2025 HAZARD MITIGATION PLAN

Prepared By: Navigating Preparedness Associates

RECORD OF REVIEWS AND REVISIONS

The table below contains the record of reviews and revisions of this LHMP document following the initial Public Review Draft (see “Distribution”).

Review & Revision Table			
Revision #	**Date**	**Sections Reviewed or Revisions Made**	**Entered by**
1	12/16/2025	Comprehensive technical and copy edits made to the full LHMP document following the internal review draft.	Dylan Kilby, NPA

DISTRIBUTION

The table below contains the record of distribution for this LHMP. All distributions of the LHMP are to be recorded within this table. including draft copies and accepted submissions to FEMA.

Record of Distribution			
Date	**Plan Version or Date of Plan**	**Method of Distribution**	**Description or Distribution Audience**
11/5/2025	0.6	Server Post and Hard Copies	Internal Review Draft #1

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

The East Valley Water District (District) has prepared the 2026 Local Hazard Mitigation Plan (LHMP) to assess the natural and human-caused risks to the District and to reduce the potential impact of these hazards by creating mitigation strategies. The 2026 LHMP represents the District's commitment to create a safer and more resilient community by taking action to reduce risk.

This plan complies with the Federal Disaster Mitigation Act (2000), Federal Register 44 Code of Federal Regulations (CFR) Parts 201 and 206, which modified the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, 322 - Mitigation Planning. As of November 1, 2004, this law requires local government entities to develop and submit hazard mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) funding and other mitigation project grants. The Human Resources & Risk Management department has coordinated the preparation of the LHMP in cooperation with the District's departments, community stakeholders, partner agencies, and members of the public.

This introduction to the LHMP provides a brief description of hazard mitigation planning, LHMP requirements, and an outline of the 2026 LHMP. There is also an overview of Federal Emergency Management Agency (FEMA) programs and grants related to hazard mitigation.

1.1 Hazard Mitigation Planning

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The intent is to reduce losses from future disasters. 44 CFR § 201.1(b) states that the purpose of mitigation planning is for local governments to identify the hazards that impact them, to identify actions and activities to reduce losses from those hazards, and to establish a coordinated process to implement the plan.

Throughout this process, the District will:

- Identify and profile hazards that could potentially affect the service area
- Analyze the District facilities and equipment at risk from those hazards
- Develop a mitigation strategy and actions to lessen or reduce the impact of the hazards profiled
- Implement the strategy and actions that may involve planning, policy changes, programs, projects, and other activities

The District's implementation of short-/long-term mitigation actions is the primary planning objective. This type of planning will supplement the District's comprehensive planning and emergency management programs.

1.2 Local Mitigation Planning Requirements

Hazard mitigation planning is governed by the Stafford Act, as amended by the Disaster Mitigation Act of 2000 (DMA 2000), and by federal regulations implementing the Stafford Act. DMA 2000 revised the Stafford Act to require state, local, and tribal governments to develop and submit to FEMA a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the jurisdiction. Plan approval by FEMA is a prerequisite to receiving federal hazard mitigation grant funds.[1]

To implement the mitigation planning requirements of the Stafford Act, FEMA promulgated 44 CFR Part 201, the federal regulations governing the planning process, plan content, and the process for obtaining approval of the plan from FEMA. The planning requirements set forth in the CFR are identified throughout this plan mirroring the order of the FEMA Regulation Checklist in the *Local Mitigation Plan Review Tool*.

Federal law and the State of California's requirements for hazard mitigation plans require coverage of only natural hazards. The District's 2025 Risk and Resilience Assessment (RRA) and the Emergency Response Plan (ERP) include technological and human-caused hazards as well as natural hazards. Likewise, the Planning Team decided to cover both natural and technological/human-caused hazards within this LHMP, including a description and analysis of each hazard.

FEMA has produced a *Local Mitigation Plan Review Tool,* which has been tailored by Region IX as an appendix to the *Local Mitigation Planning Guide (Effective 2023),* to demonstrate how the mitigation plan meets the regulation in 44 CFR § 201.6. It also offers State and FEMA Mitigation Planners an opportunity to provide feedback to the jurisdiction. The Plan Review Tool has a regulation checklist that provides a summary of FEMA's evaluation of whether the plan has addressed all requirements. Local planners can also use the checklist prior to submitting the plan for approval to ensure they have addressed all the requirements. The *Local Mitigation Plan Review Tool* is provided in **Appendix A** of this document.

1.3 Hazard Mitigation Plan Description

The 2026 LHMP consists of the sections and appendices described in **Table 1-1** below:

Table 1-1: Plan Sections, Appendices, and Descriptions	
Section 1: Plan Introduction	Section 1 includes an introduction to hazard mitigation planning, lists the LHMP planning requirements, provides a description of the plan, and discusses grants related to hazard mitigation.

[1] 42 U.S. Code § 5165(a) Retrieved from: https://www.law.cornell.edu/uscode/text/42/5165

Table 1-1: Plan Sections, Appendices, and Descriptions	
Section 2: Planning Process	Section 2 describes the planning process for the 2026 LHMP, including an overview of how the LHMP was prepared, identification of the LHMP Planning Team, involvement of outside agencies and communities, the inclusion of related plans, reports, and information, and stakeholder and public outreach activities.
Section 3: Planning Area Description	Section 3 includes a description of the natural and built states of the District, including climate, geography, demographics, and economic conditions.
Section 4: Capability Assessment and Hazard Identification	Section 4 identifies and evaluates the resources available for hazard mitigation within the District. It also lists and profiles the hazards identified in the 2026 LHMP.
Section 5: Risk Assessment	Section 5 identifies and evaluates vulnerable assets. It describes potential impacts and estimates losses for each hazard. The intention of this risk assessment is to help the community understand the greatest risks facing the District.
Section 6: Mitigation Strategy	Section 6 identifies and evaluates the current, ongoing, and completed mitigation projects and programs in the District. It also lists mitigation strategies for reducing potential losses.
Section 7: Plan Maintenance Procedures	Section 7 describes procedures for updating the LHMP to keep it current and for continued public engagement in the planning process.
Section 8: Plan Approval and Adoption Resolution	Section 8 includes documentation of Cal OES and FEMA processes and adoption of the LHMP by the District's Board.
Appendix A	Appendix A contains the FEMA *Local Mitigation Plan Review Tool*, which documents the District's compliance with the local hazard mitigation plan requirements of 44 CFR Part 201.
Appendix B	Appendix B contains documentation of the planning process for the Planning Team, including invitations, attendee lists, meetings minutes, presentations, emails, etc.
Appendix C	Appendix C contains documentation of the planning process, including surveys, social media outreach and opportunity for comment for the stakeholders and public, and other stakeholder/public outreach efforts.
Appendix D	Appendix D contains the mitigation action prioritization using the Social, Technical, Administrative, Political, Legal, Economic, Environmental (STAPLE/E) method.
Appendix E	Appendix E lists acronyms and abbreviations used in the 2026 LHMP.
Appendices F, G, H, & I	Appendix F, G, H, & I contain exhibits related to the hazard analysis.

1.4 Grant Programs with Mitigation Plan Requirements

Currently, four FEMA grant programs provide funding to local entities that have a FEMA-approved local mitigation plan meeting federal hazard mitigation plan requirements. One of the grant programs is authorized under the Stafford Act. The remaining three programs are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act.

1.4.1 Stafford Act Grant Programs

FEMA funding is provided to state, local, and tribal governments that have an approved Hazard Mitigation Plan through the Hazard Mitigation Grant Program (HMGP). The HMGP provides grants to implement long-term hazard mitigation measures after a disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. To qualify for HMGP funding, projects must provide a long-term solution to a problem, and the project's potential savings must exceed the cost of implementing the project.

HMGP funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. Under the program, the federal government may provide a state, county, tribe, or local government entity with up to 20 percent of the total disaster grants awarded by FEMA and may provide up to 75 percent of the cost of projects approved under the program.

1.4.2 National Flood Insurance Act Grant Programs

The goal of the Flood Mitigation Assistance (FMA) Grant Program is to reduce or eliminate flood insurance claims under the National Flood Insurance Program (NFIP). This program emphasizes mitigating Repetitive Loss (RL) properties. The primary source of funding for the FMA program is the National Flood Insurance Fund. Grant funding is available for planning, project, and technical assistance. Project grants are awarded to local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. In FY 2014, FMA funding totaled $190.6 million. The cost-share for this grant is 75 percent federal and 25 percent nonfederal. However, a cost-share of 90 percent federal and 10 percent nonfederal is available in certain situations to mitigate Severe Repetitive Loss (SRL) properties.

The Repetitive Flood Claims (RFC) Program provides funding to reduce or eliminate the long-term risk of flood damage to residential and non-residential structures insured under the NFIP. Structures considered for mitigation must have had one or more claim payments for flood damages. All RFC grants are eligible for up to 100 percent federal assistance.

SECTION 2: PLANNING PROCESS

This section summarizes the planning area's hazard mitigation planning efforts in 2026. In addition, the section describes public and stakeholder outreach efforts as part of the LHMP planning process. The section also summarizes the review and incorporation of existing plans, studies, and reports used to develop the LHMP.

Documentation of the 2026 LHMP planning process for the Hazard Mitigation Planning Team is provided in **Appendix B**, and documentation of the process for the public and stakeholders is found in **Appendix C**. These appendices document the planning meetings and outreach. They include meeting agendas, presentations, sign-in sheets, minutes, social media materials and other media used to conduct the planning process.

FEMA REGULATION CHECKLIST: PLANNING PROCESS

44 CFR § 201.6(c)(1): The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Element:
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?

A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?

A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?

A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))

A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

The planning process began with the District establishing the planning area (congruent with the service area) and emailing stakeholders within the planning area to invite them to participate in the process. The District then identified the financial and technical resources required to update the LHMP. Finally, the District then established the Planning Team and created a schedule for the update process.

2.1 Plan History

The 2026 LHMP is an update to the 2020 LHMP. It addresses and consolidates natural hazards assessed in the County of San Bernardino LHMP (2023-2028) Update. Although not required, it also assesses technological/human-caused hazards such as cyberattacks.

2.2 Plan Purpose and Authority

The purpose of the LHMP is to identify natural and technological/human-caused hazards that impact the District, to assess the vulnerability and risk posed by those hazards to District-wide human and structural assets, to develop strategies to mitigate those identified hazards, to present future maintenance procedures for the plan, and to document the planning process. The Plan is prepared in compliance with DMA 2000 requirements and represents an updated LHMP for the District.

The requirements for adopting this LHMP by the local governing body are described below, as set forth in the Stafford Act and as amended by DMA 2000 and its implementing regulations. The local planning requirements are documented throughout the LHMP and in **Appendix A**, *FEMA Local Mitigation Plan Review Tool*. This Plan Review Tool is documented in the governing body meeting resolution documented in **Section 8.**

FEMA REGULATION CHECKLIST: PLAN ADOPTION

44 CFR § 201.6(c)(5): The local hazard mitigation plan shall include "Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council)."

Element:
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance?

F1-a. Does the participant include documentation of adoption? Click or tap here to enter text. Choose an item.

Source: FEMA, Local Mitigation Plan Review Tool, June 2025

Funding for the development of the LHMP was provided by a FEMA grant. Navigating Preparedness Associates (NPA) was retained by the District to provide consulting services in guiding the planning process and Plan development.

2.3 Planning Process Description

The planning process began in December 2024. Select staff from various departments in the District and other stakeholders were invited to join the Hazard Mitigation Planning Team ("Planning Team"). Representatives from the County of San Bernardino, California Department of Forestry and Fire Protection (Cal Fire), the Cities of Highland and San Bernardino, and San Bernardino Valley Metropolitan Water District were invited to participate in Planning Team meetings. Documentation of participant outreach and the overall planning process are located in **Appendices B and C.**

2.4 Planning Team

An initial invitation to support the Planning Team was provided by email on December 18, 2024. A copy of the email may be found in **Appendix B.** The Planning Team's responsibility included providing feedback on hazards that affect the planning area, reviewing drafts of the plan, and participating in developing mitigation activities. The members of the Planning Team are listed in **Table 2-1** below.

Table 2-1: LHMP Planning Team

Name	Agency	Key Role
Patrick Milroy	EVWD	Operations Manager
Manny Moreno	EVWD	Water Reclamation Manager
Ray Roybal	EVWD	Water Reclamation Supervisor
Jon Peel	EVWD	Water Maintenance Supervisor
Dale Barlow	EVWD	Facilities Supervisor
Nathan Carlson	EVWD	Senior Engineer
William Ringland	EVWD	Public Affairs/Conservation Manager
Roxana Morales	EVWD	Public Affairs Supervisor
Ryan Ritualo	EVWD	IT Manager
Kerrie Bryan	EVWD	Director of Administrative Services

Table 2-1: LHMP Planning Team		
Name	**Agency**	**Key Role**
Eileen Tafolla-Bateman	EVWD	Human Resources Coordinator
Lee Rosenberg	NPA	Consultant
Dylan Kilby	NPA	Consultant

2.4.1 Planning Team Meetings & Activities

Three meetings were held with the Planning Team. The District's LHMP Project Manager reviewed all documents and sent out meeting notices. **Table 2-2** summarizes the meetings and their purpose below:

Table 2-2: Planning Meetings & Activities		
Date	**Activity**	**Purpose**
12/22/2024	Kickoff Meeting/Planning Meeting #1	Kickoff meeting and project management tools for the whole project. Discussion of the hazard mitigation process including hazard analysis, risk assessment, adoption, and approval.
10/8/2025	Planning Meeting #2	Review of hazards assessed/chosen. Discussion of the risk assessment prioritization metric. Discussion of selected hazard mitigation actions. Introduction to the public review process and remaining steps before submission to FEMA/Cal OES.
TBD	Planning Meeting #3	TBD – will happen following the public review comment period

2.5 Community Engagement

The District engaged the local community through hosting public meetings, developing a public engagement survey, and opening a public review draft for comments. All public engagement documentation may be found in **Appendix C**.

NPA developed a community public survey to source responses from residents within the District's service area. The survey was created using the SurveyMonkey platform and was open from 10/13/2025 to 10/31/2025. It asked questions on hazards of particular concern, the public's familiarity with hazard mitigation, and which agencies are trusted messengers. The survey was distributed through social media and email blasts. Out of concern that the survey was not being answered by the community, EVWD also sent the survey to local stakeholders who were a part of the Community Advisory Commission (CAC). The survey received 12 responses. The responses and outreach methods are summarized in **Appendix C**.

Given the small number of responses, the Planning Team elected not to statistically analyze the responses. Instead, the Planning Team performed content analysis by reviewing the open-ended responses and general trend about disasters experienced while living in San Bernardino County with the understanding those who responded were almost certainly highly involved community stakeholders. These comments were used to inform discussions among District staff on selecting hazard mitigation activities and ensuring the chosen hazards reflected community concerns.

A representative from NPA attended one of EVWD's quarterly meetings for the Finance/HR Committee on December 1, 2025, to discuss the hazard mitigation process, role of the LHMP, and how the mitigation actions are intended to create a more robust water and wastewater system. The Committee discussed the implementation of the LHMP and how the mitigation actions were prioritized.

On TBD, the District released a public review draft of the LHMP for review and comment. The comment period lasted for TBD days. The public review draft was advertised through TBD. Copies of the LHMP were left at TBD. XXXX comments were received on topics XXXXX. **Appendix C** contains copies of the postings and the received comments.

The District also sent copies of the public review draft directly to stakeholders including local government, educational institutions, other water and wastewater districts, and major private businesses. These organizations were invited to review the results of the hazard analysis, identify common strategies between LHMPs to facilitate cost-effective mitigation actions, and provide input on data sources. XXXXX comments were received on topics XXXXX.

Table 2-3: Local Stakeholders Contacted in Planning Process

Organization	Department & Role
TBD	TBD

2.6 Incorporation into Other Planning Mechanisms

FEMA REGULATION CHECKLIST: PLAN MAINTENANCE

44 CFR § 201.6(c)(4)(ii): The plan shall include "a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate."

Element:
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

FEMA REGULATION CHECKLIST: PLAN UPDATE

44 CFR § 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Element:
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

The LHMP planning process provided the District with an opportunity to review the policies contained in its Capital Improvement and Financial Plan (CIFP) and other plans. The CIFP and the LHMP are complementary documents that work together to reduce risk to the residents of its service area. Many of the ongoing recommendations identified in the LHMP are programs or projects that are in the CIFP.

The District will incorporate hazard mitigation identification and risk assessment, and plan recommendations and mitigation actions contained in the LHMP into the following documents:

- **Water Shortage Contingency Plan** – The Water Shortage Contingency Plan describes the stages of water conservation during shortages under various scenarios. The LHMP provides a similar, more detailed description of some of these hazards, such as drought. Updates to the LHMP can inform revisions to the Water Shortage Contingency Plan. Hazards in both plans should corroborate one another.
- **Urban Water Management Plan (UWMP)** – The District's 2020 UWMP is included as a chapter within the 2020 Upper Santa Ana River Watershed Integrated Regional Urban Water Management Plan. The UWMP supports long-term resource planning and management, especially in context of conservation, drought, and efficient use of urban water resources. The UWMP will consider using mitigation actions related to drought as part of the plan development/revision process.
- **Drought Contingency Plan (DCP)** – The District's DCP contains measures used to ameliorate the impacts of drought within the drinking water system. The DCP and LHMP will mutually inform one another given the DCP contains what are, in effect, hazard mitigation actions.
- **Water System Master Plan (WSMP)** – The District's WSMP describes how the District's drinking water system is planned, implemented, and maintained. It also provides information on potential changes to water needs depending on local demand, land use changes, and drought conditions. The WSMP was instrumental in identifying potential hazard mitigation actions and in developing the risk assessment.
- **Sewer System Master Plan (SSMP)** – The District's SSMP provides the primary guidelines for planning and implementation of the District's sewer system in addition to current and future conditions of its sewer infrastructure. The SSMP also provides information on recommended projects and facilities, proposed phasing of facilities construction, and other recommended actions to improve the system's operation. As with the WSMP, the SSMP was instrumental in identifying potential hazard mitigation actions.
- **Capital Improvement and Financial Plan (CIFP)** – The District's CIFP defines infrastructure investments necessary over a seven-year period. It is reviewed annually by the District's Board of Directors. Mitigation actions identified in the LHMP directly inform the CIFP and vice versa.
- **Emergency Response Plan (ERP)** – ERPs outline the emergency plans and procedures, mitigation actions, detection strategies, and resilience strategies at utility agencies. The Planning Team used the ERP to identify potential mitigation actions. Future revisions to the ERP will consider the hazards analyzed within this document for effective preparedness.
- **Risk and Resilience Assessment (RRA)** – The RRA is a systematic examination of the potential impacts to District infrastructure and the consequences thereof. The RRA discusses various natural and manmade hazards (e.g., fires, severe storms, cyberattacks, physical assault on facility, contamination of water). District capabilities are then assessed by if the hazard poses a "significant risk" – including but not limited to physical barriers, water sources, pipes/infrastructure, and storage/distribution facilities. The RRA was used to identify potential mitigation actions and potential hazards.

These efforts may coincide with the Plan Maintenance activities listed in **Section 7**. Additional action items may be implemented by creating new public educational programs, continued interagency coordination, and public input and participation.

2.7 Review of Existing Plans, Reports, Technical Documents, and Data

The Planning Team consulted a large number of resource documents and references in developing this update. **Table 2-4** contains a comprehensive list of the primary guidance, policy tools, extant plans, and authorities incorporated within this LHMP. Throughout the document, additional footnotes are used when other data sources are available.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
California State Hazard Mitigation Plan (2023) https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf	Technical and Planning Resource	Provides the State of California's Hazard Mitigation Plan (SHMP) for 2023-2028. Describes hazards that informed the hazard analysis and risk assessment portions of this LHMP. Referenced as "California SHMP (2023)" in footnotes.
California's Fourth Climate Change Assessment (2019) https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf	Technical and Planning Resource	Outlines the key findings for the state and local communities on how climate change is and will impact the State of California. Used throughout the hazard analysis within this LHMP. Referenced as "California 4th Climate Change Assessment (2018)" in footnotes.
National Risk Index https://hazards.fema.gov/nri/	Technical and Planning Resource	Displays the relative risk of counties and census tracts to the 18 FEMA hazards according to expected annual loss, social vulnerability, and community resilience.
County of San Bernardino Multi-Jurisdictional Hazard Mitigation Plan (2022) https://www.sbcounty.gov/uploads/SBCFire/documents/EmergencyServices/Hazard-Mitigation-Plan-202212.pdf	Technical and Planning Resource	Provides the County of San Bernardino's Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) for 2022-2027. Describes hazards that informed the hazard analysis and risk assessment portions of this LHMP. Used as a reference for community profiles and land use. Referenced as "County of San Bernardino MJHMP (2022)" in footnotes.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
City of San Bernardino Local Hazard Mitigation Plan (2024) https://www.sanbernardino.gov/460/Local-Hazard-Mitigation-Plan	Technical and Planning Resource	Provides the City of San Bernardino's LHMP for 2024-2029. Describes hazards that informed the hazard analysis and risk assessment portions of this LHMP. Used as a reference for community profiles and land use. Referenced as "City of San Bernardino LHMP (2024)" in footnotes.
EVWD – Water System Master Plan (2019) https://www.eastvalleywater.gov/business/engineering/plans-standards/overview/	Technical and Planning Resource	Describes in detail the infrastructure used by the District in providing water services to its customers. Describes changes to water demand within the service area. Used as background material in understanding the District's operations and in developing/researching hazard mitigation activities.
EVWD – Sewer System Master Plan (2019) https://www.eastvalleywater.gov/business/engineering/plans-standards/overview/	Technical and Planning Resource	Describes in detail the infrastructure used by the District in providing wastewater and sewer services to its customers. Describes transmission, collection, and maintenance. Identifies potential capital improvement projects. Used as background material in understanding the District's operations and in developing/researching hazard mitigation activities.
EVWD – Sewer System Management Plan (2023) https://www.eastvalleywater.gov/business/engineering/plans-standards/overview/	Technical and Planning Resource	Describes the procedures for implementing various sewer management programs including operations/maintenance; rehabilitation; spill emergency response plans; and the Fats, Oils, & Grease Program. Used as background material and in developing/researching hazard mitigation activities.
EVWD – 2024-2025 Fiscal Year Budget https://www.eastvalleywater.gov/media/ignlfq41/fy-2024-25-adopted-budget-low-resolution-file.pdf	Technical and Planning Resource	Provides details on finances, customer bases, and current expenses within the District. Used to develop sections on business and economy and in developing/researching hazard mitigation activities. Referenced as "EVWD FY 24-25 Budget" in footnotes.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
EVWD – 2025-2026 Fiscal Year Budget https://www.eastvalleywater.gov/media/3zlf0dfi/final-2025-budget-document-website.pdf	Technical and Planning Resource	Provides details on finances, customer bases, and current expenses within the District. A preliminary version of this edition was used to identify capital improvement projects.
CDPH – Climate Change and Health Profile Report, San Bernardino County (2017) https://www.cdph.ca.gov/Programs/OHE/Pages/ClimateHealthProfileReports.aspx	Technical and Planning Resource	Provides information on how climate change may influence human and ecosystem health throughout the County of San Bernardino. Topics include temperature changes, fire hazard severity zones, heat waves, droughts, and vector-borne illnesses.
Western Riverside Council of Governments (WRCOG) – San Bernardino County Vulnerability Assessment (2022) https://www.wrcog.us/DocumentCenter/View/7477/San-Bernardino-County-Vulnerability-Assessment	Technical and Planning Resource	Provides information on hazards and climate vulnerabilities within the County of San Bernardino. Details are provided on projects for the county's natural hazards, vulnerable sectors, and potential adaptation strategies. Referenced as "WRCOG SBC Vulnerability Assessment (2022)" in footnotes.
Upper Santa Ana River Watershed Integrated Regional Urban Water Management Plan (2020) https://www.sbvwcd.org/our-projects/upper-santa-ana-integrated-regional-water-management-plan/	Technical and Planning Resource	Describes water supply reliability under normal and drought conditions. Used in drafting sections on land use and the drought hazard analysis.
City of San Bernardino General Plan (2005) https://www.sanbernardino.gov/372/Planning-Division	Technical and Planning Resource	Provides the General Plan for the City of San Bernardino. Includes the 2021-2029 Housing Element (updated January 2024). Used throughout the document as a background resource, especially concerning developmental trends for each hazard and within discussions on land use. Referenced as "City of San Bernardino General Plan (2005)" in footnotes.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
City of Highland General Plan (2006) https://www.cityofhighland.org/191/General-Plan	Technical and Planning Resource	Provides the General Plan for the City of Highland. Includes the 2021-2029 Housing Element. Used throughout the document as a background resource, especially concerning developmental trends for each hazard and within discussions on land use. Referenced as "City of Highland General Plan (2006)" in footnotes.
California Energy Commission (2018). California's Fourth Climate Change Assessment https://www.energy.ca.gov/data-reports/reports/californias-fourth-climate-change-assessment	Technical and Planning Resource	Describes monitoring, analysis, and modeling of climate as well as efforts designed to reduce emissions.
California Governor's Office of Emergency Services http://myhazards.caloes.ca.gov/	Technical and Planning Resource	Provides a tool for the general public to discover hazards in their area (earthquake, flood, fire, and tsunami) and learn steps to reduce personal risk.
California Department of Conservation https://www.conservation.ca.gov/cgs/geohazards	Technical and Planning Resource	Identifies significant geologic hazards that exist, or are likely to exist, so that informed land use and emergency response planning decisions can be made.
California Department of Water Resources https://water.ca.gov/Programs/All-Programs/Division-of-Safety-of-Dams/Inundation-Maps https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2	Technical and Planning Resource	Provides information on dam safety, a list of dams within California and dam inundation maps for dams in the planning area.
Federal Emergency Management Agency https://www.fema.gov/	Technical and Planning Resource	Resource for LHMP guidance (How-To series), floodplain and flood-related NFIP data (mapping, repetitive loss, NFIP statistics), and historic hazard incidents. Used in the risk assessment and mitigation strategy.

Table 2-4: Resource Documents and References Reviewed And Incorporated in the Plan		
Referenced Document or Technical Source	**Resource Type**	**Description of Reference and Its Use**
Cybersecurity & Infrastructure Security Agency https://www.cisa.gov/	Technical and Planning Resource	Resource for cybersecurity and cyberattack guidance, especially regarding critical infrastructure and public utilities. Describes historical cybersecurity incidents and lessons learned. Used in the risk assessment and mitigation strategy.
HAZUS-MH https://www.fema.gov/flood-maps/products-tools/hazus	Technical Resource	Base data sets within the program were used in the vulnerability analysis.
National Centers for Environmental Information https://www.ncdc.noaa.gov/data-access	Technical Resource	Online resource for weather-related data and historic hazard event data. Used in the risk assessment.
National Integrated Drought Information System (2024) https://www.drought.gov/drought/	Technical Resource	Source for drought-related projections and conditions. Used in the risk assessment.
FEMA Dam Safety https://www.fema.gov/emergency-managers/risk-management/dam-safety	Technical Resource	Database used in the dam failure hazard profiling. Used in the risk assessment.
National Weather Service https://www.weather.gov/	Technical Resource	Source for hazard information, data sets, and historical event records. Used in the risk assessment.
United States Geological Survey Earthquake Hazards Program. https://www.usgs.gov/programs/earthquake-hazards	Technical Data	Source for geological hazard data and incident data. Used throughout the document concerning earthquakes and risk assessments. Specific programs and data sources are cited within the footnotes.
CalTopo https://www.caltopo.com	Technical Data	Source for remotely viewing topographical maps. Used in surveying the District's physical geography.
Western Regional Climate Center https://wrcc.dri.edu/	Website Data	Online resource for climate data used throughout the natural hazards analyses.

2.8 Changes in Plan Development

This LHMP demonstrates a comprehensive update to the 2020 LHMP. Both LHMPs fulfill the same requirements and follow the same general outline, from planning process and district profile to the risk assessment and mitigation strategies. Notably, this LHMP places the capabilities assessment immediately following Section 3 before the hazard analysis, and the risk assessment is now after the hazard analysis. The appendices are mostly the same, though the critical facilities list is now included within the risk assessment. Additionally, the security assessments within the 2020 LHMP are replaced by Geographic Information System (GIS) exhibits.

The Planning Team updated the District's profile, capabilities assessment, and risk assessment based on concurrent updates to the RRA and ERP. Other updates were made according to new versions of various District plans outlined within **Table 2-4**, such as the 2019 WSMP. This LHMP also includes updated hazard analyses and risk assessments following completion of the Sterling Natural Resource Center (SNRC). Information on the SNRC is provided in **Section 3**. All relevant hazard information was updated with sources when appropriate.

Public engagement broadly followed a similar timeline as the 2020 LHMP, though this LHMP includes a new public survey (described in **2.5 Community Engagement**).

The hazards addressed in the 2026 LHMP differ from the 2020 LHMP. Hazards that concerned malevolent threats and proximity hazards were removed as described in **Table 4-6**. Reasons include hazards no longer meeting the probability threshold for inclusion (Physical Adversary) and hazards recontextualized as preparedness activities (Loss of Critical Spares).

On the other hand, the 2026 LHMP substantially increases the number of natural hazards given updates to regulatory maps and data sources used in the 2020 LHMP (also described in **Table 4-6**). Dam Failure & Inundation is now included despite its low probability of occurrence given the widespread destruction that could occur. The soil liquefaction aspect of the Earthquakes & Seismic Events hazard was deleted given the service area is not within current CGS maps of soil liquefaction hazard.

The risk assessment portion of the 2026 LHMP includes a comprehensive GIS analysis on the threats to the District's buildings and infrastructure. The methodology is summarized within **Section 5: Risk Assessment**. Each mapping project analyzed the intersection of District buildings and infrastructure with the selected hazards to provide baseline financial risk. Selected maps without sensitive data were exported and included throughout the hazard analysis, risk assessment, and appendices.

Finally, the 2026 LHMP repurposes the hazard mitigation actions from the 2020 LHMP and provides them (and others) in a new template. The new hazard mitigation actions consolidate many of the actions from the 2020 LHMP into discrete projects that are Specific, Measurable, Attainable, Relevant, and Timebound (SMART).

SECTION 3: PLANNING AREA DESCRIPTION

The District is a California Special District located in the eastern section of the San Bernardino Valley. It supplies water to the City of Highland, the Yuhaaviatam of San Manuel Nation, and parts of the City of San Bernardino and unincorporated County of San Bernardino. As of June 30, 2025, the District served 21,808 water connections and 20,080 wastewater connections with 300 miles of water pipeline. On average, the District provides 17,000 acre-feet of water per year to 108,000 customers over 30.1 square miles.

The Surface Water Treatment Plant treats local surface water from the Santa Ana River and purchased water from the State Water Project's Devil's Canyon Pump station. The water goes through several treatment processes and disinfection prior to delivery. This facility provides approximately 25 percent of the water delivered to customers.

The District operates the SNRC within the City of San Bernardino proper. The SNRC supports water supply sustainability and independence through treating up to eight million gallons of wastewater per day and recharging the local Bunker Hill Groundwater Basin. The recharged water discharged into the Basin supports the 600,000 residents within the County of San Bernardino that rely on the Bunker Hill Basin for water.[2] Additionally, the SNRC uses co-digestion technology in which food waste and remaining organic waste from wastewater treatment undergo anaerobic digestion to provide low-cost power to the SNRC.

3.1 Location

The District is in the northeastern San Bernardino Valley approximately 65 miles due east of Los Angeles. The District's service area includes the easterly part of the City of San Bernardino, all of the City of Highland, and small unincorporated areas of the County of San Bernardino. The service area shares use of the local groundwater basin with the Cities of Redlands, Loma Linda, Colton, and Grand Terrace.

Formerly an agricultural area, the service area has significantly urbanized over the last three decades. The City of Highland, City of San Bernardino, and parts of unincorporated County of San Bernardino have seen high growth within the valley up to the foothills of the mountains.

Figure 3-1 on the next page provides a map of the District's service area.

[2] "Sterling Natural Resource Center". EVWD (n.d.). Archived September 11, 2025. web.archive.org/web/2/https://www.eastvalleywater.gov/our-water/systems/wastewater-system/sterling-natural-resource-center/

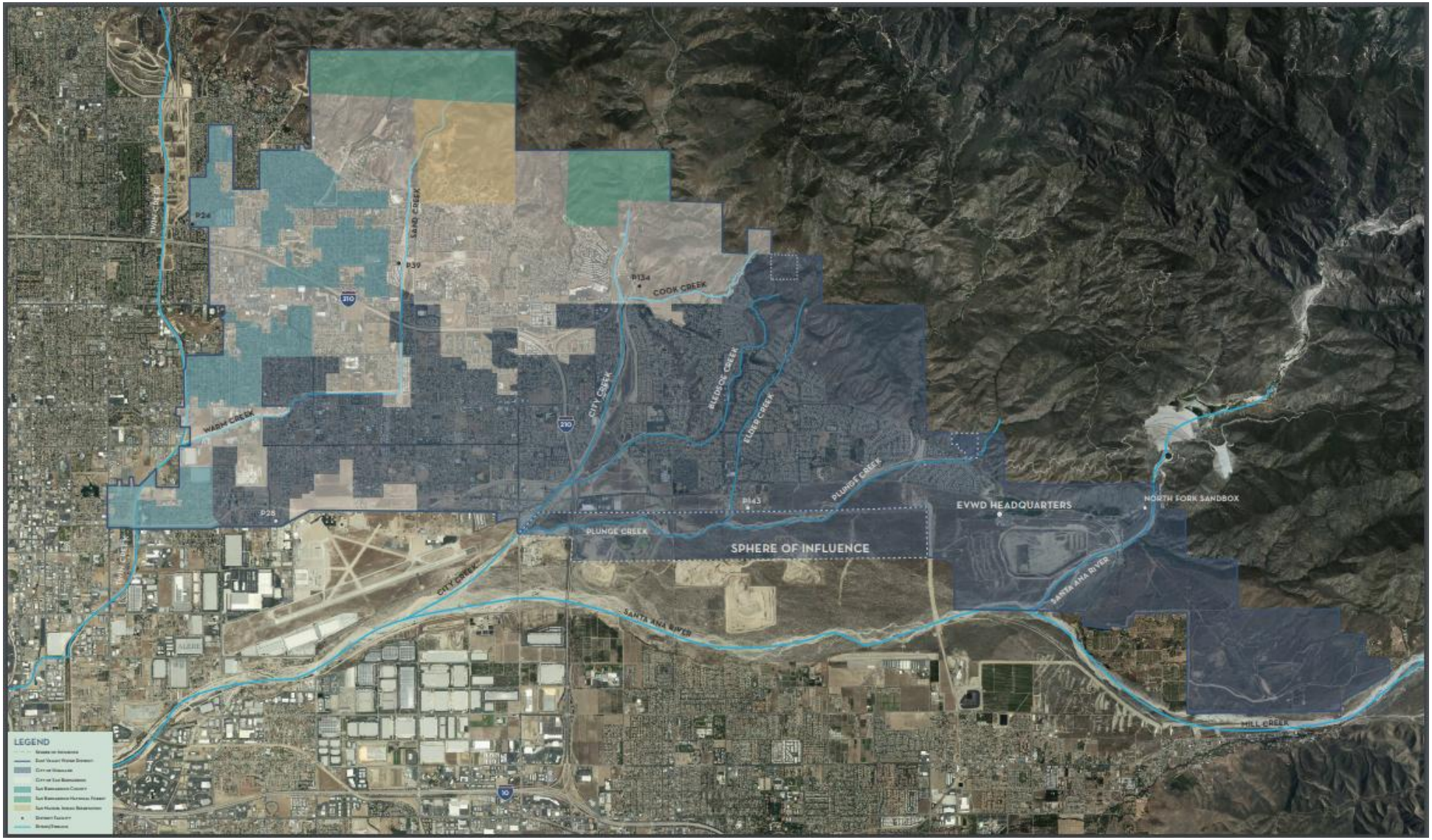

Figure 3-1: District Service Area

3.2 Geography

The San Bernardino Valley is surrounded by the San Bernardino Mountains to the north and east. The service area's elevation above mean sea level ranges from approximately 500 feet on the valley floor to 2,000 feet within the foothills. These foothills eventually rise to the 11,502-foot summit of Mt. San Gorgonio in the north – the highest peak in Southern California.

The District has access to multiple water sources including groundwater, local surface water, and imported water. 75-80 percent of total water supply is from groundwater and the remaining 20-25 percent is from surface water sources. The District has three primary sources of water supply: local groundwater from the Bunker Hill Basin pumped from District-owned wells, local surface water from the Santa Ana River, and imported surface water from the State Water Project via the San Bernardino Valley Municipal Water District. Up to 20 percent of water provided to District customers is from the Santa Ana River via the North Fork Water Company.

The Bunker Hill Groundwater Basin covers 92,000 acres and stores approximately five million acre-feet of water. It is located on the southern slopes of the San Gorgonio mountains atop the Santa Ana River watershed and receives surface water runoff from the headwaters of the Santa Ana River and other tributaries. The basin is recharged by rain, runoff from the surrounding mountains, and imported water. Its water is used for over 600,000 people in the Cities of Highland, Redlands, Loma Linda, San Bernardino, Colton, Rialto, Bloomington, Fontana, Grand Terrace, and Riverside, as well as portions of unincorporated County of San Bernardino.

There are two major earthquake faults in the San Bernardino Valley: the San Andreas Fault and the San Jacinto fault. The San Andreas Fault runs though the District's boundaries from northwest to southeast. This fault cuts the District in half, with potable water reservoirs on the north side of the fault and wells and pipeline structures on the south side of the fault. The San Jacinto Fault is within five miles of the District's southern and western boundaries.

3.3 Climate

The climate of the District's service area is typical of Southern California's Mediterranean and semi-arid climate with hot, dry summers and mild, dry winters. The Köppen climate classification within the service area is a mix of Csa (hot-summer mediterranean), BSk (cold semi-arid), and BSh (hot semi-arid) depending on the elevation.[3] On average, there are approximately 280 days of sunshine per year. High temperature average 94 degrees Fahrenheit in summer (July) and 66 degrees Fahrenheit during winter (January). Lows average between 63 and 42 degrees Fahrenheit, respectively.

According to the National Oceanic and Atmospheric Administration (NOAA), the area's dry season runs from approximately April through November, during which there is a less than 10 percent daily chance of precipitation (dropping to under one percent in June). Its rainiest month is

[3] "Koppen-Geiger Climate Classification – 2007". NOAA (2025). Archived August 21, 2025. https://web.archive.org/web/20250821205634/https://sos.noaa.gov/catalog/datasets/koppen-geiger-climate-classification-2007/

February, peaking at approximately 18 percent daily chance of precipitation. On average, there are between 0 and 2.5 days of precipitation per month from April through November and 4.1 to 4.5 days of precipitation from December through March. Average monthly rainfall in February is 2.1 inches; in June, precipitation is negligible.[4]

On occasion, Southern California experiences significant weather variability due to extremely hot weather, winter storms, and/or Santa Ana winds. **Section 4** contains additional descriptions of the service area climate regarding those hazards.

3.4 History

East Valley Water District is a California Special District formed on January 18, 1954, by local residents voting to establish water service by a public agency. Originally called the East San Bernardino County Water District, the name was changed to East Valley Water District in 1982. It initially provided water to unincorporated communities within Highland and East Highlands.

Increased urbanization of the formerly agricultural communities pushed the District to expand its services into wastewater and septic treatment beginning in 1964. The District's wastewater services were further developed following incorporation of the City of Highland and expansion of the City of San Bernardino. In January 2024, the District activated the SNRC and began its recycled water reclamation operations.

3.5 Government

The District is a California Special District under California law, providing it with limited purpose to deliver specialized services (cf. water supply, wastewater conveyance, and wastewater treatment).[5] Special districts are formed and supported by voters. The District is governed by a five-member Board of Directors who are elected at large from within the District's service area. It also retains a General Manager/Chief Executive Officer position. The District conducts its business at regularly scheduled meetings at its administrative facilities, which are open to the public. The District maintains a website which provides an opportunity for customer feedback and assistance.

3.6 Economy

According to the District's Annual Comprehensive Financial Report for the FY ending June 30, 2025 (FY 2024-2025), total operating revenue was $53.28 million. The District's total assets and deferred outflows were valued at $386.6 million. A plurality of the District's revenues and expenses are from its water services. The District received $21.28 million during FY 2024-2025 from water sales. System charges totaled $17.51 million. In contrast, wastewater treatment charges totaled $12.68 million in revenue.

[4] "Climate and Average Weather Year Round in Highland". Weatherspark (n.d.). Archived August 21, 2025. https://web.archive.org/web/20250821205752/https://weatherspark.com/y/1945/Average-Weather-in-Highland-California-United-States-Year-Round
[5] EVWD FY 24-25 Budget

Total operating expenses were $53.73 million for the same period. Of this, the administrative and general category was the highest category of expenses at $16.95 million. The water department incurred $13.01 million in operating expenses; the wastewater department, $1.45 million. The reclamation department's operating expenses were $10 million. The remaining expenses were assigned to depreciation.

The primary source of revenue from water services was meter charges. For wastewater services, the most revenue came from charges to customers, with other minor sources being inspections, plan checking, development-related fees, and reimbursements from public agencies and utilities. Expenses are primarily related to energy costs, pipeline maintenance costs, and dislodging of fats, oils, and grease. Given that the collection system is entirely gravity flow, there were no expenses for pumps or lift stations.

The previous fiscal year (FY 2023-2024) incurred major capital expenditures related to the SNRC. The District initially planned to complete and turn on the SNRC in November 2023, but a two-month delay in constructing the recycled water pipeline resulted in its actual online date being January 2024. Revenues were thereby less than projections, and the District spent more funds than expected to have wastewater treated by an outside agency. Phase redirection of wastewater to the SNRC began shortly after the January 2024 date, with all wastewater being sent to the SNRC by the end of March 2024.

The District's service area is located within the metropolitan area known as the "Inland Empire" in southeastern California. Economic information about the population served exclusively by the District is not available. City customers are likely to be significantly wealthier than those in unincorporated County of San Bernardino; for example, the City of Highland's average household income is $68,105, which is 21 percent higher than the service area average.

In FY 2024-2025, the District's top five consumers were the San Bernardino City Unified School District, Patton State Hospital, the Yaamava' Resort & Casino at San Manuel, the City of Highland government entity, and the Yuhaaviatam of San Manuel Nation government entity.[6] All five consumers are also considered major employers within the area; the Yaamava' Resort & Casino at San Manuel employs over 5,000 people.

3.7 Demographics

Per the Annual Comprehensive Financial Report for FY 2024-2025, the total number of customers served was approximately 108,000. This is an approximate six percent increase since 2015. Most of these customers are residential and commercial entities. The District does not have any major industrial users.

The exact demographics of the District's service area are difficult to quantify given the heterogeneous political entities. **Table 3-1** on the next page provides demographic information on

[6] EVWD FY 24-25 Budget

the City of Highland and the City of San Bernardino as a proxy for the broader population trends of the service area proper.

Note the District does not serve every person within the City of San Bernardino, nor do its residents exclusively receive water and wastewater services from the District. This information is from the US Census Bureau's American Community Survey for years 2019-2023.[7,8]

Table 3-1: Cities of Highland & San Bernardino Demographics		
Age	**City of Highland**	**City of San Bernardino**
<18 years	35.8 percent	34.1 percent
18-65 years	53.4 percent	55.7 percent
>65 years	11.8 percent	10.2 percent
Race & Ethnicity	**City of Highland**	**City of San Bernardino**
White alone	38.4 percent	27.6 percent
Black or African-American	6.4 percent	11.8 percent
American Indian & Alaskan Native	1.4 percent	1.2 percent
Asian alone	8.6 percent	4.1 percent
Native Hawaiian & Pacific Islander	0.1 percent	0.3 percent
Multiracial	13.4 percent	15.1 percent
Hispanic or Latino	59.2 percent	69.6 percent
White alone, not Hispanic or Latino	23.7 percent	11.8 percent
Education	**City of Highland**	**City of San Bernardino**
High School	78.5 percent	73.8 percent
Bachelor's Degree or Higher	22.8 percent	12.8 percent
Housing	**City of Highland**	**City of San Bernardino**
Households	16,401	63,133

[7] "US Census Bureau QuickFacts: San Bernardino City, California". US Census Bureau (n.d.). Archived July 11, 2025. https://web.archive.org/web/20250711163735/https://www.census.gov/quickfacts/fact/table/sanbernardinocitycalifornia/PST045224

[8] "US Census Bureau QuickFacts: Highland City, California". US Census Bureau (n.d.). Accessed September 27, 2025. https://www.census.gov/quickfacts/fact/table/highlandcitycalifornia/SEX255223

Table 3-1: Cities of Highland & San Bernardino Demographics		
Owner Occupied	65.9 percent	48.5 percent
Median Rent	$1,539/month	$1,433/month
Median Home Value	$455,200	$384,900
Employment & Poverty	**City of Highland**	**City of San Bernardino**
Total Employer Firms	421	2,581
Civilian Labor Force >15 years old	61.4 percent	60.7 percent
Median Household Income	$77,979	$63,988
Poverty Rate	16.7 percent	19.5 percent

The Yuhaaviatam of San Manuel Nation (formerly known as the San Manuel Band of Mission Indians) is a federally recognized and sovereign tribe of Native Americans. The tribe owns 1,100 acres of land north of the Cities of Highland and San Bernardino at the mountains' foothills. Their lands make up one of two independent government entities within the service area. Per the 2013-2017 American Community Survey, the District provided potable water services to 138 residents[9] in addition to fire services within the reservation boundaries.

