095.85
	Subtotal	**177.74**	**1,275.88**	**94.50**	**714.78**	**2,262.89**
ALL	**Total**	**731.36**	**2,336.76**	**1,125.08**	**991.70**	**5,184.91**



County Listing for the Region

California
- Los Angeles

Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
California				
Los Angeles	187,241	14,062,053	15,449,171	29,511,224
Total	**187,241**	**14,062,053**	**15,449,171**	**29,511,224**
Total Study Region	**187,241**	**14,062,053**	**15,449,171**	**29,511,224**

B Stakeholder Engagement

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B.1 Stakeholder Engagement

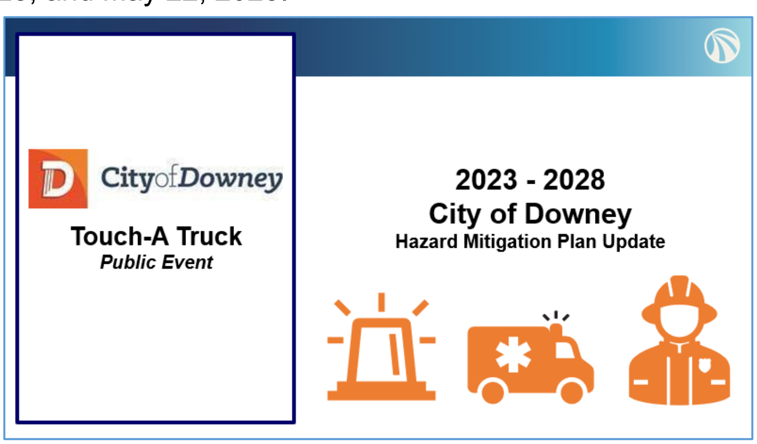
The City of Downey engaged with various stakeholders from supporting organizations on multiple occasions, including the steering committee during meetings and workshops. These partners were given the opportunity to provide feedback via email on the plan during the commend period to ensure equitable opportunity. The whole community partners assisted in identifying hazards, assessing risks and vulnerability, record critical facilities, and develop and prioritize mitigation actions. In addition to sharing technical data, reports, and studies. The City understands the importance of stakeholder engagement and that their contribution strengthens the content and outcomes of the mitigation plan. Various organizations mentioned below are also members of the Steering Committee to include the

Table B. 1: Support Organizations invited to participate

Organization		
PIH Health Whittier Hospital	Disaster Management Area Coordinator Area E	City of Paramount
City of Norwalk	SoCal Gas	Downey Unified School District

B.1.1 Public Meetings

The City utilized two existing emergency preparedness events to host public meetings to review updates to the Hazard Mitigation Plan. The public meeting presentation was developed to guide the discussion for the two public meetings. The meetings took place on: May 16, 2023, and May 22, 2023.

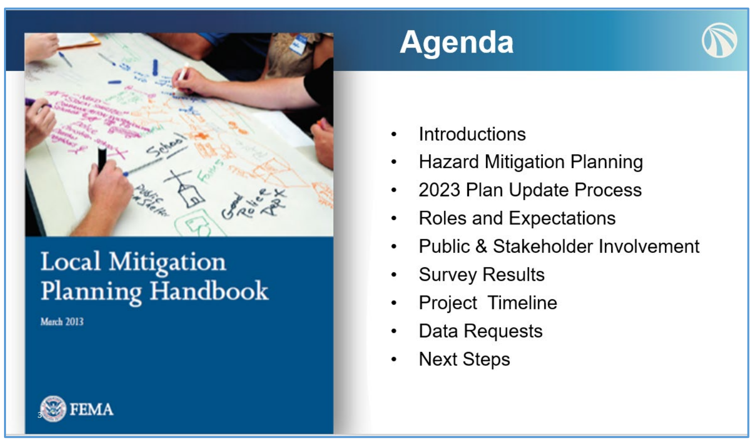


B.2 Steering Committee Meetings

A total of approximately 32 steering committee members were part of the HMP update process. See ***Chapter 1***, Section 1.2.2, Table 1.1 for a complete list of members organized by organization, name, and title of position.

B.2.1 Kick Off Steering Committee Meeting

The Kickoff Meeting for the City was conducted on March 15, 2023, and used an agenda to guide the meeting's discussion. The Kickoff Meeting acted as the first Steering Committee Meeting. Please see the agenda and sign in sheets of the steering committee meeting below.



B.2.2 Kick Off Steering Committee #1 Sign In Sheets

City of Downey

Meeting Purpose: City of Downey –HMP Update Steering Committee Meeting
Date: March 15, 2023
Time: 10:30 am – 12:00 pm PST

Name	Title & Department	Phone Number	Email
Alvin Lam	IT Manager, City of Downey	562-904-7246	Alam@downeyca.org
Anthony Hildebrand	Assistant Chief, City of Downey	562-904-7345	ahildebrand@downeyca.org
Dan Mueller	Deputy Director of Public Works - Utilities, City of Downey	562-904-7110	dmueller@downeyca.org
Jayro Roman	Program Administrator, Downey Unified	562-469-6550	Jaroman@dusd.net
Jessica Flores	Economic Development and Housing Manager, City of Downey	562 904-7152	JFlores@downeyca.org
Josef Kekula	Superintendent Maintenance and Facilities, City of Downey	562-904-7194	jkekula@downeyca.org
Matthew Lauwers	Code Enforcement Supervisor,	562 904-2392	codeenf@downeyca.org
Paul Edwards	Sergeant, Downey Police Department	562-904-2335	pedwards@downeyca.org
Socorro Cottle	Environmental Health & Safety Director, Kaiser Downey	562-622-4043	socorro.n.cottle@kp.org
Rakdy Khlok	Emergency Manager, City of Downey	562-904-7346	rkhlok@downeyca.org
Robert Jagielski	Senior Director of Student Safety, Downey Unified	562-469-6550	rjagielski@dusd.net
Matt Stanley	Project Manager, ISC	312-574-3869	matt.stanley@i-s-consulting.com
Elyzabeth Estrada	Lead Planner, ISC	305-469-7276	elyzabeth.estrada@i-s-consulting.com
Isaac Magdaleno	Planner, ISC	847-584-2849	Isaac.magdaleno@i-s-consulting.com

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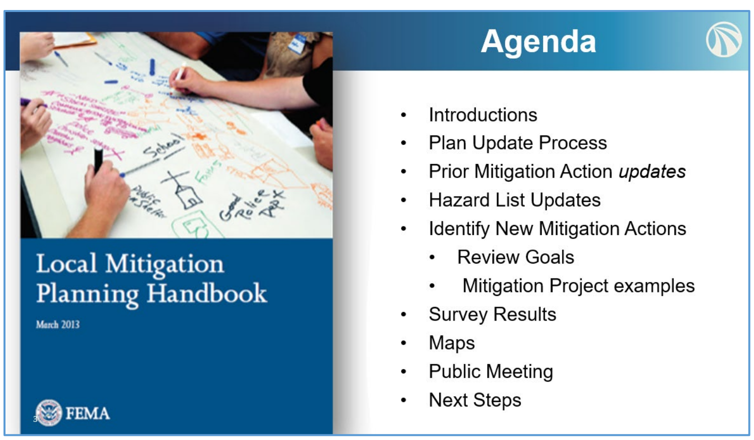
B.2.3 Steering Committee Meeting #2

The second Steering Committee Meeting for the City occurred virtually via Microsoft Teams on April 26, 2023, and used an agenda to guide the meeting's discussion. Please see the agenda and sign in sheets of the steering committee meeting below.



B.2.4 Steering Committee Meeting #2 Sign In Sheets

City of Downey

Meeting Purpose: City of Downey –HMP Update Steering Committee Meeting #2
Date: April 26, 2023
Time: 10 :30 am – 12 :00 pm PST

Name	Title & Department	Phone Number	Email
Anthony Hildebrand	Assistant Chief, City of Downey	562-904-7345	ahildebrand@downeyca.org
Carole Snyder	Director, Emergency Preparedness, PIH Health	562-698-0811	Carole.Snyder@pihhealth.org
David Ashman	Disaster Management Area Coordinator, Area E	562-505-6443	Dmac@dmae.ca.gov
Desi Gutierrez	Principal Civil Engineer, City of Downey	562-622-3468	DGUTIERR@downeyca.org
Erick Wosick	Assistant Public Safety Director, City of Paramount	562-220-2002	ewosick@paramountcity.com
Francesca Navarro	Principal Accountant, City of Downey	562-904-7265	FNavarro@downeyca.org
Jazmine Salas	Public Safety Officer, City of Norwalk	929-562-5962	jsalas@nrowalkca.gov
Jayro Roman	Program Administrator, Downey Unified	562-469-6550	Jaroman@dusd.net
Jessica Flores	Economic Development and Housing Manager, City of Downey	562 904-7152	JFlores@downeyca.org
Josef Kekula	Superintendent Maintenance and Facilities, City of Downey	562-904-7194	jkekula@downeyca.org
Julia Emerson	Public Affairs Manager, SoCal Gas	562-233-6181	Jemerson@socalgas.com
Socorro Cottle	Environmental Health & Safety Director, Kaiser Downey	562-622-4043	socorro.n.cottle@kp.org
Rakdy Khlok	Emergency Manager, City of Downey	562-904-7346	rkhlok@downeyca.org
Richard Newton	Emergency Preparedness Manager, City of Norwalk	562-9295919	Rnewton@norwalkca.gov

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City of Downey

Meeting Purpose: City of Downey –HMP Update Steering Committee Meeting #2
Date: April 26, 2023
Time: 10 :30 am – 12 :00 pm PST

Name	Title & Department	Phone Number	Email
Robert Jagielski	Senior Director of Student Safety, Downey Unified	562-469-6550	rjagielski@dusd.net
Matt Stanley	Project Manager, ISC	312-574-3869	matt.stanley@i-s-consulting.com
Elyzabeth Estrada	Lead Planner, ISC	305-469-7276	elyzabeth.estrada@i-s-consulting.com
Isaac Magdaleno	Planner, ISC	847-584-2849	Isaac.magdaleno@i-s-consulting.com

B.3 Workshops

One steering committee workshop was conducted to identify and update hazards and develop new mitigation strategies. See sign in sheets and photos of the workshop below.

B.3.1 Workshop Sign In Sheets

City of Downey

Meeting Purpose: City of Downey –HMP Update Workshop
Date: June 14, 2023
Time: 9 :00 am – 12:00 pm PST

Name	Title & Department	Phone Number	Email
Jairo Roman	Student Services - Downey USD	(562) 469-6562	jaroman@dusd.net
Robert Jagielski	Sr. Director, Downey USD	562)469-6584	rjagielski@dusd.net
Steven Coumparoulis	Community Preservation Manager	562) 220-2182	scoumparoulis@paramountcity.com
Socorro Cottle	EH+S Director / Emergency Prep Planner, Kaiser Downey	562-449-9420	socorro.n.cottle@kp.org
Jasmine Salas	Management An. / Norwalk OEM	562 929-5919	jsalas@norwalkca.gov
Jessica Flores	Econ. Dev & Housing Mngr. / CD	(562) 904-7152	jflores@downeyca.org
Brian Aleman	Public Works/Engineering	(562) 904-7110	baleman@downeyca.org
Desi Gutierrez	Public Works/Engineering	562) 904-7110	dgutierr@downeyca.org
Matt Lauwers	Code Enforcement	562-904-2392	MLAUWERS@downeyca.org
Rakdy Khlok	Fire - EM	562-841-4726	rkhlok@downeyca.org
Dan Mueller	Deputy Director of PW/utilities	562-904-7110	dmueller@downeyca.org
Josef Kekula	Superintendent	562-904-7194	Jkekula@downeyca.org
Melissa Aguilera	DRC Coord. / PLH Health	562 [illegible] x12702	melissa.Aguilera@plhealth.org
Julia Emerson	SoCalGas, Public Affairs Mgr	562-233-6181	jemerson@socalgas.com