The Patton State Hospital is a notable special population served by the District. It is a forensic psychiatric hospital within the County of San Bernardino and is an independent government entity within the service area (alongside the Yuhaaviatam of San Manuel Nation). Patton State Hospital is located within the City of San Bernardino and has a bed capacity of 1,287 for inpatient psychiatric care for inmates committed by the judicial system.

3.8 Land Use

Figure 3-2 on the next page displays the land use within the District's service area. The map was copied from the 2020 LHMP. It was created by overlaying the District's boundary with data from Southern California Association of Governments General Land Use for the County of San Bernardino. Only the land uses within the District's boundary are displayed.

[9] "San Manuel Reservation and Off-Reservation Trust Land, CA, 2013-2017 American Community Survey 5-Year Estimates". US Census Bureau (n.d.). Archived August 21, 2025. https://www.census.gov/tribal/?st=06&aianihh=3445

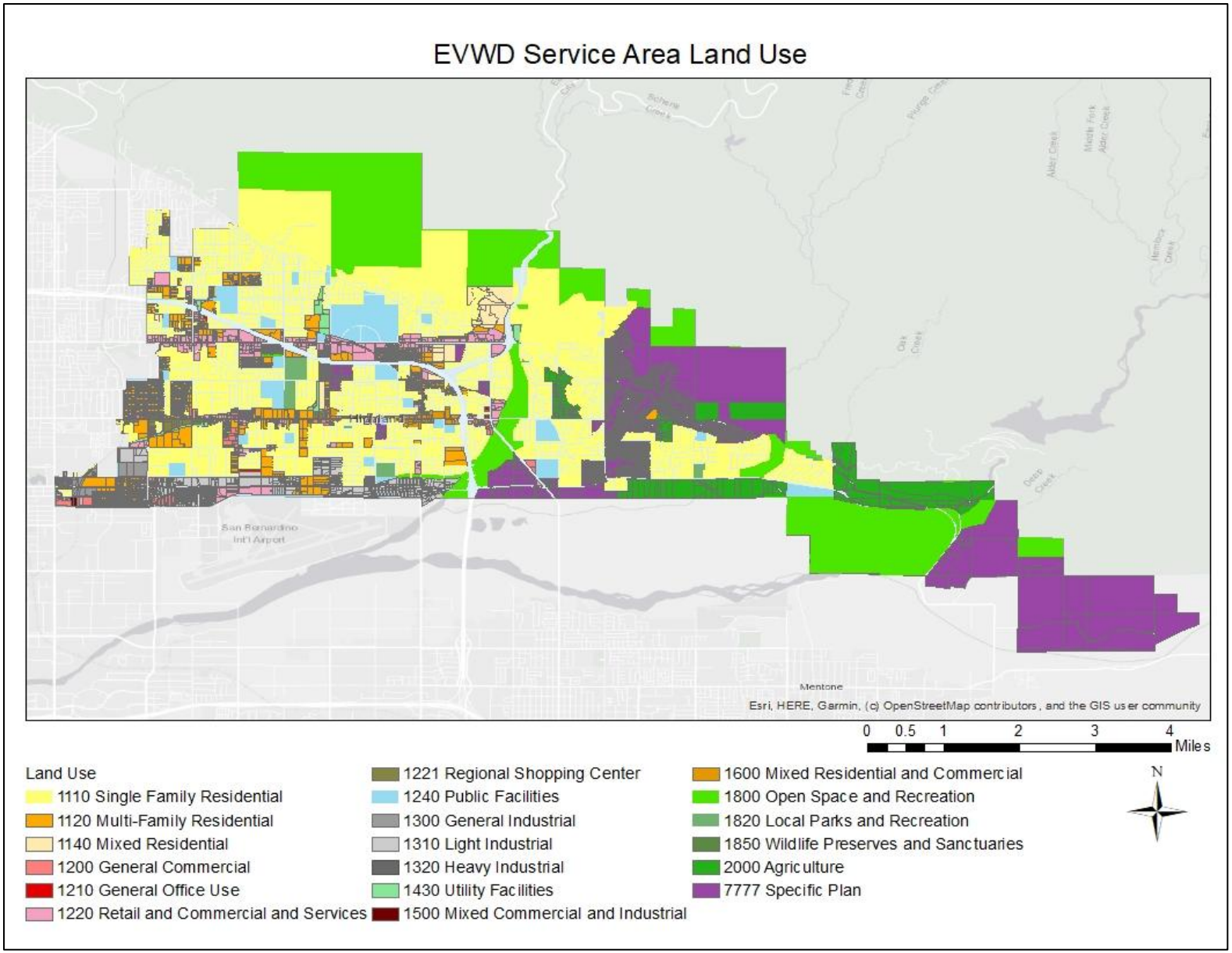

Figure 3-2: Land Use within the District's Service Area

Residential land use is primarily for both single-family and multi-family households. Most residents live within the service area but commute outside of it for employment. Zoning density is higher within the City of San Bernardino compared to the City of Highland, as noted by the abundance of multi-family residential area in the southern and western portions of the service area. Purple parcels designated “Specific Plan” are planned residential developments yet to be completed. For non-residential land uses, open space and parks are prevalent with little medium or dense commercial use.

Retail and commercial services are scattered throughout the service area with congregation around major routes and thoroughfares. Light industry is prevalent within the southwest portion of the service area with some heavy industry due to proximity to the San Bernardino Airport, which is not served by the District.

Other notable land use factors include the lands of the Yuhaaviatam of San Manuel Nation and the Patton State Hospital. While their land use is not indicated as residential, there are populations which reside in these special circumstances. The Yuhaaviatam of San Manuel Nation Land Trust is characterized as open space while the Patton State Hospital is characterized as public facility land use.

3.8.1 District Pressure Zones

A “pressure zone” is defined as an area of a water system with a similar elevation and pressure. Water systems are divided into pressure zones when the broader service area has significant differences in elevation. To reduce wear and tear on pumps, pressure zones are bound by an upper and lower elevation while receiving water from the same hydraulic grade line or discrete pressure from a particular well or reservoir. Each pressure zone is intended to be maintained without pressure release valves (PRVs) or pumps, though either might exist at the boundaries between pressure zones.

Per the 2019 WSMP, the District’s water system is divided into six main pressure zones: Lower Zone, Intermediate Zone, Upper Zone, Foothill Zone, Canal Zone, and Mountain Zone. The Canal Zone is further divided into three “hydraulically disconnected zones” that are identified as Canal Zone 1, Canal Zone 2, and Canal Zone 3. There are four smaller hydropneumatic zones and three zones supplied through PRVs.

Figure 3-3 on the next page shows a map of the District’s pressure zones, hydropneumatic zones, and PRV zones. This map comes from the 2019 WSMP.

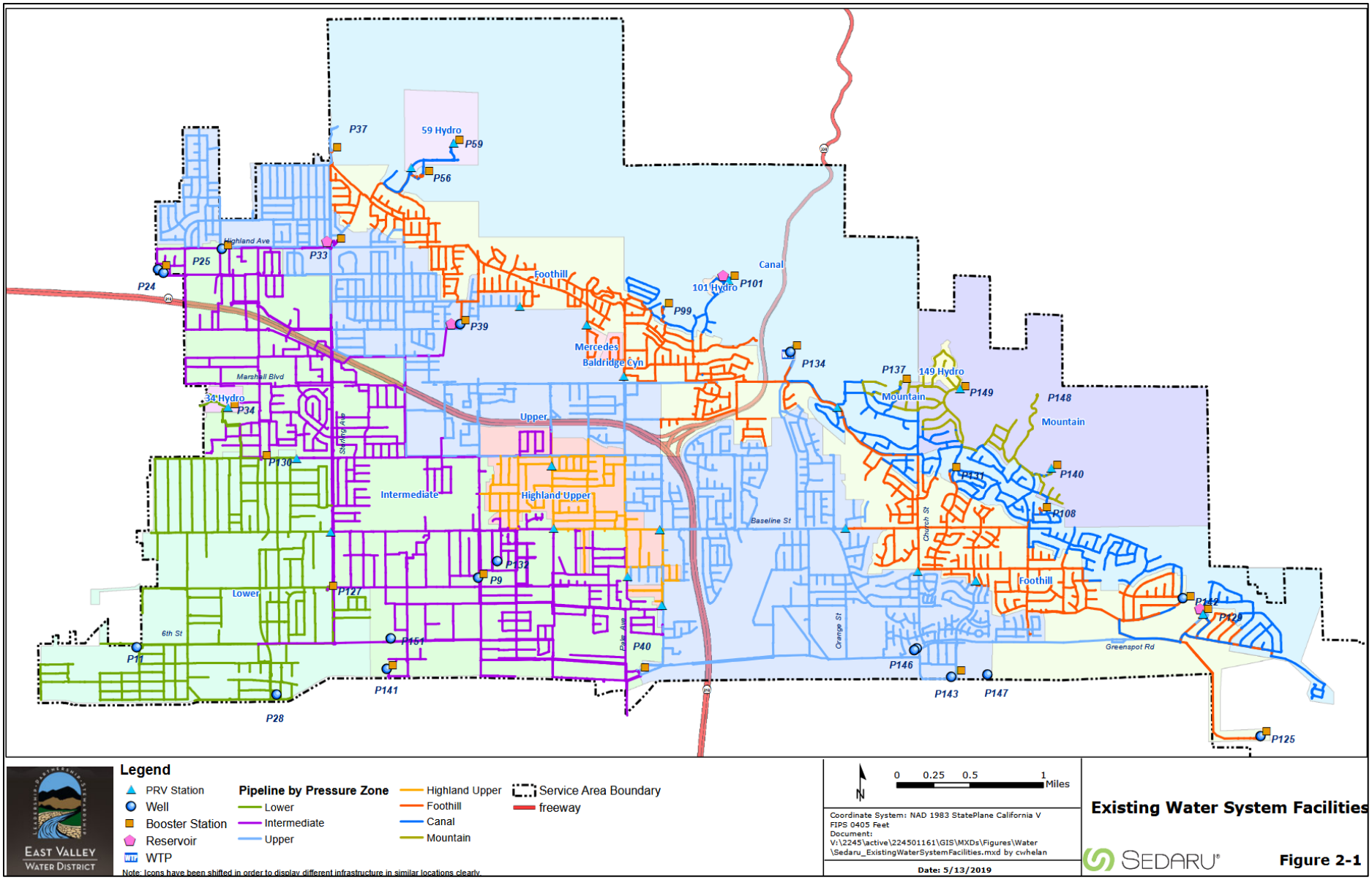

Figure 3-3: District Pressure Zones

SECTION 4: CAPABILITIES ASSESSMENT AND HAZARD IDENTIFICATION

The Planning Team conducted a capability assessment of the District's authorities, policies, programs, and resources before developing goals and mitigation actions. The results of the assessment are listed within this section alongside the results of the hazard analysis.

FEMA REGULATION CHECKLIST: CAPABILITY ASSESSMENT

44 CFR § 201.6(c)(3): The plan must include mitigation strategies that provide "the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools."

Element:
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?

C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool*, June 2025

4.1 Existing Authorities, Policies, Programs, and Resources

An assessment of authorities, policies, programs and resources was conducted to identify capabilities that reduce vulnerability to hazards. The capabilities include authorities and policies, such as legal and regulatory resources, fiscal resources, and staff (e.g., technical personnel such as planners/engineers with knowledge of land development and land management practices).

The Planning Team also considered ways to expand and improve these existing policies and programs to integrate hazard mitigation into the day-to-day activities and programs of the District. **Tables 4-1, 4-2, 4-3,** and **4-4** below summarize the existing authorities, policies, programs, and resources to implement mitigation actions and projects.

4.1.1 Planning and Regulatory Capabilities

Planning and regulatory capabilities include local ordinances, policies, and laws to manage growth and development. Examples include land use plans, capital improvement plans, transportation plans, emergency preparedness and response plans, and building codes. These capabilities may be used to inform and support mitigation planning or may be modified into mitigation actions. **Table 4-1** lists District planning and regulatory capabilities. Under the Description column is an explanation of the District's ability to use the LHMP to expound upon and improve these existing policies and programs.

Table 4-1: Local Planning and Regulatory Capabilities

Name	Description (Effect on Hazard Mitigation)	Hazards Addressed	Date	Capability Type
Upper Santa Ana River Watershed Integrated Regional Urban Water Management Plan	The purpose of this plan is for water suppliers to evaluate long-term resource plans and establish management measures to ensure adequate water supplies are available to meet existing and future demands. The plan provides a framework to help water suppliers maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during drought conditions. Expansion and Improvement: Updates to the LHMP must address climate change as per California SB 379. These updates can inform the UWMP sections on climate change including the impacts of longer and more frequent droughts and higher temperatures.	Climate Change Drought	2020	Planning Regulatory Technical
Sewer System Management Plan	The Sewer System Management Plan provides information on how the District operates and regulates sewer and wastewater services. It also outlines appropriate authorities, regulations, and ordinances that apply to its operations. Expansion and Improvement: Updates to this plan should incorporate mitigation actions and hazards to make sure plans are consistent in their priorities.	All Hazards	2023	Planning

Table 4-1: Local Planning and Regulatory Capabilities				
Name	**Description (Effect on Hazard Mitigation)**	**Hazards Addressed**	**Date**	**Capability Type**
Sewer System Master Plan	In contrast to the Management Plan, the Sewer System Master Plan is the primary document for technical specifications needs regarding the sewer system. Expansion and Improvement: Updates to this plan should incorporate mitigation actions and hazards to make sure plans are consistent in their priorities. Additionally, any capital improvement opportunities identified as hazard mitigation actions should be specified within the Sewer System Management Plan.	All Hazards	2019	Planning Technical
Emergency Response Plan (ERP) 2025	The ERP describes District hazards and preparedness/response actions in the event of an emergency. Expansion and Improvement: The District ERP contains a list of hazards. The LHMP provides a similar, more detailed description of these hazards. Updates to the LHMP can inform revisions to the ERP. Hazards in both plans should be corroborated.	All Hazards	2025	Planning
Risk and Resiliency Assessment (RRA) 2025	The RRA describes the District's vulnerabilities and values at risk. It identifies hazards of particular concern to the District and supports a quantitative analysis of relative risk. Expansion and Improvement: The RRA and the LHMP should use the same source data and similar language to describe hazards that are contained in both. Any updates to the hazard analysis or the risk/vulnerability sections of one document should be included for both.	All Hazards	2025	Planning Regulatory
California Code of Regulations – Title 22, Division 4.5, Chapter 11: Identification and Listing of Hazardous Waste	Describes characters of hazardous waste and assigns each type of waste a specific number to which it is subject to certain regulations. Expansion and Improvement: N/A	All Hazards	2025	Codes and Regulations

Table 4-1: Local Planning and Regulatory Capabilities				
Name	**Description (Effect on Hazard Mitigation)**	**Hazards Addressed**	**Date**	**Capability Type**
California Code of Regulations – Title 27, Division 2, Subdivision 1: Consolidated Regulations for Treatment, Storage, Processing or Disposal of Solid Waste	Describes the definitions of "solid waste" and solid waste management. Describes the criteria for waste management units, facilities, and disposal sites along with required documentation and reporting. Discusses special treatment, storage, and disposal units. Expansion and Improvement: Ensure that all hazard mitigation activities conform to this subdivision of the Code of Regulations.	All Hazards	2025	Codes and Regulations
California Code of Regulations – Title 24, Part 5: California Plumbing Code	Sets the standards and requirements for plumbing within the State of California, including sanitary system, sewer, and drainage requirements. Expansion and Improvement: Ensure that hazard mitigation actions comply with the California Plumbing Code and align with the Sewer System Master Plan's priorities.	All Hazards	2022	Codes and Regulations
State Water Resources Control Board: Statewide Waste Discharge Requirements – General Order for Sanitary Sewer Systems	Provides the General Order for sanitary sewer systems' safe conveyance of sewage and maintenance of pipes, valves, pump stations, manholes, and other infrastructure. Designates ownership rights of laterals and the implementation of temporary conveyance and storage facilities. Defines sewage and monitoring/tracking of spills. Expansion and Improvement: The District will reference the General Order in developing mitigation actions that comply with wastewater and sanitary sewer system requirements.	All Hazards	2023	Codes and Regulations

4.1.2 Administrative and Technical Capabilities

Administrative and technical capabilities include community (including public and private) staff and their skills and tools that can be used for mitigation planning and implementation. This capability includes engineers, planners, emergency managers, GIS analysts, building inspectors, grant writers, and floodplain managers. Small communities may rely on other government entities such as counties or special districts for resources. The capabilities outlined in **Table 4-2** may be

used when planning mitigation activities to support project feasibility studies, designs, estimates, and construction.

Table 4-2: Administrative and Technical Capabilities		
Technical Capability	**Description**	**Hazards Addressed**
Professional Engineers	Certified District staff. Provides input into facility operations and maintenance planning. Supports analyses of facility upgrades and other needs. Expansion and Improvement: Provide opportunities for continued education of engineering staff to maintain state-of-the-art knowledge of new code and regulatory requirements.	All Hazards
Trained Water and Wastewater System Maintenance Technicians	Staff trained to manage wastewater collection and treatment systems, notice impending component faults, and take preventive/repair actions. Staff perform emergency bypass training and portable generator hook-up training each year. Expansion and Improvement: Provide opportunities for continued education of engineering staff to maintain state-of-the-art knowledge of new code and regulatory requirements.	All Hazards
Supervisory Control and Data Acquisition (SCADA) and Analysis Systems	Provides automated monitoring and control of the District's wastewater pumping/treatment and water distribution system. Expansion and Improvement: Provide opportunities for continued education of SCADA staff on the latest cybersecurity practices and tools.	All Hazards
Emergency Operations Center (EOC)	The District has a fully equipped, dedicated emergency operations center for rapid response to incidents. Expansion and Improvement: Conduct systematic training for EOC staff. Develop a long-range integrated training program.	All Hazards

4.1.3 Financial Capabilities

Financial capabilities include grants, general funds, bonds, development impact fees, and others. **Table 4-3** outlines financial resources that may be used to support mitigation activities.

Table 4-3: Financial Capabilities		
Financial Resource	**Administrator**	**Purpose**
Hazard Mitigation Grant Program (HMGP)	FEMA	Provides support for post-disaster mitigation plans and projects. Expansion and Improvement: Train staff on notice of intent procedures and track opportunities on the Cal OES mitigation website to initiate applications for grant funding.
General Fund	District	Provides funding for all District activities. Funding primarily comes from utility bills. Expansion and Improvement: Hazard mitigation projects may be considered during the annual budgeting process for funding from the general fund.
Bureau of Reclamation (BOR) – WaterSMART and Energy Efficiency Grants	BOR	Provides funding for organizations including water districts that "seek to conserve and use water more efficiently" with a focus on mitigating water conflict risk and increasing water supply sustainability. Expansion and Improvement: Train staff on grant application procedures and timing.
Southern California Association of Governments (SCAG) Grants	SCAG	Provides grants to local jurisdictions (including special districts) for various activities that support local health and well-being and/or support critical infrastructure. Expansion and Improvement: Train staff on grant application procedures and timing.
Riverside Urban Area Security Initiative (Riverside UASI) Grants	Riverside UASI	Grants that support homeland security and domestic preparedness with a focus on cybersecurity, terrorism, and conflict. Expansion and Improvement: Train staff on grant application procedures and timing.
Department of Water Resources (DWR) Grants	DWR	State agency funding used to support watershed projects and mitigation programs. Expansion and Improvement: Train staff on grant application procedures and timing.
Bonds	District	Long-term funding opportunities through selling bonds. Expansion and Improvement: Hazard mitigation projects may be considered during the annual budgeting process for funding from the general fund.

Table 4-3: Financial Capabilities		
Financial Resource	**Administrator**	**Purpose**
Emergency Watershed Protection Program (EWP)	Natural Resources Conservation Service (NRCS)	Short-term funding for emergencies due to natural disasters. Support programs specific to watersheds include removing debris from stream channels and protecting eroded banks. Expansion and Improvement: Train staff on application procedures and timing.
Environmental Quality Incentives Program (EQIP)	NRCS	Long-term program funding related to water and air quality projects including soil erosion repair following disasters. Expansion and Improvement: Train staff on grant application procedures and timing.
California Forest Improvement Grant Program (CFIP)	Cal Fire	Short-/Moderate-term funding for reforestation and resource management within wildland areas. Funding is meant for management of areas with sub-merchantable or no commercial value. Expansion and Improvement: Train staff on grant application procedures and timing.
California Climate Investments (CCI) Fire Prevention Grant Program	Cal Fire	Grants specific to hazardous fuel reduction regarding dead, dying, and diseased trees. Also supports fire prevention planning and education. Expansion and Improvement: Train staff on grant application procedures and timing.
State Fire Assistance Program (SFAP)	California Fire Safe Council	Provides funding for hazard mitigation vegetation treatments specifically for fuel on the Wildland-Urban Interface. Activities supported include chipping, burning, and grazing. Expansion and Improvement: Train staff on grant application procedures and timing.
Watershed Protection Program (WPP)	California State Water Resources Control Board (SWRCB)	Provides funding for hazard mitigation programs intended to reduce chronic flooding, control water velocity, and/or reduce water volume using nonstructural methods. Funds may also be used to prevent watershed soil erosion and sedimentation. Expansion and Improvement: Train staff on grant application procedures and timing.

Table 4-3: Financial Capabilities		
Financial Resource	**Administrator**	**Purpose**
Clean Water State Revolving Fund (CWSRF)	SWRCB	Provides funding for programs that protect and improve water quality and environmental protection. CWSRF can finance publicly owned treatment facilities including wastewater treatment plants and sewer systems. Expansion and Improvement: Train staff on grant application procedures and timing.
Drinking Water State Revolving Fund (DWSRF)	SWRCB	Provides funding for drinking water infrastructure projects that comply with Safe Drinking Water Act requirements. DWSRF can finance publicly owned and non-profit community water systems. Eligible projects include treatment systems, distribution systems, consolidations, pipeline extensions, water storage, and water sourcing. Expansion and Improvement: Train staff on grant application procedures and timing.
Water Recycling Funding Program (WRFP)	SWRCB	Provides technical and financial assistance to local agencies in support of water recycling projects. Expansion and Improvement: Train staff on grant application procedures and timing, especially as the WRFP relates to SNRC operations.
Water Infrastructure Finance and Innovation Act (WIFIA) Loans	US EPA	Provides funding on an ongoing basis through loans for projects in service of critical water infrastructure projects. WIFIA loans are intended to be used in tandem with State Revolving Fund programs. Expansion and Improvement: Train staff on grant application procedures and timing.

4.1.4 Education and Outreach Capabilities

These capabilities include public information/communications office, hazard awareness campaigns, and social media accounts. Education and outreach capabilities can be used to inform the public about current and potential mitigation activities. **Table 4-4** outlines these capabilities.

Table 4-4: Education and Outreach Resources			
Name	**Description**	**Hazards Addressed**	**Capability Type**
Public Information Office	Develops and delivers outreach and engagement programs that promote hazard awareness, safety of drinking water, and water conservation methods. Expansion and Improvement: Develop a section in the newsletter that addresses mitigation planning activities. Implement a customer outreach plan.	All Hazards	Campaign
District Website https://www.eastvalleywater.gov/	The District uses the website to post public information on and to collect input for the LHMP update process. The website is also used to provide information on emergency declarations, response, and recovery conditions. Links to county, State, and federal emergency preparedness sites can be added to provide information on individual and family readiness. Expansion and Improvement: Provide links to the County website on the District's website. Post material on social media accounts that provide a link to the appropriate County website page.	All Hazards	Website
District Social Media Accounts: Instagram https://www.instagram.com/eastvalleywater/?hl=en Facebook https://www.facebook.com/eastvalleywater X https://x.com/i/flow/login?redirect_after_login=%2Feastvalleywater	Provides easily accessed information about the District. Used for LHMP public outreach and engagement. Expansion and Improvement: Devote a page on the social media accounts to post the HMP and provide updates on the progress of the mitigation action plan.	All Hazards	Social Media

Table 4-4: Education and Outreach Resources			
Name	**Description**	**Hazards Addressed**	**Capability Type**
Sterling Natural Resource Center (SNRC)	The SNRC facility produces recycled water to replenish the Bunker Hill Groundwater Basin. The Education Program at the SNRC provides facility tours, summer internships, classroom demonstrations, and equipment demonstrations. It also allows the District to engage with local communities on water conservation. Expansion and Improvement: The District recognizes the importance of engaging community members in developing mitigation techniques and plans. Consistent with the emphasis on outreach, the District will continue to foster collaboration with the community using the SNRC for outreach programs to schools and community groups.	All Hazards	Education and Outreach

4.1.5 National Flood Insurance Program Participation

The District does not participate in the NFIP. None of its facilities are located within repetitive loss areas identified on Flood Insurance Rate Maps (FIRMs).

According to the 2023 County of San Bernardino Multi-Jurisdictional Hazard Mitigation Plan, 12 RL properties exist throughout the County. Most of the RL properties within the County are in high, localized mountain areas due to debris flow, which could be located within the District's service area. The District will continue to review and design mitigation projects in accordance with NFIP requirements.

4.2 Hazard Identification

A hazard analysis consists of identifying, screening, and profiling each hazard. The hazard analysis encompasses natural hazards and human-caused hazards (also known as "technological hazards"). Natural hazards result from unexpected or uncontrollable natural events of significant size and destructive power. Human-caused hazards result from human activity; they may be intentional (e.g., cyberattacks) or unintentional (e.g., dam failure/inundation).

This section profiles each identified hazard in their respective sections. These sections include descriptions of the type, history, location, extent, impact of climate change, regulatory environment, developmental trends, and probability of future events. The impact of climate change is also discussed where appropriate. Where appropriate, hazards are accompanied by maps and graphs to demonstrate extent and probability.

FEMA REGULATION CHECKLIST: HAZARD IDENTIFICATION & ANALYSIS

44 CFR § 201.6(c)(2)(i): A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan must include information on previous occurrences of hazard events and on the probability of future hazard events.

Element:
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?
B1-b. Does the plan include information on the location of each identified hazard?
B1-c. Does the plan describe the extent for each identified hazard?
B1-d. Does the plan include the history of previous hazard events for each identified hazard?
B1-e. Does the plan include the probability of future events for each identified hazard, including the type, location, and range of anticipated intensities?
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

4.2.1 Hazard Screening

The Planning Team reviewed the 2020 LHMP hazards and other hazards identified by FEMA's National Risk Index (NRI) in selecting hazards for the 2026 LHMP. The Public Engagement Survey asked members of the public to identify hazards of community concern. Other plans that informed the hazard screening and analysis include the District's 2020 LHMP, the County of San Bernardino's 2022 MJHMP, the City of San Bernardino's draft 2024 LHMP, and the 2021 California State Hazard Mitigation Plan. **Table 4-5** shows hazards listed in the 2020 LHMP, whereas **Table 4-6** shows which hazards were considered by the Planning Team and the reasoning for inclusion or exclusion.

Based on available information, no common or recurring hazards were omitted from this LHMP. Some omitted hazards were deemed not applicable to the District's service area, such as avalanche and coastal flooding. Other hazards not included in the NRI were assessed and included within the LHMP due to recommendations from the Planning Team, such as cyberattacks. During a review of the 2020 hazards, the Planning Team decided to eliminate "Loss of Critical Spares" and "Physical Adversary". See **Table 4-6** for more information

The Planning Team developed the "HAZMAT Incident" hazard as an umbrella hazard for HAZMAT spills, pipeline failures, and transportation accidents as the hazards all have similar impacts on District operations. The Planning Team also agreed to combine thunderstorms and high winds

into the “Severe Storms” hazard given the primary impact of both will be wind damage and debris. Lightning strikes are included in discussions about thunderstorms and wildfires.

Additionally, the Planning Team agreed to carry over climate change and cyberattack as hazards from the previous LHMP cycle. Climate change as a hazard satisfies regulatory requirements and includes the correlation of climate change to other hazards such as drought, which can seriously impact District operations.

Table 4-5: Hazards Listed in 2020 LHMP
1. Climate Change
2. Cyberattack
3. Drought
4. Earthquake
5. Flood/Flash Flood/Debris Flows
6. Hazardous Materials Release (as “Hazardous Material Facilities & Pipelines”)
7. Land Subsidence
8. Loss of Critical Spares
9. Physical Adversary
10. Power Failure/PSPS (as “Loss of Power”)
11. Wildland Fire

Table 4-6: Hazard Screening

Hazard	FEMA NRI Hazard?	2020 LHMP?	2026 LHMP?	Notes
Avalanche	Yes	No	No	Snowfall is rare within the service area, and snowfall that collects to the extent of avalanche danger is nonexistent. It is extremely unlikely that avalanches will be a hazard of concern during the hazard mitigation period, especially given the relatively warm winter climate and distance from the slope angles that lead to avalanches. NRI does not assign a risk profile to the District’s census tracts.
Coastal Flooding	Yes	No	No	The service area lies entirely outside coastal flooding and tsunami zones. NRI does not assign a risk profile for coastal flooding to the County of San Bernardino.
Climate Change	No	Yes	Yes	Although climate change is no longer part of the updated FEMA LHMP guidance, it is included in this LHMP given its strong association with changes in the frequency and intensity of other hazards discussed in the LHMP, such as droughts and severe storms.
Cold Wave	Yes	No	No	Given FEMA’s definition of a cold wave as “extreme low temperatures for an extended period,” this hazard is not applicable to the service area. NRI does not assign a risk profile for cold waves to the County of San Bernardino.

Table 4-6: Hazard Screening				
Hazard	**FEMA NRI Hazard?**	**2020 LHMP?**	**2026 LHMP?**	**Notes**
Cyberattack	No	Yes	Yes	Public utilities have historically been major targets of cyberattacks for terrorism and financial gain, with several high-profile incidents occurring in the State of California over the last five years. Cyberattacks were included within the previous LHMP cycle.
Dam Failure & Inundation	No	No	Yes	The southern service area and infrastructure are at risk of inundation if the Seven Oaks Dam failed.
Drought	Yes	Yes	Yes	Droughts are a recurring problem within the County of San Bernardino. The District's infrastructure and operations have historically been stressed due to drought conditions within the last decade. Droughts are highly relevant to water districts.
Earthquakes & Seismic Events	Yes	Yes	Yes	The District's infrastructure, buildings, and service area lie near major fault lines including the San Andreas Fault System and the San Jacinto Fault.
Emerging Infectious Disease (EID)	No	No	No	Following COVID-19 and other high-profile epidemics such as 2009 H1N1 Flu and Zika Virus, the Planning Team considered adding EIDs as a hazard that could disproportionately impact staff instead of infrastructure. However, the Planning Team eventually decided not to as disease mitigation activities are the responsibility of local public health organizations.
Hail	Yes	No	No	This area of southern California very rarely experiences hail, and not to the extent of damage to infrastructure, buildings, or vehicles. NRI assigns a risk profile of "relatively low" to the census tracts that encompass the service area.
Hazardous Materials Incident (HAZMAT Incident)	No	Yes	Yes	While there are no heavy manufacturing or industrial sectors served by the District, much of its infrastructure is involved with HAZMAT. There exist gas stations, underground storage tanks, and Superfund sites nearby.
Heat Wave	Yes	No	Yes	While the Planning Team decided that infrastructure is unlikely to be stressed during a heat wave, impacts to the human population and to water consumption rates are likely. NRI assigns a risk profile of "relatively high" to the County of San Bernardino.
Hurricane	Yes	No	No	Hurricanes have not frequently impacted the County of San Bernardino. Weather hazards are subsumed within the "Severe Storms" category. NRI does not assign a risk profile for hurricanes to the County of San Bernardino.
Ice Storm	Yes	No	No	The County of San Bernardino's warm and semi-arid climate precludes the occurrence of ice storms. NRI does not assign a risk profile for ice storms to the County of San Bernardino.
Land Subsidence	No	Yes	No	A review of existing geological data shows less risk for land subsidence than assumed in the previous LHMP's iteration.

Table 4-6: Hazard Screening				
Hazard	**FEMA NRI Hazard?**	**2020 LHMP?**	**2026 LHMP?**	**Notes**
Landslide	Yes	No	Yes	Parts of the service area and water distribution infrastructure are located among the steep slopes of the San Bernardino Mountains foothills in which landslides have occurred following heavy rains. The County of San Bernardino is assigned an NRI risk profile of "relatively high".
Lightning	Yes	No	No	Thunderstorms are included within the "Severe Storms" category, and the dangers of dry lightning strikes are included within the "Wildfire" category. Lightning itself was not considered a significant hazard to warrant its own hazard category.
Loss of Critical Spares	No	Yes	No	The Planning Team considered adding this hazard again from the previous cycle. It was deemed not appropriate for this LHMP given that this is the purview of general maintenance and operations as opposed to being a distinct hazard as befits the LHMP.
Physical Adversary	No	Yes	No	The Planning Team decided that infrastructure attacks, serious criminal activity, and terrorism did not meet the threshold of probability or extent to be considered in this LHMP cycle. The major concern is a cyberattack, not attacks on the District's physical infrastructure.
Power Loss	No	Yes	Yes	Partial and complete power losses have occurred that have disrupted operations of the District's facilities resulting in loss of services and incurring costs. Retitled from "Loss of Power" per the 2020 LHMP.
Riverine Flooding	Yes	Yes	Yes	Retitled to "Flood" given that Coastal Flooding was not a hazard in this LHMP. NRI assigns a risk profile of "relatively high" for riverine flooding to the census tracts comprising the service area. Debris flows are discussed within the "Wildfire" and "Landslide" hazards.
Severe Storms	No	No	Yes	This is a natural hazards category that was developed to include the impacts of thunderstorms, atmospheric rivers, and similar weather hazards.
Strong Wind	Yes	Yes	No	Although included in the 2020 LHMP, the Planning Team decided that strong winds did not meet the criteria for probability or extent to be included in this cycle. NRI assigns a risk profile of "very low" for the census tracts that encompass the service area. Santa Ana winds were considered a subsidiary hazard to severe storms and wildfires.
Tornado	Yes	No	No	The Planning Team decided that tornadoes are not a hazard of significant concern to the District and have neither impacted the service area nor the surrounding Cities. Severe weather involving high winds (e.g., windstorms) are subsumed within the "Severe Storms" category.
Tsunami	Yes	No	No	The service area and infrastructure are outside of coastal flooding and tsunami zones. NRI does not assign a risk profile for tsunamis to the County of San Bernardino.

Table 4-6: Hazard Screening				
Hazard	**FEMA NRI Hazard?**	**2020 LHMP?**	**2026 LHMP?**	**Notes**
Volcanic Activity	Yes	No	No	There are no volcanoes within 100 miles of the District. NRI does not assign a risk profile for volcanic activity to the County of San Bernardino.
Wildfire	Yes	Yes	Yes	Wildfires are among the greatest threats to the District's staff, infrastructure, buildings, and service area population. NRI assigns a risk profile of "very high" for the County of San Bernardino, placing it within the 99.9th percentile among US counties.
Winter Weather	Yes	No	No	Snowstorms and ice storms do not occur within the service area. The impacts of major weather events that occur in the winter months (e.g., atmospheric rivers) are subsumed within the "Severe Storms" category. NRI assigns a risk profile of "very low" for winter weather within the County of San Bernardino.

4.2.2 Emergency Proclamation History

The Planning Team also considered the District's history of disasters using 25 years of historical data (2000-2024). Of the 38 declared disasters that impacted the County of San Bernardino, 14 were identified as impacting the organization. Note that some hazards rarely result in disaster declarations and may be underrepresented (e.g., hazardous materials release incidents, cyberattacks, and power failures). **Table 4-7** lists these disasters.

Table 4-7: County of San Bernardino Emergency Proclamations				
Year	**Disaster #**	**Hazard**	**Description**	**Impacted OmniTrans?**
2024	FM-5537-CA	Bridge Fire	Fire	No
2024	FM-5535-CA	Line Fire	Fire	***Yes***
2023	DR-4699-CA	Severe Winter Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	Severe Storm Flood Landslide	No
2023	EM-3591-CA	Severe Winter Storms, Flooding, and Mudslides	Severe Storm Flood	No
2023	EM-3592-CA	Severe Winter Storms, Flooding, Landslides, and Mudslides	Severe Storm Flood Landslide	No
2021	DR-4569-CA	California Wildfire	Fire	No
2021	FM-5381-CA	Blue Ridge Fire	Fire	No
2020	DR-4482-CA	COVID-19 Pandemic	Biological	***Yes***
2020	EM-3428-CA	California COVID-19	Biological	***Yes***
2020	FM-5350-CA	El Dorado Fire	Fire	No
2020	FM-5325-CA	Apple Fire	Fire	No

Table 4-7: County of San Bernardino Emergency Proclamations				
Year	**Disaster #**	**Hazard**	**Description**	**Impacted OmniTrans?**
2019	FM-5301-CA	Hillside Fire	Fire	***Yes***
2019	EM-3415-CA	Earthquakes	Earthquake	No
2016	FM-5147-CA	Blue Cut Fire	Fire	***Yes***
2016	FM-5144-CA	Pilot Fire	Fire	***Yes***
2015	FM-5089-CA	North Fire	Fire	No
2011	DR-1952-CA	Winter Storms, Flooding, and Debris and Mud Flows	Severe Storm Flood	***Yes***
2011	FM-2955-CA	Hill Fire	Fire	No
2010	DR-1884-CA	Severe Winter Storms, Flooding, and Debris and Mud Flows	Severe Storm Flood	***Yes***
2009	FM-2841-CA	Sheep Fire	Fire	No
2009	FM-2833-CA	Oak Glen Fire	Fire	No
2008	FM-2792-CA	California Freeway Complex Fire	Fire	No
2007-2008	DR-1731-CA	California Wildfires	Fire	No
2007	EM-3279-CA	Wildfires in California	Fire	No
2007	FM-2738-CA	Grass Valley Fire	Fire	No
2007	FM-2728-CA	Butler 2 Fire	Fire	No
2007	DR-1689-CA	Severe Freeze	Freezing	No
2006	FM-2653-CA	Sawtooth Complex Fire	Fire	No
2005	DR-1585-CA	Severe Storms, Flooding, Landslides, and Mud and Debris Flows	Severe Storm	***Yes***
2004-2005	DR-1577-CA	Severe Storms, Flooding, Debris Flows, and Mudslides	Severe Storm	***Yes***
2003-2004	DR-1498-CA	Wildfires in California	Fire	***Yes***
2003	FM-2503-CA	Old Fire	Fire	***Yes***
2003	FM-2501-CA	Grand Prix Fire	Fire	***Yes***
2003	FM-2497-CA	Bridge Fire	Fire	No
2003	FM-2491-CA	Locust Fire	Fire	No
2002	FM-2464-CA	Williams Fire	Fire	No
2002	FSA-2433-CA	Louisiana Fire	Fire	No
2002	FSA-2425-CA	Blue Cut Fire	Fire	***Yes***

4.2.3 Disaster Proclamation Process

When there is a condition of extreme peril or potential peril to the safety of persons and property, and the condition is beyond the capability of the local jurisdiction to control effectively, the local governing body (board of directors, city council, board of supervisors, or a person authorized by ordinance) may proclaim that a local emergency exists. The local government may request the California Governor's Office of Emergency Services (Cal OES) Director to concur in their proclamation of a local emergency and provide assistance under the California Disaster Assistance Act (CDAA).

If sufficient conditions occur, the State may proclaim a state of emergency to fully commit State and Mutual Aid assistance and provide resources to assist local government. Following the proclamation of a state of emergency, the Cal OES Director may recommend that the Governor request a Presidential declaration of a major disaster under the authority of Public Law 93-288. The Governor's request to the president is submitted through FEMA.

4.2.4 Hazard Risk Rating

The relative risk for each potential hazard was rated using the Calculated Priority Risk Index (CPRI). The CPRI examines four criteria for each hazard: probability, magnitude/severity, warning time, and duration. For each hazard, an index value is assigned for each CPRI category from 0 to 4, with "0" being the least hazardous and "4" being the most hazardous situation. This value is assigned a weighting factor, and the result is a hazard ranking score. **Table 4-8** below describes the CPRI formula.

Table 4-8: Calculated Priority Risk Index

CPRI Category	Level ID	Description	Index Value	Assigned Weight
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001	1	**45%**
	Possible	Rare occurrences with at least one documented or anecdotal historic event. Annual probability of between 0.01 and 0.001	2	
	Likely	Occasional occurrence with at least two or more documented historical events. Annual probability of between 0.1 and 0.01	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability of greater than 0.1	4	
Magnitude-Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid, and there are no deaths. Negligible quality of life lost. Shut down of critical facilities for less than 24 hours.	1	**30%**
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries and illnesses do not result in permanent disability, and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	

Table 4-8: Calculated Priority Risk Index				
CPRI Category	**Level ID**	**Description**	**Index Value**	**Assigned Weight**
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructures). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	> than 24 hours	Population receives greater than 24 hours of warning.	1	**15%**
	12 to 24 hours	Population receives between 12-24 hours of warning.	2	
	6 to 12 hours	Population receives between 6-12 hours of warning.	3	
	< than 6 hours	Population receives less than 6 hours of warning.	4	
Duration	< than 6 hours	Disaster event will last less than 6 hours.	1	**10%**
	6 to 24 hours	Disaster event will last between 6-24 hours.	2	
	24 hrs. to 1 week	Disaster event will last between 24 hours and 1 week.	3	
	> than 1 week	Disaster event will last more than 1 week.	4	

The results of the CPRI are shown in **Table 4-9** below.

Table 4-9: Calculated Priority Risk Index Summary									
Hazard	**Probability**	**Weighted 45%**	**Magnitude & Severity**	**Weighted 30%**	**Warning Time**	**Weighted 15%**	**Duration**	**Weighted 10%**	**CPRI Ranking**
1. Climate Change	*4*	1.80	*3*	.90	*1*	.15	*4*	.40	**3.25**
2. Cyberattack	*3*	1.35	*2*	.60	*4*	.60	*3*	.30	**2.85**
3. Dam Failure & Inundation	*1*	.45	*4*	1.20	*4*	.60	*4*	.40	**2.65**
4. Drought	*4*	1.80	*2*	.60	*1*	.15	*4*	.40	**2.95**
5. Earthquakes & Seismic Events	*3*	1.35	*4*	1.20	*4*	.60	*4*	.40	**3.55**

Table 4-9: Calculated Priority Risk Index Summary									
Hazard	Probability	Weighted 45%	Magnitude & Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
6. Flooding	*2*	.90	*2*	.60	*3*	.45	*3*	.30	**2.25**
7. HAZMAT Incident	*2*	.90	*2*	.60	*4*	.60	*2*	.20	**2.30**
8. Heat Wave	*4*	1.80	*1*	.30	*1*	.15	*3*	.30	**2.55**
9. Landslide	*2*	.90	*1*	.30	*4*	.60	*1*	.10	**1.90**
10. Power Loss	*4*	1.80	*2*	.60	*3*	.45	*2*	.20	**3.05**
11. Severe Storms	*4*	1.80	*2*	.60	*2*	.30	*2*	.20	**2.90**
12. Wildfire	4	1.80	3	.90	3	.45	4	.40	**3.55**

4.3 Hazard Characterization and Profiles

A hazard analysis consists of identifying, screening, and profiling each hazard. The requirements for hazard identification are described below, as stipulated in DMA 2000 and its implementing regulations.