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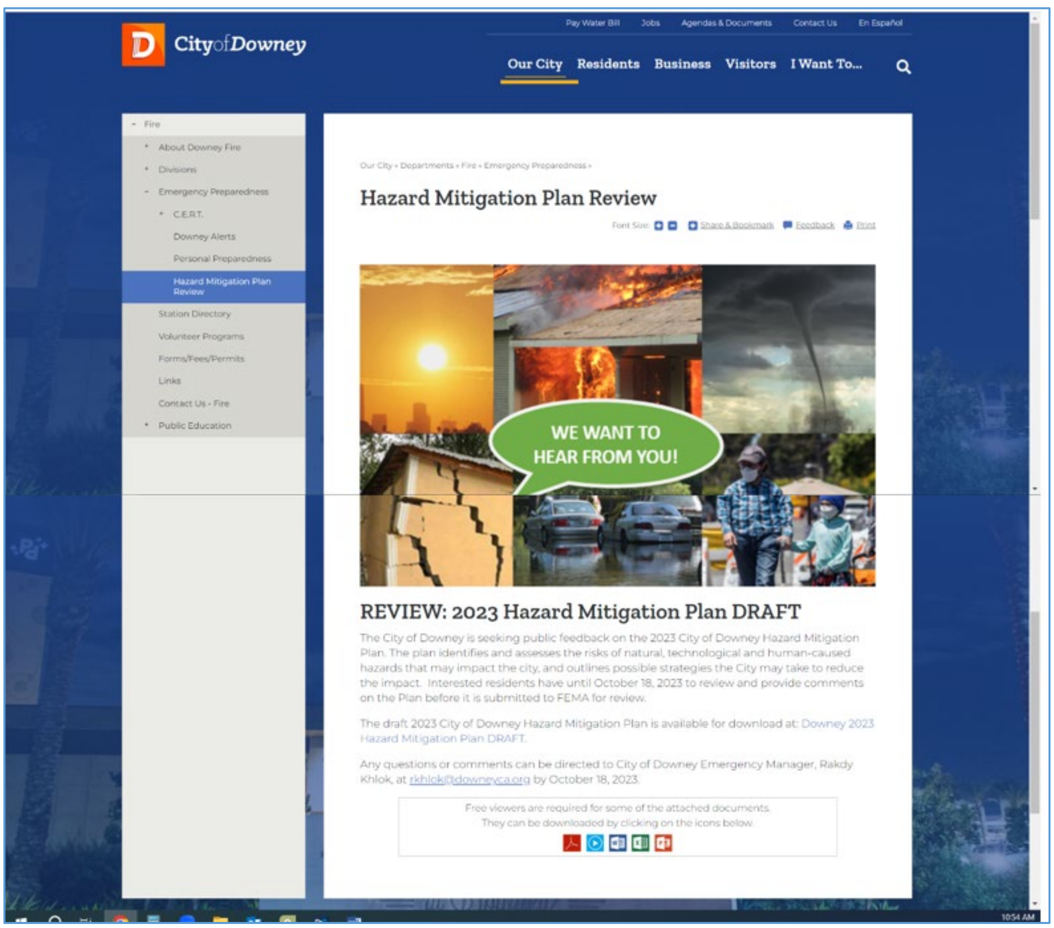
B.3.2 Workshop Photos

B.4 Public Comment Period

The City of Downey Office of Emergency Management sought public input on the Hazard Mitigation Plan. The City invited partners and public stakeholders to provide input during the comment review period before the Plan was submitted to Cal OES and FEMA for review. The comment period consisted of 2 weeks (October 3 – October 17, 2023) for feedback.

B.4.1 Social Media

The public comment period was advertised via multiple social media platforms. Screengrabs of the social media advertisement can be seen below via the City website and Instagram. The social media post on Instagram was published a total of three times during the 2-week period.



downeyemergency

View insights

Boost post

downeyemergency The City of Downey is seeking public feedback on the 2023 City of Downey Hazard Mitigation Plan. The plan identifies and assesses the risks of natural, technological and human-caused hazards that may impact the city, and outlines possible strategies the City may take to reduce the impact. Interested residents have until October 18, 2023 to review and provide comments on the Plan before it is submitted to FEMA for review.

The draft 2023 City of Downey Hazard Mitigation Plan is available for download at: Downey 2023 Hazard Mitigation Plan DRAFT.

#downeyemergency

20 seconds ago

B.5 Public Survey

A disaster preparedness and mitigation survey was developed to gauge household preparedness, perception of risk, and the perceived need to mitigate certain hazards. The questionnaire was made available online. The survey results guided the steering committee with prioritizing hazard impacts and validating goals, objectives, and mitigation strategies, and ensured the Plan adequately addressed the public's concerns and priorities.

The survey was distributed through a variety of methods beginning on February 24, 2023, and was closed on March 28, 2023. The questionnaire was dispersed via e-mail blasts, social media platforms (Facebook and Instagram), and the City main web page. Ultimately, respondents were selected from among those who volunteered to participate. No special weighing was done to reflect the demographic composition of the City.

The questionnaire used a combination of descriptive and exploratory questions to gain an understanding of general preparedness intentions and behavior, as well as personal and demographic factors influencing decision making. These questions further consisted of select categories, these categories include:

- general preparedness
- emergency information sources
- hazard risk perception
- hazard mitigation priorities
- disaster experience
- evacuation
- functional and access needs
- demographics

The questionnaire amounted to 32 questions of multiple choice and open-ended questions. In total, 105 respondents participated in the survey. To ensure all data could be accurately correlated, only the 54 completed questionnaires were used in this report (please reference the first row in the table below). 51 respondents were disqualified for partial completion and never actually submitted the survey. Completed surveys included those responses where the respondent started and reached the end of the survey. In some situations, the respondent chose not to answer one or more questions which is why some discrepancies exist in the total number of responses per question.

Table B. 2: Survey Totals

Survey Totals	
Survey Status	**Total**
Completed	54
Partial	51
Total	105

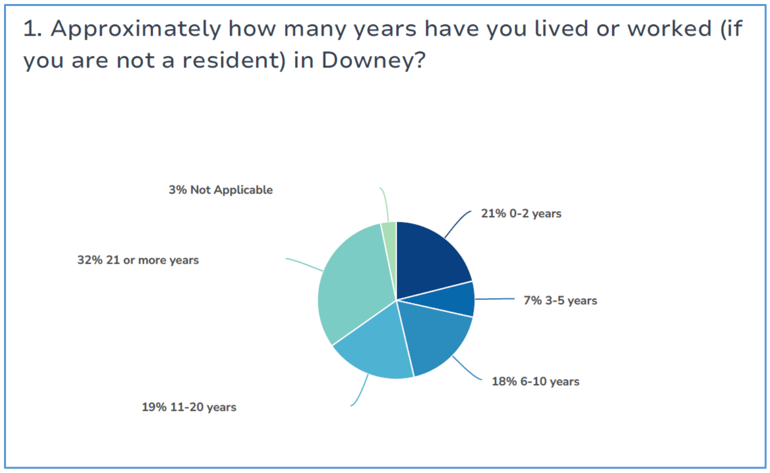
B.5.1 Social Media

The public comment period was advertised via multiple social media platforms. Screengrabs of the social media advertisement can be seen below via Facebook and Instagram. The social media posts were published three times via each platform.