4.3.1 Climate Change

Description: The U.S. Environmental Protection Agency (EPA) describes climate change as "any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, which occur over several decades or longer."[10]

Climate change is often confused with global warming, the recent and ongoing rise in global average temperatures near Earth's surface. However, global warming represents only one aspect of climate change. Climate change broadly refers to the many ways in which the climate is being altered and the anticipated effects in the future.

The State of California has seen greater fluctuations in rainfall, resulting in more floods, droughts, storm cycles, and heat waves. Glaciers and snowfields within the Sierra Nevada have shrunk, especially within Yosemite National Park and the Palisades area. Changing plant ecosystems due to a lack of killing frosts have allowed ragweed plants to produce pollen later into the year, potentially prolonging allergy season.[11]

[10] "Climate Change: Basic Information". US EPA (January 19, 2017). Archived August 21, 2025. https://web.archive.org/web/20250821210203/https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information_.html

[11] California SHMP (2023)

History: Climate change has occurred throughout the planet's history due to variations in the earth's inclination to the sun, volcanic activity, and other factors such as asteroid impacts and the amount of solar radiation reaching the earth's surface. The planet's temperature correlates to the amount of solar radiation arriving at the surface and the climate with it. There is considerable controversy over whether or not the current cycle of climate change is anthropogenic (i.e., human-caused); however, the answer to that question does not change the trends measured over the last one hundred years.[12]

In relatively recent history, the last glacial period, popularly known as the Ice Age, occurred from c. 110,000 to 12,000 years ago. This most recent glacial period is part of a larger pattern of glacial and interglacial periods known as the Quaternary glaciation (c. 2,588,000 years ago to present). From this point of view, scientists consider this "ice age" to be merely the latest glaciation event in a much longer ice age that dates back over two million years and is still ongoing.

During this last glacial period, there were several changes between glacier advance and retreat. The Last Glacial Maximum, the maximum extent of glaciation within the last glacial period, was approximately 22,000 years ago. While the general pattern of global cooling and glacial advance was similar, local differences in advance/retreat make it difficult to compare the details from continent to continent. Generally, temperature variation and glaciation patterns have lagged in atmospheric carbon dioxide (CO_2) content.

Figure 4-1 depicts global variations during the past 400,000 years as a correlation between temperature and atmospheric CO_2 content in parts per million.[13]

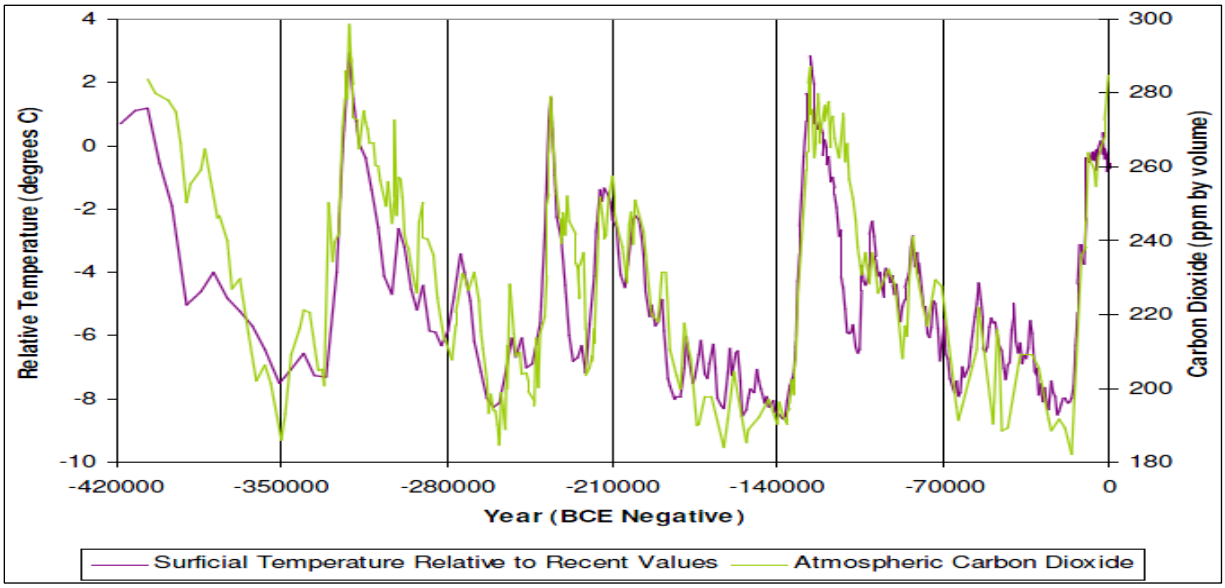

Figure 4-1: Temperature and Atmospheric CO2 Variation, Past 400,000 Years

[12] California SHMP (2023)
[13] Hogg, A.M. "Glacial cycles and carbon dioxide: A conceptual model". *Geophysical Research Letters*, 35, L01701 (2008). doi: 10.1029/2007GL032071.

For 22,000 years ago, the planet has slowly warmed, and the glaciers retreated to high northern latitudes and mountains. In addition to natural warming, anthropogenic effects have resulted in an increase in atmospheric CO_2, which is associated with a matching rise in global temperature. The result has been a potential acceleration of climate change. **Figure 4-2** provides a graphical depiction of the recent history of temperature rise.[14]

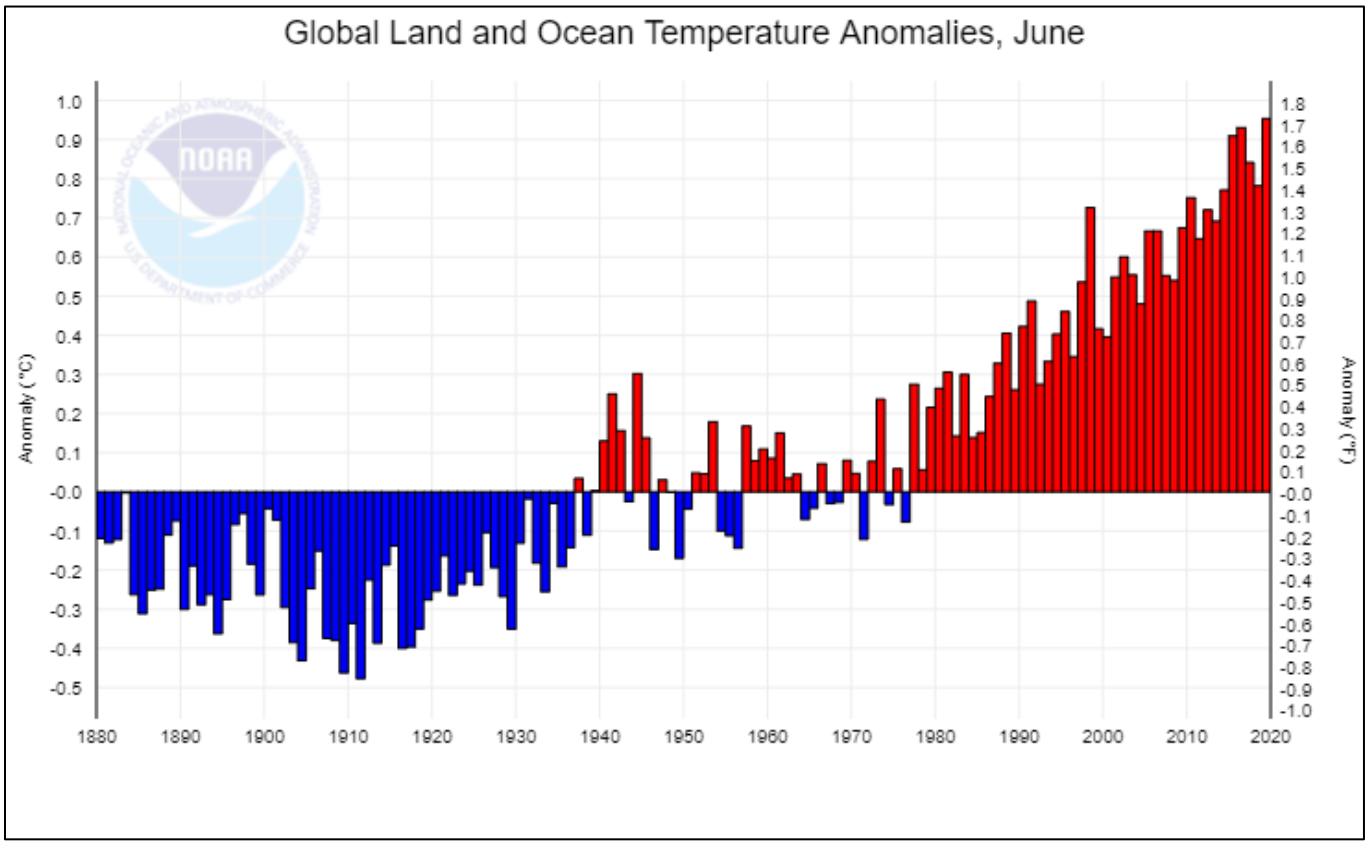

Figure 4-2: Temperature Rise Since 1880

Location: Climate change by its very definition is a global phenomenon, and so it is expected to affect the entire San Bernardino Valley. Information on location-specific impacts may be found within the County of San Bernardino's MJHMP (2022), City of San Bernardino's LHMP (2024), and the *San Bernardino County Vulnerability Assessment* (2022).

Extent: In addition to a broad increase in baseline temperatures, the *San Bernardino County Vulnerability Assessment* and the *Climate Change and Health Report* describe several ways by which the County of San Bernardino (especially the populous southwestern area, which the District serves) may experience climate change. A full summary of every effect is outside the scope of this LHMP, and interested parties are encouraged to read the *Vulnerability Assessment*

[14] Dahlmen, L. & Lindsey, R. "Climate change: global temperature". NOAA (May 29, 2025). Archived August 21, 2025. https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature

in particular for more information. Salient examples from both documents are described below and in the "Impact of Climate Change" subsections within other hazards.

- **Increased frequency and intensity of droughts.** The southwestern United States normally experiences drought. However, droughts are expected to become longer-lasting and of deeper intensity, impacting the region's agricultural products and reducing water availability for drinking, manufacturing, and waste conveyance.
- **Increased frequency and intensity of wildfires.** As with droughts, wildfires are a natural part of the southwestern United States' ecosystem. Many forests rely on fires to clear underbrush and release seeds. However, increased dryness of deadfall as well as hotter temperatures and winds may increase the destructive potential of wildfires, especially those near the wilderness-urban interface. On average, more than 2 percent of the land area in the State of California each decade over the last four decades. Additionally, wildfires smoke can reduce air quality and increase medical costs.
- **Changes to native and invasive species.** Warmer and drier conditions can make certain types of forests more susceptible to pests, as with the goldspotted oak borer in southern California. Tree-kill due to bark beetles has increased fuel loads throughout the State, which can likewise increase the destructive potential of wildfires. Giant reed, pampas grass, and salt cedar are invasive within the Upper Santa Ana River Watershed and thrive under warmer conditions.
- **Increased frequency of heat waves.** As discussed within the "Heat Wave" hazard, southwestern County of San Bernardino is poised to experience a greater number of hotter days and heat advisories. Per the *Vulnerability Assessment*, the service area is projected to experience 35-40 "additional maximum heat days" by 2050.[15] The average hottest day of the year is expected to increase approximately 8-11°F by 2100.
- **Increased number of severe storms and flooding.** One of the seemingly paradoxical impacts of climate change is long-term reduction in overall moisture but with greater fluctuations between extreme events. In other words, it is expected that southwestern County of San Bernardino will be drier on average, but severe storms and flash flooding events would be more extreme when they do occur. Extremely wet seasons are projected to occur twice as frequently by 2050 within southern California, even as drier seasons are projected to be drier and longer. Warmer temperatures are also expected to cause rapid snowmelt once spring begins.

Regulatory Context: Key laws, regulations, and policies developed by the State of California and local jurisdictions are described below.

- **The California Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32 and Senate Bill [SB] 32):** AB 32 was the primary legislation driving the State's greenhouse gas regulation. It instructed the California Air Resource Board (CARB) to develop and enforce regulations for the reporting and verifying of statewide greenhouse emissions with the goal of reducing statewide emissions to 1990 levels by 2020. In September 2016, the

[15] Note: "Additional maximum heat days" is defined as days with temperatures hotter than 95 percent of the daily maximum temperatures from 1976-2005.

Governor signed SB 32, which builds upon the statewide targets for 2020 by establishing a longer-term target so that "statewide greenhouse gas emissions are reduced to 40 percent below the 1990 levels by 2030."[16] The bill further authorized CARB to adopt regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emissions reductions.

- **California Executive Orders S-3-05 (2005) and B-30-15 (2015):** Both executive orders highlight longer-term emissions reduction targets for the State of California. Specifically, Executive Order S-3-05 sought a reduction of greenhouse gas emissions of 80 percent below 1990 levels by 2050, consistent with the scientific consensus that developed regions will need to reduce emissions at least 80 percent below 1990 levels to limit global warming to 2.0°C.[17] Executive Order B-30-15 seeks to establish an interim target between the 2020 target established through AB 32 and the long-term targets in EO S-3-05, to achieve a reduction of GHG emissions of 40 percent below 1990 levels by 2030.[18]
- **CEQA and Greenhouse Gas Emissions (Senate Bill 97):** In 2007, the Natural Resources Agency was directed by the legislature to prepare amendments to the California Environmental Quality Act (CEQA) Guidelines, providing direction to lead agencies on how to analyze and mitigate greenhouse gas emissions.[19]
- **Senate Bill 379 (2015) Planning and Zoning Law:** This legislation requires that the next revision of a jurisdiction's local hazard mitigation plan on or after January 1, 2017, or, if the local jurisdiction has not adopted a local hazard mitigation plan, beginning on or before January 1, 2022, include a review and update of the safety element to address climate adaptation and resiliency strategies applicable to that city or county. The bill would require the update to include a set of goals, policies, and objectives based on a vulnerability assessment, identifying the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts.[20]

California has also prepared programs and guidance for local governments to consider when identifying hazards and adapting to a changing climate, including:

- **California Climate Adaptation Strategy (Executive Order S-13-08):** In 2008, the Governor signed EO S-13-08, which directed the California Natural Resources Agency to lead a statewide effort to develop a climate adaptation strategy. Published in 2009, the statewide plan describes climate trends and the potential impacts of climate change on

[16] "Climate Change". CARB (n.d.). Archived August 21, 2025. https://web.archive.org/web/20250821210705/https://ww2.arb.ca.gov/our-work/topics/climate-change
[17] Executive Order S-3-05. Signed June 2, 2005. Archived July 2, 2025. https://web.archive.org/web/20250702230104/https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/5129-5130.pdf
[18] Executive Order B-30-15. Signed April 29, 2015. Archived July 24, 2025. https://web.archive.org/web/20250724113812/https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-30-15.pdf
[19] Senate Bill No. 97, Chapter 185. Filed August 24, 2007. Archived May 26, 2025. https://web.archive.org/web/20250526165113/https://www.lci.ca.gov/ceqa/docs/20210721-SB_97_bill_20070824_chaptered.pdf
[20] CA SB379 2015-2016. Passed October 8, 2015. Archived August 21, 2025. https://web.archive.org/web/20250821211229/https://legiscan.com/CA/text/SB379/id/1265233

key sectors, and it outlines short- and long-term actions that state and local governments can take to address future climate impacts.[21]

- **California Adaptation Planning Guide (APG):** Published in 2012 and updated in 2020, this statewide resource serves as a guide to local governments to identify, evaluate, and plan for the range of unavoidable consequences their community may face in the future due to climate change. The APG includes a step-by-step process for conducting a vulnerability assessment and identifying potential adaptation strategies.[22]

Regulatory actions taken specifically by the County of San Bernardino include:

- **Regional Greenhouse Gas Reduction Plan (2021):** This Plan was initially developed in 2014 and updated in 2021 for the San Bernardino Council of Governments to define relevant greenhouse gases, discuss actions that may be taken by each participating jurisdiction, and identify strategies in which County and State goals align. Finally, the plan discusses local climate action plans and broader regional coordination between jurisdictions to satisfy the plan's goals.[23]
- **San Bernardino County Vulnerability Assessment (2022):** The *Vulnerability Assessment* contains a detailed analysis of the County's social, economic, and environmental vulnerabilities to eight climate change-induced hazards: extreme heat, wildfire, drought, flooding, air quality, severe weather, extreme wind, and landslides.[24]

Developmental Trends: The Cities of Highland and San Bernardino incorporate environmental planning considerations within their General Plans to address both climate change and expected secondary impacts. The City of Highland's Land Use Element, Housing Element; Conservation & Open Space Element; and Public Health, Safety, & Environmental Justice Element describe actions and ordinances prioritized by the City for responsible, sustainable development.

Probability of Future Events and Magnitude: Climate change is an ongoing and accelerating process. Essentially, it has occurred, is occurring, and will continue to occur for several decades, centuries, or longer. Its probability is considered "highly likely" under the definitions of **Table 4-8**, reflecting its documented occurrence within other State of California and County of San Bernardino planning and preparedness documents.

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[21] Executive Order S-13-08. Filed November 14, 2008. Archived July 2, 2025. https://web.archive.org/web/20250702230104/https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/38-S-13-08.pdf

[22] "California Adaptation Planning Guide". California Governor's Office of Emergency Services (June 2020). Archived June 29, 2025. https://web.archive.org/web/20250629111124/https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf

[23] "San Bernardino County Regional Greenhouse Gas Reduction Plan". San Bernardino County Council of Governments (March 2021). Archived August 21, 2025. https://web.archive.org/web/20250821211612/https://www.gosbcta.com/wp-content/uploads/2019/09/San_Bernardino_Regional_GHG_Reduction_Plan_Main_Text_Mar_2021.pdf

[24] WRCOG SBC Vulnerability Assessment (2022)

4.3.2 Cyberattack

Description: A cyberattack is an intentional and malicious crime that compromises the digital infrastructure of a person or organization, often for financial or terror-related reasons. Such attacks vary in nature and are perpetrated using software, backdoors, or social engineering to target human operators. Attacks generally last from minutes to a few days, but large-scale events and their impacts can last much longer. As information technology continues to grow in capability and interconnectivity, cyberattacks become increasingly frequent and destructive. The impacts of cyberattacks differ by motive, attack type, and perpetrator profile.

Types of cyberattacks include using viruses to erase operating systems and/or data, breaking into systems and altering files, using someone's personal computer to attack other computers on the same network, or stealing confidential information. Cyberattacks may also involve security breaches that steal information from organizations such as usernames, passwords, credit card information, and other personal details. The spectrum of risk is limitless, with threats having a wide range of effects on the individual, community, organization, and nation.

Perpetrators typically use some form of social engineering to carry out their attacks. The UC Berkeley's Information Security Office defines "social engineering" as "the art of manipulation used to gain access to information or devices" through "exploiting your trust, respect for authority, or sympathy".[25] Social engineering is often used to target individuals to gain access to systems that require passwords or institutional access, such as a spoofed email address stating they forgot their password.

Since 2013, a type of cyberattack called "cyber-ransom" has become increasingly common against individuals and small- and medium-sized organizations. Cyber-ransom occurs when an individual downloads ransom malware (also known as "ransomware"), often through phishing or drive-by download. The subsequent execution of code results in encryption of all data and personal files stored on the system. The victim then receives a message that demands a fee in cryptocurrency, such as Bitcoin or Ethereum.

History: Cyberattacks on U.S. companies occur daily, though they are not always successful. The quantity and quality of information being hacked, stolen, destroyed, or leaked is progressively becoming a problem for more consumers, government entities, and businesses. In the State of California, the Attorney General maintains a list of data security breaches from organizations that have sent notices of a breach by way of cyberattacks.[26] The range of impacted organizations – from healthcare organizations to banks to public utilities – demonstrates how cyberattacks are a common and important threat for any system connected to the Internet.

Recent examples of cyberattacks on utilities and government within California include:

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[25] "What is Social Engineering?". UC Berkeley, Information Security Office (n.d.). Archived June 17, 2025. https://web.archive.org/web/20250618042745/https://security.berkeley.edu/education-awareness/toolkits/social-engineering

[26] "Security Data Breaches". California Office of the Attorney General (n.d.). Archived July 22, 2025. https://web.archive.org/web/20250722194932/https://oag.ca.gov/privacy/databreach/list

- **April 7, 2023:** The County of San Bernardino's Sheriff's Office reported a security breach that encrypted its systems and reduced operations for over two weeks. A member of the Sheriff's Office clicked on a phished link and downloaded ransomware, disrupting emails and dispatch computers. The ransom cost $1.1 million in cryptocurrency.
- **May 28, 2023:** UC Los Angeles reported a breach within the file transfer system MOVEit. Information from approximately 16 million users was stolen by the CLoP Ransomware Gang, although no actual ransomware was loaded onto its systems.
- **January 15, 2021:** An unidentified hacker gained access to a water treatment plant within the San Francisco Bay Area by taking a username and password from a former employee's TeamViewer account. The hacker deleted programs used to treat drinking water. The problem was identified the following day, and the facility changed passwords and reinstalled programs.

Location: Cyberattacks are not characterized by location. Attacks can originate from any computer to affect any other computer in the world. If a system is connected to the Internet or operating on a wireless frequency, then it is susceptible to exploitation. This includes the District's Supervisory Control and Data Acquisition (SCADA) systems used to manage water and wastewater infrastructure. Cyberattacks do not target a particular section of pipe or facility but the networks used in managing them.

Targets of cyberattacks can be individual computers, networks, organizations, business sectors, or governments. Financial institutions and retailers are often targeted to extract personal and financial data that can be used to steal money from individuals and banks. The most commonly targeted sectors are finance, energy and utilities, defense and aerospace, communications, retail, and health care.

Extent: All critical facilities and infrastructure, such as water and wastewater systems operated by electricity and/or a computer system, are vulnerable to cyberattacks. Cyberattacks are systemic and are not reliant on particular computers so long as they are connected to the Internet or Intranet and have control capabilities. For instance, a cyberattack may cripple the electronic system that controls a cooling system or pressure system within critical infrastructure.

The District's SCADA systems and financial, human resources, and administrative systems are vulnerable to cyberattacks. This scenario may result in physical damage to the structure from components overheating or an explosion if pressure relief systems are rendered inoperable.

Types of cyberattacks include:

- **Socially Engineered Trojans:** Programs designed to mimic legitimate processes (e.g., updating software, running fake antivirus software) with the end goal of system infection. When the victim runs the fake process, the Trojan is installed on the system. It then installs or runs malicious software without the victim knowing.
- **Unpatched Software:** Nearly all software has weak points that may be exploited by malware. The most common software exploitations occur with Java, Adobe Reader, and

Adobe Flash. These vulnerabilities are often exploited as small amounts of malicious code often downloaded via drive-by download.

- **Phishing:** Phishing involves malicious actors sending email messages that ask users to click a link or download a program. Phishing attacks may appear as legitimate emails from trusted third parties. They may also spoof the names or positions of District staff and/or leadership. Phishing is often used to trick victims into downloading malware.
- **Password Attacks:** A malicious actor uses a program to crack a user's password and subsequently gain access to a system. Password attacks do not typically require malware but rather stem from software applications on the attacker's system. These applications may use a variety of methods to gain access, including generating large numbers of generated guesses, or dictionary attacks, in which passwords are systematically tested against all the words in a dictionary or the list of the 1,000 most common passwords.
- **Drive-by Downloads:** Malware is downloaded unknowingly by the victims when they visit an infected site or run a browser-based program. Accessing the site or interacting with the webpage causes a download to automatically occur, or the weblink itself attaches to a file.
- **Direct Denial of Service (DDoS) Attacks:** Attacks that focus on disrupting service to a network in which attackers send high volumes of data until the network becomes overloaded and can no longer function.
- **Man-in-the-Middle:** Man-in-the-Middle attacks mirror victims and endpoints for online information exchange. In this type of attack, the attacker communicates with the victims, who believe they are interacting with a legitimate endpoint website. The attacker is also communicating with the actual endpoint website by impersonating the victim. As the process goes through, the attacker obtains entered and received information from both the victim and endpoint.
- **Malvertising:** Malware downloaded to a system when the victim clicks on an affected ad that launches a program.
- **Advanced Persistent Threat (APT):** An attack in which the attacker gains access to a network and remains undetected. APT attacks are designed to steal data.

The District's 2025 RRA includes a cybersecurity survey. This document (Not For Public Release) addresses the District's vulnerability to cyberattacks. More information on how the assessment is conducted is available from the Environmental Protection Agency[27].

Impact of Climate Change: Cyberattacks have no direct correlation with climate change. Indirectly, the impacts of cyberattacks that shut down major resources can exacerbate any simultaneously occurring hazards that are associated with climate change (e.g., hacking the District's SCADA systems during a severe drought).

[27] Accessible here (as of September 27, 2025): https://www.epa.gov/waterresilience/cybersecurity-assessments

Regulatory Context: Cybersecurity threats concerning drinking water systems are addressed primarily through the 2018 America's Water Infrastructure Act (AWIA) and Section 1433 of the Safe Drinking Water Act (SDWA). Under these laws, community water systems that serve over 3,300 people (such as the District) are required to conduct RRAs and develop Emergency Response Plans (ERPs) then certify their completion. These organizations must also review the RRA and ERP every five years, revise if needed, and complete the same certification step. SDWA Section 1433 also provides the EPA with the ability to provide guidance and technical assistance to community water systems that serve 3,300 persons and under on how to conduct RRAs and ERPs despite not being required to do so.

Local, State, and Federal agencies have steadily increased the legal enforcement of cybersecurity practices within critical infrastructure. In May 2025, the EPA issued an Enforcement Alert in which EPA would increase enforcement activities to "ensure drinking water systems address cybersecurity threats" pursuant to AWIA/SDWA Section 1433. The 2025 Enforcement Alert acknowledged that "over 70 percent of the systems inspected by EPA since September 2023 are in violation of [SDWA Section 1433] requirements" concerning RRAs and ERPs along with "alarming cybersecurity vulnerabilities". Examples included failure to change default passwords, non-unique credentials used by staff to login to systems, and lack of access removal from former employees.[28]

Developmental Trends: As stated in the "Description" and "History" sections, cybersecurity incidents are increasing in frequency and severity. On November 13, 2024, an internal memo issued by the EPA's Office of the Inspector General stated that 9 percent of over 1,000 public drinking water systems assessed by the EPA had "critical" or "high" risk vulnerabilities to cyberattacks. 21 percent had "medium" or "low" risk vulnerabilities, though the memo stresses that "low risk" does not imply "no risk".[29] Other agencies have likewise been concerned that state-sponsored cyberattack groups such as Volt Typhoon have positioned themselves within critical infrastructure and utilities with the ability to disrupt them should tensions between countries escalate.[30]

Land use changes within the service area are unlikely to increase the risk of cyberattacks or other incidents. Cyberattacks are based on vulnerabilities within technology and staff's resistance to social engineering tactics. Risk is not based on zoning, parcels, lots, or land ownership. Updates to the District's SCADA system or other industrial control methods may close the loopholes that allow perpetrators the ability to attack.

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[28] "Enforcement Alert: Drinking Water Systems to Address Cybersecurity Vulnerabilities". US EPA (May 2024). Archived September 21, 2025. https://web.archive.org/web/20250921185907/https://www.epa.gov/enforcement/enforcement-alert-drinking-water-systems-address-cybersecurity-vulnerabilities

[29] "'Critical' cyber vulnerabilities found in many water utilities, warns EPA inspector general". US EPA (November 18, 2024). Archived July 29, 2025. https://web.archive.org/web/2/https://statescoop.com/epa-critical-cybersecurity-vulnerabilities-water-utilities-2024/

[30] McGuane, R. "White House Issues Dire Warning Regarding Drinking Water Supply and Wastewater System Cyberattacks". California Water Views (April 1, 2024). Archived April 23, 2025. https://web.archive.org/web/20250424012518/https://www.californiawaterviews.com/white-house-issues-dire-warning-regarding-drinking-water-supply-and-wastewater-system-cyberattacks

Probability of Future Events and Magnitude: While there is little evidence to confirm the exact likelihood of a cyberattack against the District, there is nearly 100 percent certainty that cyberattacks will continue to impact the utilities sector. As discussed earlier, many governmental and non-governmental organizations within the State of California have been victims of cyberattacks that either shut down resources or cause millions of dollars in cyber-ransom payouts.

An initial attack is often followed by more severe attacks to cause harm or steal data. As cyberattacks become more sophisticated and numerous, all of the District's digital infrastructure is at risk. The magnitude of any individual cyberattack depends on the aims and goals of the attacking entity.

4.3.3 Dam Failure & Inundation

Description: The term "dam failure" encompasses a wide variety of circumstances, from high flow/overtopping to a partial or catastrophic collapse of the entire dam. Potential causes of dam failure are numerous and can be attributed to deficiencies in the original design of the dam, the quality of construction, the maintenance of the dam, the operation of the appurtenances while the dam is in operation, and acts of nature. The last category includes precipitation in excess of design, damage from major flooding events, and damage from earthquakes.

Dam failures can occur through several mechanisms. Acts of nature that impact the foundation or siting of a dam can cause structural failures, as with earthquakes or major landslides. Water overtopping the dam crest is a common cause of failure in earthen and embankment dams. Overtopping causes erosion of the dam crest and (if unchecked) eventual dam breach.[31]

Piping is another common form of failure. Piping is a form of internal erosion where water seeps through the soils and slowly carries away soil particles. This creates a cavity through the foundation, embankment, or other earthen structure, allowing more water to flow. Piping can be exacerbated by rodent burrowing and extensive root systems from vegetation growing on and around the dam.

Dam failures and inundation events are especially dangerous because they can occur suddenly, providing little warning or evacuation time for the downstream communities. The flows resulting from dam failure generally are much larger than the conveyance capacity of the downstream channels and therefore lead to extensive flooding. Flood damage occurs due to the momentum of the flood caused by the sediment-laden water flooding over the channel banks and debris within the flow hitting structures.

History: The District has not experienced a dam failure or inundation event. However, dams within California have failed or had the potential to fail within the past 100 years. Major incidents include:

[31] "Causes and Types of Dam Failures". USACE, Hydrologic Engineering Center (n.d.). Archived October 24, 2025. https://web.archive.org/web/20251024202728/https://www.hec.usace.army.mil/confluence/rasdocs/ras1dtechref/6.5/performing-a-dam-break-study-with-hec-ras/estimating-dam-breach-parameters/causes-and-types-of-dam-failures

- **March 12, 1928:** The St. Francis Dam catastrophically failed, and the resulting flood caused approximately 400 fatalities. The collapse is considered one of the worst American civil engineering disasters of the 20th century and remains the second-greatest loss of life due to a disaster in Californian history, natural or technological.[32]
- **December 14, 1963:** The Baldwin Hills Dam inundated the neighborhood of South Los Angeles when the dam suffered a catastrophic failure and flooded the surrounding residential neighborhoods. It began with signs of lining failure followed by increasingly serious leakage through the east abutment. After three hours, the dam breached, with a total release of 250 million U.S. gallons resulting in five deaths and the destruction of 277 homes.[33]
- **February 9, 1971:** The 1971 San Fernando earthquake in metropolitan Los Angeles County was one of the most devastating earthquakes in California history. With a magnitude of 6.6, it claimed 65 lives and caused over $500 million in damages. It was California's third-worst earthquake in terms of lives lost, only exceeded by San Francisco (1906) and Long Beach (1933) events. The 1,100-foot Lower Van Norman Dam nearly collapsed, with the reservoir's half-full status saving downstream residences from inundation. The top 30 feet of the dam crumbled, leaving six feet between the water and the remaining structure. A UC Los Angeles study estimated that the collapse of the dam could have killed between 71,600 and 123,400 people.[34]
- **February 7, 2017:** Heavy rainfall during the 2017 California floods damaged the main Oroville Dam spillway, resulting in DWR closing the spillway to assess damage. However, the reservoir level continued to rise and flowed over the emergency spillway, even after the damaged main spillway was reopened. Water flowing over the emergency spillway caused headward erosion threatening to undermine and collapse the concrete weir, which would have flooded communities downstream of the dam along the Feather River. No collapse occurred, but more than 180,000 people were evacuated.[35]

Location: The District's southern service area faces potential inundation from the failure of the Seven Oaks Dam (NID CA01530), which impounds the Santa Ana River to create the Seven Oaks Reservoir. The Seven Oaks Dam is operated and maintained by the Orange County Flood Control District, San Bernardino County Flood Control District, and Riverside Flood Control and Water Conservation District. It is an ungated dam used for flood control along the Santa Ana River and was developed following a series of high-impact floods within Los Angeles, Orange, and San

[32] "Case Study – St. Francis Dam (California, 1928)". Association of State Dam Safety Officials, Lessons Learned (n.d.). Archived July 7, 2025. https://web.archive.org/web/20250707150845/https://damfailures.org/case-study/st-francis-dam-california-1928
[33] "Case Study – Baldwin Hills Dam (California, 1963)". Association of State Dam Safety Officials, Lessons Learned (n.d.). Archived July 7, 2025. https://web.archive.org/web/2/https://damfailures.org/case-study/baldwin-hills-dam-california-1963
[34] Reich, K. "'71 Valley Quake a Brush with Catastrophe". Los Angeles Times (February 4, 1996). Archived April 21, 2025. https://web.archive.org/web/20250421123335/https://www.latimes.com/archives/la-xpm-1996-02-04-mn-32287-story.html
[35] "Case Study – Oroville Dam (California, 2017)". Association of State Dam Safety Officials, Lessons Learned (n.d.). Archived July 7, 2025. https://web.archive.org/web/2/https://damfailures.org/case-study/oroville-dam-california-2017

Bernardino Counties. It operates in conjunction with the Prado Dam, which also has a flood control purpose.

The Seven Oaks Dam is an earthen embankment dam located east of the City of Highland's downtown in the foothills of the San Bernardino Mountains. Construction began in 1993 and the dam opened in 2000. It is currently owned by the County of San Bernardino Department of Public Works. The dam is approximately 3 miles east of the District Headquarters. It is 2,980 feet long and 550 feet high with a dam capacity of 145,600 acre-feet. Downstream areas include the Cities of Highland, San Bernardino, and Riverside, as well as unincorporated communities along the river. **Figure 4-3** provides the location of the dam.

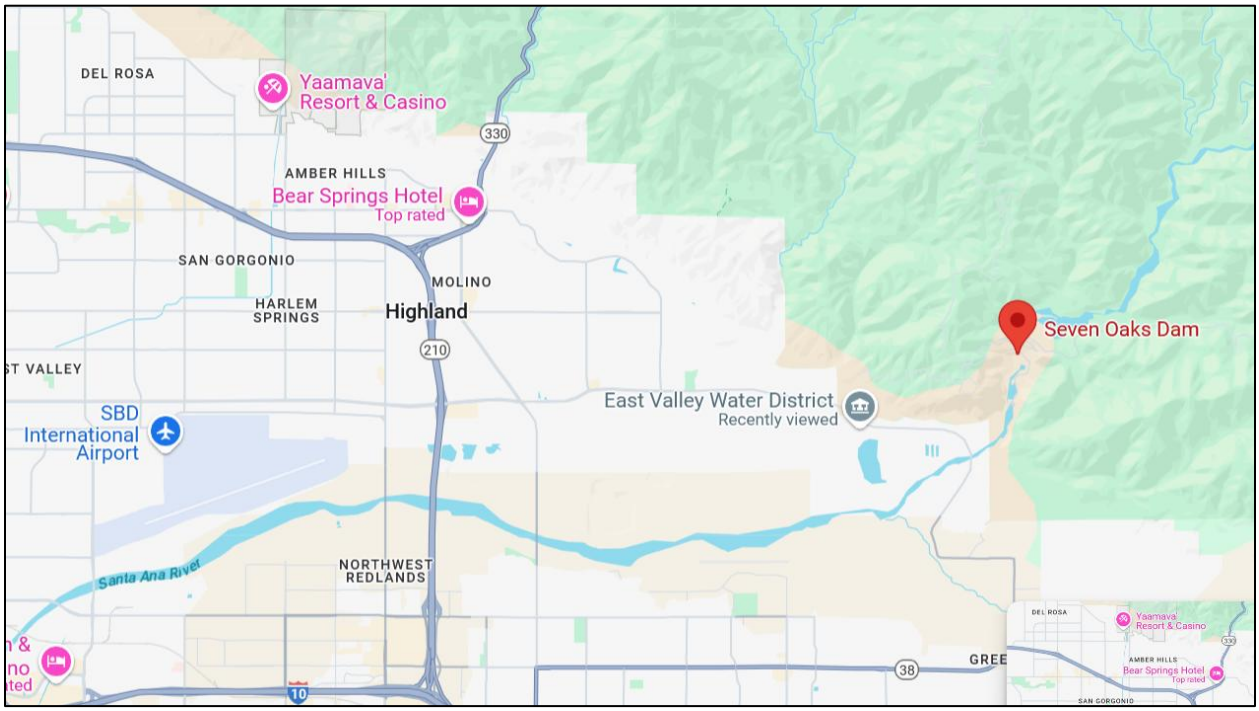

Figure 4-3: Location of the Seven Oaks Dam

Figure 4-4 on the next page shows the complete inundation area according to the dam inundation maps published by the State of California's Division of Safety of Dams (DSoD). According to a "fair weather" failure scenario that assumes no additional flooding due to severe storms, the floodwaters would reach District infrastructure between 12- and 30-minutes following dam failure. **Appendix F** shows the inundation map overlaid with District boundaries.

Figure 4-4: Complete Inundation Map of the Seven Oaks Dam

Extent: The Dam Safety Action Classification (DSAC) is a classification system used to categorize the safety level of dams. **Table 4-10** provides a copy of Dam Safety Action Classes.

Table 4-10: DSAC Ratings

Dam Safety Action Class (DSAC)			Characteristics
I		**Urgent and Compelling** (Unsafe)	Critically near failure or extreme high risk
II		**Urgent** (Unsafe or Potentially Unsafe)	Failure initiation foreseen or very high risk.
III		**High Priority** (Conditionally Unsafe)	Significantly inadequate or moderate to high risk.
IV		**Priority** (Marginally Safe)	Inadequate with low risk.
V		**Normal** (Adequately Safe)	Residual risk considered tolerable.

Each of the DSAC ratings are defined below. This text comes from the Federal Energy Regulatory Commission's March 2016 report on Risk-Informed Decision Making Guidelines:[36]

- **DSAC Class I (Urgent and Compelling):** Dams where progression toward failure is confirmed to be taking place under normal operations, and the dam is almost certain to fail under normal operations within a time frame from immediately to within a few years without intervention; or the combination of life or economic consequences with probability of failure is extremely high.
- **DSAC Class II (Urgent):** Dams where failure could begin during normal operations or be initiated as the consequence of an event. The likelihood of failure from one of these occurrences, prior to remediation, is too high to assure public safety, or the combination of life or economic consequences with probability of failure is very high.
- **DSAC Class III (High Priority):** Dams that have issues where the dam is significantly inadequate, or the combination of life, economic or environmental consequences with probability of failure is moderate to high.
- **DSAC Class IV (Priority):** Dams that are inadequate with low risk such that the combination of life, economic or environmental consequences with a probability of failure is low, and the dam may not meet all essential USACE engineering guidelines.
- **DSAC Class V (Normal):** Dams considered adequately safe, meeting all essential agency guidelines, and the residual risk is considered tolerable.

Per a 2014 review by the US Army Corps of Engineers (USACE), the Seven Oaks Dam is in "Satisfactory" condition and conforms to Class V (Normal).[37]

In 2004, FEMA developed the Hazard Potential Classification for Dams.[38] According to this framework, dams are classified "according to the potential impact a dam failure (breach) or misoperation (unscheduled release) would have on upstream and/or downstream areas or at locations remote from the dam". The three classifications are:

- **Low Hazard Potential:** Dams assigned the low hazard potential are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- **Significant Hazard Potential:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

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[36] "Risk-Informed Decision Making Guidelines: Chapter 4 – Risk Management". Federal Energy Regulatory Commission (March 2016). Archived April 20, 2025. https://web.archive.org/web/20250420065910/https://www.ferc.gov/sites/default/files/2020-04/chapter-4.pdf

[37] "Seven Oaks Dam: Updated Water Control Manual". US Army Corps of Engineers, Los Angeles District (May 2014). Archived on June 16, 2024. https://web.archive.org/web/2/https://www.spl.usace.army.mil/Portals/17/docs/publicnotices/Draft%20Public%20Review%20WQS%20SEA%20w%20IS_MAY%202014.pdf#:~:text=elevation%20was%202%2C322%20feet%2C%20and%20found%20no,storage%20at%20the%20start%20of%20every%20storm

[38] "Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams". FEMA (April 2004). Archived on July 1, 2025. web.archive.org/web/2/https://www.ferc.gov/sites/default/files/2020-04/fema-333.pdf

- **High Hazard Potential:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

The Seven Oaks Dam is listed as a "high hazard" dam according to FEMA's downstream hazard potential. DSoD appends FEMA's classification with the "extremely high hazard" category – which is defined as dams whose downstream impacts are "expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more".

Regulatory Context: Dams and reservoirs are defined within the California Water Code Sections 6000 through 6008. There are currently more than 1,400 dams of "jurisdictional size" in the State of California – including those managed by the federal government. Approximately 1,250 non-federal dams are regulated by DWR under the Division of Safety of Dams (DSoD). Applicable statutes are contained in Parts 1 and 2 of Division 3, Dams and Reservoirs, California Water Code.

Federal dams are regulated by the agency that owns and operates them. *Federal Guidelines for Dam Safety, Emergency Action Planning for Dams, FEMA 64* provides guidelines for developing EAPs for all dams except those producing hydroelectric power. Dams owned by the federal government are not subject to State jurisdiction except as otherwise provided by federal law. As of July 2025, there are 149 dams owned by federal government agencies including the US Forest Service, Bureau of Reclamation, USACE, and branches of the US military.

On June 27, 2017, California Senate Bill 92 required EAPs for all dams that do not have a low downstream hazard potential. Senate Bill 854 amended California Water Code section 6161 on June 27, 2018, to clarify requirements for dams with an EAP as of March 1, 2017.

Developmental Trends: There are currently no plans to retrofit, build upon, or change any of the Seven Oak Dam's infrastructure or operations. No faults in the dam's infrastructure or operations have been noted in any past or recent assessments. There are no plans to build other dams along the Santa Ana River or any of its tributaries within or near the service area.

In 2011, the outlet works of the Seven Oaks Dam were subjected to hydraulic testing by USACE. The program tested that the outlet works were capable of discharging flows up to 6,200 cubic feet per second. No modifications were made to the dam during or after the test.

Impact of Climate Change: Many US dams were built decades ago and are unsuited to a warmer world with stronger storms.[39] The Oroville Dam incident in 2017 was a result of mountain runoff into the reservoir after heavy snowmelt. A post-incident study found that an increase in early-season Sierra Nevada runoff contributed to the dam's high-water levels. This early season runoff can be attributed to human-caused warming. In addition to short-duration extreme precipitation,

[39] Fountain, H. "'Expect More': Climate Change Raises Risk of Dam Failures." New York Times (May 21, 2020). Archived June 19, 2025. https://web.archive.org/web/20250619175814/https://www.nytimes.com/2020/05/21/climate/dam-failure-michigan-climate-change.html/

rainfall of longer duration but less intensity may increase this risk.[40] However, existing control and monitoring measures continue to place this scenario as an unlikely hazard, and climate change is not expected to change the less-than-one-percent annual probability of occurrence.

Fair-weather dam failures are strongly associated with seismic shaking due to earthquakes. This hazard is not associated with climate change.

Probability of Future Events and Magnitude: Dam failure can result from numerous natural or human activities. Earthquakes, internal erosion, improper siting, structural and design flaws, and rising floodwaters can all lead to dam failure and inundation events. A dam failure may also be a result of the age of the structure or inadequate spillway capacity. The probability of a future dam failure affecting the District is unknown but considered highly unlikely given the significant rarity of earthen embankment dam failures. Additionally, no deficiencies in the dam's appurtenances or operations have been identified by USACE. This LHMP therefore places a probability of failure under 0.1 percent chance annually.

The magnitude of potential dam failure depends on the amount of water stored and the condition of the dam upon failure. For high hazard dams that create reservoirs primarily for flood control, any failure would be catastrophic due to these reservoirs usually being partially or completely full.