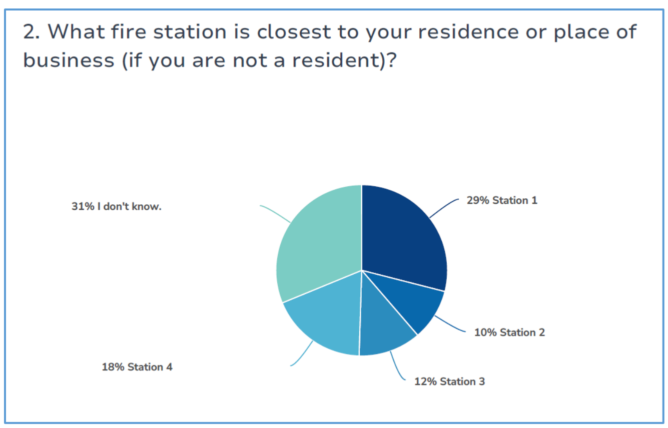
B.5.2 Survey Results

Screengrabs of the questions and their corresponding results are outlined below.

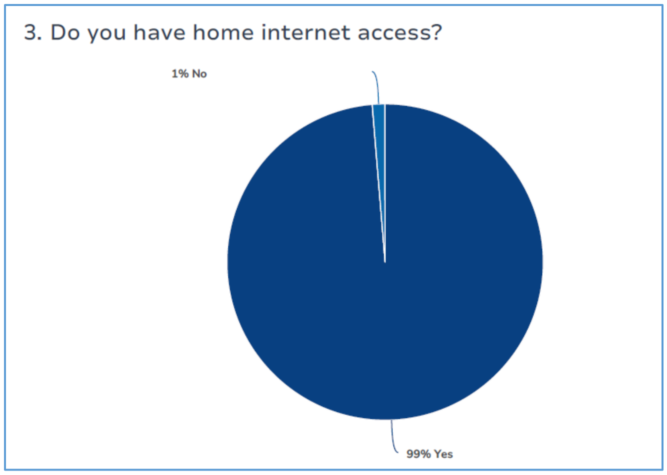
1. Approximately how many years have you lived or worked (if you are not a resident) in Downey?



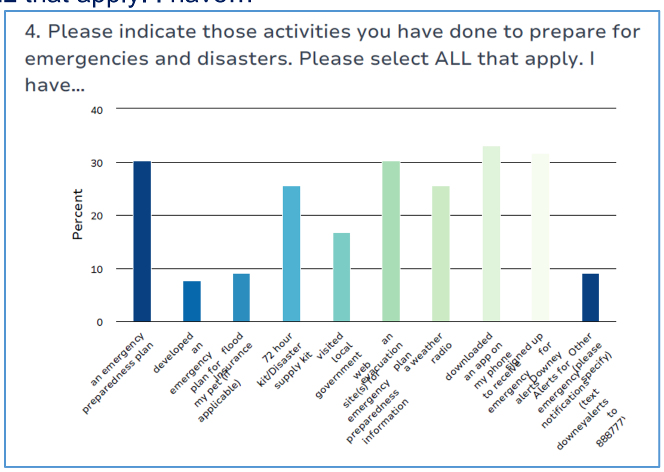
2. What fire station is closest to your residence or place of business (if you are not a resident)?



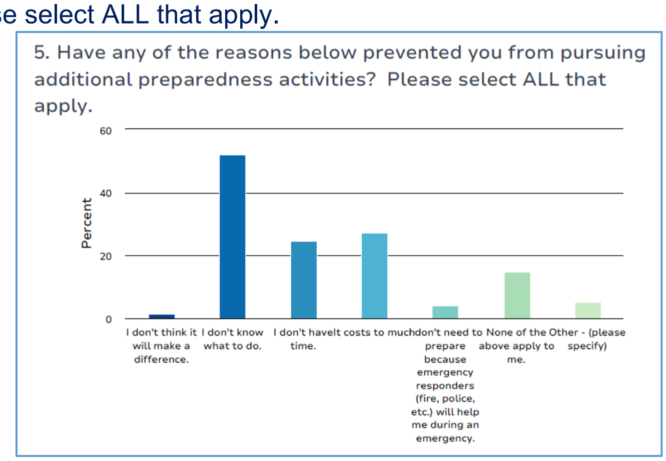
3. Do you have home internet access?



4. Please indicate those activities you have done to prepare for emergencies and disasters. Please select ALL that apply. I have…



5. Have any of the reasons below prevented you from pursuing additional preparedness activities? Please select ALL that apply.



6. If you have an emergency supply kit, what items do you have in your kit? Please select ALL that apply.

Value	Percent	Responses
I do not have an emergency/disaster supply kit	40.3%	29
Water	37.5%	27
Food (nonperishable)	36.1%	26
Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert	19.4%	14
Flashlight	56.9%	41
First aid kit	45.8%	33
Extra batteries	30.6%	22
Whistle (to signal for help)	22.2%	16
Dust mask (to help filter contaminated air)	22.2%	16
Matches in a waterproof container	16.7%	12
Feminine supplies and personal hygiene items	11.1%	8
Mess kits, paper cups, plates, paper towels and plastic utensils	12.5%	9
Paper and pencil	18.1%	13
Books, games, puzzles or other activities for children	8.3%	6
Other (please specify)	5.6%	4
Plastic sheeting and duct tape (to shelter in place)	13.9%	10
Moist towelettes, garbage bags and plastic ties (for personal sanitation)	18.1%	13
Wrench or pliers (to turn off utilities)	25.0%	18
Manual can opener (for food)	23.6%	17
Local maps	5.6%	4
Cell phone with chargers and a backup battery	18.1%	13
Prescription medications	8.3%	6
Non-prescription medications such as pain relievers, anti-diarrhea medication, antacids or laxatives	25.0%	18
Prescription eyeglasses and contact lens solution	8.3%	6
Infant formula, bottles, diapers, wipes and diaper rash cream	4.2%	3
Pet food and extra water for your pet	9.7%	7
Cash or traveler's checks	20.8%	15
Important family documents such as copies of insurance policies, identification and bank account records saved electronically or in a waterproof, portable container	19.4%	14
Sleeping bag or warm blanket for each person	19.4%	14
Complete change of clothing appropriate for your climate and sturdy shoes	13.9%	10
Fire extinguisher	18.1%	13