While still possible, it is unlikely that a dam failure event at the Seven Oaks Dam will occur within the next ten years. According to Orange County Public Works, the dam was designed to resist an earthquake up to moment magnitude 8.0. However, serious seismic shaking could still weaken its foundations and siting, increasing the potential for future failures in the absence of retrofit.

4.3.4 Drought

Description: Droughts are defined as long-term shortages in water – including precipitation and groundwater recharge – that exist for at least one season. Drought cycles are a normal part of virtually every climate on the planet, including areas of high and low rainfall.

Contrary to popular belief, drought is different from the baseline aridity of a location, which is a permanent characteristic of low rainfall within certain climates such as the Mojave Desert and the Great Basin. Instead, drought is a decline in the expected precipitation over an extended period of time, typically one or more seasons in length. The severity of drought can be aggravated by other climatic factors that reduce water retention and groundwater recharge, such as prolonged high winds, low relative humidity, and an increase in impermeable surfaces that cause runoff (e.g., sidewalks and roads).

Drought is a complex natural hazard. The University of Nebraska's National Drought Mitigation Center defines drought through four different subcategories:[41]

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[40] Ibid.

[41] "Types of Drought". University of Nebraska, National Drought Mitigation Center (n.d.). Archived July 29, 2025. https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

- **Meteorological drought:** Defined solely on the degree of dryness, which is expressed as the deficit of precipitation relative to a location's baseline level. This difference is compared to monthly, seasonal, and annual time scales.
- **Hydrological drought:** Defined by how precipitation deficits impact the local water supply and its ability to recharge. Hydrological drought measures impacts to stream flows, reservoirs, lake levels, water tables, and groundwater recharge. A hydrological drought may lag behind a prolonged meteorological drought if precipitation nominally returns to normal but the groundwater has not yet recharged.
- **Agricultural drought:** Defined by how precipitation deficits, soil water content, reduced groundwater, and other deficiencies impact crops. Like hydrological droughts, agricultural droughts can lag behind a meteorological drought if the type of crop is not immediately impacted.
- **Socioeconomic drought:** Defined by how the other three types of droughts impact the supply and demand of goods and services. For example, a socioeconomic drought might be defined in how fruits, vegetables, grains, and meat availability changes following prolonged drought in the San Joaquin Valley.

A drought's severity depends on numerous factors, including duration, intensity, geographic extent, and regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms. Droughts also pose challenges in terms of comprehensive risk assessments. Given their systemic nature, there exist many secondary impacts such as soil hardening, which can increase floods due to reduced soil permeability. Wildfire risk may also increase as vegetation and deadfall become drier.

Drought differs from other natural hazards in three ways. First, 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. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

Droughts may cause water shortages for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline, and the number and severity of wildfires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment. Droughts can impact groundwater supplies and water collected within reservoirs.

History: Droughts frequently occur in California. Notable droughts in recent history include:

- **1976–1977:** At the time of occurrence, 1977 was the driest year in State history and was only surpassed by the 2020-2022 drought. According to an October 19, 1977, report issued by the Comptroller General of the United States, the drought "did the most damage to California's agriculture, especially the livestock industry" and recognized the inadequacy of current local, federal, and State government response mechanisms to

ameliorate the drought. The severity spurred the US Department of the Interior to develop statistical modeling tools to predict future droughts.[42]

- **1986–1992:** California experienced a 7-year drought from late 1986 through late 1992. The 1988 year was typified by severe drought throughout the United States. The prolonged drought ended following an El Niño weather event that brought heavy rains in the 1992 winter season.[43]
- **2007–2009:** This three-year drought period demonstrates how the severity of drought is determined by a combination of ecological and social/economic factors. Though hydrologically less severe than the droughts of the 1920s, 1976-1977, and 1986-1992, the 2007-2009 drought saw great demands for freshwater and changes in water rights, especially regarding restrictions on the State Water Project.[44]
- **2011–2017:** The 2011 through 2017 drought season was the driest in California's recorded climatic history, though no single year exceeded the intensity of the 1977 drought. Governor Jerry Brown instituted a mandatory 25 percent water restriction on June 2015. The Sacramento and San Joaquin Valley Water Year Indices labeled most of these years "dry" or "critical" within their watersheds, representing substantial ecological and agricultural stress.[45] Groundwater depletion-related subsidence and runoff resulted in widespread flooding and erosion in northern California throughout 2016 when heavy rains in January and February could not be quickly absorbed by the drought-hardened lands, leading to substantial runoff. Hydrological drought persisted in southern California until 2017.[46,47]
- **2020–2022:** These three years are the driest on record in California according to NOAA's National Centers for Environmental Information. The first year of drought coincided with the most destructive wildfire season on record in California, with lightning complex fires such as the CZU Fire and SCU Fire surpassing previous fires in both size and intensity. Lake Oroville receded to 38% of its capacity. The Loch Lomond Reservoir receded to 86 percent of its capacity in July 2022. As with the 2011-2017 drought years, the Sacramento

[42] Report of the Comptroller General of the United States. "California Drought of 1976 and 1977 – Extent, Damage, and Governmental Response". Prepared October 19, 1977. Archived on June 29, 2025. https://web.archive.org/web/20250629101437/https://www.gao.gov/assets/ced-77-137.pdf

[43] Dixon, L., Moore, N., & Pint, E. "Drought Management Policies and Economic Effects in Urban Areas of California, 1987-1992". RAND Corporation (1996). Archived October 13, 2024. https://web.archive.org/web/20241013163756/https://www.rand.org/pubs/monograph_reports/MR813.html

[44] "California's Drought of 2007-2009: An Overview". Department of Water Resources (September 2010). Archived on May 26, 2025. https://web.archive.org/web/20250526051332/https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Resources/California-Drought-of-200709.pdf

[45] "Hydroclimate Report Water Year 2015". California Office of the State Climatologist (Fall 2016). Archived on November 29, 2023. https://web.archive.org/web/20231130045207/https://cwc.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-Data/Climate-summaries/Hydroclimate_Report_2015-ADA-Final.pdf

[46] "California Is No Stranger to Dry Conditions, but the Drought from 2011-2017 Was Exceptional". NOAA, NIDIS (n.d.). Archived on July 8, 2025. https://web.archive.org/web/20250708110047/https://www.drought.gov/california-no-stranger-dry-conditions-drought-2011-2017-was-exceptional

[47] "Water Year 2017: What a Difference a Year Makes". California Department of Water Resources (September 2017). Archived on June 21, 2025. https://web.archive.org/web/2/https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Water-Year-2017---What-a-Difference-a-Year-Makes_ay_19.pdf

and San Joaquin Valley Water Year Indices were “critical” through 2021 and 2022.[48] The drought ended during the 2023 winter season, which resulted in one of the largest-recorded Sierra Nevada snowpacks.

Figure 4-5 depicts periods of drought in California from 2000 to 2025, taken from an article by the Los Angeles Times using data from the US Drought Monitor.[49] The colors used correspond to the NIDIS Drought Classification scheme depicted in **Table 4-12** within the “Extent” subsection.

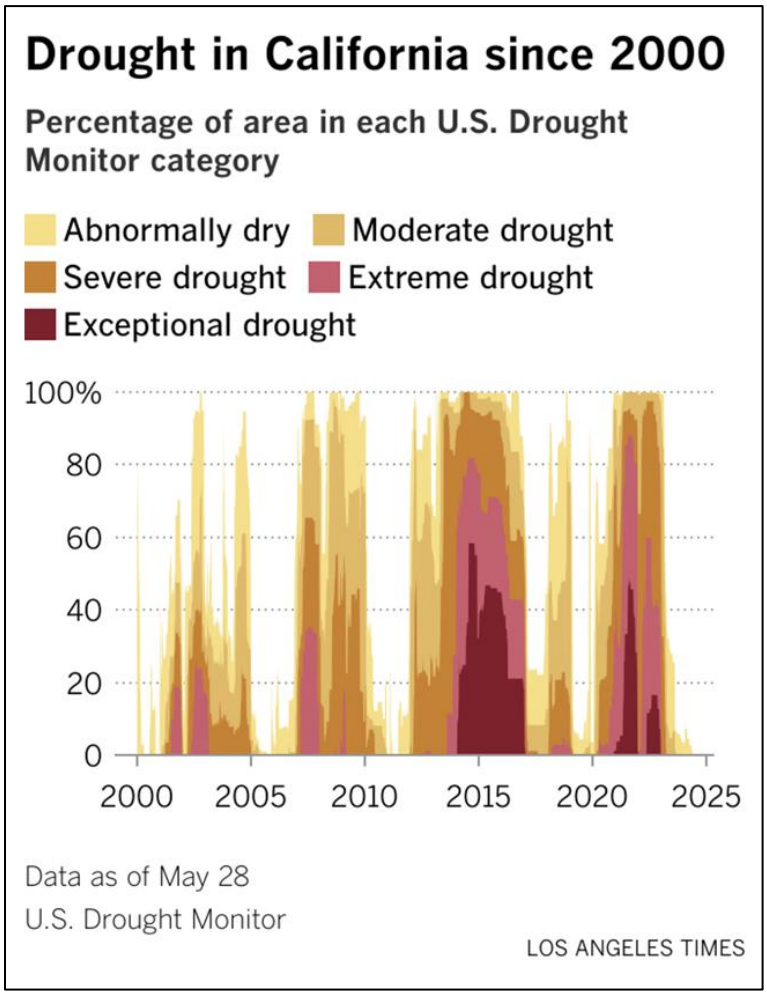

Figure 4-5: Periods of Drought in California from 2000 to 2025

[48] “Sacramento-San Joaquin Delta Watershed Drought & Curtailments 2021-2023”. State Water Resources Control Board (n.d.). Archived on July 11, 2025. https://web.archive.org/web/20250711154725/https://www.waterboards.ca.gov/drought/delta/

[49] Smith, H. “Nearly all of California exits the worst drought categories in U.S. Drought Monitor”. Los Angeles Times (January 12, 2023). Archived on February 10, 2025. https://web.archive.org/web/20250210000201/https://www.latimes.com/california/story/2023-01-12/most-of-california-exits-worst-drought-categories

Figure 4-6 shows the Palmer Drought Severity Indices for the South Coast Drainage division, which includes the entirety of the service area. Data is from January 1, 2005, through January 4, 2025. This chart is sourced from NOAA's National Centers for Environmental Information.[50]

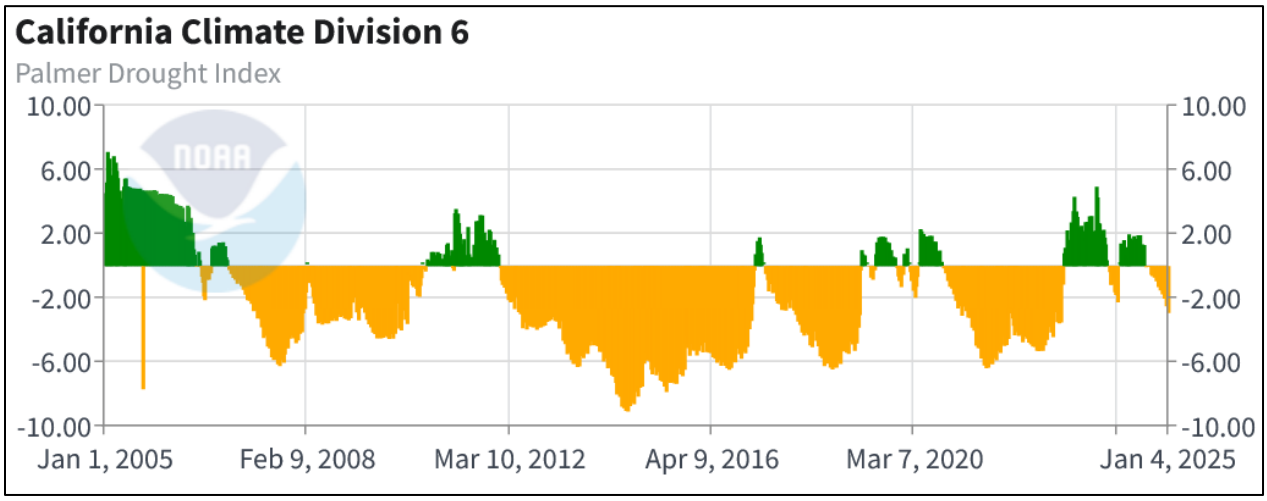

Figure 4-6: Palmer Drought Severity Indices for the South Coastal Drainage Division

Figures 4-7 through 4-9 (starting on the next page) show the state of drought in California in mid-May through the years 2025, 2020, and 2015.

[50] "Climate at a Glance – Divisional Time Series". NOAA, National Centers for Environmental Information (n.d.). Archived February 28, 2025. https://web.archive.org/web/20250228071550/https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series/0406/pcp/12/12/1950-2021

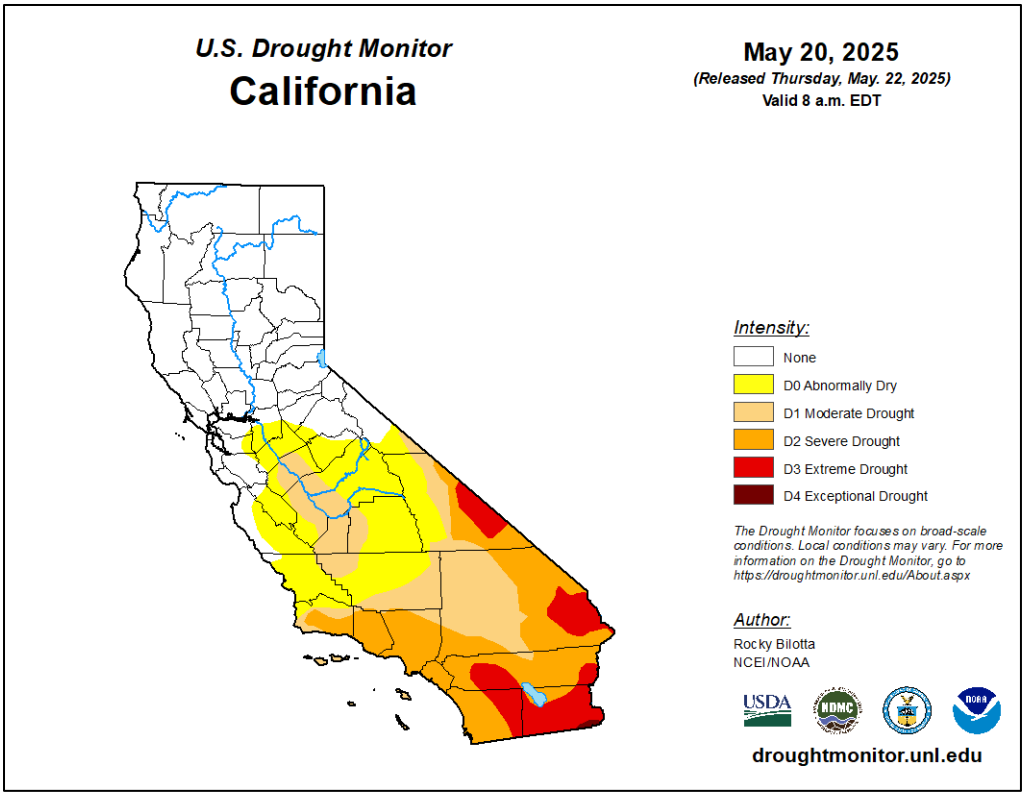

Figure 4-7: Drought in California on May 20, 2025

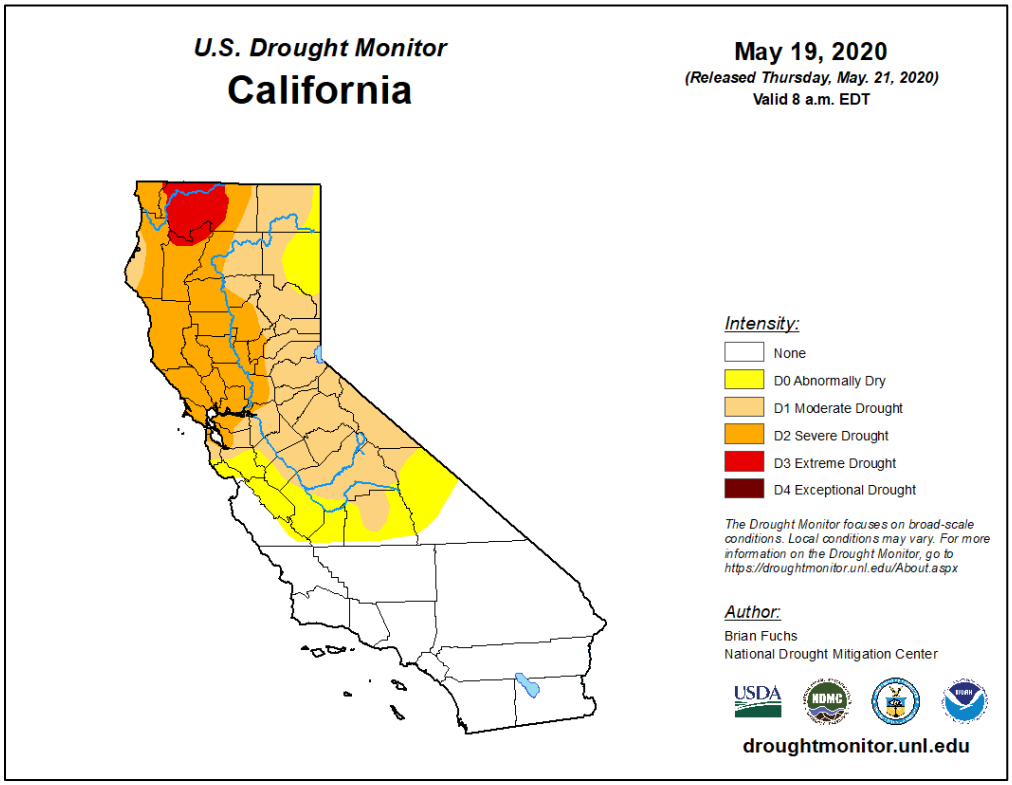

Figure 4-8: Drought in California on May 19, 2020

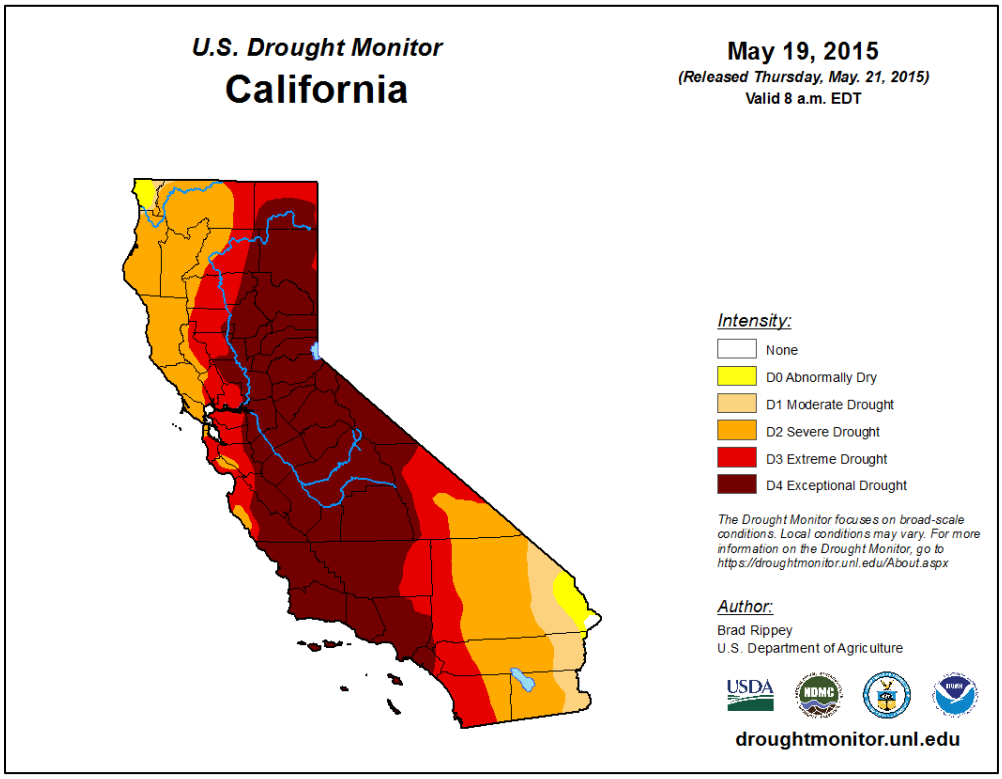

Figure 4-9: Drought in California on May 19, 2015

Location: By definition, droughts are regional events. Given the District's size, droughts are highly unlikely to disproportionately impact one part of the service area over another.

Extent: The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning.[51] The NIDIS maintains the U.S. Drought Portal,[52] a centralized, web-based access point to several drought-related resources, including the US Drought Monitor and the US Seasonal Drought Outlook.

The primary indicators for maps used by either agency are the Palmer Hydrologic Drought Index and the 60-month Palmer Z-index. Both indices are combined within the Palmer Drought Severity Index (PDSI), a commonly used statistic that measures the severity of drought from the perspective of agricultural and water resource management. It is calculated on a scale from negative 10.0 to positive 10.0 according to observed temperature and precipitation values. The PDSI then estimates soil moisture and standardizes the final statistic according to water demand curves. The PDSI is primarily used by NOAA and is calculated on a weekly basis. **Table 4-11** describes the PDSI and includes NOAA's color-coding.

[51] "The National Integrated Drought Information System Implementation Plan – December 2016 Update". NOAA, NIDIS (December 2016). Archived on April 11, 2025. https://www.drought.gov/sites/default/files/2020-06/Implementation-Plan-December-2016-Update.pdf
[52] Acccessible here (as of August 22, 2025): https://www.drought.gov/drought/

Table 4-11: PDSI Statistic Description	
PDSI Value	**Description**
4.0 and above	Extremely moist
3.0 to 3.99	Very moist
2.0 to 2.99	Moderately moist
1.0 to 1.99	Slightly moist
0.99 to -0.99	Mid-range and “incipient wet/dry spell”
-1.0 to -1.99	Slight drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 and below	Extreme drought

NIDIS uses a five-point scale to define drought that ranges from D0 through D4 and is color-coded from yellow to maroon. Federal and State-level agencies use the NIDIS scale when defining drought risk and severity. The NIDIS scale is considered more generalizable and easier to interpret than the PDSI. The scale is described in **Table 4-12** below alongside its approximate correspondence to the PDSI and US Geological Survey (USGS) Weekly Streamflow percentiles.

Table 4-12: NIDIS Drought Classifications				
Category	**Description**	**Impacts**	**PDSI**	**USGS Weekly Streamflow (Percentile)**
D0	Abnormally Dry	If going into drought: short-term dryness slowing planning and growth of crops or pastures. If coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9	21 to 30
D1	Moderate Drought	Some damage to crops and pastures. Streams, reservoirs, or wells are low. Some water shortages developing or imminent; voluntary water-use restrictions requested.	-2.0 to -2.9	11 to 20
D2	Severe Drought	Crop or pasture losses are likely. Water shortages are common, and water restrictions are imposed.	-3.0 to -3.9	6 to 10
D3	Extreme Drought	Major crop and pasture losses. Widespread water shortages and/or restrictions.	-4.0 to -4.9	3 to 5
D4	Exceptional Drought	Exceptional and widespread crop and pasture losses. Shortages of waters in reservoir, streams, and wells that lead to water emergencies.	-5.0 and under	0 to 2

Beginning in December 2024, NIDIS proclaimed all of the County of San Bernardino in D0 or higher drought following “extreme record or near-record dryness” since the start of the 2024-2025 water year.[53] Drought is anticipated to persist throughout all of the County of San Bernardino and extend northward through the San Joaquin Valley and Sierra Nevada. As of July 10, 2025, approximately 49 percent of the County is in D1, 47 percent in D2, and 4 percent in D3. The service area is in D2 as of August 2025.[54]

Potable water operations are highly vulnerable to shortages during prolonged droughts. Indirect impacts of drought include greater wear and tear on infrastructure and treatment facilities, as well as diminished water quality due to greater silt concentration. Groundwater reservoirs are less impacted by drought than runoff and above-ground reservoirs; nonetheless, the District’s reliance on the Bunker Hill Basin for over 75 percent of its water supply means prolonged hydrological drought could substantially impact service.

Each water supply agency in the State of California with over 3,000 connections is required to prepare and submit an Urban Water Management Plan, which includes (among other topics) how the agency will respond to drought. The District has access to water from the State Water Project, which allows the District to import water from northern California in extreme need. Northern California’s climate is generally wetter and contains greater snowfall than the naturally more arid Southern California. Additionally, the District has an intertie with the neighboring San Bernardino Valley Municipal Water District.

Drought does not have an explicitly quantifiable impact on solid waste services, other than higher costs for water used in the treatment process. However, wastewater treatment infrastructure may be negatively impacted by drought. Lower water supplies may increase concentration of dissolved solids, thereby reducing effluence and increasing strain.

Regulatory Context: The California Water Code (CWC) Sections 10610-10656 and 10608 require “urban water suppliers” to develop an Urban Water Management Plan (UWMP) every five years. UWMPs are necessary to support “long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs”. UWMPs are required for any supplier that either provides over 3,000 acre-feet of water annually to its customers or serves over 3,000 urban connections. They must include: 1) an assessment of the reliability of water sources over a 20-year timeframe; 2) a description of demand management measures; 3) a water shortage contingency plan; and 4) a discussion of the use/planned use of recycled water.[55]

[53] “Drought Status Update for California-Nevada”. NOAA, NIDIS (January 16, 2025). Archived on July 24, 2025. https://web.archive.org/web/2/https://www.drought.gov/drought-status-updates/drought-status-update-california-nevada-2025-01-16

[54] “Drought Conditions for San Bernardino County”. NOAA, NIDIS (n.d.). Archived on August 22, 2025. https://web.archive.org/web/20250822182615/https://www.drought.gov/states/california/county/san%20bernardino

[55] “Urban Water Management Plans”. California Department of Water Resources (n.d.). Archived on July 22, 2025. https://web.archive.org/web/2/https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans

Furthermore, CWC Section 10635(b) requires a Drought Risk Assessment (DRA) to be developed within each UWMP. Each DRA can be updated outside of the UWMP's five-year update cycle. The DRA evaluates water supply reliability and compares available supplies/projected demands to a five-year drought scenario.

The District has an Integrated Regional UWMP with other agencies that source water from the Upper Santa Ana River Watershed. The UWMP was initially developed in 2020 with San Bernardino Valley Water District as the major partner. 20 agencies are represented by this UWMP. The plan was formally adopted in July 2021.

The 1972 Federal Water Pollution Control Act (also known as the Clean Water Act) provides the legal basis for the protection of inland surface waters, estuaries, and coastal waters. Under the States of California's Porter-Cologne Water Quality Control Act of 1970, the State's Regional Water Quality Control Board is the acting agency for implementing Clean Water Act requirements throughout the total Santa Ana Watershed.

Developmental Trends: As described in Section 3 of this LHMP, the Cities of Highland and San Bernardino are increasing in population at a much greater rate than the County of San Bernardino and State of California at-large. Increased populations and land use will necessitate greater demand on the water supply, thereby putting additional strain on the Bunker Hill Basin (and the District's resources) if and when drought occurs.

Three of the last five years (2020-2025) incurred a D2-D4 drought within the District's service area. At these levels, the District's ability to meet its water supply mission criteria is significantly reduced. Future developments of all land use may be impacted if projected population growth continues to outpace the water supply.

The SNRC will abate some water supply issues. Its treatment capacity of eight million gallons per day will support the District's ability to mitigate the impacts of acute and chronic drought. Given that the SNRC was only recently placed online, there is currently no data to show its impact on water shortages, but the Planning Team believes it will be an important source of groundwater recharge and water independence during this LHMP cycle.

Impact of Climate Change: Higher temperatures and changing weather patterns throughout the state will result in an increasing number of and length of droughts and are likely to affect the District. Annual precipitation has decreased in California during the last century, and it may continue to decrease.

Like many such utilities in California, the District's water supply relies on watersheds that are mostly fed by melting winter snowpacks. The major mountain ranges of southern and eastern California (e.g., San Gorgonio Mountains and Sierra Nevada) are likely to have reduced snowpacks as average temperatures rise and the density of the snowpacks decreases. This decrease will remain a problem even if total precipitation remains the same, as many water and wastewater management systems are calibrated to the winter/spring snowpack melt.

The higher temperatures associated with climate change are also likely to intensify existing drought conditions, especially during the summer and autumn months. Soils are likely to be drier, and periods without rain are likely to become longer, making hydrological drought more severe. Increasing temperatures in the lower atmosphere may also shift extratropical cyclones closer to the poles, which will reduce the probability of atmospheric river events.

However, the relationship between human-caused climate change and droughts remains complex. There are multifaceted and disproportionate influences that climate change has on various weather patterns. According to the Fourth National Climate Assessment, total annual precipitation may increase in other areas of the United States due to increases in evaporation and air moisture content. However, the southwestern United States is less likely to receive this change.[56] Additional impacts on soil quality and aquifer recharge are more straightforward, per the USGS's page on climate change's impact on droughts:

> *Droughts don't just affect water stored in wetlands, lakes, and rivers, but also water below ground stored in aquifers and in the soil. When this groundwater gets used up, the dry ground can act like a sponge, sucking surface water straight in. The surface water-groundwater relationship gets even more complicated with snowpack. If snow melts too early in the year, water can move through the environment too quickly, causing the ground to dry up and become "thirsty" too soon. So even if there is "enough" water, the timing of the water may dictate whether an area is in a drought.*[57]

Probability of Future Events and Magnitude: There is no commonly accepted return period or non-exceedance probability for defining the risk from drought (such as the 100-year or 1 percent annual chance of flood). The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. Drought conditions can be monitored at the NIDIS website.[58]

Per NIDIS, the County of San Bernardino has been in drought conditions for more time than it has been in wet periods over the last 25 years, which is why drought is in the most critical probability category within the CPRI. Given expected influences due to climate change on the State's hydrological systems and development factors, it is expected that droughts will continue to be a salient hazard throughout this LHMP cycle.

The probability of the District experiencing drought is considered virtually guaranteed over the next ten years – especially given that the service area is under a declared drought as of this LHMP's publication date. Per the "probability" definition of the CPRI used in **Table 4-8**, drought is considered "highly likely" with a well-documented history of occurrence.

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[56] Means, T. "Why is it raining so hard? Global warming is delivering heavier downpours". University of Yale, Climate Connections (April 30, 2021). Archived on July 8, 2025. web.archive.org/web/2/https://yaleclimateconnections.org/2021/04/global-warming-is-delivering-heavier-downpours/

[57] "Droughts and Climate Change". USGS (n.d.). Archived on July 11, 2025. https://web.archive.org/web/20250711180205/https://www.usgs.gov/science/science-explorer/climate/droughts-and-climate-change

[58] Accessible here (as of August 22, 2025): https://www.drought.gov/drought/states/

Damages due to droughts will entirely involve the District's infrastructure and water conveyance systems; droughts are extremely unlikely to result in staff illness or death. The severity of droughts will depend on its ability to maintain adequate influence/effluent for wastewater treatment. Service infrastructure may experience greater wear and tear.

4.3.5 Earthquakes and Seismic Events

Description: An earthquake is a sudden motion or trembling caused by a release of energy accumulated within or along the edge of Earth's tectonic plates and faults. When a fault ruptures, seismic waves radiate and cause the ground to vibrate. The severity of the vibration increases as the amount of energy released increases and decreases with distance from the epicenter (i.e., the earthquake's origin). The initial release of energy can range from unfelt by all but the most sensitive instruments to wildly destructive events depending on soil/slope conditions, proximity and type of fault, and earthquake magnitude/depth.

Earthquakes usually occur without warning and can cause massive damage and extensive casualties within minutes. Ground shaking, surface fault ruptures, aftershocks, and soil liquefaction are common primary effects of earthquakes. Secondary effects include landslides, power outages, fires, and dam failures. Together, earthquakes and associated seismic events are likely the greatest threat to the District given its presence within the geologically active southern California region.

Terms used when describing earthquakes and seismic hazards include:

- **Active Fault:** Faults are cracks in the Earth's crust where two tectonic plates join or one is splitting apart. Faults may be active or inactive, and they are often visible as rifts, mountains, and distortions within the Earth's crust. Per the California Geological Survey (CGS), an active fault is one that has experienced surface movement in the past 11,700 years. Inactive faults are not considered hazards within this LHMP.
- **Fault Rupture:** The term "fault rupture" is often used synonymously with "earthquake", though not all earthquakes become fault ruptures. A fault rupture occurs when the Earth's surface shifts, slips, and/or cracks along a fault. Greater movement along the fault generally causes more intense ruptures. As tectonic plates pull away from, move toward, or slip past each other, the tension created by extremely high friction forces is released with sudden movement along faults. The energy is released in waves that spread through the crust, causing the ground shaking felt during earthquakes.
- **Ground Shaking:** Ground shaking is the motion felt on the Earth's surface as seismic waves ripple through it from the epicenter. It is the primary cause of earthquake damage both due to the motion of the ground and the energy that passes through objects. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and the distance from the epicenter.
- **Amplification:** Certain types of rocks can increase the power of ("amplify") the energy imparted into objects from ground shaking. The particles within soils and sedimentary rocks can shift greatly during earthquakes, thereby increasing damage. Buildings built on

poorly consolidated soils, thick soils, and sediment-filled basins face greater risk than buildings the same distance away from the earthquake built on firmer bedrock.

- **Slip:** Slip is defined simply as the distance that a fault moves. A large slip releases a similarly large amount of energy , thereby causing powerful earthquakes. Slip is often measured in centimeters or millimeters.
- **Moment Magnitude:** Moment magnitude (often simply called “magnitude”) is described as the intensity of seismic shaking. It is a function of the amplitude of waves traveling through the Earth’s crust, the rigidity of the fault, and the slip. Since energy travels through the ground in three dimensions as opposed to only on the surface, an earthquake closer to the surface will be more destructive and cover a wider area than one deep underground. Moment magnitude is measured on the Moment Magnitude Scale, defined in the “Extent” section of this hazard.
- **Soil Liquefaction:** Soil liquefaction occurs when ground shaking causes groundwater to mix with soil and sand, completely filling the space between particles and water. As they shake, these saturated soils cause soil and sand to flow past one another like a liquid. The soil then loses its strength, causing spontaneous and destructive settling of any structures on top. Buried structures may be pushed up or float atop the liquefied soil before becoming re-buried once the event stops and the water settles. Soil liquefaction is more common in areas with fine- to medium-grained soils (cf., sand or silt) and the water table is within 50 feet of the ground surface.
- **Earthquake-Induced Landslides:** Landslides are one of the most common secondary effects of earthquakes. These landslides are often quite violent and can destroy roads, buildings, utilities, and critical facilities built near steep slopes.

History: Since the District’s establishment, there have been no major earthquakes in which magnitudes of 7.0 or greater have been felt within the service area. There have also been no instances of fault rupture or soil liquefaction. Minor seismic shaking has been detected from earthquakes elsewhere within the western and southwestern United States, as with the 1992 Landers earthquake (M7.3) and 1992 Big Bear earthquake (M6.3).

A comprehensive list of every earthquake impacting southern California would be outside the scope of this LHMP. **Table 4-13** below lists earthquakes greater than M5.0 that have occurred within Southern California since data was available. Note that data before 1900 is sparse due to the comparative lack of modern monitoring capabilities and loss of Native American knowledge. Earthquakes with notable impacts near the service area are in bold.[59]

[59] “Earthquake Information – Chronological Earthquake Index”. California Institute of Technology, SCEDC (n.d.). Archived April 6, 2025.
https://web.archive.org/web/20250406135610/https://scedc.caltech.edu/earthquake/chronological.html

Table 4-13: Magnitude 5.0 or Greater Earthquakes in the Southern California Region	
Date/Location (Magnitude)	
1769 Los Angeles Basin (6.0)	1946 Walker Pass (6.0)
1800 San Diego Region (6.5)	**1948 Desert Hot Springs (6.0)**
1812 Wrightwood (7.0)	1952 Kern County (7.5)
1812 Santa Barbara Channel (7.0)	1954 Arroyo Salada (6.4)
1827 Los Angeles Region (5.5)	1966 Parkfield (6.0)
1855 Los Angeles Region (6.0)	1968 Borrego Mountain (6.5)
1857 Great Fort Tejon (8.3)	**1970 Lytle Creek (5.2)**
1858 San Bernardino Region (6.0)	1971 San Fernando (6.6)
1862 San Diego Region (6.0)	1973 Point Mugu (5.2)
1881 Parkfield (6.0)	**1975 Galway Lake (5.0)**
1883 Santa Barbara Channel (5.8)	1979 Malibu (5.2)
1890 Northeast San Diego (6.8)	1979 Imperial Valley (6.5)
1892 Laguna Salada (7.3)	1980 White Wash (5.5)
1892 San Jacinto or Elsinore Fault (6.5)	**1986 North Palm Springs (5.6)**
1893 Pico Canyon (5.8)	1986 Oceanside (5.4)
1894 Lytle Creek Region (6.0)	1987 Elmore Ranch/Superstition Hills (6.2/6.6)
1894 East of San Diego (5.8)	1987 Whittier Narrows (5.9)
1899 Cajon Pass (5.7)	1988 Tejon Ranch (5.4)
1899 Lytle Creek Region (5.8)	**1990 Upland (5.4)**
1899 San Jacinto and Hemet (6.4)	1991 Sierra Madre (5.8)
1901 Parkfield (6.4)	**1992 Landers (7.3)**
1906 Imperial Valley (6.5)	**1992 Big Bear (6.3)**
1907 San Bernardino Region (5.3)	**1992 Joshua Tree (6.1)**
1908 Death Valley (6.0)	1993 Wheeler Ridge (5.2)
1910 Glen Ivy Hot Springs (5.5)	1994 Northridge (6.7)
1910 Elsinore (~6.0)	1995 Ridgecrest (5.8)
1915 Imperial Valley (6.3)	**1999 Hector Mine (7.1)**
1916 Tejon Pass Region (5.3)	2003 Big Bear (5.4)
1916 Baker (6.1)	2004 Coronado (5.3)
1918 San Jacinto (6.8)	2005 Anza (5.2)
1923 San Bernardino Region (6.0)	2005 Wheeler Ridge (5.2)
1923 North San Jacinto (6.3)	**2008 Chino Hills (5.4)**
1925 Santa Barbara (6.3)	2009 Northern Baja California (5.8)
1927 Lompoc (7.1)	2010 Sierra El Mayor (7.2)
1933 Long Beach (6.4)	2010 El Centro/Baja, Ca (5.7)
1937 San Jacinto Fault (6.0)	2014 La Habra (5.1)
1940 Imperial Valley (6.9)	2019 Ridgecrest (6.4)
1941 Carpentaria (5.9)	2019 Ridgecrest (7.1)
1941 Santa Barbara (5.5)	2020 Lone Pine (5.8)
1942 Fish Creek Mountains (6.6)	2025 Julian (5.2)

Further information on the above earthquakes may be found at the Southern California Earthquake Data Center (SCEDC), managed by the Southern California Seismic Network.

Additional information is available through USGS and the California Integrated Seismic Network (CISN).

The most recent significant earthquake event that impacted southern California was the 1994 Northridge Earthquake. At 4:31 a.m. on Monday, January 17, 1994, a moderate-intensity (M6.7) but highly damaging earthquake struck the San Fernando Valley. MMI values of IX were felt within Los Angeles County and IV as far away as San Diego. **Figure 4-10** shows the CISN ShakeMap.[60]

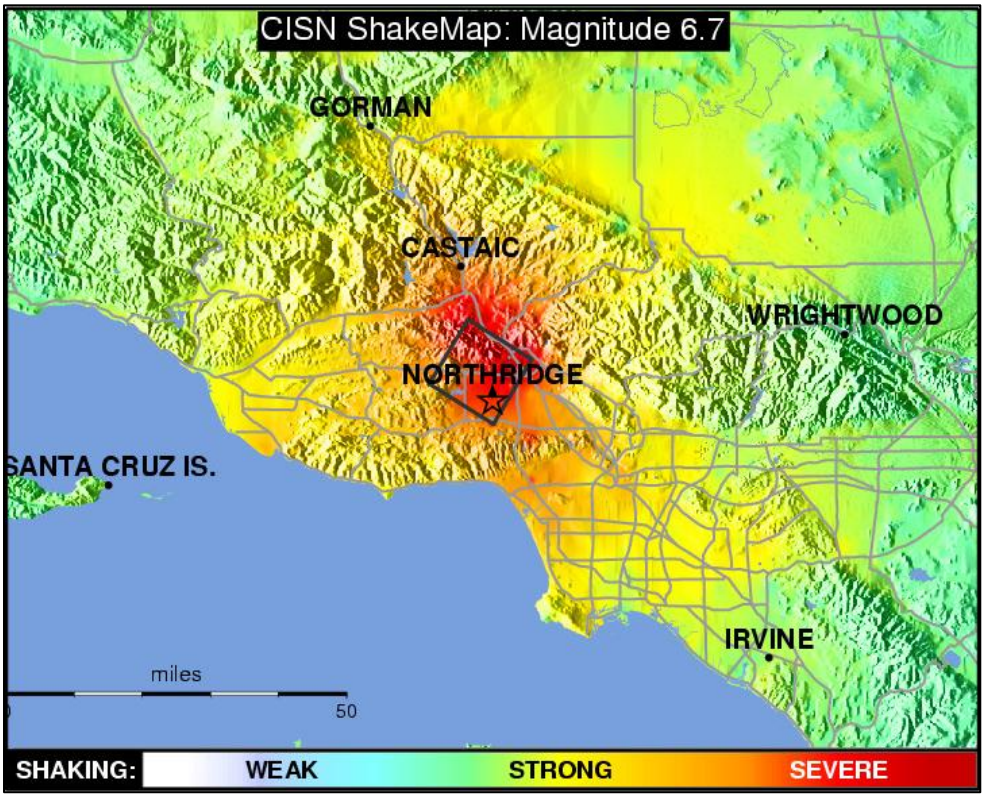

Figure 4-10: CISN ShakeMap of the 1994 Northridge Earthquake

In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures. 57 people were killed and more than 9,000 people were seriously injured. Thousands of homes and businesses were without power for days, tens of thousands had no gas, and nearly 50,000 had little or no water due to damaged lines. Outbreaks of valley fever in Ventura County were attributed to large dust clouds triggered by landslides from seismic shaking.

The extremely strong ground motion felt in sizable portions of Los Angeles County resulted in record economic losses, though the earthquake's occurrence in the early morning on a holiday likely reduced deaths and financial cost. Many collapsed buildings were unoccupied, and most

[60] "1994 M6.7 Northridge, CA Shakemap". USGS, Earthquake Hazards Program (n.d.). Archived on April 5, 2025. https://web.archive.org/web/20250405125120/https://www.usgs.gov/media/images/1994-m67-northridge-ca-shakemap

businesses were not yet open. According to USGS, damages ranged between $13-20 billion, with other estimates being as high as $40 billion in 1994 dollars.[61]

Location: The State of California is highly geologically active as the relatively fast-moving Pacific tectonic plate slips northwest of the North American tectonic plate. While most tectonic plates move at a relative annual speed of 1 centimeter or less, the Pacific plate is moving between 7 and 11 centimeters per year.[62] This causes significantly greater friction forces, resulting in California's massive earthquakes. Much of Southern California is near one of the over 300 faults that crisscross the region. The area at risk to fault rupture is limited to the immediate vicinity of the fault, though ground shaking can extend hundreds of miles from the epicenter.

Figure 4-11 shows a satellite map of faults within the service area (yellow lines) along with District facilities. This image was sourced from the previous LHMP iteration (2020).

Figure 4-11: Fault Zones in the District Service Area

[61] "Significant Earthquake Information". NOAA, National Centers for Environmental Information (n.d.). Archived August 22, 2025. https://web.archive.org/web/20250822192421/https://www.ngdc.noaa.gov/hazel/view/hazards/earthquake/event-more-info/5372

[62] "Plate Tectonics". Pacific Northwest Seismic Network (n.d.). Archived June 29, 2025. https://web.archive.org/web/20250629034838/https://www.pnsn.org/outreach/about-earthquakes/plate-tectonics

Figure 4-12 depicts a map of major fault zones within southern California and northern Mexico.[63] Faults and fault zones within 100 miles of the service area are described within the following paragraphs. Unless otherwise stated, all data is taken from the SCEDC's Fault Name Index and Historical Earthquakes & Significant Faults Map.[64]

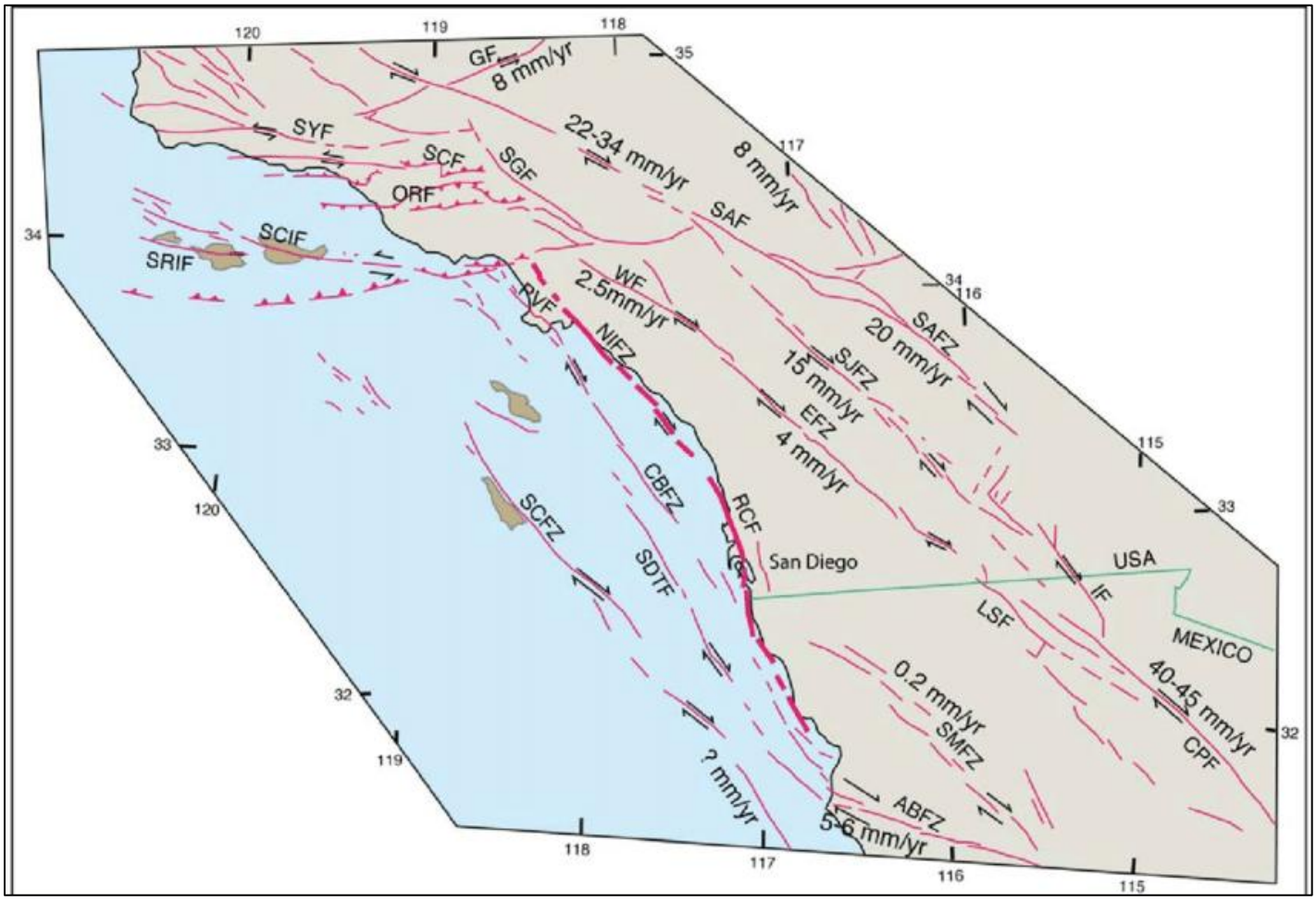

Figure 4-12: Major Fault Zones within Southern California

The **San Andreas Fault Zone (SAFZ)** is the dominant active fault in the southwestern United States. The SAFZ is the main fault boundary between the Pacific and North American plates. It is approximately 650 miles long and extends from Cape Mendocino in northern California to east of the County of San Bernardino. The SAFZ passes through the northeastern end of the service area by way of the San Bernardino Fault.

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[63] Rockwell, T. "The Rose Canyon Fault in San Diego". Fifth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics (May 24-29, 2010). Paper No. 7.06c. https://www.researchgate.net/publication/266912188_The_Rose_Canyon_Fault_in_San_Diego

[64] "Historical Earthquakes & Significant Faults in Southern CA". California Institute of Technology, SCEDC (n.d.). Archived on April 6, 2025. https://web.archive.org/web/20250406182347/https://scedc.caltech.edu/earthquake/significant.html

The SAFZ is characterized by “slip-strike” earthquakes where plates move horizontally past one another as opposed to vertically. The constant friction between these two plates has splintered the southern zone into many smaller fault zones near the Los Angeles Basin.

At least eight major earthquakes of M7.0+ have occurred within the southern SAFZ over the past 1,200 years. This averages to an interval of approximately 150 years per earthquake of M6.8-8.0. The most recent event was the 1857 Fort Tejon event (M7.9). The nearly 170 years since this earthquake encourages the idea that southern California is “overdue” for a major seismic event. However, SCEDC stresses that this interval “varies greatly” along the SAFZ’s hundreds of miles.

The **Elsinore Fault Zones (EFZ)** is located along the borders of San Bernardino, Los Angeles, Orange, and Riverside Counties. The EFZ traces a series of faults east of the Santa Ana Mountains into Mexico for approximately 112 miles. The SCEDC reports the interval between major ruptures is estimated at 250 years with a probable magnitude of M6.5-7.5, making it simultaneously one of the largest and least-active fault zones in the region. To the north, the EFZ splits into two segments: the 25-mile-long Whittier Fault (M6.0-7.2) and the 13-mile Chino Fault (M6.0-7.0). Both faults have an unknown recurrence interval.

The fault zones with the most consistent seismicity along its constituent faults is the **San Jacinto Fault Zone (SJFZ)**, which is located within the Counties of San Bernardino, Riverside, Imperial, and San Diego. Like the SAFZ, it splinters into smaller sub-faults along its 130-mile length. The SJFZ’s recurrence interval is approximately 100 to 300 years for an M6.5-7.6 earthquake, depending on which of its seven segments ruptures. The segment most relevant to this LHMP is the 26-mile San Jacinto segment located to the service area’s immediate southwest within the San Jacinto Valley. The last major earthquake was the 1918 San Jacinto event at M6.9.

The **El Modeno/Peralta Hills Fault** was only recently recognized as a distinct fault splintering off the SAFZ. Both faults are categorized as “blind faults” in which geomorphological distortion (e.g., mountains and cracks in the crust) are not visible. These faults run approximately 12.5 miles within eastern Orange County near Anaheim Falls. No studies have yet been undertaken to determine the fault’s seismicity and activity, though in 2017 USGS simulated an M6.6 scenario[65] in which the service area would experience an MMI of VI+.

Smaller faults and fault zones that threaten the District are scattered throughout the San Bernardino Valley and nearby mountain ranges. Most of these faults do not have established recurrence intervals, were only recently discovered, and/or have high recurrence intervals with relatively low probable magnitudes. These include the Cucamonga Fault Zone (interval: 600-700 years, M6.0-7.0), Sierra Madre Fault Zone (interval: “several thousand years”, M6.0-7.0), and the Crafton Hills Fault Zone (interval: unknown).

[65] “M 6.6 Scenario Earthquake – Peralta Hills”. USGS, Earthquake Hazards Program (May 16, 2017). Archived on August 22,2 2025. https://web.archive.org/web/20250822193225/https://earthquake.usgs.gov/scenarios/eventpage/bssc2014peraltahillsellbgeol_m6p55_se/shakemap/intensity

Considering the location and seismicity of these fault zones (especially the SAFZ and SJFZ), all of the service area is at risk of moderate to extreme ground shaking. Ground shaking can cause structural failures, pipe breakage, building collapses, and power disruption. The District is located within Seismic Design Category E, in which buildings in California Building Code Occupancy Groups I-III are located in areas near major active faults.

Soil liquefaction hazard exists in areas susceptible to ground shaking with sandy, high-silt soils atop shallow groundwater. None of the service area is within any CGS soil liquefaction zones.[66]

Extent: The intensity of seismic shaking is measured using the **Moment Magnitude Scale (MMS)**, which is reported as M_w or simply M. The MMS replaced the well-known Richter Scale. MMS measures the relative amount of energy released during seismic events. The M value is expressed as a decimal number such as "4.4" or "7.8". The scale is logarithmic, and each increase of 1.0 represents 10 times the amplitude and 32 times the energy. The magnitude decreases with distance from the epicenter, so an M6.7 earthquake in an unpopulated area might be felt at a relative M4.3 in the nearest population center. All earthquakes are reported by the moment magnitude at the epicenter.

In contrast, damage caused by an earthquake is assessed by the **Modified Mercalli Intensity Scale (MMI)**. MMI values do not consider ground shaking. Therefore, an earthquake with relatively low moment magnitude can have a higher MMI if it impacts more structures and/or structures not built to earthquake code. MMI values are represented by Roman numerals from I ("Not Felt") to X+ ("Extreme"). **Table 4-14** describes the scale with language provided by USGS.[67]

Table 4-14: Modified Mercalli Intensity Scale

Intensity	Shaking	Description
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on the upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on the upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone, many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

[66] Shapefiles accessible through the CGS Seismic Hazard Program, accessible here (as of August 22, 2025): https://data.ca.gov/dataset/cgs-seismic-hazards-program-liquefaction-zones

[67] "The Modified Mercalli Intensity Scale". USGS, Earthquake Hazards Program (n.d.). Archived July 11, 2025. https://web.archive.org/web/20250711231421/https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale

Table 4-14: Modified Mercalli Intensity Scale		
Intensity	**Shaking**	**Description**
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. Greater damage is progressively assigned values of XI and XII, with XII representing total destruction.

A major earthquake (M7.0+; MMI VIII+) could be catastrophic in impact, exceeding the response capability of County and State partners. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food/water, and temporary shelter would be required for injured or displaced persons. Mass evacuation may be essential to save lives in areas threatened by secondary effects.

Emergency operations could be seriously hampered by the loss of communications; damage to transportation routes within, to, and out of the disaster area; and by the disruption of public utilities and services. Significant public health concerns (e.g., exposure to contaminated water) may arise due to a lack of adequate water infrastructure. Extensive mutual aid may be required to bring water and wastewater services back online.

While historical earthquakes had limited damage because they occurred in areas that were sparsely populated, the rapid development of Southern California and significant urban infrastructure has greatly increased potential damages and risk to life. Damage from the 1933 Long Beach Earthquake was estimated at more than $40 million ($970 million in 2024 dollars), and 115 lives were lost. The seismic risk is much more severe today than in the past because the population at risk is in the millions rather than a few hundred or a few thousand persons.

Regulatory Context: Two laws inform the State of California's approach toward earthquake hazard mitigation: the Alquist-Priolo Earthquake Fault Zoning Act (1972) and the Seismic Hazards Mapping Act (1990). Additional regulatory and advisory information relevant to the State's earthquake hazard mitigation and building codes may be obtained through the California Seismic Safety Commission.

The **Alquist-Priolo Earthquake Fault Zoning Act ("Alquist-Priolo Act")** regulates development and infrastructure near active faults to mitigate earthquake hazards. It was signed into law following the 1971 San Fernando earthquake (M6.6).[68] Pursuant to the Alquist-Priolo Act, counties and municipalities within California must conduct a geological investigation of proposed human-occupied buildings to ensure they are not built upon known, approximate, concealed, or inferred faults. Its provisions[69] may be broadly summarized as:

1) CGS is charged with maintaining detailed maps of Alquist-Priolo Earthquake Fault Zones (APEFZs), which include faults, surface traces of those faults, and buffer zones around known and inferred faults.
2) Property owners and real estate agents must formally disclose whether their property lies within APEFZs prior to selling that property. This augments the Natural Hazards Disclosure Act (Section 1103, California Civil Code), which requires a Natural Hazard Disclosure Statement (or equivalent document within the Real Estate Transfer Disclosure Statement) to accompany the sale of any property within the State.
3) Construction of new human-occupied dwellings within APEFZs is prohibited unless a comprehensive geological investigation demonstrates that the fault will not pose a danger to the structure.

The **Seismic Hazards Mapping Act (SHMA)** requires CGS to identify and develop maps for "seismic hazard zones". More broadly, these zones led to the development of CGS's Earthquake Zones of Required Investigation (EZRI), which includes areas where ground failure is likely to occur due to primary and secondary impacts of seismic events including seismic shaking, fault rupture and landslides. The accompanying EZRI maps are Seismic Hazard Reports and Fault Evaluation Reports, which describe the methods and information sources used in making EZRI maps. The SHMA was established following the 1989 Loma Prieta earthquake (6.9).

Figure 4-13 shows the EZRIs within the District's service area. Yellow areas designate faults and fault buffers according to the APEFZs.[70]

[68] "The 1971 San Fernando Earthquake". California Department of Conservation, CGS (n.d.). Archived June 26, 2025. https://web.archive.org/web/20250626225158/https://www.conservation.ca.gov/cgs/earthquakes/san-fernando
[69] California Public Resources Code, Division 2. Geology, Mines and Mining [2001-2815], Chapter 7.5. Earthquake Fault Zoning [2621-2630]. Retrieved from: https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?division=2.&chapter=7.5.&lawCode=PRC
[70] EZRI shapefiles and data are available through CGS, accessible here (as of August 22, 2025): https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/

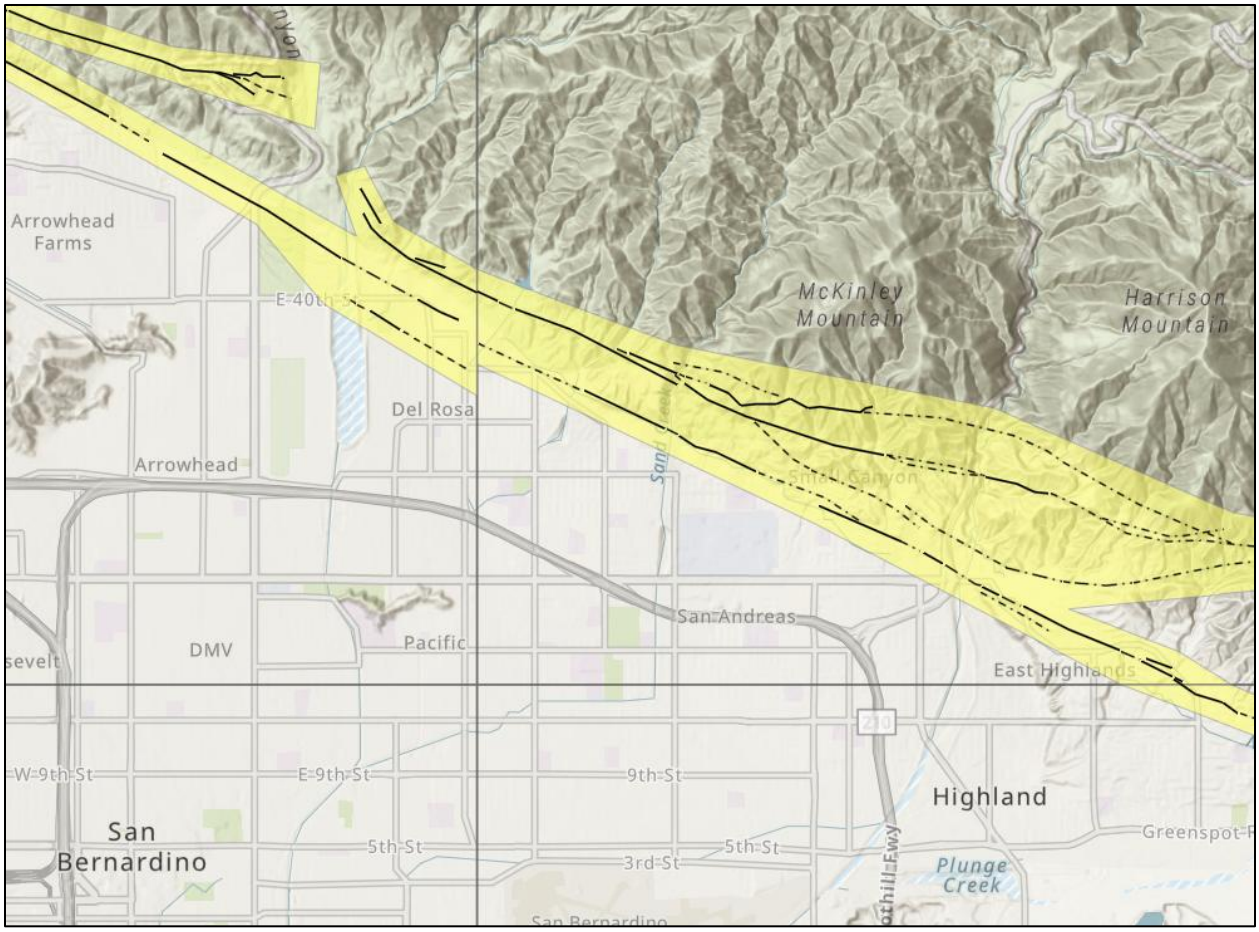

Figure 4-13: EZRIs Near the District

The American Society of Civil Engineers (ASCE) is a professional organization that lists standards, codes, and design loads for new construction, retrofitting, and rehabilitation. ASCE standards are referenced by the federal register and are legally binding. Those most relevant to the District are ASCE 7 Standard Minimum Design Loads for Buildings and ASCE 41-06 Seismic Rehabilitation of Existing Buildings. Both set standards for new construction and mitigation of seismic hazards. Any new construction or rehabilitation must conform to these standards by law.[71]

The California Building Code is the "minimum requirement intended to protect life safety and prevent collapse". The Code does not intend to completely prevent damage due to an earthquake, and buildings "may not be habitable or functional after a moderate or large earthquake".[72] The Code incorporates standards from ASCE with additional requirements based on the Alquist-Priolo Act and local standards. It is updated every thee years.

[71] Further information may be found at the ASCE website (accessible as of September 9, 2025): https://www.asce.org/publications-and-news/asce-7

[72] "Expected Earthquake Performance of Buildings Designed to the California Building Code". Seismic Safety Commission (n.d.). Archived May 26, 2025. https://web.archive.org/web/2/https://ssc.ca.gov/wp-content/uploads/sites/9/2020/08/ssc19-01.pdf

A second set of standards particularly relevant for water systems is the American Lifelines Alliance's (ALA) Seismic Guidelines for Water Pipelines (2005). ALA was established as a "public-private partnership" between FEMA and the National Institute of Building Sciences "to reduce risk to utility and transportation systems from natural hazards and manmade threats".[73] Unlike the ASCE standards, ALA's guidelines are not legally binding but are considered the gold standard for reducing damage to water systems and pipeline infrastructure from earthquakes.

Developmental Trends: Many earthquakes in southern California's history had limited damage because they occurred in areas that were sparsely populated at the time. However, rapid development has greatly increased potential damages and risk to life. Damage from the 1933 Long Beach Earthquake was estimated at over $40 million ($970 million in 2024 dollars), and 115 lives were lost. The risk is much greater today than in the past as the population has increased from tens of thousands to over ten million.

The "Planning, Maintenance, and Preservation of District Resources" section of the District's 2025-2026 Fiscal Year Budget lists project goals for District infrastructure. Project descriptions include replacing pipelines (North Fork Creek Crossings), retrofitting and upgrading water facilities (Plant 101 Rehabilitation), and repairing and replacing aging water mains (Water Main Replacement Program). All of these projects will increase resiliency.

Impact of Climate Change: There is no known relationship between climate change and earthquake recurrence.

Probability of Future Events and Magnitude: To explore future earthquake risk, USGS partnered with CGS and the Southern California Earthquake Center in developing 2013's Third Uniform California Earthquake Rupture Forecast (UCERF3). UCERF3 synthesizes historic and paleoseismic information to produce probabilistic forecasts of seismic hazards throughout the State of California. The model is the best available resource for estimates of the magnitude, location, and likelihood of potentially damaging earthquakes in the area.[74]

Table 4-15 summarizes the 30-year likelihood of major earthquakes occurring along the three major fault zones within southern California. UCERF3 identified an overall 30-year likelihood of an M6.0 or higher earthquake at 98 percent.

Table 4-15: 30-Year Probability of Major Seismic Event in Southern California

Fault Zone	Moment Magnitude (M)	30-Year Probability
San Andreas Fault Zone	≥ 6.7	19.0 percent

[73] Eidinger, J. et al. "Seismic Guidelines for Water Pipelines". American Lifelines Alliance (March 2005). Archived on October 4, 2024. https://web.archive.org/web/2/https://www.geengineeringsystems.com/ewExternalFiles/Seismic_Guidelines.pdf

[74] "Third Uniform California Earthquake Rupture Forecast (UCERF3)". Southern California Earthquake Center (July 2017). Archived July 29, 2025. https://web.archive.org/web/2/https://southern.scec.org/ucerf

Table 4-15: 30-Year Probability of Major Seismic Event in Southern California		
Fault Zone	**Moment Magnitude (M)**	**30-Year Probability**
	≥ 7.5	17.3 percent
	≥ 8.0	6.8 percent
Elsinore Fault	≥ 6.7	3.8 percent
	≥ 7.5	1.0 percent
	≥ 8.0	< 0.1 percent
San Jacinto Fault Zone	≥ 6.7	5.0 percent
	≥ 7.5	4.9 percent
	≥ 8.0	2.7 percent

Appendix G contains exhibits that plot potential earthquake scenarios in southern California over the District's service area. Each map includes the scenario's moment magnitude and estimates MMI intensity/damage using contour intervals. All scenarios are sourced from CISN data. The results of each scenario are described in **Table 4-16** below:

Table 4-16: Earthquake Damage Scenarios		
Fault Zone	**Moment Magnitude (M)**	**Estimated MMI**
Peralta Hills Fault Zone	M6.6	IV-V
San Jacinto Fault Zone	M7.0	VI-VII
Elsinore Fault Zone	M7.1	V-VI
San Andreas Fault Zone – Mojave Section	M7.9	VIII-IX

4.3.6 Flood

Description: Floods are a common hazard anywhere near a river or coastline. A flood occurs when excess runoff from rainfall or snowmelt accumulates faster than can be drained by channels, rivers, canyons, or drains, resulting in overflow into nearby lands. Floods can be deep enough and the waters fast enough to drown persons who enter the floodwaters. Additionally, large floods can move substantial enough water to damage or displace buildings. Finally, standing floodwaters that have not yet drained can hamper the ability for critical infrastructure staff and search and rescue personnel to access the isolated areas.

Floods in the Santa Ana River's watershed are often caused by heavy rainfall, though floods can also occur after a long period of moderate rainfall or if unusually warm weather causes mountain snow to melt faster than expected. Severe floods can inundate local District facilities and infrastructure, causing damage due to the heavy volume, speed, and force of the floodwaters.

The District's three major flooding concerns are riverine flooding (also known as overbank flooding), localized flooding, and flash floods. Coastal flooding is not applicable to the District as the service area and infrastructure are not within coastal flooding zones.

- **Riverine flooding** occurs when streams, rivers, and channels receive more rain, snowmelt, and/or runoff in the watershed than normal. This causes swelling and local flooding if the water overtops riverbanks or urban channels. The excess water then flows

into the surrounding floodplain. High excess water can also create flash floods within more mountainous areas. Larger rivers typically have longer and more predictable flooding sequences with broad floodplains, whereas smaller channels and steeper rivers may be faster and strike with less warning time.

- **Localized flooding** occurs when urban and suburban areas are inundated due to heavy precipitation that does not adequately drain. Non-permeable surfaces such as streets, sidewalks, driveways, and foundations impede the ability for water to drain into the groundwater. Localized flooding often drains more slowly than riverine flooding. This type of flooding may often reoccur within urban areas until effective drainage and conveyance systems are implemented.
- **Flash floods** are defined by NOAA as floods "caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours".[75] Flash floods may occur during severe storms or inundation events and often provide little warning to those impacted. Within the District's service area, flash floods are most likely to occur within seasonal riverbeds and steep, mountainous gullies.

Despite their potentially catastrophic nature, floods are a natural part of watersheds. Areas that recurringly experience floods are part of a river's "floodplain". Floods are often described in terms of yearly occurrence, such as a "100-year flood" in which a flood of similar magnitude occurs on average once every 100 years. Likewise, the "500-year flood" occurs once every 500 years.

Both of these terms are used by FEMA and hazard mitigation planners to assess the flood risk within an area. The 100-year floodplain is necessarily smaller than the 500-year floodplain, as 500-year floods are much larger and more destructive. Therefore, an area might be in a 500-year floodplain but not within the 100-year floodplain, whereas by definition the 500-year floodplain subsumes the 100-year floodplain. Floodplains may change over time due to natural or human processes such as erosion, changes to the watershed itself (e.g., conversion to swampland), or construction of bridges and channels.

History: According to National Weather Service (NWS) data, over 785 flash floods and 145 flood events occurred in the County of San Bernardino between 1996 and 2024, totalling $306.9 million in damages with 21 deaths. Most of these events occurred in July (233) and August (266). Very few floods impacted buildings and infrastructure or harmed people, as many occurred in unpopulated desert and mountainous areas.[76]

NOAA's Storm Events Database lists nine major floods or flash floods between 2000 and 2025 caused by storms within the Cities of San Benardino and/or Highland, described in **Table 4-17**.[77]

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[75] "Definitions of Flood and Flash Flood". NWS (n.d.). Archived July 25, 2025. https://www.weather.gov/mrx/flood_and_flash#:~:text=Flash%20flood:%20A%20flood%20caused,canyons%20sweeping%20everything%20before%20them.

[76] Real-time information available through the Flash Flood Warning system, accessible here (as of August 22, 2025): https://www.flashfloodwarn.com/california/san-bernardino

[77] Information of all events taken from the Storm Events Database maintained by the National Centers for Environmental Information under NOAA. Accessible here (as of August 22, 2025): https://www.ncei.noaa.gov/stormevents/

Table 4-17: Selected Flood Events Caused By Storms			
Date	**Location**	**Event**	**Description**[78]
February 20-22, 2004	City of San Bernardino	Flash Flood	Thunderstorms with heavy rain caused flooding and mudslides along the foothills of the San Bernardino Mountains in areas recently burned by the Old Fire and Grand Prix Fire in 2003. 12-25 inches of snow fell throughout the San Bernardino Mountains and 1.6-3.2 inches of rain fell throughout lower elevations. Throughout the 3-day event, over $60,000 of damages were reported.
October 20, 2004	City of San Bernardino	Flash Flood	A series of October storms brought heavy rain and thunderstorms throughout southern California. Nine inches of rain fell within the San Bernardino Mountains, causing flash flooding and debris flows. “Hundreds of car accidents” were reported alongside closure of “several mountain roads” and “sporadic power outages”. A large mudslide killed a 49-year old man outside of Lytle Creek.
December 29, 2004	City of San Bernardino	Flash Flood	A mud and rockslide occurred in Upper Waterman Canyon to the north of the City of San Bernardino on the outskirts of the District’s service area.
January 9-11, 2005	Unincorporated County of San Bernardino City of Highland	Flood	Flooding along the Santa Ana River destroyed several buildings, swept away vehicles, and damaged a sewer line. 2-3 million gallons of untreated sewage spilled into the watershed. One injury was sustained by a man who fell into the river. Property damage totaled $3 million. A 35-year old pregnant woman drowned after being swept by a flash flood along City Creek in the City of Highland. The flash flood brought the creek from a “trickle” to a “6 ft deep torrent” (*sic*).
October 13, 2006	City of San Bernardino	Flash Flood	A strong pressure system over the City of San Benardino dropped almost two inches of rain within 30 minutes. 18 structures and two vehicles were damaged during the resulting flash flood.
December 20-22, 2010	City of San Bernardino	Flood	A series of floods occurred throughout the southern Great Basin and Mojave Desert following a series of late-December storms and heavy snowfall. President Obama declared a disaster under DR-1884-CA for ten impacted counties. The District lost road access to Plant 134 during the floods. The District received FEMA funding to construct a bridge over an often-flooded channel formerly crossed by the road.

[78] Note: The “Description” column conforms to the “Episode Narrative” and/or “Episode Description” columns within the Storm Events Database.

Table 4-17: Selected Flood Events Caused By Storms			
Date	**Location**	**Event**	**Description**[78]
August 3, 2014	City of San Bernardino	Flash Flood	Thunderstorms throughout the San Bernardino Mountains caused 2-4 inches of rain in less than 3 hours. Debris flows led to road damage and closures as well as flash floods in low-lying areas near the deserts. The County of San Bernardino was "the hardest hit with flash flooding", with 25 homes inundated and $11 million of damages reported.
September 15, 2015	City of Highland	Flood	Remnants of Tropical Cyclone Linda merged with a lower-pressure system off the coast of southern California. 1-2 inches of rain fell throughout the area, causing traffic impacts, debris flows within Silverado Canyon, and "widespread urban flooding" throughout San Diego, Orange, Riverside, and San Bernardino Counties. Two houses on Yuhaaviatam of San Manuel Nation lands sustained damage from floodwaters.
February 6, 2024	City of San Bernardino	Flood	An atmospheric river event over southern Califronia resulted in over a foot of rain falling throughout southwestern County of San Bernardino, including several feet of snow within the mountains. The off-ramp from I-215 South near Base Line Street was closed due to flooding.

The Santa Ana River has a history of cyclical floods. The most destructive event in California history occurred in during March 1-5, 1938. This "Great Flood" occurred after a series of storms precipitated over 30 inches of rain within the upper Santa Ana River watershed, causing the river's levees to fail. Portions of the City of San Bernardino and what would become the City of Highland were submerged by the flood, isolating both areas from the surrounding lands. 22 people died as a direct result of the flooding and over $14 million of damages occurred ($323.4 million in 2025 dollars). One year later, the San Bernardino Flood Control District was formed as a special district charged with monitoring and maintaining the upper Santa Ana River watershed to reduce the risk of another catastrophic flood.

Location: The Santa Ana River places parts of the District's inhabited areas within the 100-year and 500-year floodplain. **Appendix H** contains an exhibit of FEMA's Flood Insurance Rate Maps (FIRMs) encompassing the service area. This information was downloaded from the National Flood Hazard Layer Viewer available on FEMA's website.[79]

[79] Information available via the shapefiles hosted on FEMA's Flood Hazard Layer, accessible here (as of August 22, 2025): https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

According to the FIRMs, the District's service area and infrastructure primarily lie outside of most 100-year floodplains. The southern service area adjacent to the Santa Ana River proper and Plunge Creek are substantially within the 100-year floodplain.

The 500-year floodplain primarily subsists of areas between Plunge Creek and the Santa Ana River, both of which are under-developed. Other 500-year floodplains are present along Twin Creek and Sand Creek.

Levees throughout the upper Santa Ana River watershed have substantially reduced the risk of riverine flooding throughout the service area. Areas between City Creek and Bledsoe Creek are within FEMA Zone X, demonstrating "areas with reduced flood risk due to levee". Zone X areas are also found at the confluence of Plunge Creek and City Creek near the San Bernardino International Airport.

The service area is not within any coastal flooding and tsunami inundation zones.

Extent: The National Flood Insurance Program (NFIP) defines floods as the "general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties".[80] The inundation must be caused by overflow of inland or tidal waters, unusual and rapid runoff, and/or mudflow. This definition includes land collapsing or subsiding along shorelines.

FEMA designates areas within the 100-year floodplain as "Special Flood Hazard Areas" (SFHAs). SFHAs may be inundated at a 1 percent annual chance or higher. Moderate Flood Hazard Areas are those within the 500-year floodplain at approximately 0.2 percent annual chance. Finally, Minimum Flood Hazard Areas are locations that are completely outside of the 500-year floodplain.

Table 4-18 below provides a full description of FEMA's flood zone designations.

Table 4-18: FEMA Flood Zone Designations

Hazard Level	Flood Zone	Description
Minimum Flood Hazard Area	Zones C or X (unshaded)	Areas outside of the 500-year floodplain and are of minimal flood hazard. Zone C areas might have ponding or local drainage problems but are not part of the 500-year floodplain.
Moderate Flood Hazard Area	Zones B or X (shaded)	Areas between the 100-year floodplain and the 500-year floodplain. Also includes areas that are protected by levees from 100-year floods and shallow flooding areas with average depths of less than one foot.
Special Flood Hazard Area	Zones A or A99	Areas within the 100-year floodplain. Detailed analyses are not performed, so base flood elevations are not

[80] "Section II. Definitions – Flood". FEMA (n.d.). Archived on May 31, 2025. https://web.archive.org/web/2/https://emilms.fema.gov/IS1104/groups/62.html

		shown. Zone A99 are areas protected by federal flood control systems.
	Zone AE	Areas within the 100-year floodplain where base flood elevations are available. Zone AE replaces the previous Zone A1-A30 designation.
	Zone AH	Areas within the 100-year floodplain where the average depth ranges between 1-to-3 feet.
	Zone AO	Rivers and streams that are within a 100-year floodplain in which shallow flooding from 1-to-3 feet is possible.
	Zones V, VE, or V1-30	Areas within a 100-year floodplain along coastlines due to storm surge and waves.
Undetermined Risk	Zone D	Possible but undetermined flood risk and/or unstudied areas.

NWS maintains watches and warnings for floods, as described in **Table 4-19**. Note that any watch or warning requires immediate action to be taken due to the fast-developing and destructive nature of floods.[81] Each color corresponds to NWS's flood map products.

Table 4-19: NWS Flood Notifications

Notification	Description
Flood Advisory	Issued when flooding is not expected to lead to a warning. However, standing waters may cause significant inconvenience and may still threaten life and/or property.
Flood Watch	Issued when conditions are favorable for flooding or a weather event that can lead to flooding. Watches are issued when floods are possible but not occurring.
Flash Flood Watch	Issued when conditions are favorable for flash flooding, such as a forecasted weather event that brings significant rain to overwhelm the drainage capacities of the surrounding landscape.
Flood Warning	Issued when a flood or weather event that can lead to flooding is imminent or occurring.
Flash Flood Warning	Issued when a flash flood is imminent or occurring. If you are in a flood-prone area, immediately move to higher ground. Warnings are often issued within six hours of the causative event and when there is a rapid rise in water levels in urban areas, small drainages, or arroyos.

A fundamental concern specific to wastewater utilities and floods is "infiltration and inflow" (I/I). Both terms refer to how water can enter sewer pipes, increase wear and tear, and cause sewer backups. "Infiltration" refers to water entering sewer pipes through cracks and leaks in joints. "Inflow" is specifically water that enters sewer systems through direct connections such as drains, manhole covers, and catch basins. Flooding can strongly increase I/I, though infiltration is the greater concern given the pressure from water entry can degrade already damaged pipes.[82]

[81] "Flood Warnings Vs. Watch". NWS, NOAA (n.d.). Archived on July 29, 2025. https://web.archive.org/web/20250729083048/https://www.weather.gov/safety/flood-watch-warning

[82] "Infiltration and Inflow: What Is It and Why Should We Care?" Bay Area Clean Water Agencies (n.d.). Archived April 23, 2025. https://web.archive.org/web/2/https://bacwa.org/wp-content/uploads/2008/11/BACWA-Infiltration-and-Inflow-Factsheet.pdf

Regulatory Context: The County of San Bernardino's 2007 Development Code contains several chapters to encourage effective land use. These include Chapter 82.14 (Flood Plain Safety Overlay), Chapter 85.07 (Flood Hazard Development Review), and Chapter 86.04 (Floodplain Management Administrator). The Cities within the service area contains various zoning ordinances that support floodplain protection.

The County of San Bernardino is a participant within the NFIP. The County currently has over 1,000 flood protection policies in place. Some areas – including most of the upper Santa Ana River Watershed – have been evaluated by FEMA through detailed Flood Insurance Studies that describe base flood elevations. Through its participation, the County has the ability to regulate development within SFHAs. New buildings and existing developments undergoing improvement must be elevated to protect against damage by 100-year floods, and new developments "must not aggravate existing flood problems or increase damage to other properties".[83]

Developmental Trends: As stated in the 2024 City of San Bernardino LHMP, flooding "will continue to affect land use and development patterns […] as flood-related impacts have to be accounted for, mitigated, and minimized."[84] However, developments by the District are unlikely to change how floods and floodwaters are anticipated. Water and wastewater underground infrastructure exists underground within and without SFHAs. The District does not currently have plans to expand into SFHAs, and neither do the Cities of San Bernardino and Highland.

Impact of Climate Change: Although climate change is frequently associated with hotter and drier weather, there also exists greater potential for heavier precipitation days that could increase localized flooding. According to the *Climate Change and Health Profile Report – San Bernardino County* prepared in 2017 by CDPH, extant climate models "predict an increase in the frequency and intensity of extreme weather events such as hurricanes, floods, and droughts".[85] Since the flooding potential of the Santa Ana River is based on precipitation and runoff, any increase in the number and/or intensity of extreme precipitation events will increase the risk of destructive floods.

Overall, the southwestern areas of the County of San Bernardino are expected to have a reduction in precipitation of 2-to-4 inches by 2050 and 3.5-to-6 inches by 2100.[86] Nonetheless, extreme precipitation events may become more frequent and intense as warmer temperature increase the amount of water vapor in the atmosphere. Despite an average reduction in precipitation, the events that do occur are expected to be larger and potentially more destructive. The *Vulnerability Assessment* cites Swain et al. (2018) in stating that "extremely wet seasons" with a historical 4

[83] County of San Bernardino MJHMP (2022)
[84] City of San Bernardino LHMP (2024)
[85] "Climate Change and Health Profile Report – San Bernardino County". CDPH, UC Davis (February 2017). Archived February 22, 2025.
https://web.archive.org/web/2/https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/CHPRs/CHPR071SanBernardino_County2-23-17.pdf
[86] Ibid.

percent chance of occurring in previous years "are projected to occur twice as frequently by mid-century in Southeastern California".[87]

Probability of Future Events and Magnitude: Appendix H identifies the flood hazard zones according to 100-year and 500-year floodplains overlaid with the District's service area. Statements of probability for future events accompanies each FIRM. Given the definitions of each floodplain, it may be assumed that any part of the service area within the 100-year floodplain has at least a 1 percent annual chance of occurring, whereas the 500-year floodplain has a 0.2 percent chance of occurring.

4.3.7 Hazardous Materials Incident

Description: "Hazardous materials" (HAZMAT) refers to any material that is harmful to human health and the environment. These include but are not limited to biologics, acids, carcinogens, corrosive materials, flammable and explosive materials, toxic chemicals, and radioactive materials. Many such materials have important industrial, manufacturing, and medical uses, or they are byproducts of those industries.

HAZMAT incidents involve the accidental or intentional release of HAZMAT into an area. Reasons include transport or manufacturing incidents, sanitary sewer spills, chemical storage leaks, contamination from Superfund sites, and explosions. Of these, the most likely incident to occur within the District's service area is a sanitary sewer spill, which occurs when a pipe, facility, pump, or other sewer infrastructure breaks and releases human waste underground or aboveground. Sanitary sewer spills are most likely to occur simultaneously with another hazard (e.g., earthquake) or due to built-up fats, oils, and grease (FOG) within pipes.

Hazardous chemicals will be accompanied by a Safety Data Sheet (SDS). These are detailed documents prepared by the manufacturer, importer, or storer of the material. SDS describe the properties of the chemical, storage guidelines, its toxicity and health impacts, recommended personal protective equipment (PPE), disposal and transport, and procedures for cleaning spills. Employers are required to provide HAZMAT workers with access to SDS, be they fixed to the storage area or easily accessible upon request.

History: While the District has not experienced any major sewer system issue that resulted in State/County action, such incidents have occurred within southern California. For example, in mid-January 2025, beaches in Laguna Beach and Aliso Viejo were closed by the Orange County Healthcare Agency following a major sewer main break near Laguna Niguel Regional Park that spilled over 465,000 gallons.[88] An eight-million-gallon spill similarly shut down Long Beach's beach access after a 48-inch sewer main failed in the City of Carson on December 30, 2021.[89]

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[87] WRCOG SBC Vulnerability Assessment (2022)
[88] Farzan, Y. "Sewage spill forces beach closures in Orange County". LAist (January 15, 2025). Archived July 23, 2025. https://web.archive.org/web/20250723150812/https://laist.com/news/climate-environment/sewage-spill-forces-beach-closures-in-orange-county
[89] Elassar, A. & Sutton, J. "More than 8 million gallons of sewage shuts beaches in California's Long Beach". CNN (January 2, 2022). Archived April 18, 2025. https://web.archive.org/web/2/https://www.cnn.com/2022/01/02/us/long-beach-sewage-spill-california/index.html

According to Cal OES's HAZMAT Spill Release Reporting Archive,[90] four HAZMAT incidents with uncontained releases occurred between 2010 and 2024 for which the District was the responsible/reporting party. These are summarized in **Table 4-20** below.

Table 4-20: Uncontained HAZMAT Incidents (2010-2024)

Date	Substance	Quantity (gallons)	Location	Description
2/25/2011	Raw Sewage	1,800-2,000	City of Highland	FOG blockage on a private lateral line released raw sewage out of a nearby manhole. All on-site sewage was cleaned by the District, but 1,800-2,000 gallons were released into a storm drain running into Bledsoe Creek.
10/31/2011	Sewage	1,350	City of Highland	FOG blockage from an unknown source led to sewage leakage from a manhole covered by asphalt. Sewage leaked into a catch basin and storm drain
6/13/2024	Sewage	1,800,000	City of San Bernardino	A major power loss at a wastewater treatment plant between 4:30PM and 11PM led to a discharge of 1.8 million gallons of sewage out of a manhole and contained within a nearby catch basin. There were no known impacts form the released sewage.
10/22/2024	Recycled Water	1,200	City of San Bernardino	Recycled water "reached a level and impacted the storm channel". There were no known impacts from the released water.

Location: HAZMAT incidents may occur anywhere these materials are transported, stored, or used. The service area does not have significant industrial or manufacturing areas. There are no battery storage sites within 25 miles of the service area. A natural gas transmission pipeline traverses the City of San Bernardino from east to west along Mill Street, Tippecanoe Avenue, and East San Bernardino Avenue. Were a HAZMAT incident to occur that does not involve sewer lines, it would likely be a minor spill occurring during chemical transportation.

The District stores chemicals used for treatment of water and wastewater in large vats at various facilities. The contents and locations are not for public knowledge. A breach at any one of these vats could result in chemical spillage. Likewise, a spill at the SNRC could result spillage of recycled or untreated wastewater. Structural damage to the membrane bioreactors could also result in spillage of untreated wastewater and sewage – however, this is highly unlikely except in the case of severe structural damage.

"Superfund" is the colloquial name for polluted sites designated under National Priority List of the Comprehensive Environmental Response, Compensation, and Liability Act (more information under the "Regulatory Context" section of this hazard). The service area contains

[90] Accessible here (as of August 22, 2025): https://www.caloes.ca.gov/office-of-the-director/operations/response-operations/fire-rescue/hazardous-materials/spill-release-reporting/#

one Superfund site (Norton Air Force Base)[91] and is adjacent to another (Newmark Groundwater Contamination Site).[92] Both are located within the City of San Bernardino. **Figure 4-14** on the next page shows the locations of both sites in relation to the District.