7. Please indicate where you go to obtain emergency and disaster related information? Please select ALL that apply.

Value	Percent	Responses
Local government web sites	33.3%	24
LA County 211	16.7%	12
State government web sites	16.7%	12
Federal government web sites (example: www.fema.gov)	20.8%	15
Web search (example: bing.com, google.com)	41.7%	30
Social media (example: facebook, twitter, google+, etc.)	34.7%	25
Voluntary organizations (example: American Red Cross, Salvation Army, etc.)	9.7%	7
Religious Organization	8.3%	6
Local English-speaking television	15.3%	11
Local English-speaking radio	8.3%	6
Spanish-speaking television	6.9%	5
Local Spanish-speaking radio	2.8%	2
National News (Radio and Television)	9.7%	7
Print Media - English (example: newspapers)	9.7%	7
Brochures and Newsletters	4.2%	3
Word of Mouth (example: friends, family, co-workers)	20.8%	15
Other (please specify)	1.4%	1
Do Not Know	11.1%	8
Not Applicable	2.8%	2

8. Would you agree or disagree with the following statements?

8. Would you agree or disagree with the following statements?

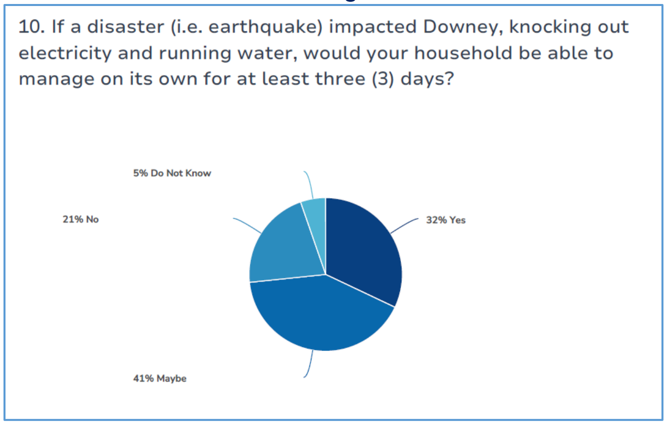
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Do Not Know	Responses
The City of Downey is providing the services necessary to prepare me for a disaster. Count Row %	10 13.5%	12 16.2%	23 31.1%	7 9.5%	6 8.1%	16 21.6%	74
I am familiar with Downey's web site (https:downeyca.org) and can easily obtain information about emergencies and disasters. Count Row %	9 12.3%	26 35.6%	23 31.5%	7 9.6%	2 2.7%	6 8.2%	73
During times of emergency, information is provided in a format I can understand. Count Row %	14 19.2%	25 34.2%	13 17.8%	6 8.2%	2 2.7%	13 17.8%	73
I can easily obtain emergency information in times of crisis. Count Row %	8 10.7%	29 38.7%	15 20.0%	10 13.3%	2 2.7%	11 14.7%	75
Total Total Responses							75

9. Please indicate how the City of Downey can better assist you in preparing for emergencies and disasters (example: provide preparedness materials in my language).

9. Please indicate how the City of Downey can better assist you in preparing for emergencies and disasters (example: provide preparedness materials in my language).

ResponseID	Response
3	Be more inclusive with Spanish speaking downey community. Request the help of Religious centers to distribute information about preparedness.
6	Maybe provide some classes
7	Send out preparedness tips
8	Possibly providing backpack emergency kits for residents within the area
9	M
11	Provide more information
12	Mail brochure with information
13	Class
14	Providing a basic emergency kit for those that are low income
15	Español
16	Providing workshops for residents and affordable preparedness kits
17	Print info available at community center, library, etc.
19	Send information in the mail and post on social media
22	Instagram posts, letters, etc
24	Provide information as of now I Dont know where to find information
26	Emergency Preparedness Community Wide Training, Brochures
27	English materials
28	Provide preparedness materials
29	Give more examples of what to have ready
31	I would like to take a cert class.
34	Have more community training events
35	Every month have the city provide us with a tool or supply for emergency or disaster
38	90240
39	Provide a plan of communication in case of emergency. In case 1st source of communication failed like the tv
44	Provide a list of preparedness items needed at home
46	Providing family emergency kits
49	Provide lists or workshops to create emergency plans and bags
50	Provide more cert emergency trainings and informational zoom or in person meetings
51	Provide information like they do when they want our vote
54	Mail me hard copy of stuff
57	Show me samples of preparedness kits and how to store
59	Giving out a sample of what really is needed
65	Provide kits
66	Links to prepare us for any disaster
67	have meetings
68	English info
69	Have messages be sent out on real time
73	Make website more user friendly
76	N/A
77	We live in a building in Downey we need preparation for evacuation, in case of fire or earthquake. my smoke detector doesn't work.. my building hasn't a lot careful about us we need information In Spanish
78	Supplies for evacuation
80	I believe reminders ex. Via your social media most of us want to be prepared but forget due to time. Reminders regularly will help us add things as we go to make sure we're fully prepared
81	List of all things necessary for an emergency for home & car
82	Offer more preparedness classes, 1st aid, CPR classes
83	Ongoing communication via mail and email
84	They provide everything
85	Not sure what the city can do but i would need to start
86	Where can citizens learn to be prepared and obtain a list of materials for an emergency?
91	Fire station 4 is closed...I learned of fire via newspaper. I did not know about this survey; just saw it today on Twitter and it's title made me think it did not apply. Disappointed it was due 3/3/23 but it only came up today 3/8/23.
92	They provide all the info I believe I should know
94	Hosting a event or mail information
95	Host event or video
96	Provide an example of what we should have in out emergency kit
99	Que nos proporcionen kit anti desastres
101	Provide simple emergency kits. Provide location of shelters in case of emergency..
102	I guess I just need a simple list of things to put in my kit.
104	Offer basic kits to start people off. Offer information in Spanish and other languages possibly needed in Downey. Offer more information readily on social media and in all languages. Offer information in hard copy or some other way to people that do not have access to social media.