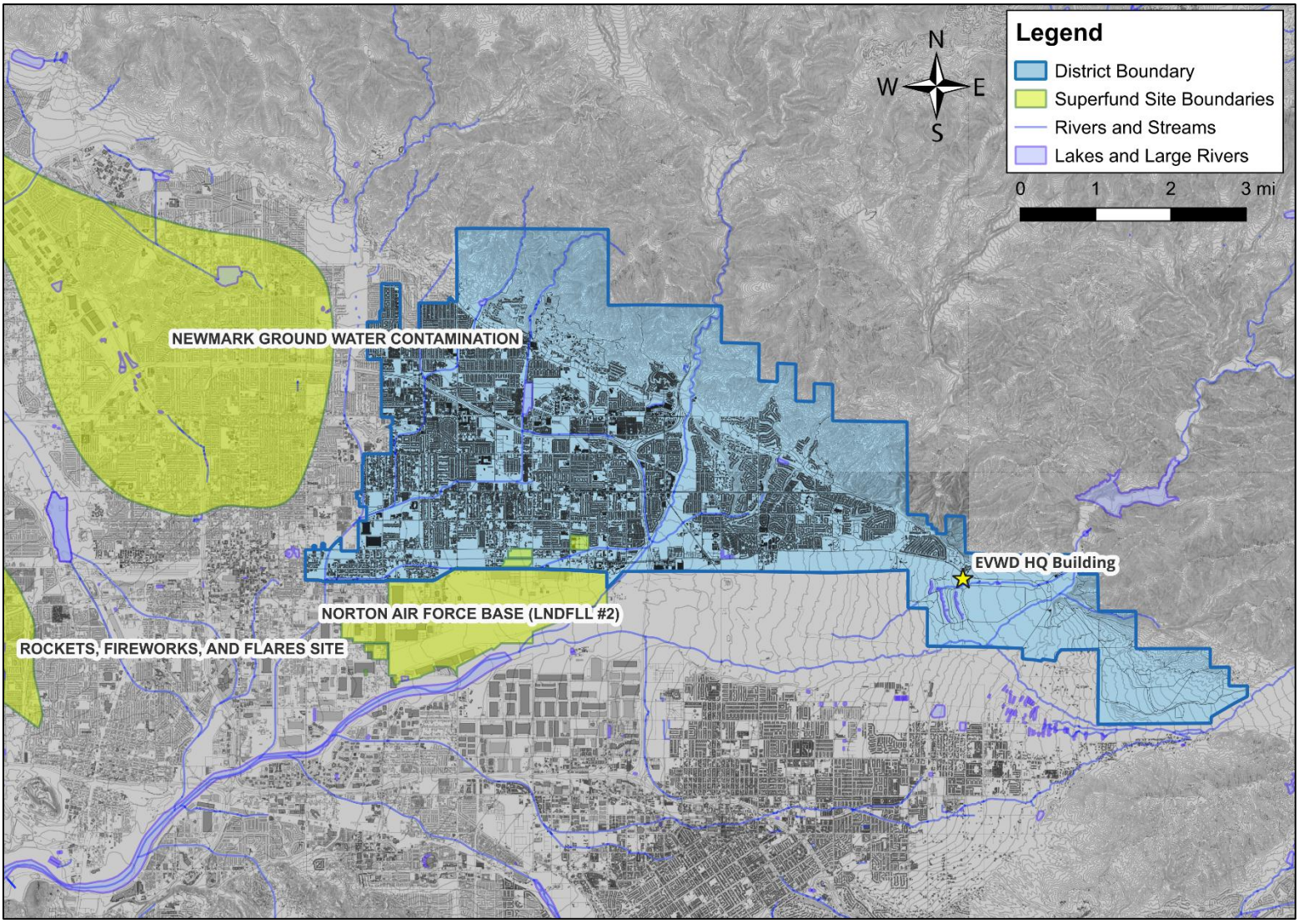

Figure 4-14: Map of Superfund Sites Near the Service Area

Norton Air Force Base is located in eastern City of San Bernardino in the southwest of the District's service area. It was operable between 1942 and 1994, when it was closed pursuant to the 1988 Base Realignment and Closure Action. The site is 2,165 acres. For most of its service time, Norton Air Force Base was used as an overhaul center for jet engines and aircraft repair. The primary environmental contamination site is the Area II Landfill.

[91] "Superfund Site: Norton Air Force Base (LNDFLL #2) San Bernardino, CA". EPA (n.d.). Archived August 22, 2025. https://web.archive.org/web/20250822200646/https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902760

[92] "Superfund Site: Newmark Ground Water Contamination San Bernardino, CA". EPA (n.d.). Archived August 22, 2025. https://web.archive.org/web/20250822200922/https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902439

Insufficient HAZMAT management at Norton Air Force Base resulted in contaminated groundwater and soil with polychlorinated biphenyls, dioxins, heavy metals, and acids. Clean-up activities were the responsibility of the US Air Force. Actions include groundwater monitoring, groundwater extraction/treatment, and institutional controls to restrict residential use. According to EPA, construction of remedies finished in 2006, and removal of lead-contaminated soils finished in 2019. Groundwater and landfill gas monitoring will continue for the foreseeable future. Groundwater migration/infiltration is listed as "under control". Many of the extant aviation buildings were converted to the San Bernardino International Airport.

The Newmark Groundwater Contamination Site is a dispersed site of groundwater contamination that impacts over 25 percent of the City of San Bernardino's municipal water supply. The source of the contamination is a US Army landfill and depot operated from 1942 to 1947 at which solvents, trucks, and munitions were disposed. Notable contaminants include trichloroethylene and tetrachloroethylene, both of which are cleaning solvents. The contamination covers approximately eight square miles.

The Site is defined by two contaminant plumes: the Newmark Plume and the Muscoy Plume. Both plumes are "several hundred feet" deep underground. Three water treatment plants are constructed to scrub and return the contaminated groundwater via adsorption using activated carbon. Construction on the Newmark Plume plants finished in 1998; Muscoy Plume, 2005. EPA conducts a review of the Site's progress every five years "until the aquifer is restored to its beneficial uses".

Sanitary sewer spills may occur anywhere sewer infrastructure exists. This includes laterals, despite those being the responsibility of the homeowner. Pipes with greater risk for spillage are those with a Condition Grading System of 4 or 5. These represent imminent need of repair or potential holes. Higher grades (1-3) are not anticipated to be at risk unless in the event of seismic shaking or other major event.

Extent: The primary concern of HAZMAT incidents is the long-term health impact of exposure to seepage or the material itself. HAZMAT incidents occurring alongside significant structural damage (e.g., an earthquake causing a major sewer main to break) can complicate repair and emergency response. Health impacts will vary by material, exposure pathway, and exposure length. Information on specific substances may be found within the Agency for Toxic Substances and Disease Registry's Toxic Substances Portal[93] or within the material's SDS.

Sanitary sewer systems that spill untreated or partially treated sewage must be reported, per a 2006 General Order issued by California's State Water Resources Control Board. **Table 4-21** describes the four categories of sanitary sewer spills and their indicator color on maps.[94]

[93] Accessible here (as of August 22, 2025): https://wwwn.cdc.gov/tsp/substances/SubstanceAZ.aspx
[94] "Discharge Types". State Water Resources Control Board (n.d.). Archived June 16, 2025. https://web.archive.org/web/20250616225034/https://www.waterboards.ca.gov/water_issues/programs/sso/sso_map/files/sso_legend.html

Table 4-21: Categories of Sanitary Sewer Spills	
Category	**Description**
Category 1	A spill of any volume of sewage from or caused by a sanitary sewer system regulated under the General Order that results in: • A discharge to surface water, including a surface water body that contains no flow or volume of air; or • A discharge to a drainage conveyance system that discharges to surface waters when the sewage is not fully captured and returned to the sanitary sewer system or disposed of properly. Any spill volume not recovered from a drainage conveyance system is considered a discharge to surface water, unless the drainage conveyance system discharges to a dedicated stormwater infiltration basin or facility.
Category 2	A spill of 1,000 gallons or more that is from or caused by a sanitary sewer system regulated under the General Order. These spills do not discharge to surface water. This category also includes spills of 1,000 gallons or more that spill out of a lateral but are caused by a failure or blockage in the main lines of the sanitary sewer system.
Category 3	A spill of between 50 and 1,000 gallons that is from or caused by a sanitary sewer system regulated under the General Order. These spills do not discharge to surface water. This category also includes spills of between 50 and 1,000 gallons that spill out of a lateral but are caused by a failure or blockage in the main lines of the sanitary sewer system. Spills of less than 50 gallons that were reported according to the 2006 General Order are Category 3 spills. These types of spills are reported as Category 4 spills from 2022 onward.
Category 4	A spill of less than 50 gallons that is from or caused by a sanitary sewer system regulated under the General Order. These spills do not discharge to surface water. This category also includes spills of less than 50 gallons that spill out of a lateral but are caused by a failure or blockage in the main lines of the sanitary sewer system. This is a new spill category (Order 2022-0103-DWQ).

Regulatory Context: Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the EPA is authorized to maintain a list of heavily polluted locations for targeted clean-up and long-term response. These sites may be placed on the National Priorities List for investigation and environmental remediation, colloquially called “Superfund sites”. Following appropriate and documented clean-up, these sites may be removed from the list.

If a spill occurs, the potentially responsible party (PRP) ensures funding and/or clean-up with oversight from relevant local, State, and Federal agencies. If a sewer system spill, wastewater main breakage, or other chemical spill were to happen at the fault of District infrastructure, then the District would be the PRP. This includes FOG obstructions.

Chemical manufacturers, distributors, and importers are required to provide SDS for each hazardous chemical under the 1993 Occupational Health and Safety Act. A list of mandatory information within SDS may be found in Appendix D to *OSHA Standards 1910.1200 – Safety Data Sheets (Mandatory)*.[95]

Storm drains are a common way for pollution to enter waterways and groundwater. The National Pollutant Discharge Elimination System's Municipal Separate Storm Sewer System requires permits for cities to build storm drains, catch basins, channels, and other methods of conveying runoff into local watersheds. The Cities of Highland and San Bernardino are required to conduct stormwater compliance inspections of local businesses to ensure they are complying with the permit and each city's stormwater ordinance.

Developmental Trends: According to the General Plans of the Cities of Highland and San Bernardino, there are no plans for developing heavy industry and/or manufacturing within the service area. The San Bernardino International Airport is planning to expand its air cargo services, though construction plans are not yet set.[96]

The greatest change to the service area in context of HAZMAT risk is the SNRC, which became online at the start of 2024. This facility massively increases the concentration of influent, digester chemicals, and recycled wastewater located at a single position. However, the newness of the facility and lack of old or damaged pipes and other infrastructure make it an unlikely location for a HAZMAT incident.

Impact of Climate Change: There is no association between climate change and the risk of HAZMAT incidents. HAZMAT releases are entirely a technological hazard – in other words, a failure of infrastructure or maintenance as opposed to an act of nature.

Probability of Future Events and Magnitude: The exact probability of a HAZMAT incident is unknown. Multiple factors described within this LHMP contribute to such incidents including the structural integrity of pipes and facilities, changes in land use, and impacts to the water table. Barring transport incidents, with no hazard mitigation performed on District-owned wastewater pipes or solid waste infrastructure, it is anticipated that annual recurrence would be between one and ten percent.

4.3.8 Heat Wave

Description: NOAA defines "heat waves" (or "extreme heat events") as any period of abnormally hot temperature that lasts longer than two days.[97] Heat waves are typically caused by high-

[95] Standard Number 1910.1200, Appendix D – Safety Data Sheets (Mandatory). Retrieved from: https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1200AppD
[96] A Deeper Look at San Bernardino International Airport". County of San Bernardino, Economic Development Team (August 3, 2020). Archived on October 6, 2022. https://web.archive.org/web/2/https://selectsbcounty.com/blog/a-deeper-look-at-san-bernardino-international-airport
[97] "During a Heat Wave". NWS (n.d.). Archived on July 28, 2025. https://web.archive.org/web/20250728204417/https://www.weather.gov/safety/heat-during

pressure systems from the south moving north and forcing warm air to the ground. The lack of air movement stops precipitation from forming and allows the air to continually absorb warmth from solar radiation and the Earth's surface.

EPA defines a heat wave as when the "daily minimum apparent temperature […] in a particular city exceeds the 85th percentile of historical July and August temperatures (1981-2010) for that city".[98] For the service area, this amounts to daily minima above approximately 70°F and maxima above 102-103°F during July and August. **Figure 4-15** below shows a chart of the average high and low temperatures in the City of Highland (exported July 15, 2025).

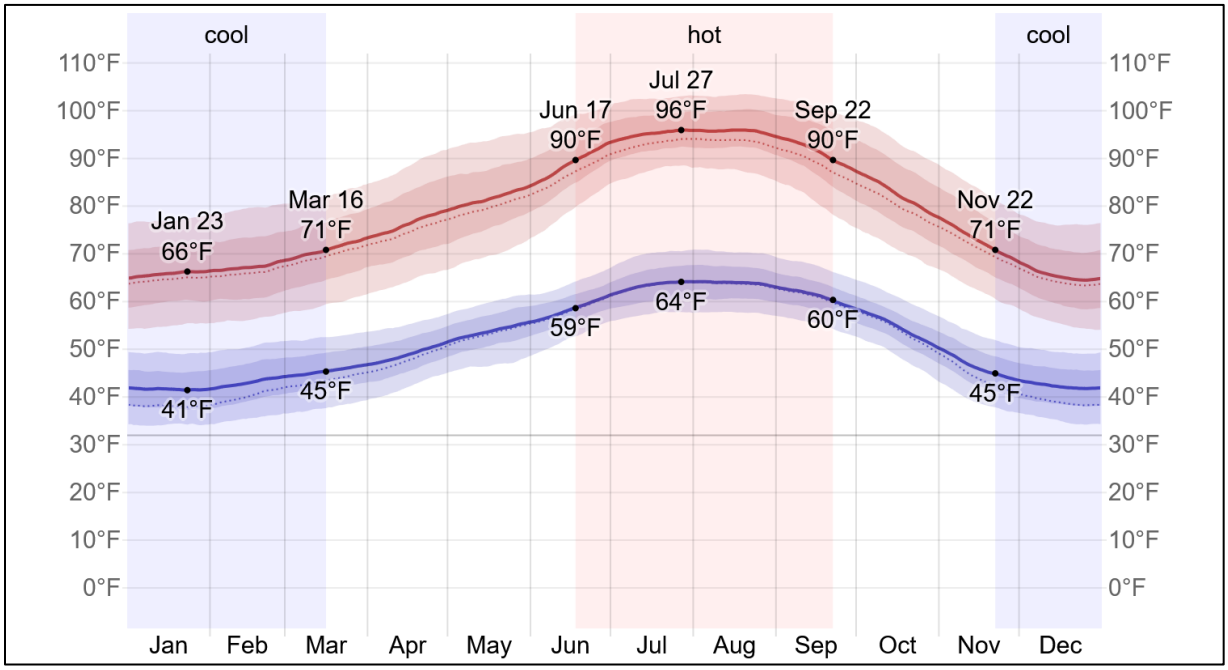

Figure 4-15: Temperature History of the City of Highland

According to NWS, extreme heat occurs when the temperature reaches high levels or when the combination of heat and humidity causes the air to become oppressive. NWS will issue advisories or warnings when the heat index is expected to significantly impact public safety. The common guidelines for the issuance of excessive heat warnings are when the maximum daytime index is expected to reach 105°F and the nighttime low temperature does not fall below 75°F.

History: A general history of southern California heat waves and other "extreme heat" events from 1990-2023 is maintained by the NWS station in San Diego.[99] Selected events germane to the service area and surrounding Counties of San Bernardino and Riverside are listed in **Table 4-22** below. Descriptions are taken directly from NWS.

[98] "Climate Change Indicators: Heat Wave". EPA (June 2024). Archived on July 30, 2025. https://web.archive.org/web/20250730003335/https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves

[99] "A History of Significant Weather Events in Southern California". NWS (March 2025). Archived on July 26, 2025. https://web.archive.org/web/2/https://www.weather.gov/media/sgx/documents/weatherhistory.pdf

Table 4-22: Selected History of Southern California Heat Waves	
Date	**Event Description**
August 16-17, 1992	Tropical air brought hot and muggy weather with high heat index values to the region for a week. On this day it was 99°F in LA with a heat index of 110°F. Temperatures in the valleys and Inland Empire ranged from 100-110°F.
July 27-29, 1995	Heat wave: 123°F at Palm Springs on July 28-29. 120°F at Coachella, 113°F San Jacinto, 112°F Riverside, 111°F Banning, Moreno Valley, and Sun City. 110°F at Yucaipa on July 17.
October 10, 1996	Strong high pressure engulfed the Southwest. Temperatures soared accordingly in the deserts, allowing Victorville to reach 100°F, the latest date in the season for a triple-digit reading on record.
August 2-7, 1997	Heat wave: 121°F at Thermal, 113°F Brea, 110°F Riverside and Ontario, 101°F Julian. Low of 93°F at Palm Springs on August 5. Five deaths.
May 21, 2000	A strong ridge of high pressure built over the region in the wake of a storm system over the Intermountain West. Temperatures in the Inland Empire and Coachella Valley subsequently soared, with Riverside reaching 105°F and Palm Springs topping out at 113°F.
May 7-9, 2001	Heat wave. 109°F at Palm Springs, Thermal, and Borrego Springs, 103°F at Hemet, 102°F San Bernardino.
March 21, 2004	This day fell in the middle of a three-day heat wave in the deserts, brought on by a strong area of high pressure over the Western US. Thermal recorded its highest temperature in March with a reading of 103°F, while Mecca reached 107°F.
July 10-20, 2005	Strong high pressure brought a lengthy heat wave to the region. 121°F in Thermal, 120°F in Palm Springs and Borrego Springs, 116°F in Hesperia. Big Bear Lake tied their all-time record at 94°F on July 18. 98°F at Idyllwild. Low temperature at Indio was 90°F on July 13. One death in the Anza Borrego Desert. Near record power consumption.
July 22, 2006	A major heat wave with humidity, in some ways unprecedented, hit Southern California. 121°F in Palm Springs, 120°F at Indio and Thermal, 114°F at Ontario and the Wild Animal Park, 113°F at El Cajon. It was 112°F at Escondido and 109°F in La Mesa (both highest all time). Record minimum temperatures were recorded in most places. Desert locations reported the all-time warmest month on record. Sea temperatures hit 80°F. 16 were killed from the heat, and many more were treated. Some power outages occurred.
July 3-6, 2007	A major heat wave struck the mountains and deserts. A strong persistent marine layer precluded the heat wave from impacting the coasts and valleys. 119°F in Ocotillo Wells, 116°F in Palm Springs and Indio, 115°F in Anza Borrego, 107°F in Julian, 103°F at Lake Cuyamaca, 100°F at Idyllwild, 97°F at Palomar Mountain, 94°F at Big Bear Lake (ties all time high) and Mt. Laguna. Some heat illnesses, poorly documented.
September 1-3, 2007	A heat wave with a monsoon flavor. Temperatures exceeded 95°F in the coasts and the mountains, 105°F in the valleys, 110°F in the Inland Empire and high deserts, and 115°F in the lower deserts. At least six deaths from heat-related illnesses.

Table 4-22: Selected History of Southern California Heat Waves	
Date	**Event Description**
June 16-23, 2008	A prolonged heat wave that lingered for nearly a week peaked on June 21 in the valleys, mountains and deserts. Highs reached 117°F in Palm Springs and 114°F in Indio. West of the mountains Ramona recorded a high of 107°F while San Diego reached 92°F.
November 3-4, 2010	Strong high pressure and offshore flow led to all-time November record high temperatures. At San Diego it reached 100°F on November 4, the highest temperature on record in November, and the only time it has reached the century mark in November. This was also the first time a 100°F reading was reached in more than 21 years. In Riverside, the temperature of 99°F on November 3 tied and the 101°F reading on November 4 broke all time November records. On November 3, it was 101°F in Santa Ana, equaling the highest November temperature on record. And it was 96°F in Laguna Beach, the second highest November temperature on record.
June 28-30, 2013	A heat wave on the order of a 20-year event enveloped the west and Southern California. Death Valley hit highest U.S. June temperature ever recorded: 129°F on June 30. Other desert cities like Palm Springs, Thermal, and Borrego Springs tied or set new June records and came within one degree of the all-time highest temperature on record on June 29.
June 20, 2016	An intense heat wave peaked on this day with a total of 13 daily high temperature records set. Borrego Springs tied an all-time record high of 122°F. Palm Springs reached 122°F, an all-time record for June and the second highest temperature on record. Indio and Thermal both reached 121°F, the second highest temperatures on record for June. West of the mountains Riverside was 114°F, while Ramona (109°F) and El Cajon (107°F) both set records for June.
June 15-18, 2021	Strong high pressure brought a dry heat to inland areas. Temperatures reached 123°F in Palm Springs on June 17, tying the highest reading on record. It was also 123°F at Ocotillo Wells on June 17 and June 18. 104°F in Idyllwild and 112°F in Apple Valley on June 16. 107°F in San Jacinto and 97°F in Yorba Linda on June 15.
July 21, 2023	A long heat wave enveloped the region for most of the month. Palm Springs hit 120°F on this day. 18 days this July recorded a high of 115°F or higher. Several low temperatures remained in the 90s Fahrenheit. July 2023 was the hottest month on record for Palm Springs, with an average temperature of 98.5°F.

A recent event not listed within the San Diego station's list occurred on June 5-9, 2024. The County of San Bernardino Health Officer issued a heat advisory due to forecasts of temperatures "soaring into the 90s in the valley and into the triple digits in the deserts".[100] NWS forecasted temperatures as high as 120°F in Needles.

[100] "Hot weather returns to San Bernardino County". Conty of San Bernardino, County Administrative Office (June 6, 2024). Archived on June 19, 2025. https://web.archive.org/web/20250620043953/https://main.sbcounty.gov/2024/06/06/hot-weather-returns-to-san-bernardino-county/

Heat waves often accompany periods of drought and strong dust – known as "compound events". According to a December 2022 joint article from researchers at the University of Kansas, NOAA Geophysical Fluid Dynamics Laboratory, and Peking University, California experienced 16 "compound events" from 2007 to 2018 with maximum temperature anomalies between 3.19 and 14.02°F.[101]

Location: By definition, heat waves are regional events. This LHMP assumes that any heat wave impacting one part of the service area will impact the rest.

Urban areas such as the Cities of Highland and San Bernardino are naturally hotter than periurban, rural, and wilderness areas that immediately surround them. This effect is called the "urban heat island". The World Meteorological Organization states that urban areas may be warmer by up to 5-10°C (9-18°F), and this difference will be exacerbated during heat waves.[102]

Extent: High air temperatures can harm the body's ability to maintain a consistent temperature suitable for life. Uncommon yet severe health impacts include heath stroke and dehydration. Technician, maintenance, construction, and other staff whose work is outside or within non-air-conditioned spaces may have to operate on altered time schedules to avoid the heat.

Infrastructure can also be impacted due to heat waves. As with droughts, greater evaporation due to the heat can reduce waterflow and increase maintenance costs. Above-ground pipes can buckle and crack. Increased energy demand due to greater HVAC use can increase strain on power stations, thereby increasing the likelihood of a power failure or PSPS event.

The "heat index" is defined as the relative intensity of heat depending on a combination of ambient temperature, sunlight, wind, and humidity. It may be interpreted as what the heat feels like when outside as opposed to only the nominal temperature. NWS will issue advisories, watches, and warnings when the heat index endangers public health and safety. **Table 4-23** describes heat-related public notifications according to NWS descriptions.

Table 4-23: NWS Heat Notifications

Notification	Description
Excessive Heat Outlook	The potential for excessive heat exists over the next 3-to-7 days. No temperature thresholds need to be met to issue an outlook other than the potential for a heat event may develop based on weather patterns and climate. Outlooks are intended for local agencies and utilities to begin preparing for a potential event.
Excessive Heat Advisory	The heat index is at or above 100°F for at least two hours. Heat Advisories are issued when people may be impacted by heat if precautions are not taken. Heat Advisories may trigger regulations concerning evictions, turning off power, and outdoor work requirements.

[101] Pu et al. "Compound Heat Wave, Drought, and Dust Events in California". American Meteorological Society (December 15, 2022). doi: 10.1175/JCLI-D-21-0889.s1.
[102] "Heatwave". World Meteorological Organization (n.d.). Archived on July 26, 2025. https://web.archive.org/web/20250726032407/https://wmo.int/topics/heatwave

Table 4-23: NWS Heat Notifications	
Notification	**Description**
Excessive Heat Watch	Issued when a Heat Warning is anticipated within 1-to-2 days in advance of the criterion being met.
Excessive Heat Warning	The heat index is at or above 105°F for at least two hours. Heat Warnings are issued when people may be seriously impacted by heat if precautions are not taken, with injuries such as heat stroke expected for persons who spend a significant amount of time working or living outside. Heat Warnings are used by hospitals and public agencies to take certain actions to prepare and respond to an increase in emergency calls, as well as perform wellness checks on elderly and homebound persons. Local jurisdictions may establish public cooling centers. As with Heat Advisories, a declared Heat Warning may trigger regulations concerning evictions, turning off power, and outdoor work requirements.

To supplement the official advisories, NWS developed the HeatRisk index to forecast the risk of heat-related impacts over a 24-hour period.[103] HeatRisk considers the duration of the heat through day and night, if the heat index poses an elevated risk of heat-related impacts, and how unusual the heat is for the time of year. For example, an 85°F day might not be unusual in the City of Highland, but it would be highly unusual and factored into HeatRisk if it occurred in Anchorage, Alaska. **Table 4-24** describes each HeatRisk level.

Table 4-24: NWS HeatRisk Index	
Notification	**Description**
Green (0)	Little to no risk is expected from the heat.
Yellow (1)	Minor: This level of heat primarily affects individuals who are highly sensitive to heat already, especially when outdoors without effective cooling and/or adequate hydration.
Orange (2)	Moderate: This level of heat affects most individuals sensitive to heat, especially those without effective cooling or adequate hydration. Impacts are possible to some health systems and persons in heat-sensitive industries.
Red (3)	Major: This level of heat affects anyone without effective cooling and/or adequate hydration. Impacts likely in some health systems, heat-sensitive industries, and infrastructure.
Magenta (4)	Extreme: This level of rare and/or long-duration extreme heat with little-to-no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries, and infrastructure.

Regulatory Context: Regulations concerning heat waves primarily center around occupational health guidelines pursuant to the requirement that employers ensure their workplaces are "free

[103] "NWS HeatRisk". NWS, NOAA (n.d.). Archived July 30, 2025. web.archive.org/web/2/https://www.wpc.ncep.noaa.gov/heatrisk/

from recognized hazards that are causing or likely to cause death or serious harm to employees".[104]

The State of California's Heat Illness Prevention Standard further requires employers to provide training, water, shade, and comprehensive planning resources if the workplace's temperature exceeds 80°F.[105] In July 2024, the Standard was amended with the Heat Illness Prevention in Indoor Places of Employment Standard that requires similar actions to be taken if the workplace temperature exceeds 82°F.[106] The standards do not apply to "incidental or brief exposure" of 15 minutes or less between 82°F and 95°F.

In April 2022, the State of California released the Extreme Heat Action Plan.[107] This Plan identifies the State's goals and actions to reduce the impact of future heat waves and warmer temperatures. The four action tracks include: A) build public awareness and notification; B) strengthen community services and response; C) increase resilience of our build environment; and D) utilize nature-based solutions.

Developmental Trends: Increased urbanization and development within the Cities of Highland and San Bernardino may intensity the urban heat island effect and thereby exacerbate the impacts of heat waves. Both Cities include within their General Plans' Housing Elements provisions for increased energy efficiency of residential homes and other buildings to reduce the impact of heat. There is no additional development among District-owned buildings and infrastructure that would influence the impact of heat waves.

Impact of Climate Change: Climate change will lead to warmer average temperatures and more extreme weather events throughout most of the western United States. According to NOAA, "heat waves are occurring more often than they used to […] from an average of two heat events per year during the 1960s to more than six per year during the 2020s."[108]

In 2020, the County of San Bernardino developed a Resilience Strategy to identify "possible actions the County and other agencies […] could implement to address and ameliorate key

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[104] Occupational Safety and Health Act of 1970, Section 5(a)(1). Retrieved from: https://www.osha.gov/laws-regs/oshact/Section5-duties

[105] California Code of Regulations Title 8 – Industrial Relations, General Safety Orders, Group 2 Safe Practices and Personal Protection. Section 3395: Heat Illness Prevention in Outdoor Places of Employment. Retrieved from: https://www.dir.ca.gov/title8/3395.html

[106] California Code of Regulations Title 8 – Industrial Relations, General Safety Orders, Group 2 Safe Practices and Personal Protection. Section 3396: Heat Illness Prevention in Outdoor Places of Employment. Retrieved from: https://www.dir.ca.gov/oshsb/documents/Indoor-Heat-updated-txtbrdconsider.pdf

[107] "Protecting Californians from Extreme Heat: A State Action Plan to Build Community Resilience". California Air Natural Resources Agency (April 2022). Archived July 26, 2025. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Climate-Resilience/2022-Final-Extreme-Heat-Action-Plan.pdf

[108] Lindsey, R. & Collins, N. "Heat wave in Southern California and the Southwest in early September 2024". NOAA (September 13, 2024). Archived on June 18, 2025. https://web.archive.org/web/20250618233320/https://www.climate.gov/news-features/event-tracker/heat-wave-southern-california-and-southwest-early-september-2024

vulnerabilities".[109] Reducing heat impacts to vulnerable communities was listed as a topmost priority. Within this discussion, the County developed a map (**Figure 4-16** below) that overlaid low, moderate, and high Social Vulnerability Index values with the projected additional maximum heat days by 2050. The service area was entirely within "moderate" and "high" values with 35-40 additional maximum heat days.

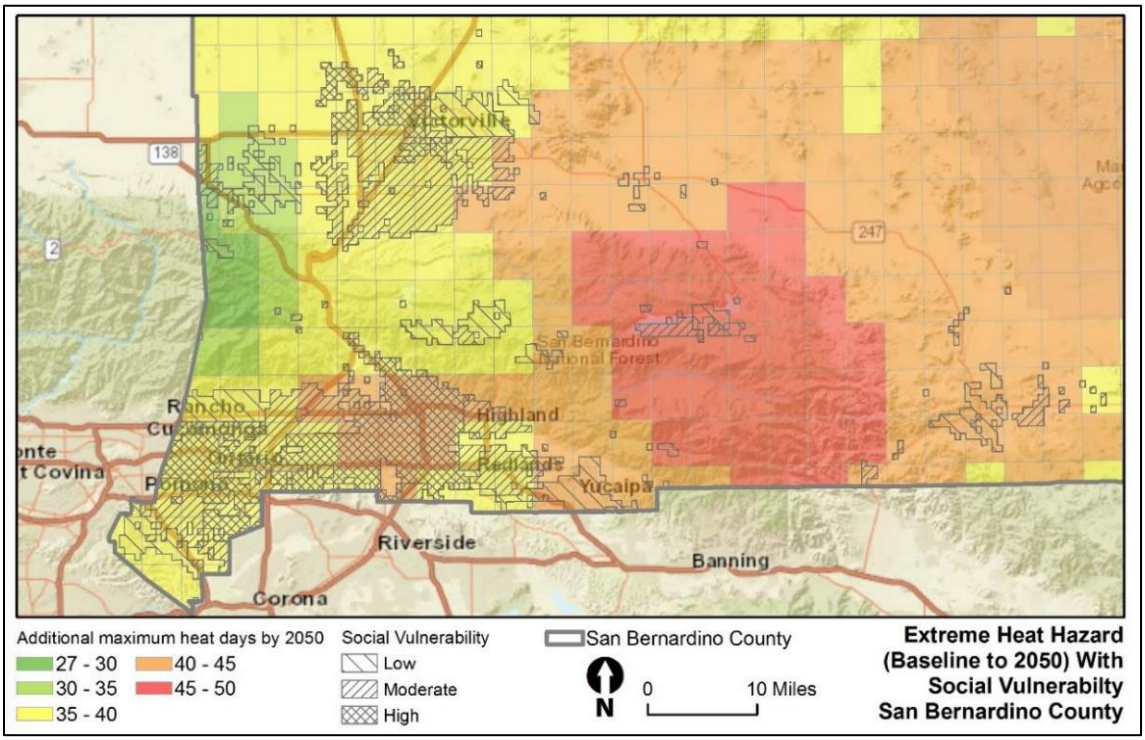

Figure 4-16: Heat Exposure in Southwestern County of San Bernardino

Probability of Future Events and Magnitude: As stated previously, heat waves are expected to rise in frequency and duration over the next 25 years. Regardless of the cause, "annual average temperature has been rising since the beginning of the 20th century, and temperatures are expected to continue to rise through the end of this century". The Southwest US is expected to warm faster than other regions of the country.[110]

Cal-Adapt, California's database of climate data and visualization tools, provides five different ways to define the extreme heat hazard: (1) the number of extreme heat days by year; (2) the number of warm nights by year; (3) the number of heat waves by year; (4) the timing of extreme heat days by year (cf., which months do extreme heat hazards occur); and (5) the maximum

[109] "San Bernardino County Resilience Strategy". WRCOG (2019). Archived on July 4, 2024. https://web.archive.org/web/20240704221017/https://wrcog.us/DocumentCenter/View/7660/San-Bernardino-County-Resilience-Strategy2019_FINAL

[110] "Extreme Heat & Public Health Report". SCAG (September 2020). Archived on July 14, 2020. https://web.archive.org/web/20250714122158/https://scag.ca.gov/sites/default/files/2024-05/extremeheatpublichealthreportfinal_09302020.pdf

duration of the heat wave by year. These metrics project both the intensity and the temporal nature of extreme heat.[111]

Using Cal-Adapt's tool for Extreme Heat Days & Warm Nights, the Upper Santa Ana River Watershed is expected to have an average of 26 days per year with temperatures above 95.2°F under a "Medium Emissions" scenario between 2036 and 2064. The 30-year range is 4 to 60 days per year. The modeled historical baseline period of 1961-1990 averaged 5 days per year with a range of 0-16 days above the same temperature.[112]

Heat waves are likely to be an annual occurrence in and around the service area. It is likely that multiple events may occur in years with multiple high-pressure systems as in 2017 and 2022.

4.3.9 Landslide

Description: Landslides are defined by USGS as "the movement of a mass of rock, debris, or earth down a slope".[113] Landslides may occur suddenly and unexpectedly, or they may occur following storms, wildfires, and/or earthquakes. They are the result of friction between layers of soil and rock failing, which causes uncontrollable sliding of the topmost layers. Natural causes of landslides include intense rainfall, prolonged rainfall, earthquakes, freeze-thaw cycles, and flooding. Human causes include improper excavation, unstable earth fills, improper loading of a slope, deforestation, and water leakage from water or sewer lines.[114]

Landslides are a fairly common occurrence within the San Bernardino Mountains, though events large enough to cause an emergency declaration are rare. They are most likely to occur during and immediately after storms when soil water saturation is at the highest level or due to seismic shaking during earthquakes.

Table 4-25 describes the most common types of landslides. For the purposes of the LHMP, "landslide" collectively refers to these unless otherwise specified. USGS's *Landslide Handbook* contains additional information on landslide types and causes.[115]

[111] Cal-Adapt "delivers critical climate data and cutting-edge tools" concerning climate change's potential impacts and adaptability measures. The website is accessible as of August 24, 2025: https://cal-adapt.org/tools/extreme-heat
[112] Ibid. See Cal-Adapt's Tool Array.
[113] "What is a landslide and what causes one?". USGS (n.d.). Archived on July 22, 2025. https://web.archive.org/web/2/https://www.usgs.gov/faqs/what-a-landslide-and-what-causes-one
[114] "Appendix A: Basic Information about Landslides". *The Landslide Handbook – A Guide to Understanding Landslides*. USGS (n.d.). Archived on April 19, 2025. https://web.archive.org/web/20250419081749/https://pubs.usgs.gov/circ/1325/pdf/Sections/AppendixA.pdf
[115] Ibid.

Table 4-25: Common Types of Landslides	
Type	**Description**
Earthflow	A soil flow landslide in which the soil materials are fine-grained and cohesive with little material strength. As the soil slides, it shears off and creates a lumpy slope with an outward bulge at the end. Earthflows usually occur on moderately steep slopes after prolonged rainfall. They can be fast- or slow-moving. Extremely slow-moving earthflows are called “creep”.
Debris Flow	Fast-moving landslides that often occur with little warning. They may propagate after heavy rains, especially on slopes where the soils are not cohesive or denuded after wildfires. Debris flows can carry boulders, trees, vehicles, and small buildings. They can be especially destructive and extend for several miles if they travel into gullies and seasonal river channels. Debris flows are also known as mudslides.
Debris Avalanche	Debris avalanches are fast-moving landslides that occur when an unstable slope collapses and falls away from the slope. They occur in steep terrain and can be very large. Not to be confused with snow avalanches.
Earthquake-Induced Landslide	Landslides that occur due to seismic shaking. These types of landslides can cause very large landslides as soils that would otherwise remain cohesive are sufficiently disturbed at greater moment magnitudes.
Rockfall	A mass of rock detaches from a steep slope by sliding or toppling off the slope and into the air. They can be caused by heavy rains, earthquakes, and freeze-thaw cycles.

History: Landslides are a common occurrence within mountainous areas. However, they are likely to be unreported if they do not impact a populated area or road. Large, destructive landslides often occur after wildfires. A series of debris flows and debris avalanches occurred in January 2018 throughout southern California, mostly along slopes denuded in Santa Barbara County during the 2017 wildfire season.[116]

The California Department of Conservation’s Reported California Landslides Database lists major landslides that caused casualties, property damage, and/or road closures. According to this database, no destructive landslides have occurred at the District’s northern boundaries. However, some have occurred nearby – especially on State Road 18 and State Road 330 that travel north into the San Bernardino Mountains. According to the Database, eight landslides occurred on State Road 18 and six on State Road 330 in 2023. All landslides occurred during the winter months (January through March). [117]

[116]“The Economic Impacts of the Montecito Mudslides: A Preliminary Assessment”. Robert D. Niehaus, Inc. (March 2018). Archived on May 26, 2018. https://web.archive.org/web/20180526185909/http://www.rdniehaus.com/rdn/wp-content/uploads/2018/03/RDN_Montecito_Mudslides_Impacts-1.pdf

[117] The Reported California Landslides Database is accessible as of August 24, 2025. Available information include landslide photographs, State reports, maps, and location data. See: https://www.conservation.ca.gov/cgs/landslides

Location: Landslides can occur at any place where steep slopes and soils exist together. These qualities are present along the slopes of the San Bernardino Mountains in the northernmost service area. **Appendix I** shows a projection from the Landside Susceptibility Map maintained by USGS overlaid with the District's boundaries.[118] Dark red portions demonstrate the highest value of landslide susceptibility during favorable conditions (e.g., saturated soils).

Extent: Human activities that destabilize slopes can increase vulnerability, such as removing trees or building structures near steep ground. Any District buildings, roads, pipelines, and other infrastructure that are adjacent to or on top of eroded landscapes can be at risk. Any infrastructure adjacent to fault lines (such as the San Andreas Fault) may be at increased risk to landslides following even minor earthquakes.

One of the few systematized reporting metrics is the National Atmospheric and Space Administration's Cooperative Open Online Landslide Repository (COOLR), which allows citizen scientists to submit reports on landslides. COOLR uses the following landslide size classifications:[119]

- **Small:** Less than 10 cubic meters of debris. These minimally impact infrastructure and roads though may still hold enough mass to kill a human.
- **Medium:** Between 10 and 1,000 cubic meters of debris. These can block roads for days, damage houses and facilities, and easily kill humans.
- **Large:** Between 1,000 and 100,000 cubic meters of debris. Often cover wide areas with substantial impact to roads and infrastructure, likely displacing people and causing tens to hundreds of casualties.
- **Very Large:** Between 100,000 and 1,000,000 cubic meters of debris. These landslides cover extremely large areas that can cover entire towns and neighborhoods.
- **Catastrophic:** Over 1,000,000 cubic meters of debris. Multiple towns, neighborhoods, and boroughs may be impacted or completely covered. Fatalities might be over 1,000.

Landslide risk may change based on natural and human factors. Erosion can steepen a slope and increase the risk of debris avalanches or earthflows. Severe storms may cause water to percolate between layers, increase their weight, and reduce friction forces. The shaking caused by earthquakes can loosen soils that would otherwise be firm. Vegetation plays an important role in reducing landslide risk by absorbing water and providing structural integrity to soils through root systems. Removing plans can increase landslide risk even if the slope remains the same. Finally, wildfires can drastically increase the probability of highly destructive landslides and debris flows.

Regulatory Context: As discussed within the Earthquake & Seismic Events hazard analysis, the State of California's Seismic Hazards Mapping Act (SHMA) directs the Department of Conservation to identify and map areas that are prone to seismic hazards, including earthquake-

[118] The February 3, 2025, edition of the Landslide Inventory and Susceptibility Map was used in constructing this LHMP. See: https://www.usgs.gov/tools/us-landslide-inventory-and-susceptibility-map

[119] "The Landslide Reporter's Guide; Primer and Landslide Identification". NASA (n.d.). Archived on February 23, 2025.
https://web.archive.org/web/20250223161959/https://gpm.nasa.gov/landslides/guides/COOLRGuide_Primer.pdf

induced landslides. EZRIs with landslide risk "generally indicate steep hillslopes composed of weak materials that may fail when shaken by an earthquake".[120] The Natural Hazards Disclosure Act requires sellers of real property to disclose if the property is within a state-mapped hazard area. Seismic Hazard Zone Maps are available through the Department of Conservation and the California Earthquake Hazards Zone Application.[121]

Developmental Trends: There are no known developmental trends or changes in land use that would either increase the risk of destructive landslides or place significant infrastructure near steep slopes. The Cities of Highland and San Bernardino are not expanding further into the mountainous slopes, and no major construction is currently planned by the District in any landslide-prone areas.

Impact due to Climate Change: Debris flows and mudslides may become more common as more extreme weather events cause greater soil saturation.[122] El Niño weather events could also increase the amount of water dumped during each event despite the area becoming dryer on average. There is no association between climate change and earthquakes, so the risk of landslides associated with seismic shaking is unlikely to change.

Probability of Future Events and Magnitude: It is difficult to predict where landslides will occur, and landslide risk is often defined following destructive events. Slopes that previously experienced landslides will not necessarily be safer, especially if lingering weaknesses in the soil or bedrock remain. Any slopes burned by wildfires should be assumed to have significantly increased risk of debris flows. **Appendix I** shows areas within the service area at greatest risk for landslides. Based on previous history, a landslide that impacts actual infrastructure (as opposed to being in an unpopulated/undeveloped gully) is estimated at under 1 percent but greater than 0.1 percent annual chance of occurrence.

4.3.10 Power Failure/PSPS

Description: A power failure is the partial or total loss of the electricity supply to an area or region. In addition to natural hazards such as earthquakes and high winds, power failures may occur due to a defect in a power station, damage to a power line or other part of the distribution system, a short circuit, or the overloading of electricity mains.

There are three categories of power failures relevant to this LHMP:

- **Blackout:** Occurs if power is completely lost within a section of the grid. They may occur due to transmission failures, extremely high demand, and cascading failures at substations. Blackouts may last for hours to days in severe cases.
- **Brownout:** Occurs if some power supply is retained, but the voltage level is below the minimum level specified for the system. Brownouts typically occur due to periods of

[120] "California Seismic Hazard Zones". California Department of Conservation (n.d.). Archived on August 24, 2025. https://web.archive.org/web/20250824161714/https://www.conservation.ca.gov/cgs/shma
[121] Accessible as of August 24, 2025: https://www.conservation.ca.gov/cgs/geohazards/eq-zapp
[122] WRCOG SBC Vulnerability Assessment (2022)

high demand and do not necessarily result in blackouts. Typically, power grids quickly recover from brownouts upon reduction of demand.

- **Short Circuit:** Indicates a loss of power over a short amount of time, usually measured in seconds as opposed to the longer duration of blackouts and brownouts.

An intentional power outage called a Public Safety Power Shutoff (PSPS) may be induced by power companies due to high power demand that exceeds supply or to de-energize power lines in wildfire-prone areas. PSPS are planned reductions of service and will be accompanied by press releases or statements from the power company one to three days in advance. PSPS often occur in conjunction with "red flag days" when wildfire risk is much higher than normal due to low humidity, strong winds, and heavy fuel loads.

Major power failures most often occur because of transmission issues and heavy demand, as might happen during heat waves when HVAC use is very high. Strong winds and severe storms can knock down power lines, which is especially dangerous within rural and mountainous areas. Earthquakes can disrupt power lines and substations, knocking out power for days or weeks as in the 1989 Loma Prieta earthquake in northern California.

History: According to the US Department of Energy's Form OE-417 ("Electric Emergency Incident and Disturbance Report"), 138 outages impacting at least 50,000 customers occurred in the State of California from 2000 to 2023.[123] Two-thirds of the causes were "weather-related" by way of storms, strong winds, and heat waves. Most failures were restored within minutes. Larger power failures that significantly impacted southern California are detailed in **Table 4-26.**

Table 4-26: History of Major Power Failures in Southern California

Date	Description
December 1982	High winds and storms knocked out transmission towers throughout the western United States, leading to over two million businesses and homes losing power throughout Nevada, southern California, and the San Francisco Bay Area.
July 2 – August 10, 1996	The Western North America blackouts impacted power grids throughout Canada, northern Mexico, and the western United States over a six-week span. Most of the blackouts lasted minutes to hours, with the cause identified as grounding and relay issues over long-range power transportation. The August 10 blackout occurred during a heat wave that placed additional strain on the power grid due to reliance on air conditioning.

[123] "Power Outages in California". PowerOutage.report (n.d.). Archived on June 16, 2025. https://web.archive.org/web/20250616195409/https://poweroutage.report/ca

Table 4-26: History of Major Power Failures in Southern California	
Date	**Description**
May 2000 – March 2001	A series of escalating planned and unplanned blackouts and brownouts occurred throughout California. Reasons included deregulation of the State's electric utilities, higher wholesale energy costs, no new investment in new power plants, price manipulation by energy sellers, and an unsustainable reliance on energy imports from other states. Droughts within the Pacific Northwest reduced the amount of hydroelectric power available for import and increased prices. Heat waves throughout the western United States likewise increased demand. Electricity supply further decreased following transmission failures and a natural gas pipeline rupture. Some utilities companies (such as PG&E) filed for bankruptcy.
September 8, 2011	The largest power failure in California history resulted in over six million customers losing power in southern California due to an overload brought by a mix of lack of contingency for power dispatch issues, unusually warm weather, misclassification of emergency protocols, and human error among transmission operators. Within 11 minutes, 23 failures occurred on five separate power grids. This "Great Blackout of 2011" lasted for approximately 12 hours.
August 2020	California ISO and electricity providers instituted the first statewide rolling blackouts since 2001 following a major heat wave that placed significant strain on the statewide power grid. 492,000 customers lost power on August 14 for between 15 and 150 minutes. 321,000 customers lost power on August 15 for between 8 and 90 minutes.

Location: The power grid within the service area is operated by Southern California Edison (SCE), a subsidiary of Edison International. SCE maintains the general power system and electrical transmission facilities for over 15 million customers within southern California. A power outage that impacts the service area due to SCE service is likely to affect other nearby communities. Brownouts and blackouts can occur anywhere within the power grid.

Figure 4-17 shows nearby power stations and transmission lines within southwest County of San Bernardino per the United States' Energy Information Administration (EIA). The map is a screenshot of the EIA's US Energy Atlas.[124] The service area does not directly provide power to

[124] EIA's Energy Infrastructure and Resource Maps resource is accessible as of August 24, 2025: https://atlas.eia.gov/pages/energy-maps

any power stations, nor is it near any substations that could secondarily impact District-owned facilities or infrastructure if an explosion occurred.[125]

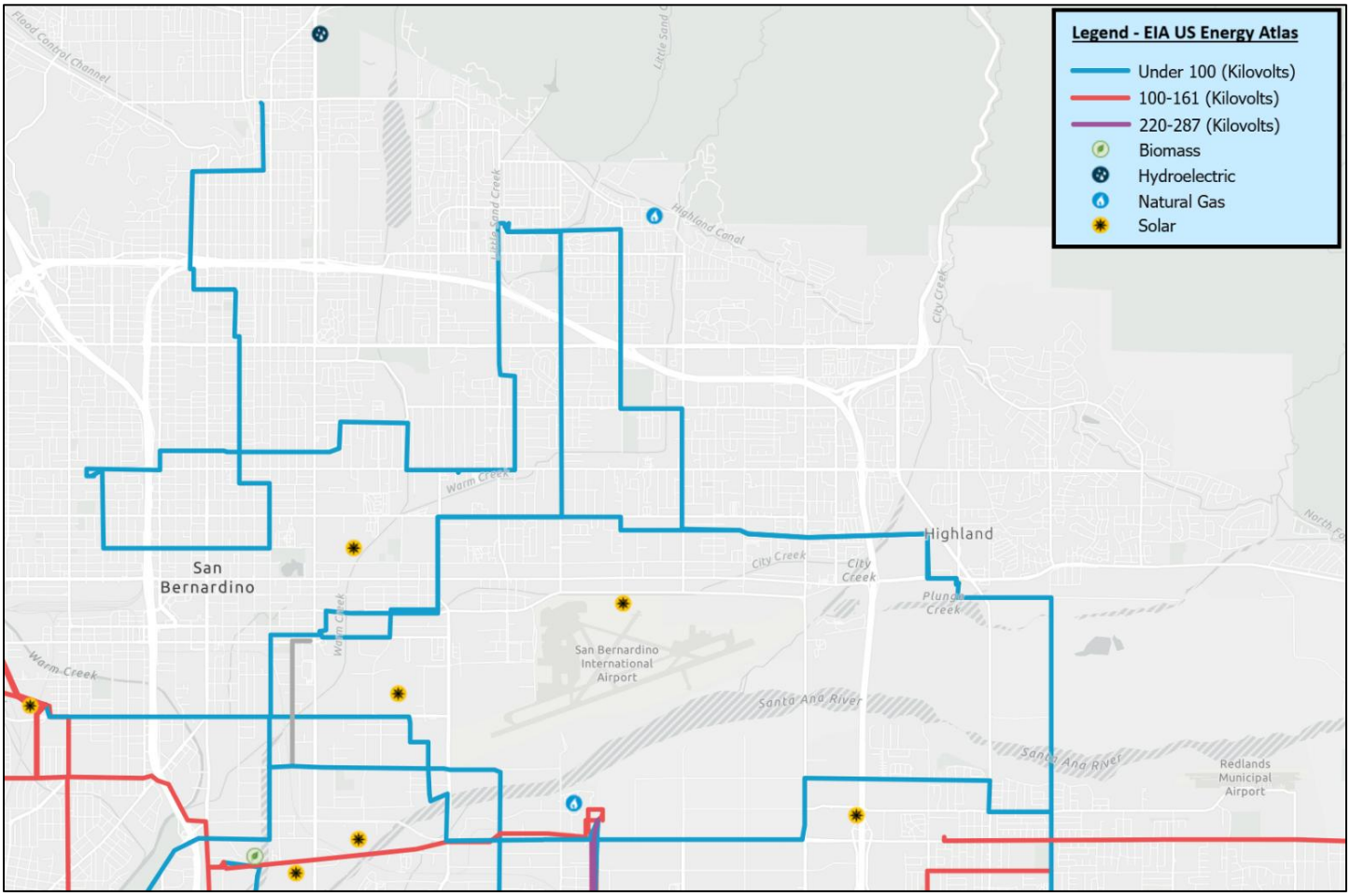

Figure 4-17: Energy Infrastructure Near Southwest County of San Bernardino

As shown above, the service area exclusively contains electrical transmission lines under 100 kilovolts. The only power plant within the service area is the San Manuel Central Plant Cogens natural gas power plant. It is operated by the Yuhaaviatam of San Manuel Nation and produced approximately 26.5 gigawatts-per-hour in 2023.[126]

Localized power failures could impact a single facility. These types of failures are more likely during other disasters such as floods or earthquakes that damage power lines.

Extent: Small brownouts are relatively common and do not often result in an emergency response. Larger blackouts can lead to grid-wide cessation of service, which can cause backups within sewer and water treatment facilities. Power loss can also impact staff through a lack of air

[125] Note: The District's FY 24-25 Budget states that excess energy produced by the SNRC could be sold back to SCE. However, this has not yet occurred at a reportable level as of July 15, 2025.
[126] "San Manuel Central Plant Cogens – Plant Summary Information". GridInfo (n.d.). Archived on August 24, 2025. https://web.archive.org/web/20250824162625/https://www.gridinfo.com/plant/san-manuel-central-plant-cogens/66472

conditioning and an inability to wash and maintain vehicles. The District may more easily prepare for PSPS given they are often announced 72 hours in advance; however, the risk to infrastructure that rely on continuous energy still exists.

There are four different metrics used to define power reliability. Of these, the System Average Interruption Duration Index (SAIDI) is the most commonly used index. The following definitions come from the California Public Utilities Commission (CPUC):[127]

- **System Average Interruption Duration Index:** Measures the average total minutes of outage that a customer on the system experienced in the reporting year.
- **System Average Interruption Frequency Index:** Measures the average number of sustained outages (i.e., outages that lasted greater than five minutes) that a customer on the system experienced in the reporting year.
- **Customer Average Interruption Duration Index:** Measures the average duration of a single sustained outage that a customer experienced in the reporting year.
- **Momentary Average Interruption Duration Index:** Measures the average number of momentary outages (i.e., outages that lasted less than five minutes) that a customer experienced in the reporting year.

Under California law, each of these metrics is reported with and without Major Event Days (MEDs). MEDs are defined as days when the SAIDI of an event exceeds a statistically-defined threshold based on the previous five years of daily SAIDI data. According to CPUC, MEDs are "low frequency, high consequence events" that exclude "all but the worst 0.63 percent of outage events".[128] PSPS are considered MEDs only when they exceed the threshold.

Regulatory Context: EIA's Energy Disruption Maps show current and potential threats to energy infrastructure.[129] EIA also provides information on large-scale energy infrastructure, energy source production, and energy resources. The California State Geoportal provides Power Outage Incidents maps that are updated every 15 minutes.[130] These materials and maps can assist the District in planning for potential emergencies, especially if wildfires or urban fires could potentially impact transmission lines. Finally, SCE provides information on current outages, scheduled outages, and potential PSPS on its website.[131]

Development Trends: Over the last decade, power companies such as SCE have become more risk-averse, especially following the destructive 2018 and 2020 wildfire seasons. In 2018 SCE initiated three separate PSPS; it was its first year doing so. In 2024, SCE initiated 20 PSPS from

[127] "Electric System Reliability Annual Reports". CPUC (n.d.). Archived on July 4, 2025. https://web.archive.org/web/20250704171738/https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/electric-system-reliability-annual-reports
[128] Ibid.
[129] EIA provides information on disruptions due to hurricanes and tropical storms, wildfires, and flooding events. Accessible as of August 24, 2025: https://atlas.eia.gov/pages/energy-disruptions
[130] Cal OES's Statewide Power Outages public map contains data pulled from utilities' power outage maps. Accessible as of August 24, 2025: https://data.ca.gov/dataset/statewide-power-outages-public-view
[131] Accessible as of August 24, 2025: https://www.sce.com/outage-center/check-outage-status

June through December, with most occurring October through December.[132] While an important component of wildfire mitigation, the relatively high frequency of PSPS events demonstrates a trend toward more frequent power loss events.

To mitigate wildfire risk, SCE is implementing "targeted undergrounding" of high-risk power lines throughout southern California. Given that blown power lines are a common ignition source, targeted undergrounding will reduce power utilities' vulnerability and risk of power loss due to strong winds. Targeted undergrounding takes place under CPUC's Rule 20, which sets the policies and procedures for converting overhead power lines to underground. Further information may be found within CPUC's Rule 20 Frequently Asked Questions page.[133]

Impact of Climate Change: There is no direct link between climate change and power failure. However, indirect effects due to the changing probability of other natural hazards may increase the number and severity of power outages. The August 2020 rolling blackouts resulted from high energy usage during record-setting heat throughout the State. The hazard analysis for the Heat Wave hazard described an increase in the frequency and duration of extreme heat events and hot days over the next several decades; these events will further strain the power grid.

Probability of Future Events and Magnitude: Power failures are inherently difficult to predict. They are predicated on a complex system of economic factors, natural hazards, climate, and population needs. Power failures are likely to occur in tandem with heat waves, earthquakes, and wildfires – the last of which is the greatest risk to power given their association with PSPS and long-term damage to energy infrastructure.[134,135,136]

According to SCE's 2024 Annual Electric Reliability Report, the SAIDI value for 2024 was 158.30 (100.25 when MEDs excluded). That means the average customer on the SCE power grid experienced 158.30 minutes of power loss throughout 2024. This value is slightly higher than 2022 (131.13) and 2023 (115.90) but lower than 2019 (177.97), 2020 (201.32), and 2021 (179.79).[137] This data shows that some form of annual power loss is virtually guaranteed for the

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[132] Each year's reports are released in April of the following year. For a list of post-event reports, pre-season reports, and post-season reports, please see (accessible as of August 24, 2025): https://www.cpuc.ca.gov/consumer-support/psps/utility-company-psps-reports-post-event-and-post-season

[133] "CPUC Rule 20 Undergrounding Programs – FAQ". CPUC (n.d.). Archived on June 9, 2025. https://web.archive.org/web/2/https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/undergrounding-program-description/rule-20/cpuc-rule-20-undergrounding-programs----faqs

[134] Skibell, A. "Wildfires are jacking up California's power bills". Politico (January 15, 2025). Archived on April 19, 2025. https://web.archive.org/web/2/https://www.politico.com/newsletters/power-switch/2025/01/15/wildfires-are-jacking-up-californias-power-bills-00198429

[135] Penn, I., Levitt, Z., & González Gómez, M. "New Data Shows Major Electrical Disruption Ahead of Eaton Fire". New York Times (January 29, 2025). Archived on July 22, 2025. https://web.archive.org/web/20250722223915/https://www.nytimes.com/interactive/2025/01/29/business/energy-environment/eaton-fire-electrical-faults-southern-california-edison.html

[136] "Moody's says LA fire may pose risk to Southern California Edison". Reuters (January 16, 2025). Archived on January 17, 2025. https://web.archive.org/web/20250117104211/https://www.reuters.com/world/us/moodys-says-la-fire-may-pose-risk-southern-california-edison-2025-01-16/

[137] "Annual Electric Reliability Report – Calendar Year: 2024". SCE (July 15, 2025). Prepared for: CPUC. Archived on August 24, 2025.

District in the absence of backup power sources that do not rely on SCE's grid. The CPRI places power failure and PSPS in the highest probability category at greater than 10 percent chance of annual occurrence.

4.2.11 Severe Storms

Description: Severe storm events are common throughout southern California, though not always to the extent of a disaster declaration. These events include thunderstorms, high winds, and the El Niño-La Niña oscillation cycle. Severe storms are strongly related to other hazards described within this LHMP including floods, wildfires, power loss/PSPS events, and landslides.

The climate within the service area is a mix of semi-arid and hot-dry mediterranean in which winters are generally cool and damp. The dominating factor in the area's weather is the semi-permanent high-pressure area of the northern Pacific Ocean, which moves northward in summer and reduces precipitation during summer and early fall. This leads to the San Bernardino Valley (and most of southern California at-large) having zero recorded precipitation from June through August – and often very little well into fall.

Beginning in August and September, much of southern California is subject to Santa Ana winds. These are strong and extremely dry down-slope winds that originate inland and bring hot, dry weather. Santa Ana winds are often responsible for fanning the area's most destructive wildfires, but they are very rarely strong enough to harm buildings or infrastructure.

Much of southern California's wet season is driven by "atmospheric rivers". Atmospheric rivers are defined as narrow bands of highly concentrated moisture within the atmosphere that transport water out of tropical areas.[138] Upon making landfall, the water vapor cools and releases extremely large amounts of precipitation, typically over a few days. While an important part of California's water cycle, large atmospheric rivers can cause widespread flooding and debris flows.

The El Niño and La Niña events strongly influence global weather patterns. These events refer to the periodic warming and cooling of the eastern Pacific Ocean, especially near the California and Mexico coastlines. El Niño generally leads to wetter winters, whereas La Niña is associated with warmer and drier winters. El Niño periods often cause greater and more powerful thunderstorms and atmospheric river events given the significant warming of the eastern Pacific Ocean.[139]

History: The area's history of significant storms and wind events is described within the 2022 County of San Bernardino MJHMP and NWS's "A History of Significant Weather Events in Southern California".[140] A list of all events would be outside the scope of this LHMP. **Table 4-27**

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https://web.archive.org/web/20250824163900/https://www.sce.com/sites/default/files/AboutUs/Reliability/Annual%20Reliability%20Report%202024%20FINAL.pdf

[138] "What are atmospheric rivers?". NOAA (February 21, 2025). Archived on July 27, 2025. https://web.archive.org/web/20250727062801/https://www.noaa.gov/stories/what-are-atmospheric-rivers

[139] "Extreme Weather – El Niño". California Coastal Commission (n.d.). Archived on June 27, 2025. https://web.archive.org/web/2/https://www.coastal.ca.gov/climate/extreme-weather/el-nino/

[140] A History of Significant Weather Events in Southern California". NWS (March 2025). Archived on July 26, 2025. https://web.archive.org/web/2/https://www.weather.gov/media/sgx/documents/weatherhistory.pdf

below lists major storm and wind events within the region over the last 100 years. Text comes directly from NWS.

Table 4-27: Selected History of Severe Storms in the County of San Bernardino	
Date	**Description**
September 1932	A late-season tropical storm brought four days of rain to most of southern California, coinciding with the El Niño year of 1932-1933. At least 15 people died due to floods and debris flows.
March 1938	22 inches of rain fell within the San Bernardino Mountains, flooding the Santa Ana River and causing mudslides within western Orange County. Over 210 people died.
January 25-27, 1956	Heavy storms washed over the Counties of Los Angeles, Orange, and San Bernardino. Almost eight inches of rain are recorded in Los Angeles. Mudslides occurred throughout mountainous areas
September 9-12, 1976	Tropical Storm Kathleen passed over southern California with significant rainfall during the El Niño year of 1976-1977.
February 13-21, 1980	A series of six storms hit southern California, dumping 9-10 inches throughout the area.
February 18-19, 1984	Mudslides occurred within the mountainous areas of the Counties of Orange, Los Angeles, and San Bernardino after a period of severe storms.
December 6-8, 1997	Widespread flooding, mudslides, and coastal erosion occurred in southern California after a line of thunderstorms brought the heaviest rain in over 70 years.
March 15, 2003	A slow-moving cold front brought 3-7 inches of rain into southern California. NWS states that over 1,000 traffic accidents and six deaths were attributed to this particular storm due to flooded roadways.
July 18-19, 2015	Residual showers from a dissipating Hurricane Dolores brought a series of thunderstorms throughout southern California.
January 5 and February 12, 2019	Two winter atmospheric river events brought heavy precipitation throughout southern California. High winds, flooding, debris flows, and power outages occurred. Governor Gavin Newsom declared a state of emergency on February 21, 2019.
February 25, 2021	An extreme Santa Ana wind event resulted in gusts of 80-90 miles per hour within the foothills of the San Bernardino Mountains north of the city.
January 9-10 and 14-16; and February 23-26, 2023	Widespread flooding throughout southern California followed a series of atmospheric river events.
August 19, 2023	Hurricane Hillary made landfall in southern California as a Category 4 hurricane, resulting in widespread flooding and evacuations throughout the area.
January 7-8, 2025	An extreme Santa Ana Wind event lasted for 48 hours throughout the County of San Bernardino. Gusts reached over 80 miles per hour in some area, with most areas in the Inland Empire experiencing sustained winds of 50-60 miles per hour.

Location: Storms, high winds, and the El Niño-La Niña oscillation cycle are regional by definition. There is no particular location in the service area or among District infrastructure where storm events are more or less likely.

NWS, NOAA, and other government agencies maintain several tools that facilitate forecasting storms and high winds. The most common of these is the NWS's system of local forecasting offices (LFOs). NWS summarizes information from LFOs and distributes it through weather forecasts in a simple graphic format, including comprehensive day and night forecasts for up to three days in the future. Additional information is provided on temperature, humidity, windspeeds, precipitation, and heat index. **Figure 4-18** shows a screenshot of the local forecast for the City of Highland.

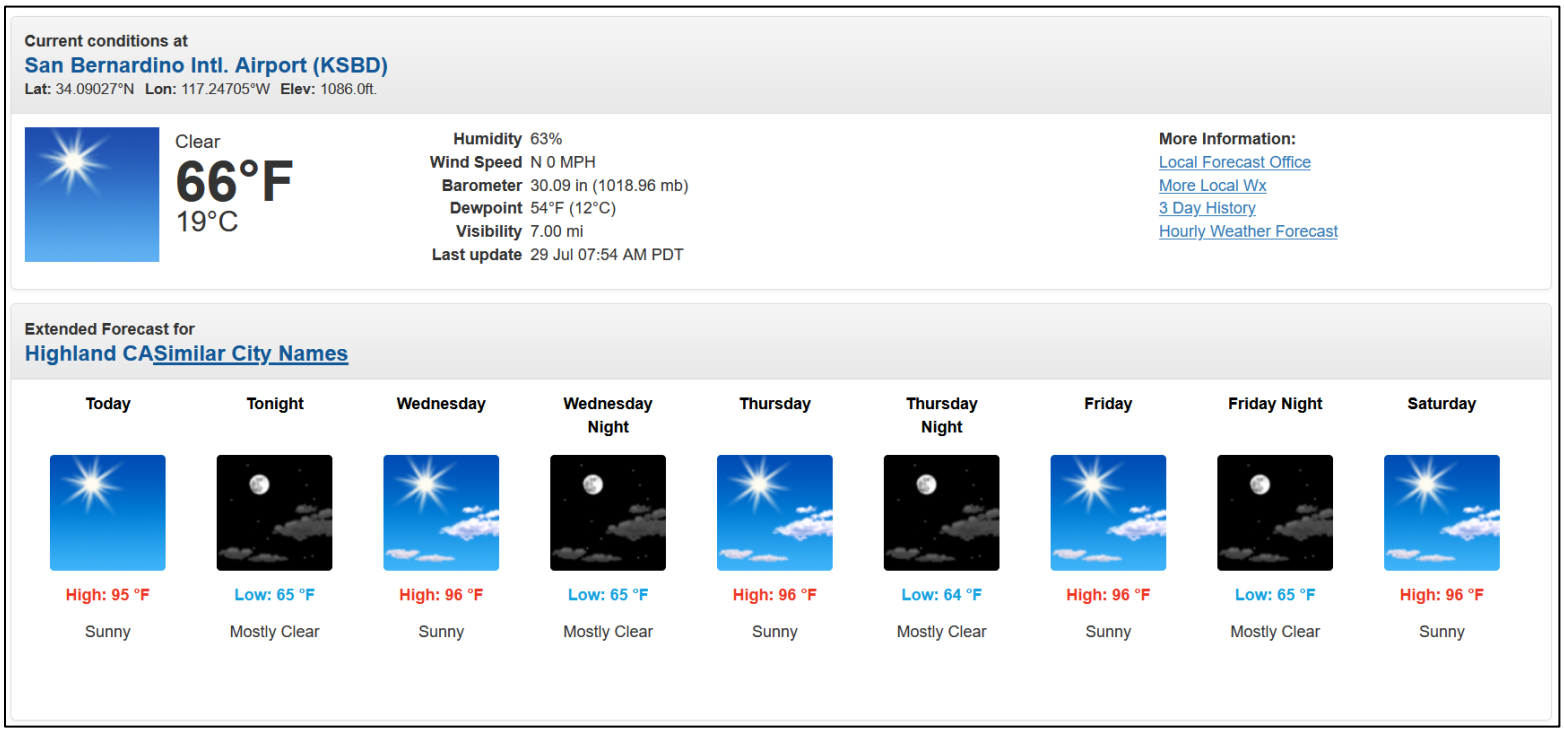

Figure 4-18: Local Forecast for the City of Highland (Exported 7/29/2025)

Extent: Storms are strongly associated with many other hazards. The extent and vulnerabilities outlined for floods, landslides, and wildfires will apply to severe storms. Additionally, there are several different categories of severe storms based on expected damage and windspeed. **Table 4-28** describes the Storm Prediction Center's classification for thunderstorm risk.[141]

Table 4-28: Storm Prediction Center Risk Categories

Risk Category	Description
Marginal (MRGL)	Isolated severe thunderstorms are possible. Storms are limited in duration and/or coverage and/or intensity.
Slight (SLGT)	Short-lived and/or not widespread; isolated intense storms are possible.
Enhanced (ENH)	Numerous severe storms are possible. Storms are more persistent and/or widespread, but few are intense.

[141] "SPC Products – Understanding Severe Thunderstorm Risk Categories". Storm Prediction Center, NOAA (n.d.). Archived on July 29, 2025. https://web.archive.org/web/2/https://www.spc.noaa.gov/misc/about.html

Table 4-28: Storm Prediction Center Risk Categories	
Risk Category	**Description**
Moderate (MDT)	Widespread severe storms are likely. Storms may be long-lived, widespread, and intense.
High (HIGH)	Widespread severe storms are expected. Storms may be long-lived and particularly intense.

In 2019, the Scripps Institution of Oceanography at UC San Diego published a five-level scale developed by F. Martin Ralph at the Center for Western Water and Weather Extremes that evaluates the relative strength of atmospheric river events. The scale ranges from AR 1-5. The intention of the scale is to assist planners in assessing if an event is "beneficial" or "hazardous" based on the intensity of rainfall and length of the event. Shorter events with greater rainfall may be ranked similarly to longer events with less average rainfall. Rainfall is defined according to "maximum vertically integrated water vapor transport" (Max. IVT), which approximates the total amount of water vapor precipitated.

An example of an AR 1 event is the February 2, 2017, atmospheric river that produced "modest rainfall" throughout the central and southern California coastline.[142] The series of atmospheric river events throughout January and March 2023 during the record-setting Sierra Nevada snow year included ten AR 2 events and seven AR 3 events.[143] This series ended the 2020-2022 California drought.

Table 4-29 depicts the scale.[144]

Table 4-29: Atmospheric River Event Categories			
Category	**Strength & Impact**	**Max. IVT (kg/m^2s)**	**Duration**
1	Weak – Primarily beneficial	500-750	<24 hours
		250-500	24-48 hours
2	Moderate – Mostly beneficial, also hazardous	750-1000	<24 hours
		500-750	24-48 hours
		250-500	>48 hours
3	Strong – Balance of beneficial and hazardous	1000-1250	<24 hours
		750-1000	24-48 hours

[142] A History of Significant Weather Events in Southern California". NWS (March 2025). Archived on July 26, 2025. https://web.archive.org/web/2/https://www.weather.gov/media/sgx/documents/weatherhistory.pdf
[143] "The Atmospheric Rivers of Water Year 2023: End of Water Year Summary". Scripps Institution of Oceanography at UC San Diego, Center for Western Weather and Water Extremes (October 20, 2023). Archived on May 18, 2025. https://web.archive.org/web/2/https://cw3e.ucsd.edu/the-atmospheric-rivers-of-water-year-2023-end-of-water-year-summary/
[144] Monroe, R. "New Scale to Characterize Strength and Impacts of Atmospheric River Storms". Scripps Institution of Oceanography at UC San Diego, Center for Western Weather and Water Extremes (February 5, 2019). Archived on June 12, 2025. https://web.archive.org/web/20250612195921/https://scripps.ucsd.edu/news/new-scale-characterize-strength-and-impacts-atmospheric-river-storms

Table 4-29: Atmospheric River Event Categories			
Category	**Strength & Impact**	**Max. IVT (kg/m^2s)**	**Duration**
		500-750	>48 hours
4	Extreme – Mostly hazardous, also beneficial	≥1250	<24 hours
		1000-1250	24-48 hours
		750-1000	>48 hours
5	Exceptional – Primarily hazardous	≥1250	24-48 hours
		≥1000	>48 hours

El Niño and La Niña events do not have associated scales, but there are consistent atmospheric and oceanic impacts that can be measured. Both events are "oscillations" in that they occur due to variations in sea surface temperatures, wind strength, and precipitation patterns. They occur irregularly but semi-cyclically. Both events can result in significant swings in heat/cold and precipitation throughout the North American continent. They are typically measured by oceanographic and atmospheric surveys performed by NOAA that monitor sea surface temperatures and precipitation averages.

El Niño events are associated with warmer sea surface temperatures, when central and western Pacific Ocean waters near the tropics exceed 80 degrees Fahrenheit. According to NWS,[145] El Niño causes a pattern of hotter-than-average temperatures within Californian coastal areas from December through March. Precipitation also generally increases, with wetter conditions expected from January through March.

La Niña events incur the opposite oscillation; the same tropical waters are often within the low 60s degrees Fahrenheit. Northern and coastal California are generally cooler, especially February through April. Coastal California is slightly dryer from November through January, whereas southern California is extremely dry. For either oscillation, the impacts to the District are measured via the drought and storm scales discussed in this LHMP.

As described in the hazard analysis for floods, severe rainfall is a serious concern for areas like the District. Rainfall-derived inflow and intrusion (RDII) into sewer systems is "the main cause of sanitary sewer overflows" and can "create serious operating problems for sewage treatment plants".[146] The severe storms and atmospheric river events described within this hazard analysis can cause heavy precipitation that leads to RDII and exacerbates wear and tear.

[145] "El Niño: Risk of Weather Extremes". NOAA (n.d.). June 23, 2025. https://web.archive.org/web/2/https://www.weather.gov/mhx/risknino
[146] Kesik, T. "Best practices guide: Management of inflow and infiltration in new urban developments". Institute for Catastrophic Loss Reduction (February 2015). Archived on February 17, 2025. https://web.archive.org/web/20250217020058/https://academic.daniels.utoronto.ca/pbs/wp-content/uploads/sites/13/2023/04/II-Best-Practices-Guidelines.pdf

Regulatory Context: There are no regulations that pertain to thunderstorms, Santa Ana winds, or the El Niño-La Niña oscillation cycle. The regulatory context for related hazards (floods, wildfires, landslides) may be found in their respective hazard analyses.

Developmental Trends: Building and infrastructure development within the San Bernardino Valley does not influence severe storm risk. Likewise, any population growth is not expected to change the service area's vulnerability to storms and wind. As with the "Regulatory Context" subsection, developmental trends concerning related hazards may be found in their respective analyses.

Impact of Climate Change: According to the *San Bernardino County Vulnerability Assessment*, "recent studies project that future atmospheric rivers could be approximately 25 percent longer and wider, while carrying larger amounts of water vapor compared to historical conditions".[147] This finding corresponds with the general trend toward dryer climate on average but a greater preponderance of extreme events when such events occur.

The City of San Bernardino's 2024 LHMP states "atmospheric rivers that deliver storms to southern California may intensify […] storms are expected to increase by 10 to 20 percent".[148] The 4th Climate Change Assessment qualifies this sentiment in that "climate change is projected to increase the strength of the most intense atmospheric rivers affecting California" even if "climate model projections do not present a strong consensus towards the whole of California 'getting wetter' or 'getting drier'".[149]

The data on Santa Ana winds are more mixed. Santa Ana winds may follow the trend of other weather-related phenomena in having a greater number of extreme events. Other studies show a potential decrease in the duration of Santa Ana winds coupled with increased temperatures in December and January. The State of California's 4th Climate Change Assessment reflects this lack of consensus as "some results suggest decreased activity […] however, there is no indication of decreased activity in the longest record of Santa Ana winds available".[150]

Probability of Future Events and Magnitude: The State of California has the most variable seasonal and annual precipitation in the contiguous United States. This causes multi-year wet and dry periods (cf. droughts and record-setting water years) that can feature periods of variable storm frequency, intensity, and duration. Per the 4th Climate Change Assessment, "most of the heaviest precipitation events occur in winter" and the "wettest days explain the dominant portion of year-to-year variability".[151] Annual extreme precipitation events are all but guaranteed.

Thunderstorms are common throughout southwestern County of San Bernardino and occur many times each year. The County of San Bernardino's disaster history demonstrates that storms

[147] WRCOG SBC Vulnerability Assessment (2022)
[148] City of San Bernardino LHMP (2024)
[149] California 4th Climate Change Assessment (2018)
[150] Ibid.
[151] Ibid.

severe enough to cause localized flooding are rarer but occur on average once every 5-10 years. Atmospheric river events occur multiple times throughout the rainy season. At least one AR 2-3 event hits southern California each year, though AR 4-5 events occur approximately once every ten years.[152]

Santa Ana winds are a seasonal occurrence. The winds can be expected to blow throughout the fall and early winter each year. Extremely strong winds that incur gusts over 60-70 miles per hour occur on average once per year, according to historical data and the City of San Bernardino's 2024 LHMP.

According to NOAA, El Niño and La Niña events are irregular and occur on average every three to five years. However, this interval can be as large as two to seven years.[153]

4.3.12 Wildfire

Description: Wildfires (or "wildland fires") are any fires involving outdoor vegetation, typically used in reference to large, uncontrolled, and/or unintended fires. Fires are a natural part of wild spaces and are often beneficial to the landscape. Many species of trees (such as pine) require fires to propagate their seeds. However, increased human habitation and landscape changes over the last two hundred years of rapid development have made even natural fires much more hazardous as uncontrolled fires can lead to conflagrations in periurban spaces.

Wildfires are typically described in context of the "Wildland Urban Interface" (WUI), which the US Fire Administration defines as "the area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels."[154] Scattered residential development within wilderness areas increases the number of potential manmade ignition sources due to the greater perimeter along the WUI in contrast to the deprecated view of the WUI being a single urban center abutting a forest or grassland.

Wildfires are influenced by fuel, weather, and topography:

- **Fuel:** The rate of fire spread is strongly based on the type of vegetation present and whether it is living or dead. The dry fallen wood of late summer can cause extremely hot and fast-moving fires. Trees that have been defoliated due to insects or previous fires may be more susceptible to ignition. The San Bernardino National Forest is primarily mixed-conifer, oak woodlands, and chaparral, all of which are associated with wildfires.
- **Weather:** High temperatures, low humidity, and fast winds create conditions that make "Red Flag" days, when wildfires are at the greatest potential to both start and spread

[152] Monroe, R. "New Scale to Characterize Strength and Impacts of Atmospheric River Storms". Scripps Institution of Oceanography at UC San Diego, Center for Western Weather and Water Extremes (February 5, 2019). Archived on June 12, 2025. https://web.archive.org/web/20250612195921/https://scripps.ucsd.edu/news/new-scale-characterize-strength-and-impacts-atmospheric-river-storms
[153] "El Niño and La Niña". NOAA (n.d.). Archived on July 29, 2025. web.archive.org/web/2/https://www.noaa.gov/education/resource-collections/weather-atmosphere/el-nino
[154] "What is the WUI?". US Fire Administration (n.d.). Archived on July 3, 2025. https://web.archive.org/web/2/https://www.usfa.fema.gov/wui/what-is-the-wui/#:~:text=The%20WUI%20is%20the%20zone,undeveloped%20wildland%20or%20vegetative%20fuels

quickly. Long periods of drought or little precipitation can also increase the speed of spread, whereas coastal fog increases humidity and reduces spread. Lightning storms are also an important ignition source for wildfires. As described within the Severe Storms hazard analysis, the hot and dry Santa Ana winds can rapidly spread sparks.

- **Topography:** The mountainous landscape north of the District's service area and infrastructure can change the rate at which fire can spread. Valleys can funnel heat and wind from wildfires, increasing spread and destructive force. The tops of fires burn hotter, allowing easier spread up ridgelines. Mountainous terrain can also impede firefighters' ability to enter the area.

The potential for both life and property losses within the WUI is exponentially higher than non-populated wildlands. Most wildfires that directly threaten communities are caused by human activity.[155] The most common types of ignitions include:

- **Lightning strikes:** Lightning is the main cause of natural wildfires.[156] When lightning strikes the ground, it can ignite dry fuels such as brush and deadfall. "Dry lightning storms" have caused some of California's largest wildfires, such as the August Complex fire in 2020. These storms occur when lightning strikes the ground but all or most precipitation evaporates before hitting the ground.
- **Utility-caused wildfires:** Utility-caused wildfires typically occur when power lines short or arc near vegetation, thereby sparking fires similar to lightning strikes. Overhead power lines have caused wildfires throughout the southwestern United States, as with the 2018 Camp Fire that began due to a faulty hook on a transmission line owned by PG&E. Older transmission lines that are downed due to storms can cause high-energy and high-temperature arcing.
- **Arson:** Arson is defined as the intentional ignition of fire. The destructive 2024 Line Fire and 2003 Old Fire were both caused by arson.

History: According to the 2023 California State Hazard Mitigation Plan, "California has long been recognized as one of the most fire-prone natural landscapes in the world".[157] While wildfires have always been a part of the State's natural history, recent large conflagrations throughout the State have devastated human and natural landscapes.

Table 4-30 shows a partial list of wildfires that burned within ten miles of the service area over the last 25 years with an emphasis on declared disasters. Smaller wildfires that do not threaten human life or infrastructure are unlikely to be declared as disasters and are not reported within this table.

[155] Iglesias, V. "Wildfires Started by Daily Human Activities Are Often More Destructive". Scientific American (January 15, 2025). Archived on June 27, 2025. https://web.archive.org/web/2/https://www.scientificamerican.com/article/wildfires-started-by-human-activities-are-often-more-destructive/
[156] Pérez-Invernón, F., Gordillo-Vázquez, F., Huntrieser, H., & Jöckel, P. "Variation of lightning-ignited wildfire patterns under climate change". *Nature Communications* 14, 739 (2023). doi: 10.1038/s41467-023-36500-5
[157] California SHMP (2023)

This information comes from Cal Fire's incidents database unless otherwise noted.[158] A full list of all fires that impacted the County of San Bernardino is outside the scope of this LHMP.

Table 4-30: Selected Wildfire History in the County of San Bernardino (2000-2025)		
Date	**Fire Name (FEMA #)**	**Description**
September 8 – November 26, 2024	Bridge Fire (FM-4437-CA)	The Bridge Fire began at 2:15PM on September 8, 2024, along the boundaries of the Angeles and San Bernardino National Forest. Though the cause is unknown, it is suspected to be caused by lightning. Excessive heat and winds resulted in a Red Flag Warning on the day of the fire. It burned simultaneously with the destructive Line Fire ten miles east. Mandatory evacuations took place in Mt. Baldy Village, Wrightwood, and Jackson Lake. $10 million in damages were reported alongside eight injuries, 81 destroyed structures (including 20 homes in Mt. Baldy Village), and 17 damaged structures. There were no deaths.
September 5 – December 23, 2024	Line Fire (FM-5535-CA)	The Line Fire started north of the City of Highland on the boundary of the San Bernardino National Forest at Baseline and Alpin Streets. The fire began after several days of extremely high temperatures throughout southern California, hitting over 107°F in southwest County of San Bernardino and 112°F in Los Angeles County. The fire rapidly burned north into the Santa Ana drainage within the mountains due to upslope winds. 9,200 homes throughout the Cities of Highland, East Highland, and Running Springs were evacuated. The cause of the fire was arson. Firefighting costs topped $14.5 million to keep the fire away from populated areas. There were six injuries and zero deaths. One structure was destroyed and four were damaged for $1 million in damages. 43,978 acres were burned.
September 5 – November 16, 2020	El Dorado Fire (FM-5350-CA)	The El Dorado Fire burned 22,744 acres along the borders of Riverside County and southwest County of San Bernardino after a pyrotechnic device during a gender reveal party ignited brush. The fire threatened areas near Oak Glen, Mentone, and Yucaipa south of Big Bear Lake. One firefighter died and 13 were injured. 20 buildings were destroyed, and Highway 38 was briefly closed in September.
October 31 – November 14, 2019	Hillside Fire (FM-5301-CA)	The Hillside Fire only burned 200 acres but occurred within periurban areas north of the Cities of San Bernardino and Highland. Six homes were destroyed and 18 homes were damaged.
July 6 – October 22, 2018	Valley Fire (N/A)	The Valley Fire began as a brush fire near Forest Falls in the San Bernardino National Forest on a steep mountainside. The fire resulted in the evacuation of Forest Falls and road closures along Highway 38. There were five injuries and zero deaths with unknown damages.

[158] Incident database is accessible here (as of August 24, 2025): https://www.fire.ca.gov/Incidents

Table 4-30: Selected Wildfire History in the County of San Bernardino (2000-2025)		
Date	**Fire Name (FEMA #)**	**Description**
August 16-23, 2016	Blue Cut Fire (FM-5147-CA)	The Blue Cut Fire was one of the most destructive wildfires in California history at the time. It began within the San Gabriel Mountains along Interstate 15 on the Blue Cut hiking trail during Red Flag conditions. Temperatures were over 100°F with wind gusts up to 30 miles per hour. The fire rapidly spread north and burned most of its footprint within the first two days. A mandatory evacuation order was issued for 35,000 homes near Oak Hills, Lytle Creek, Summit Valley, and other communities. I-15 was closed in both directions for two days. The cause of the fire is unknown but may have been an electrical shortage along SCE-owned transmission lines. The fire burned 105 homes and 213 outbuildings over its 37,000-acre footprint. Two civilian injuries occurred and zero deaths. Damages were over $50 million.
October 22 – November 6, 2007	Slide Fire (N/A)	The Slide Fire began during Red Flag conditions near Green Valley Lake and Crestline. The fire burned 12,759 acres, destroyed 272 homes and 3 outbuildings, and damaged 43 additional structures. Nine firefighters were injured. Over $65 million in damages were reported.
October 22 – November 6, 2007	Grass Valley Fire (N/A)	The Grass Valley Fire started during Red Flag conditions on October 22nd near the community of Lake Arrowhead. The fast-moving fire burned 1,247 acres, destroyed 199 homes, and damaged 25 additional structures as firebrands ignited multiple homes at once.[159] One civilian was injured, and there were no deaths. Total damages topped $50 million.
July 22 – July 24, 2006	Ramp Fire (N/A)	The Ramp Fire began in the late morning at the junction of I-15 and Highway 18 within the San Bernardino Mountains. Gusty winds from afternoon thunderstorms quickly fanned the fire toward populated areas, burning 450 acres and destroying 8 structures. There was one civilian death and 17 injuries. Over $11.7 million in damages were reported.
October 25 – November 2, 2003	Old Fire (FM-2503-CA)	The Old Fire and Grand Prix Fire were two of the 15 wildfires through southern California's "Fire Siege of 2003". The Old Fire is one of the most destructive fires in the State's history. It blew through southwest County of San Bernardino, threatening the Cities of San Bernardino and Highland as well as the mountain communities of Lake Arrowhead and Running Springs. Over $1.3 billion in damages (2003 dollars) were reported as the fire burned 975 structures and killed five people. The cause of the fire was arson.
October 21 – November 2, 2003	Grand Prix Fire (FM-2501-CA)	The Grand Prix Fire occurred southwest of the Old Fire and eventually merged with it. An additional $100 million of damages was attributed to the Grand Prix Fire.

[159] "Home Destruction Examination: Grass Valley Fire". USDA (June 2008). Archived on July 9, 2025. https://web.archive.org/web/20250709084655/https://www.fs.usda.gov/rm/pubs_other/rmrs_2008_cohen_j001.pdf

Location: The 2023 California SHMP specifically mentions the San Bernardino Mountains and foothills as areas of significant wildfire risk. The dense brush and steep terrain increase the risk of destructive and fast-moving wildfires, especially during drought years.

Figure 4-19 below shows a map of the Fire Hazard Severity Zones (FHSZs) within the service area. FHSZs are determined by models of how fire behaves on various terrain and by the probability of flames and embers threatening buildings. Within wilderness areas near the WUI, the FHSZ model assesses ignition probability, weather, fuel, and terrain. Higher scores reflect great potential of destruction, hotter embers, and higher likelihood of burning.