10. If a disaster (i.e. earthquake) impacted Downey, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days?



11. Which of the following may prevent you from recovering from a disaster? Please select ALL that apply.

Value	Percent	Responses
Lack of financial savings	49.3%	37
Disruption of employment	28.0%	21
No access to healthcare	12.0%	9
Mental health concerns	6.7%	5
Lack of insurance (i.e. homeowners insurance, renter's insurance, flood insurance, etc.)	14.7%	11
Lack of alternative housing options	33.3%	25
Lack of outside support from family	16.0%	12
Limited food supply	40.0%	30
Limited water supply	44.0%	33
No alternative power supply	41.3%	31
Not Applicable	5.3%	4
Do Not Know	14.7%	11

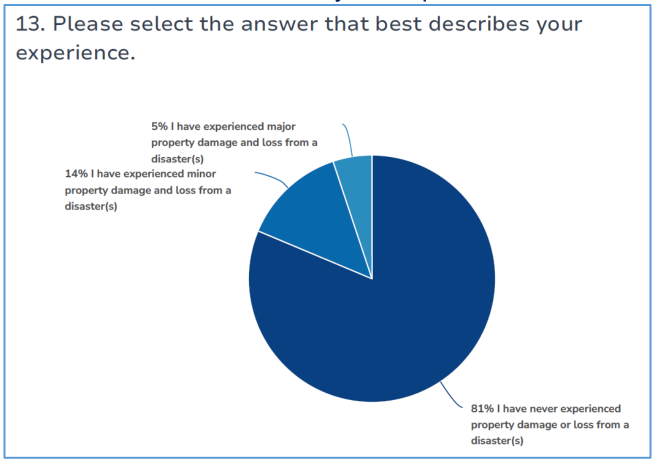
12. Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk. Low Risk = Low impact on threat to life and property damage. Medium Risk = Medium impact on threat to life and property damage. High Risk = High impact on threat to life and property damage

12. Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk.Low Risk = Low impact on threat to life and property damageMedium Risk = Medium impact on threat to life and property damageHigh Risk = High impact on threat to life and property damage

	Low Risk	Medium Risk	High Risk	Not Applicable	Responses
Earthquake Count Row %	9 15.3%	21 35.6%	29 49.2%	0 0.0%	59
Dam Release Count Row %	30 50.8%	18 30.5%	8 13.6%	3 5.1%	59
Pandemic Count Row %	17 28.8%	22 37.3%	19 32.2%	1 1.7%	59
Hazardous Materials Release Count Row %	16 27.1%	23 39.0%	19 32.2%	1 1.7%	59
Windstorm Count Row %	25 42.4%	24 40.7%	10 16.9%	0 0.0%	59
Severe Weather/Storm Count Row %	13 22.0%	31 52.5%	14 23.7%	1 1.7%	59
Drought Count Row %	16 27.1%	16 27.1%	26 44.1%	1 1.7%	59
Urban Flood Count Row %	23 40.4%	24 42.1%	10 17.5%	0 0.0%	57
Transportation Accident/Incident Count Row %	20 35.1%	27 47.4%	10 17.5%	0 0.0%	57

	Low Risk	Medium Risk	High Risk	Not Applicable	Responses
Adversarial/Human-Caused Events Count Row %	20 35.1%	26 45.6%	9 15.8%	2 3.5%	57
Utility Loss Count Row %	11 19.0%	26 44.8%	19 32.8%	2 3.4%	58
Civil Unrest Count Row %	24 40.7%	19 32.2%	12 20.3%	4 6.8%	59
Total Total Responses					59

13. Please select the answer that best describes your experience.



14. If you have experienced any damage(s) or injury(ies) from a disaster, please list the hazard(s) that caused the damages/losses and/or injuries (Example: flooding, wind, winter storm)

ResponseID	Response
2	Lost a block wall in Whittier Earthquake at a different home in Downey
9	None
14	Na
15	Wind
17	items broken in earthquakes
19	None
26	Winter Storm
34	Property damage
44	N/A
50	Earthquake
51	N/A
74	none
76	N/A
77	N/A
80	N/a
84	N/A
86	1994 Northridge earthquake, I was in the army national guard, and experienced first hand the damage from that earthquake.
92	Earthquake
99	earthquakes
102	Winter storm caused or revealed leaks in roof
104	n/a

15. If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (Example: my home, on a roadway or intersection, at work, on vacation, etc.)

15. If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (Example: my home, on a roadway or intersection, at work, on vacation, etc.)

ResponseID	Response
2	My home
9	None
14	Na
15	Home
17	home
19	None
26	Hime
34	Home
44	None
50	Home
74	home
76	N/A
80	N/A
84	N/A
92	My home
99	My home
102	Home
104	n/a

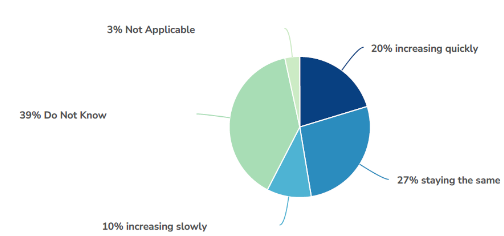
16. If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (Example: basement flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.)

16. If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (Example: basement flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.)

ResponseID	Response
2	Block wall fell
9	None
14	Na
15	Roof
17	personal belongings broken
19	None
26	Damaged roof, interior home flooding
34	Damaged foundation
44	None
50	Structure damage
59	None
69	Na
74	basement flooded
76	N/A
80	N/a
84	N/A
92	Cracks in walls and block fence
99	split walls and stairs
102	Roof damaged
104	n/a

17. Please select the best answer. The risks associated with the City of Downey's most prevalent hazards are:

17. Please select the best answer. The risks associated with the City of Downey's most prevalent hazards are:



18. Based on YOUR PERCEPTION of the City's hazards, to what degree of emphasis would you expect the City to mitigate the following hazards? Mitigation definition: Hazard mitigation is any sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Hazard mitigation includes long-term solutions that reduce the impact of disasters in the future.

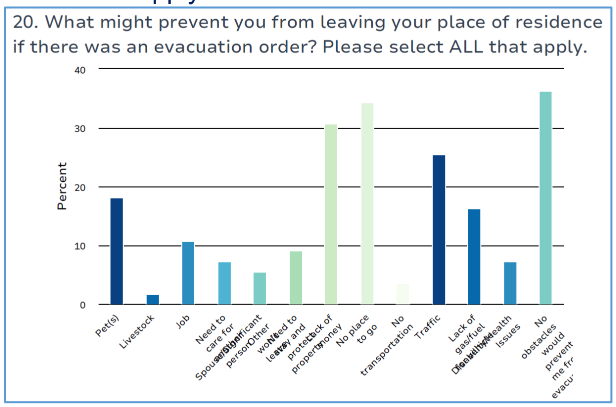
	No Mitigation Needed	Low Priority	Medium Priority	High Priority	Responses
Urban Flood Count Row %	7 12.5%	21 37.5%	16 28.6%	12 21.4%	56
Transportation Accident/Incident Count Row %	6 10.7%	17 30.4%	22 39.3%	11 19.6%	56
Adversarial/Human-Caused Events Count Row %	5 8.9%	17 30.4%	14 25.0%	20 35.7%	56
Utility Loss Count Row %	3 5.4%	8 14.3%	21 37.5%	24 42.9%	56
Civil Unrest Count Row %	9 16.1%	17 30.4%	13 23.2%	17 30.4%	56
Total Total Responses					58

	No Mitigation Needed	Low Priority	Medium Priority	High Priority	Responses
Earthquake Count Row %	7 12.1%	10 17.2%	17 29.3%	24 41.4%	58
Dam Release Count Row %	16 27.6%	24 41.4%	7 12.1%	11 19.0%	58
Pandemic Count Row %	5 8.6%	13 22.4%	25 43.1%	15 25.9%	58
Hazardous Materials Release Count Row %	3 5.3%	14 24.6%	18 31.6%	22 38.6%	57
Windstorm Count Row %	8 14.0%	23 40.4%	17 29.8%	9 15.8%	57
Severe Weather/Storm Count Row %	8 14.0%	13 22.8%	24 42.1%	12 21.1%	57
Drought Count Row %	6 10.7%	17 30.4%	19 33.9%	14 25.0%	56

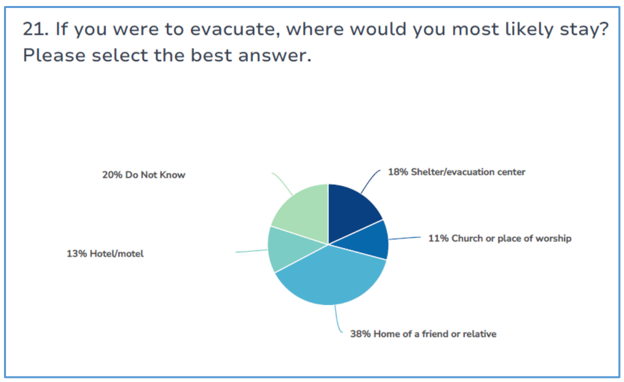
19. If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

	Very Likely	Somewhat Likely	Not Very Likely	Not Likely at All	Do Not Know	Not Applicable	Responses
Immediately evacuate as instructed. Count Row %	26 47.3%	16 29.1%	4 7.3%	3 5.5%	4 7.3%	2 3.6%	55
I would first consult with family and friends outside my household before making a decision to evacuate. Count Row %	14 25.0%	19 33.9%	6 10.7%	11 19.6%	5 8.9%	1 1.8%	56
Wait and see how bad the situation is going to be before deciding to evacuate. Count Row %	13 23.2%	14 25.0%	13 23.2%	12 21.4%	3 5.4%	1 1.8%	56
Refuse to evacuate no matter what. Count Row %	3 5.4%	3 5.4%	9 16.1%	36 64.3%	3 5.4%	2 3.6%	56
Total Total Responses							56

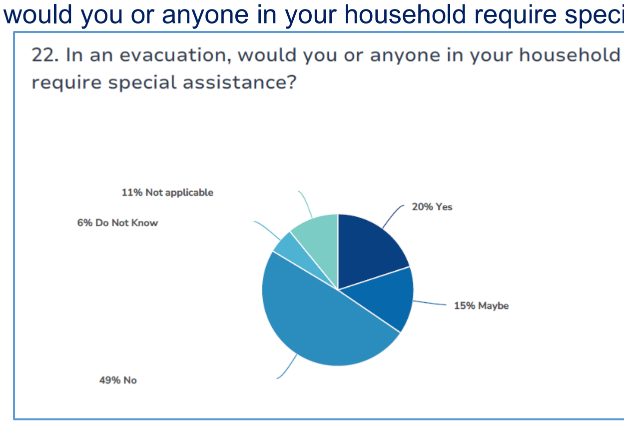
20. What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



21. If you were to evacuate, where would you most likely stay? Please select the best answer.

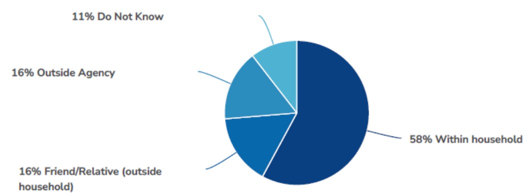


22. In an evacuation, would you or anyone in your household require special assistance?



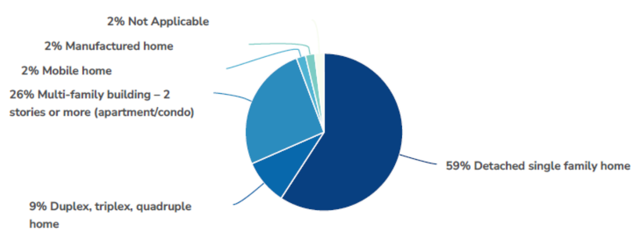
23. If yes, would that assistance be provided by someone within your household, by an outside agency, or by a friend or relative outside your household?

23. If yes, would that assistance be provided by someone within your household, by an outside agency, or by a friend or relative outside your household?



24. What type of structure do you live in?

24. What type of structure do you live in?

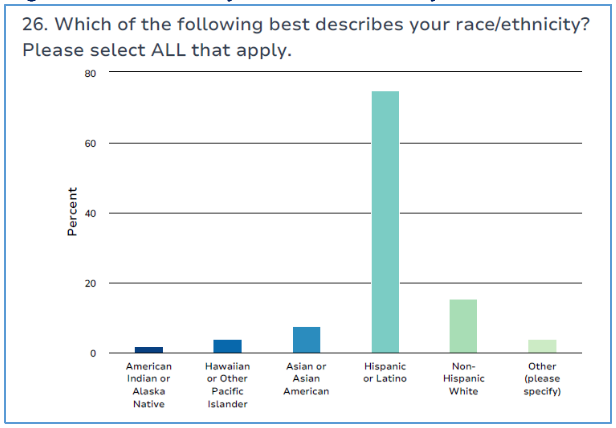


25. How many persons, including yourself, are currently living in your household?

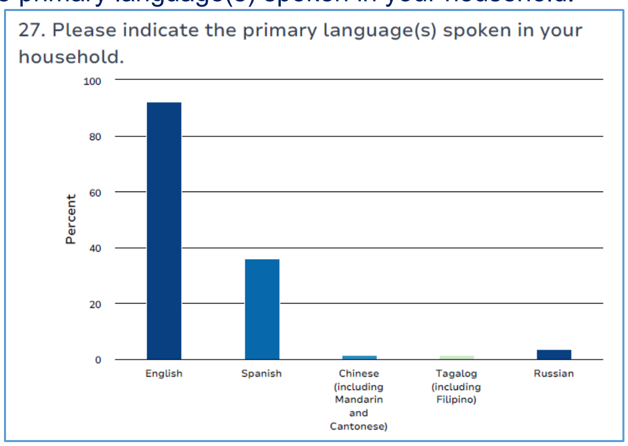
25. How many persons, including yourself, are currently living in your household?

	Number of people in household	Responses
Under age 5: Count Row %	50 100.0%	50
Ages 6-10: Count Row %	49 100.0%	49
Ages 11-19: Count Row %	50 100.0%	50
Ages 20-44: Count Row %	49 100.0%	49
Ages 45-64: Count Row %	51 100.0%	51
Ages 65-79: Count Row %	47 100.0%	47
Ages 80+ Count Row %	47 100.0%	47
Total		105 100.0%

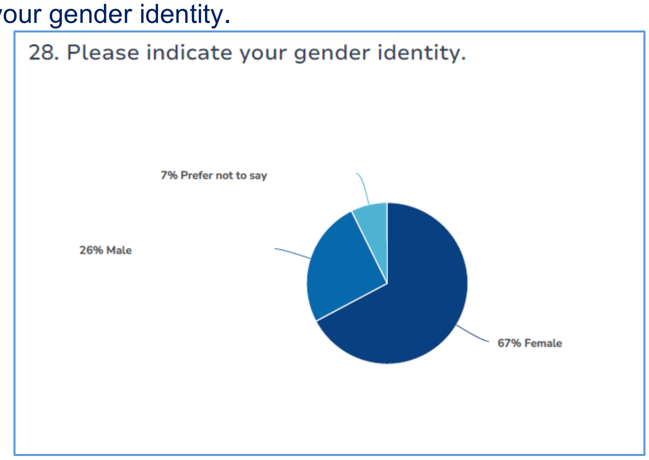
26. Which of the following best describes your race/ethnicity? Please select ALL that apply.



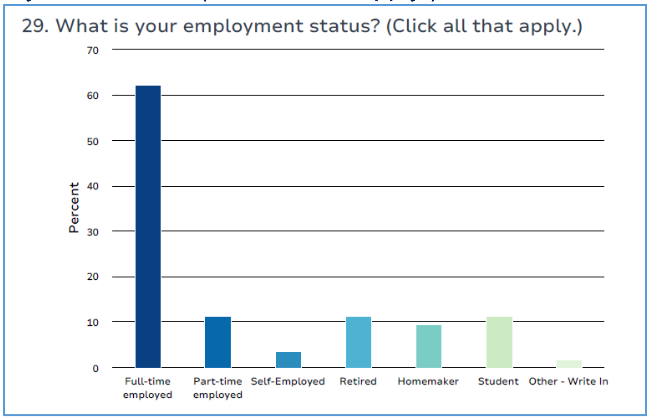
27. Please indicate the primary language(s) spoken in your household.



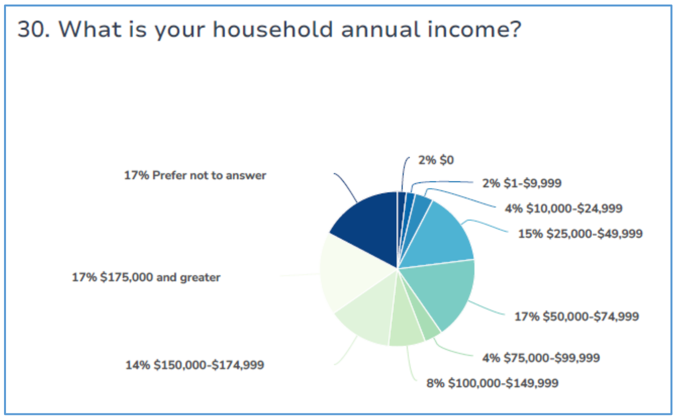
28. Please indicate your gender identity.



29. What is your employment status? (Click all that apply.)



30. What is your household annual income?



31. (OPTIONAL): If you would like to learn how to better prepare yourself for emergencies, the city offers the Community Emergency Response Training (CERT) two times a year. Please provide your contact information below and we will provide you with the information.

Resident contact information is not provided in this document due to privacy. Respondent answers are available via the Office of Emergency Management.

32. (OPTIONAL): If you have any additional comments, questions, or feedback, please use the space below to provide your comment.

32. (OPTIONAL): If you have any additional comments, questions, or feedback, please use the space below to provide your comment.

ResponseID	Response
19	None, thank you
84	N/A
91	Good information with easy access is needed. I like the idea of receiving a text etc. to update me on current happenings. My Ring has been helpful in notifying me of incidents in the vicinity.

C Resolution Documentation

Table of Contents

C.1 Resolution Placeholder