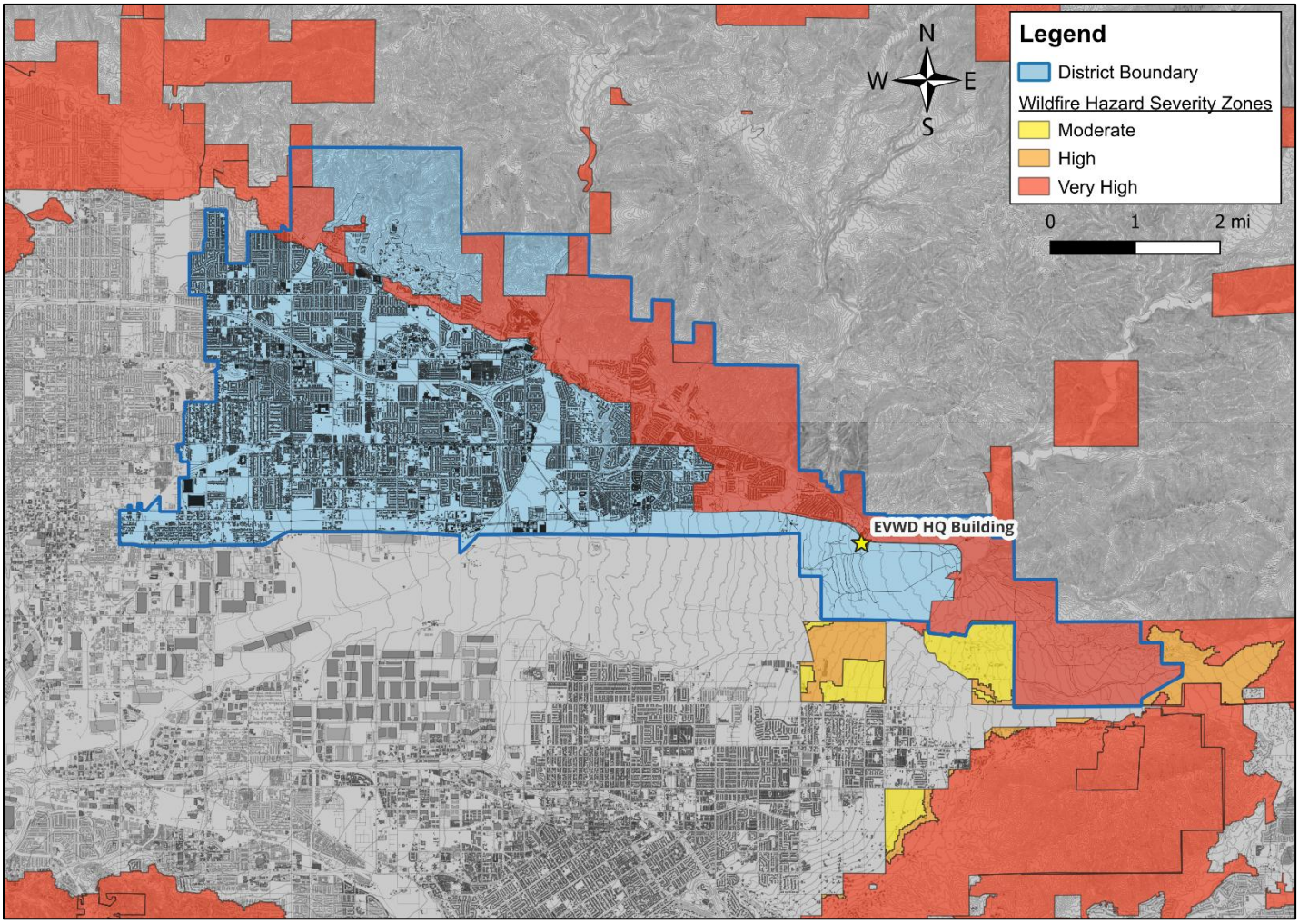

Figure 4-19: Fire Hazard Severity Zones near the District

Extent: Between 1993 and 2022, the County of San Bernardino had the third-highest number of declared disasters (33) due to wildfires out of all California counties. Events such as the 2024 Line Fire show that District's service area infrastructure is at high risk of potential impact if a fire were to occur within the northern foothills.[160]

[160] California SHMP (2023)

The US Forest Service uses the National Fire Danger Rating System (NFDRS) to assess potential fire danger. This five-level scale rates the relative danger of daily fire potential. **Table 4-31** describes the scale, using the descriptions from the US Forest Service website.

Table 4-31: National Fire Danger Rating System	
Level	**Description**
Low	Fuels do not easily ignite from small embers, but lightning may start fires in duff or dry and rotten wood. Fires in open grasslands may burn easily a few hours after rain, but most wood fires will spread slowly by creeping or smoldering. Control of fires is generally easy.
Moderate	Fires can start from most accidental causes, but the number of fire starts is usually pretty low. If a fire does start in an open, dry grassland, it will burn and spread quickly on windy days. Most wood fires will spread slowly to moderately. Average fire intensity will be moderate except in heavy concentrations of fuel, which may burn hot. Fires are still not likely to become serious and are often easy to control.
High	Fires can start easily from most causes and small fuels (such as grasses and needles) will ignite readily. Unattended campfires and brush fires are likely to escape. Fires will spread easily, with some areas of high intensity burning on slopes or concentrated fuels. Fires can become serious and difficult to control unless they are put out while they are still small.
Very High	Fires will start easily from most causes. The fires will spread rapidly and have a quick increase in intensity, right after ignition. Small fires can quickly become large fires and exhibit extreme fire intensity, such as long-distance spotting and fire whirls. These fires can be difficult to control and will often become much larger and longer-lasting fires.
Extreme	Fires of all types start quickly and burn intensely. All fires are potentially serious and can spread very quickly with intense burning. Small fires become big fires much faster than at the "very high" level. Spot fires are probable, in which embers are blown long distances to ignite fires nominally outside of the fire perimeter. Long-distance spotting is likely. These fires are very difficult to fight and may become very dangerous and often last for several days.

As stated previously, NWS may issue various fire weather statements[161,162] to alert the public about the onset of conditions that may cause rapidly spreading wildfires that are easy to ignite. These conditions chiefly concern very low humidity and high windspeeds. The definitions of each are listed in **Table 4-32** below:

[161] "What Is a Red Flag Warning?". NOAA (n.d.). Archived on June 30, 2025. https://web.archive.org/web/2/https://www.weather.gov/media/lmk/pdf/what_is_a_red_flag_warning.pdf
[162] "Watches and Warnings for California". National Interagency Fire Center, Geographic Area Coordination Centers (n.d.). Archived March 29, 2025. https://web.archive.org/web/2/https://gacc.nifc.gov/oscc/predictive/weather/myfiles/Watches_and_Warnings_for_California.htm

Table 4-32: NWS Heat Notifications	
Notification	**Description**
Fire Danger Statement	Not issued by all weather forecast offices. Fire Danger Statements are issued when there is a low but present fire danger that is outside normal conditions.
Fire Weather Watch	Fire Weather Watches are issued any time the area has been dry for a substantial amount of time (or for a shorter period during spring green-up or after fall color); the NFDRS is “high”, “very high”, or “extreme”; and critical weather conditions are expected within the next 48 hours. These conditions include sustained winds averaging 15 mph or greater, relative humidity 25 percent or less, and temperature 75°F or greater. Fire Weather Watches are issued when there is high potential for a Red Flag Warning.
Red Flag Warning	Red Flag Warnings are issued any time there is an ongoing wildfire or when critical weather conditions will occur within the next 24 hours. These conditions include sustained winds averaging 15 mph or greater, relative humidity 25 percent or less, and temperature 75°F or greater. Additionally, NWS monitors fuel loads that can dry out quickly within ten hours. Red Flag Warnings are issued to inform the public, firefighters, and land management staff that conditions are present for easy ignition and rapid spread of wildfires.

Debris flows can occur after highly destructive wildfires. Wildfires that burn hot enough (such as the 2024 Line Fire and 2003 Old Fire) can completely strip vegetation, burning away root systems and topsoil. If this occurs on steep slopes, then future precipitation can cause massive debris flows that endanger any structures and people in their path. Debris flows are often fast-moving and may contain slurries of rock, soil, trees, and boulders.

In addition to casualties and destroyed structures, the destructive potential of wildfires is described through identifying values-at-risk (VARs) either within or near the burned area. For example, the Watershed Emergency Response Team report on the 2024 Line Fire identified 66 VARs within and downslope of the fire, with 22 VARs encompassing multiple individual sites due to similar hazard and risk. VARs can include buildings, roads, pipes, infrastructure, and landscapes.[163]

Fire damage to the landscape is most commonly characterized by soil burn severity. When fires burn, they can char the ground surface and strip away organic matter, leaving a water-repellent layer. Soil burn severity is often used to identify how wildfire changes the soil properties itself, thereby changing the potential for vegetation regrowth or destructive debris flows. Each severity indicator is described in **Table 4-33** below:[164]

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[163] “Watershed Emergency Response Team (WERT): 2024 Line Fire”. Cal Fire, California Department of Conservation, & CGS (November 6, 2024). CA-BDF-012520. Archived on June 28, 2025. https://web.archive.org/web/2/https://www.conservation.ca.gov/cgs/documents/publications/wert/11062024_Line_Fire_WERT_Final_ADA.pdf

[164] Parsons, A., Robichaud, P., Lewis, S., Napper, C., & Clark, J. “Field Guide for Mapping Post-Fire Soil Burn Severity”. USDA (October 2010). Archived on July 26, 2025. web.archive.org/web/2/https://www.fs.usda.gov/rm/pubs/rmrs_gtr243.pdf

Table 4-33: Soil Burn Severity Indicators	
Indicator	**Description**
Unburned/Very Low	Areas that are clearly unburned or do not have significant heat impacts from the fire. The surface may appear normal or close to normal with substantial remaining vegetation and greenery.
Low	Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying material. The ground surface may appear brown or black, and the canopy and understory will likely appear green.
Moderate	Up to 80 percent of the pre-fire ground cover may be consumed. Fine roots may be scorched but are rarely completely consumed. The color of the ash on the surface is generally blackened with possible gray patches. Scorched needles or leaves remaining in the canopy might fall to the ground.
High	All or nearly all of the pre-fire ground cover and surface organic matter is consumed, and charring may be visible on larger roots. The site is often black due to extensive charring. Bare soil or ash is exposed and susceptible to erosion. The aggregate structure may be less stable. White or gray ash indicates considerable ground cover and fuels were consumed. Very large tree roots (over 3 inches in diameter) may be entirely burned and extending from a charred stump hole. Soil is often grey, orange, or reddish where large fuels were concentrated and consumed.

Soil burn severity assessments are often used by the State of California's Watershed Emergency Response Teams and in the Burned Area Emergency Response (BAER) program in assessing damage to burned areas and identifying potential remediation actions. BAER reports and summaries are publicly available through CGS, Cal Fire, the California Department of Conservation, and local county websites.

According to the BAER report for the 2024 Line Fire, soil was severely burned (21 percent "high", 50 percent "moderate") with significant risk of erosion in subsequent rainstorms that "can cause tremendous damage to homes and other structures in the years after a fire".[165] This represents an extremely hot and destructive fire. For context, the highly destructive Blue Cut Fire had 5 percent "high" and 43 percent "moderate" soil burn severity.[166]

[165] "Line Fire Burned Area Summary: Burned Area Report". USDA, USFS (November 2024). Archived on April 2, 2025. https://web.archive.org/web/2/https://burnareainfo.sbcounty.gov/wp-content/uploads/sites/49/2024/11/Line-Post-Fire-BAER-Assessment-Report-Summary_PUBLIC.pdf

[166] "Blue Cut Fire – San Bernardino National Forest, Front Country Ranger District". USDA (September 6, 2016). FS-2500-8 (7/00). Archived on August 24, 2025. https://web.archive.org/web/20250824170947/https://www.wrightwoodfsc.com/fires/BlueCut/BlueCutBAERReport.pdf

Another post-fire impact is contaminated drinking water. This may occur following flash floods, destruction of pipes and conveyance systems, greater sediment and runoff in reservoirs, and/or decreased downstream water supply. Depressurization combined with greater demand for water during a fire can create partial vacuums that suck in volatile organic compounds such as benzene.[167] Degradation of plastic pipes can leach high amounts of carcinogenic vinyl chloride. Raw water sampling may detect organic carbon, iron, and manganese.[168]

Regulatory Context: In the State of California, building materials must comply with the California Building Code's Title 24, Part 2, Chapter 7A (colloquially known as "Chapter 7A"). Chapter 7A lists mandatory requirements for materials and construction methods on building exteriors to reduce the risk of ignition. Among its mandates are fire-resistant siding, Class A fire-rated roofing, tempered glass, and ventilation. Additionally, Chapter 7A lists requirements for managing flammable vegetation and building defensible spaces for firefighters. It applies to all structures built after 2008 within any FHSZ (moderate, high, very high).[169]

In 2007, the County of San Bernardino established the Fire Safety Overlay within the County's Development Code (Chapter 82.13). The Fire Safety Overlay includes areas "designated by the applicable Fire Authority as wildfire risk areas" with "moderate to heavy fuel loading contributing to high fire hazard conditions".[170] The Fire Safety Overlay consolidated several outdated fire laws and aligned the County's wildfire planning priorities more closely with the State's. It broadly overlaps with "very high" FHSVs and extends further into flat, less-forested areas in which brush fires are the chief concern, though the Fire Safety Overlay predates FHSZs. Development within these locations requires augmentations to emergency access, driveways/roadways, fencing, vegetation management, and vehicular access to water sources.[171]

Similar to ASCE and earthquakes, the National Fire Protection Association (NFPA) maintains peer-reviewed standards for building construction and operations, fire extinguishers, foam systems, sprinkler systems, and more. NFPA's standards are considered the gold standard for reducing fire risk to life and safety. Although these standards are not legally binding, they are strongly recommended and will be the standards to which the District conforms in its wildfire mitigation actions. More information on the NFPA standards may be found through their website.[172]

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[167] Liu, J. "When wildfires compromise drinking water, utilities lean on this professor's advice". APM Reports, published by CPR News (August 26, 2025). Archived August 26, 2025. https://web.archive.org/web/20250826195810/https://www.cpr.org/2025/08/26/wildfire-impact-drinking-water/

[168] "Addressing Contamination of Drinking Water Distribution Systems from Volatile Organic Compounds (VOCs) After Wildfires" EPA, Office of Water (October 2021). Archived July 14, 2025. https://web.archive.org/web/2/https://www.epa.gov/system/files/documents/2021-09/addressing-contamination-of-drinking-water-distribution-systems-from-volatile-organic-compounds-after-wildfires_508.pdf

[169] California Building Code Title 24, Part 2, Chapter 7A "Materials and Construction Methods for Exterior Wildfire Exposure". Retrieved from: https://codes.iccsafe.org/content/CABC2025P1/chapter-7a-materials-and-construction-methods-for-exterior-wildfire-exposure

[170] County of San Bernardino Building Code Chapter 82.13 "Fire Safety (FS) Overlay". Retrieved from: https://codelibrary.amlegal.com/codes/sanbernardino/latest/sanberncty_ca/0-0-0-168320

[171] "Fire Safety Overlay Zone: San Bernardino County". California Climate Investments (n.d.). Archived August 16, 2025. web.archive.org/web/2/https://lci.ca.gov/docs/20220817-San_Bernadino_County_Case_Study.pdf

[172] More information on NFPA standards may be found through their website (accessible as of September 9, 2025): https://www.nfpa.org/for-professionals/codes-and-standards/list-of-codes-and-standards

Given its propensity toward destructive wildfires, the State of California requires property owners to establish defensible space. A "defensible space" is defined as a landscape buffer around a building that is free of flammable vegetation and debris to both reduce the risk of ignition and aid firefighters' access. At least 100 feet of defensible space around buildings or structures is required on any property that exists within a Very High FHSZ.[173]

Developmental Trends: Wildfires are an ever-present aspect of California's environment, but their nature and frequency have changed over the past 20 years. Greater development throughout the State's heavily forested and mountainous areas has increased the destructiveness of wildfires as measured by property damage and human casualties.[174]

The 2023 California SHMP identifies an increase in destructive wildfires, with 18 of the largest wildfires in the State's history occurring between 2018 and 2023 The SHMP identifies the following factors in explaining the recent increase:[175]

- Increased fuel loading due to fire exclusion and suppression policies as opposed to controlled burns
- Increases in human-caused ignitions that cause destructive conflagrations in periurban areas
- Climate change's influences on drought and extreme heat events
- Insect infestations and non-native species impacting extant plant life
- Increases in tree mortality, thereby creating more deadfall and fuels
- Longer fire seasons in which vegetation are more receptive to ignition and combustion

According to the Housing Elements within the General Plans of the Cities of San Bernardino and Highland, all new construction and refurbishment will take place occurring to the updated 2019 California Fire Code.[176] The Conservation & Open Space Element of the City of Highland's General Plan makes explicit the "use of fire-resistant vegetation and ample spacing between trees and shrubs […] to reduce the spread of fires". Additionally, the City will "enforce hillside development standards that call for […] fire-retardant building materials". Vegetation will be reduced within high fire hazard zones.[177]

Power companies throughout the State of California are increasing their efforts to harden infrastructure and reduce the risk of utilities-caused wildfires. SCE's 2026-2028 Wildfire Mitigation Plan systematically describes the steps that SCE will take to reduce the risk of ignition and spread,

[173] More information on defensible space requirements may be found through Cal Fire (accessible as of September 9, 2025): https://readyforwildfire.org/wp-content/uploads/2024/07/Defensible-Space-and-the-Law-Factsheet-Revisions-Jan-2024.pdf
[174] "Frequently Asked Questions About Wildfires in California". Legislative Analyst's Office (February 13, 2025). Archived on June 14, 2025. web.archive.org/web/2/https://lao.ca.gov/Publications/Report/4952
[175] California SHMP (2023)
[176] City of San Bernardino General Plan (2005); City of Highland General Plan (2006)
[177] City of Highland General Plan (2006)

including risk scenarios, vegetation management, grid monitoring, emergency preparedness, community outreach, and PSPS.[178]

Impact of Climate Change: Per California's 4th Climate Change Assessment, the current trajectory of greenhouse gas emissions will result in a 50 percent increase in large wildfires over 25,000 acres over the next 75 years. Increasing temperatures throughout the State may increase wildfire risk in forest ecosystems that are vulnerable to more intense drought. Changing water cycle patterns in the desert might reduce the risk of lightning-caused fires as storms become less frequent, but a greater preponderance of more intense storms could lead to a greater number of lightning strikes were such events to occur. Finally, changing climates could shift insect habitats throughout southern California's forest, increasing tree mortality.[179]

According to the UC Davis Division of Agriculture and Natural Resources, invasive plant species within the southern California deserts may contribute to increasing wildfire risk. For example, non-native annual grasses that dry out during the summers (e.g. red brome) can increase fuel loads within arid and semi-arid areas that would previously be protected from fires. The giant reed (which mostly grows near riparian areas) can create dense masses of fuels that violently burn during wildfires and also take little time to regrow. Finally, woody plants such as acacia and eucalyptus may also burn rapidly and regrow quickly.[180]

Probability of Future Events and Magnitude: According to Cal Fire, 77,518 wildfire events occurred between January 2013 and July 2022. This averages approximately 8,000 wildfires per year – not all of which reach a large size or burn near populated areas. Numerous large fire complexes in the County demonstrate their destructive potential and ability to impact the District for years to come. Given recent history and trends, the probability of a wildfire occurring within ten miles of the service area in the next ten years is very high. The CPRI assumes an annual chance of over 10 percent, placing wildfires within the highest probability category.

Historically, wildfire management throughout the United States has focused on fire suppression in which the primary goal is to avoid ignition and spread altogether. Fire suppression allowed fuel build-up that would normally be cleared away during natural fire cycles.[181] Fire management practices on the State and Federal level are now moving away from total fire suppression for a combination of timber regulation, forest restoration, and controlled burns;[182] nonetheless, the District must be prepared for the potential of large fires in the future.

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[178] "2026-2028 Wildfire mitigation Plan". SCE (May 16, 2025). Archived on June 13, 2025. https://web.archive.org/web/20250613130855/https://www.sce.com/sites/default/files/AEM/Wildfire%20Mitigation%20Plan/2026-2028/SCE%202026%20Base-WMP%20R0.pdf

[179] California SHMP (2023)

[180] Bell, C., Ditomaso, J., & Brooks, M. "Invasive Plants and Wildfires in Southern California". University of California, Division of Agriculture and Natural Resources (August 2009). Archived on July 25, 2025. https://web.archive.org/web/20250725155614/https://anrcatalog.ucanr.edu/pdf/8397.pdf

[181] California SHMP (2023)

[182] "Restoring and Maintaining Forest Ecosystem Health and Wildfire Resilience". California Natural Resources Agency (n.d.). Archived on July 6, 2025. https://web.archive.org/web/2/https://resources.ca.gov/Initiatives/Forest-Stewardship

SECTION 5: RISK & VULNERABILITY ASSESSMENT

The District's critical assets include wastewater infrastructure, drinking water infrastructure, administrative buildings, processing facilities, and piping. The Planning Team conducted a risk assessment that concerned critical assets, impacted populations, land use, and cultural/natural resources.

A risk assessment involves evaluating vulnerable assets, describing potential impacts, and estimating losses for each hazard. The risk assessment defines and quantifies the assets at risk from hazards with potential losses, as well as potential impact to staff and the served populations. All information is based on the most available and recent data.

FEMA REGULATION CHECKLIST: RISK ASSESSMENT

44 CFR § 201.6(c)(1): The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Element:
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))
B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

5.1 Identification of Critical Facilities and Assets

Critical facilities and assets include headquarters buildings, distribution infrastructure, pump stations, reservoirs, wells, and storage facilities. Most of these assets are located within the City of Highland at the north-central side of the service area. The SNRC is located in the southwestern end. Other assets (such as drinking water pipes and sewer lines) lie underground.

The following information conforms to the District's water system RRA, the WSMP, the SSMP, and a GIS model. The risk assessment does not identify the vulnerabilities of specific assets, nor does it identify the financial vulnerabilities of the entire East Trunk pipeline.

The Planning Team acknowledges the possibility that some infrastructure might not be captured within the various data sources used in developing this LHMP, such as sewer siphons and certain pumping stations. Therefore, the described valuations and number of at-risk assets should be considered the absolute minimum.

This LHMP does not attempt to quantify the financial value of employees' lives or risk thereof. For hazards that have substantial risk to life but little impact on property (e.g., heat waves), this LHMP will reflect no risk to buildings or infrastructure but will emphasize the risk to human health.

5.1.1 Critical Assets and Devices at Risk

Table 5-1 shows the number and value of critical assets according to the District's insurance schedules and RRA as of June 2025. This includes the SNRC facility. The RRA also reported discrete wells and pressure release valves (PRVs) not associated with a plant, which are likewise treated as separate assets in this LHMP.

Table 5-1: District-Owned Critical Assets

Asset Category	Number	Total Value
Buildings	3	$237,865,211
Electrical Facilities	1	$75,000
Plants	14	$26,737,500
Wells	3	$1,600,000
PRVs	6	$150,000
Total Asset Value		***$266,427,711***

Tables 5-2 and 5-3 below list the length and cost of each diameter of pipelines within the District's water and wastewater systems. This information comes from District-maintained shapefiles for both water lines and sewer lines, which the Planning Team assumed is the most up-to-date source on District infrastructure.

Note that these tables differ from the 2019 WMSP and SSMP for two distinct reasons: 1) these shapefiles contain updated line data from land use developments and expansions over the six years since the WMSP and SSMP's GIS models were developed; and 2) these shapefiles include water and sewer system laterals, which were excluded from both the WMSP and SSMP. The preponderance of 1-inch diameter pipe within the water system model is almost entirely due to inclusion of the laterals. Within the sewer system model, pipes of 27-inch diameters and greater are related to the East Trunk Sewer while the overwhelming majority of 4-inch pipe are laterals.

The modeled water system pipes totaled 311.8 miles. Internal estimates place the water pipe distance at approximately 300 miles. Water system pipes with diameter values of "0", "1.25", "2.5", "27", "39", "48", and "78" inches were excluded from this analysis. These values totaled approximately 8.4 miles of pipe, of which 5.1 miles were in the "0" value bucket.

In comparison, the modeled wastewater system pipes totaled 263.2 miles while excluding diameter values of "0" and "14" (0.53 total miles). Internal estimates place the wastewater pipe

distance at approximately 220 miles. This discrepancy may be explained by the GIS model including laterals and some wastewater pipes that are outside the service area (as with the northwestern pipe system) due to being a part of the expanded sphere of influence or a part of the East Trunk Sewer, the latter of which is part of the 2019 SSMP.

The unit cost of water system pipes greater than or equal to 2-inch diameter comes from the District's water system RRA. ¾- and 1-inch pipes were assumed to be $60/ft based on extrapolations from the unit cost of other pipes. Though of negligible total length, 5-inch pipe was interpolated at $130/ft.

In the absence of an equivalent RRA metric for wastewater systems, the Planning Team assumed that the unit cost per pipe would be roughly equivalent to that of drinking water pipes. The cost of pipe diameters without drinking water pipe analogues (15-inch, 27-inch, 33-inch, 39-inch, 48-inch) were interpolated from the other pipe valuations and rounded to the nearest $5 interval.

Table 5-2: Breakdown of District Pipelines Model (Water Systems)

Diameter	Modeled Miles	Modeled Percent	Unit Cost ($/ft)	Total Cost
¾"	7.2	2.3%	$60/ft*	$2,284,652
1"	95.4	30.6%	$60/ft*	$30,222,652
2"	2.7	0.9%	$75/ft	$1,091,332
3"	1.3	0.4%	$90/ft	$622,654
4"	9.3	3.0%	$113/ft	$5,511,426
5"	0.01	0.0%	$130/ft*	$9,782
6"	60.0	19.2%	$150/ft	$47,488,172
8"	64.8	20.8%	$180/ft	$61,623,854
10"	4.4	1.4%	$200/ft	$4,634,242
12"	35.3	11.3%	$215/ft	$40,144,110
14"	1.4	0.4%	$240/ft	$1,694,652
16"	13.2	4.2%	$300/ft	$20,841,232
18"	0.3	0.1%	$375/ft	$632,041
20"	5.0	1.6%	$450/ft	$11,816,065
21"	0.87	0.3%	$505/ft	$2,341,899
24"	2.8	0.9%	$560/ft	$8,350,948
30"	2.8	0.9%	$615/ft	$9,071,040
36"	5.1	1.6%	$725/ft	$19,437,182
Total Asset Value				***$267,817,313***

*Interpolated values

Table 5-3: Breakdown of District Pipelines Model (Sewer Systems)

Diameter	Modeled Miles	Modeled Percent	Unit Cost ($/ft)	Total Cost
3"	0.12	0.05%	$90/ft	$56,567
4"	95.7	36.4%	$113/ft	$57,097,258
6"	20.8	7.9%	$150/ft	$16,460,000

Table 5-3: Breakdown of District Pipelines Model (Sewer Systems)				
Diameter	**Modeled Miles**	**Modeled Percent**	**Unit Cost ($/ft)**	**Total Cost**
8”	117.0	44.5%	$180/ft	$111,210,769
10”	6.0	2.3%	$200/ft	$6,274,200
12”	8.0	3.0%	$215/ft	$9,089,991
15”	6.3	2.4%	$280/ft*	$9,309,024
16”	0.06	0.03%	$300/ft	$123,559
18”	2.0	0.8%	$375/ft	$3,920,136
21”	1.9	0.7%	$505/ft	$5,208,876
24”	2.2	0.8%	$560/ft	$6,564,503
27”	0.37	0.1%	$590/ft*	$1,112,673
30”	0.25	0.1%	$615/ft	$777,035
33”	0.25	0.1%	$670/ft*	$875,591
36”	0.50	0.2%	$725/ft	$1,840,520
39”	0.25	0.1%	$780/ft*	$983,413
48”	1.6	0.6%	$945/ft*	$7,954,346
Total Asset Value				***$238,858,462***

*Interpolated values

The District maintains a large swathe of water infrastructure to maintain service outside of plants. These are broadly termed “water devices” and were not given financial valuations given the high number of devices in addition to diverse installation dates, materials, models, sizes, and functions. **Table 5-4** below enumerates these devices according to GIS data received from the District’s GIS consultants.

Table 5-4: Breakdown of District Water Devices		
Asset Category	**Description**	**Total Number**
Flow Control Valves	Regulate the flow or pressure of drinking water within the system. Do not regulate flow between pressure zones.	7
System Valves	Pipeline valve where the closure member is rotated to control or stop flow within pipes. Common for basic maintenance of pressure throughout the system.	4841
Pressure Valves	Prevent backflow within the water system.	17
Service Valves	Stop the flow of water into specific facilities, appliances, and pipelines at lower pressure gradients.	3358
Hydrants	Above-ground appliances in which nozzles and hoses can be attached directly to water mains to allow a pressurized stream.	3099
Flushings & Blow Offs	Allow water mains to discharge water from the water system.	357
Service Meters	Monitor water use. Primarily used for accurate billing within the District’s customer base.	23,760
Storage Units	Areas in which the District stores supplies for water infrastructure operations and maintenance.	32

Table 5-4: Breakdown of District Water Devices		
Asset Category	**Description**	**Total Number**
Minor Wells	Wells not associated with specific plants that are used to draft groundwater from the basin.	30
Sampling Devices	Assess the quality and contamination of drinking water to ensure compliance with EPA and State of California regulations.	39
Weirs	Barriers built across bodies of water to control water flow while allowing flow over the crest.	20
Pumps	Used to maintain consistent pressure within the drinking water system.	13
Total Assets		***35,584***

As with the water system, the District maintains a large number of additional infrastructure to maintain wastewater service. These are broadly termed “sewer devices” and were not given financial valuations given the high number of devices in addition to diverse installation dates, materials, models, sizes, and functions. **Table 5-5** below enumerates these devices.

Table 5-5: Breakdown of District Sewer Devices		
Asset Category	**Description**	**Total Number**
Pumps	The District owns a single wastewater pump. This device is not used for maintaining pressure within the wastewater system, which is entirely gravity-fed.	1
Service Connections	Act as the physical connections of the wastewater system to customers’ service lines.	20,501
Cleanouts	Pipe or capped pipe that provides District access to sewer lines to remove blockages, especially FOG.	338
Manholes	Street-level opening to the wastewater system that allow access by maintenance and operations staff.	5192
Total Assets		***26,032***

An additional cost is that of providing imported potable water that might occur in cases of serious water system plant malfunctions or losses of power due to hazards. According to the 2019 WSMP, the modeled average daily demand for 2025 within the water system is 93.4 acre-feet per day (25.34 million gallons per day). At a blended cost of $125.80 per acre-foot, the District would pay a maximum of approximately $11,750 per day for imported water. No similar measurement of wastewater exports or hook-ups exist, but the cost would be similarly non-negligible.

5.1.2 GIS Methodology

The Planning Team used GIS technology to assess the impact of each hazard on the District’s critical infrastructure. The main program used in the analysis was QGIS3 (3.40.5 “Bratislava”), an open-source software initially launched in 2002 with the most recent stable release in July 2025. QGIS supports integration with the Python programming language and R software. Shapefiles

are loaded as layers into "projects" that act as the workspace for data cleaning and analysis. Each layer can be made visible or invisible to aid in data projection and map development.[183]

Each analysis followed these basic steps:

1. Develop a new QGIS project specific to the District's 2026 LHMP.
2. Load each relevant shapefile into the QGIS project.
3. Review the metadata for District and hazard-specific shapefiles to make note of what attributes are appropriate for analysis.
4. Clean each shapefile so it conforms to the District's service area boundaries and can be properly interpreted by analysis software.
5. Fine-tune the modeling used in developing the pipe infrastructure shapefiles within the District's water and sewer systems so that information on pipe sections and diameters conforms to the RRA.
6. Determine overlaps between hazards and District infrastructure (e.g., total feet of pipelines overlaid with fire severity hazard zones).
7. Export maps with overlays of each hazard and impacted infrastructure.

Table 5-6 on the next page shows the shapefiles, information sources, and uses. Copies of each shapefile are available upon request.

Table 5-6: GIS Data Sources

Shapefile	Source	Description
California County Boundaries	US Census Bureau	Shows the terrestrial boundaries for each county within the State of California. Used to establish a baseline map.
Address Features & Structures	OpenStreetMap	Shows the buildings, utilities, and other infrastructure throughout the State of California. Does not include lines or polygons for military bases and critical infrastructure. Used to establish a baseline map.
Roads and Highways	OpenStreetMap	Shows primary, secondary, and city/county-owned roads and highways as line data. Used to establish a baseline map.
Elevation Contour Lines	USGS	Shows the elevation contour lines in 20-foot and 40-foot intervals throughout southern California. Data is preliminary and was derived July 12, 2012. Used to establish a baseline map.
Rivers, Streams, and Lakes	OpenStreetMap	Shows rivers and streams as line data. Lakes and large rivers are depicted as polygons. Used to establish a baseline map and to provide context to the FIRM analysis.
Service Area Boundaries	EVWD	Shows the boundaries of the District's service area. Used to establish a baseline map.
District-Owned Facilities and Buildings	EVWD	Shows point data for the facilities and buildings owned and operated by the District. Does not include any water or wastewater infrastructure (e.g., pipelines). Used to assess what facilities/buildings would be impacted by various hazards.

[183] The QGIS website is accessible here (as of September 11, 2025): https://qgis.org/

Table 5-6: GIS Data Sources		
Shapefile	**Source**	**Description**
District-Owned Water Lines	EVWD	Shows the line data for water (not wastewater) lines within the service area, including connections. Used to assess the proportion of water lines that would be impacted by various hazards.
District-Owned Wastewater Lines	EVWD	Shows the line data for sewer pipelines, mains, and laterals within the service area. Note that laterals are considered the responsibility of property owners. The types of pipelines are not separated out within this analysis. Used to assess the proportion of wastewater lines that would be impacted by various hazards.
District-Owned Center Lines	EVWD	Shows the line data for sewer center lines within the service area. Used to assess the proportion of center lines that would be impacted by various hazards.
District-Owned Sewer Devices	EVWD	Shows point data for sewer devices such as manholes and cleanouts within the service area. Used to assess the proportion of sewer devices that would be impacted by various hazards.
District-Owned Water Devices	EVWD	Shows point data for water devices such as pressure valves and service meters within the service area. Used to assess the proportion of water devices that would be impacted by various hazards.
South San Andreas Fault – M7.9 Scenario	USGS	Describes a hypothetical scenario for an M7.9 earthquake along the South San Andreas Fault approximately within ten miles of the service area's boundaries. Intensity estimates are provided by the MMI Scale in contour lines radiating from the scenario's epicenter.
Elsinore Fault – M7.1 Scenario	USGS	Describes a hypothetical scenario for an M7.1 earthquake along the Elsinore Fault within Los Angeles County. Intensity estimates are provided by the MMI Scale in contour lines radiation from the scenario's epicenter.
San Jacinto Fault – M7.0 Scenario	USGS	Describes a hypothetical scenario for an M7.0 earthquake along the San Jacinto Fault within Riverside County. Intensity estimates are provided by the MMI Scale in contour lines radiation from the scenario's epicenter.
Peralta Hills Fault – M6.6 Scenario	USGS	Describes a hypothetical scenario for an M6.6 earthquake along the Peralta Hills Fault within Los Angeles County. Intensity estimates are provided by the MMI Scale in contour lines radiation from the scenario's epicenter.
Landslide Susceptibility	USGS	Shows the polygons of "landslide susceptibility" based on slope-relief threshold and documented landslide occurrence.
California Soil Liquefaction Zones	CGS	Shows the boundaries of soil liquefaction zones mapped by USGS and maintained by the California Geological Survey. This dataset was used to confirm that the service area is not within a soil liquefaction zone, and therefore it is not part of any exhibit.
Superfund Site Boundaries	EPA	Shows the polygons of each superfund site's footprint within the State of California. Used to demonstrate the proximity of the District's service area to the two discussed Superfund sites in the HAZMAT Release hazard analysis.
Wildfire Hazard Severity Zones	Cal Fire	Shows the polygons of the Wildfire Hazard Severity Zones within the County of San Bernardino. Used to demonstrate the proximity of various District buildings and infrastructure to each zone.

Table 5-6: GIS Data Sources		
Shapefile	**Source**	**Description**
Flood Hazard Areas	FEMA	Shows the line and polygon data of the flood hazard areas according to collated FIRM data. Used to assess what proportion of District buildings and infrastructure are within the 100-year and 500-year floodplains.

5.2 Land Use Trends and Development

FEMA REGULATION CHECKLIST: PLAN UPDATE

44 CFR § 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Element:
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?

E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))
E2-a. Does the plan describe how it was revised due to changes in community priorities?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

Per the 2020 LHMP, the service area consists of much scenic open space, light commercial, and light residential zoning, which are conducive to short- and long-term growth. Demand for utilities will increase alongside projected growth; the District therefore needs actionable and appropriate hazard mitigation activities.

Table 5-7 below compares the population size of the service area and local jurisdictions through three distinct periods. Estimated population growth within the service area and the Cities of Highland and San Bernardino outpaces that of the County of San Bernardino and the broader State of California. All information comes from the US Census Bureau.

Table 5-7: Population Estimates within District-Served Populations				
Area	**Population (2010)**	**Population (2017)**	**Population (2023)**	**Percent Change (2017-2023)**
District Service Population	97,000	103,000	108,000	4.85 percent
City of Highland	53,000	55,000	56,700	3.09 percent
City of San Bernardino	210,484	216,818	223,728	3.19 percent
County of San Bernardino	2,035,000	2,171,000	2,181,000	0.46 percent
State of California	37,254,000	39,557,000	39,198,000	-0.91 percent

The City of Highland's Community Design Element of the General Plan outlines the following priorities for infrastructure and city planning/design:[184]

- Revitalize and enhance the quality of the Base Line, 3rd Street, 5th Street, 9th Street Pedestrian Promenade, Victoria Avenue, and Palm Avenue by developing "unifying streetscape elements" and consolidating vacant parcels.
- Place above-ground utility and power lines underground, where possible.
- Plant fire-resistant plants native to the San Bernardino Valley along streetscapes, especially in areas near the foothills to the north.
- Develop a plan for the Town Center to revitalize downtown areas and encourage new growth. Encourage compactness; design plazas and "pedestrian amenities"; and promote a mix of retail, office, and civic use space.
- Zone and encourage mixed-use development within the Town Center and within vacant lots.
- Design local commercial centers with appropriate landscaping, unified design themes, and usable pedestrian features (e.g., shaded sitting areas, fountains, arcades, and secondary entrances).
- Encourage single-family residential development, such as a planned mid-block residential development along the Base Line. Designate lots throughout the City as medium density residential land use.
- Encourage industrial and business park development via coordinated site planning, signage, and cohesive architectural design.
- Preserve the City's historic buildings, especially within the Town Center. Enhance community outreach programs and update design guidelines for rehabilitation and new construction within historic areas.
- Locate and design plazas to encourage third spaces within the City.
- Prioritize and encourage "green planning" within the area, with a focus on drought-tolerant landscaping, drip irrigation, and channeling water to permeable surfaces.

[184] City of Highland General Plan (2006)

The City of Highland's 6th Cycle (2021-2029) Housing Element identifies 33 programs related to the City's housing needs for the eight-year planning period. Land use and development programs relevant to this LHMP are described below:[185]

- **Program 11:** Continue capital improvements on infrastructure throughout the City, especially the Town Center, Base Line Corridor, and Victoria Avenue Corridor Policy Areas. Prioritize projects in lower and moderate resource areas. Complete the widening of the Interstate 210 interchange. Complete development of the Local Roadway Safety Plan.
- **Program 14:** Coordinate with the East Valley Water District to ensure proposed housing developments (especially lower-income households) are prioritized for providing water and sewer services.
- **Program 30:** Identify and prioritize local surplus lands for housing development for lower-income households. Support the development of 89 senior rental units, with a focus on extremely low-income, very low-income, and low-income households. The development will occur on a two-parcel site owned by the Highland Housing Authority.

During the previous LHMP cycle, four major developments were mentioned as having potential for large-scale land use changes. Updates are discussed below:

- **Harmony Specific Plan:** The Harmony Specific Plan was proposed as a high-density mixed-use development on 1,650 acres within the City of Highland. This project was challenged in-court and the land purchased for $31.8 million by the San Bernardino Valley Municipal Water district. There are currently no plans to start a similar project.[186]
- **Greenspot Village and Marketplace:** The Greenspot Village and Marketplace is a planned mixed-use development project with a mixture of residential, commercial, and office uses. Greenspot would cover 104 acres within the City of Highland, including 21 acres previously owned by the San Bernardino County Flood Control District. Greenspot is located at Greenspot Road between Palm Avenue and Boulder Avenue. This project includes the Residence at Greenspot (200 residential multi-family units) the San Carlo developments (200 two-story townhomes and 272 residential multi-family units), and the Greenspot Villages (550 residential units).[187]
- **Mediterra:** The Mediterra Planned Development is a partially constructed project within the City of Highland. It will contain 316 housing units in a mix of low- and medium-density parcels. Mediterra will be developed by D.R. Horton south of the San Bernardino National Forest boundary.[188]

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[185] Ibid.
[186] Hernandez, H. "Water district purchases Harmony property for $31.8 million". Redlands Community News (October 14, 2021). Archived on November 29, 2021. web.archive.org/web/2/https://www.redlandscommunitynews.com/news/government/water-district-purchases-harmony-property-for-31-8-million/article_ea587ad8-2d12-11ec-9c89-3fb4d843d12a.html
[187] Project information available via the Greenspot Village & Marketplace Specific Plan on CEQA (as of August 24, 2025): https://ceqanet.lci.ca.gov/2008031058/5
[188] "Mediterra at East Highlands". City of Highland (January 12, 2021). Archived on August 24, 2025. https://web.archive.org/web/20250824172315/https://www.cityofhighland.org/DocumentCenter/View/2682/Mediterra-Planned-Development-Document-PDF

- **Yaamava' Resort & Casino:** The Yuhaaviatam of San Manuel Nation began developing a major expansion to the Yaamava' Resort & Casino in 2018 and completed construction 2021.[189]

Other salient projects are listed below. Information on other projects may be found via the City of Highland's 2025 Community Activity Map:[190]

- **Halcyon Apartments:** 220 apartments to be developed by Helios Holdings.
- **Anacapa Residence:** 79 single-family detached residential units to be developed by Anacapa Developments.
- **Smart & Final:** 27,500 square foot mixed-use retail building with a 2.9-acre vacant mixed-use lot. The project would include 34 housing units. The project is to be developed by KZ DevCo.
- **Woodbridge Planned Development and Glenrose Planned Development:** These are two housing developments located adjacent to each other. The former is to be developed by Center Stone; the latter, Richmond American Homes. Both would total 251 single-family residential units "with recreational facilities".
- **East Highlands Ranch:** This designation includes two housing developments located adjacent to each other, both listed under "East Highlands Ranch PA". The first (PA 39) includes 13 single-family residential units developed by Mastercraft Homes Group. The second (PA 40/42) includes 137 detached single-family units developed by Sunland Communities.

5.3 Natural and Cultural Resources Inventory

5.3.1 Natural Resources

There are no natural resources on District-owned lands or facilities. However, the service area significantly overlaps with forest, riparian, and mountainous habitats.

As described within **3.2 Geography**, the District sources much of its water from the Bunker Hill Basin via District-owned wells. The Bunker Hill Basin stores approximately 5 million acre-feet of water, of which 1.2 million acre-feet are accessible by the District for pumping. The basin's recharge is approximately 16,000 acre-feet per year via rain, runoff, imported water, and recycled water from the SNRC. It is a vital resource for over 600,000 residents of southern California, namely the Cities of Highland, Redlands, Loma Linda, San Bernardino Colton, Rialto, Bloomington, Fontana, Grand Terrace, and Riverside, in addition to portions of unincorporated County of San Bernardino. Stewardship of the Bunker Hill Basin is shared by the Cities of

[189] "Casino Expansion". Yuhaaviatam of San Manuel Nation (n.d.). Archived on July 17, 2025. https://web.archive.org/web/2/https://sanmanuel-nsn.gov/community/casino-expansion
[190] "Community Development Activity Map". City of Highland (2025). Archived on August 24, 2025. web.archive.org/web/2/https://www.highlandca.gov/DocumentCenter/View/4248/Community-Development-Map-2025-PDF

Redland, San Bernardino, Loma Linda, and Riverside; East Valley Water District; and West Valley Water District.[191]

The District's northern service area extends into the foothills of the San Bernardino Mountains, much of which is managed by the US Forest Service via the San Bernardino National Forest. The National Forest totals over 800,000 acres, of which over 680,000 acres are federally managed. Flora is primarily a mix of coniferous forest within the foothills proper; species include ponderosa pine, sugar pine, lodgepole pine, and pinyon. Sagebrush and chaparral are present within the lowest elevations. The service area does not encounter any designated wilderness areas, and there is no known old growth forest.[192]

The service area is entirely within the watershed of the Santa Ana River, and its southern boundaries align with the river itself. The Santa Ana River is the largest river within Southern California and drains the largest watershed within the region. It flows out of the San Bernardino Mountains through the Counties of San Bernardino, Riverside, and Orange into the Pacific Ocean. The service area encompasses several of the river's tributaries, including Plunge Creek, Elder Creek, Bledsoe Creek, Cook Creek, City Creek, Sand Creek, and Warm Creek. Downstream of the Seven Oaks Dam, the ecology of the Santa Ana River becomes an alluvial scrub zone with a mixture of desert and coniferous flora.[193]

According to the Habitat Conservation Program of the Upper Santa Ana River Sustainable Resources Alliance, there are 23 endangered or threatened species native to the watershed.[194] Factors for endangerment include flood control projects changing historical flooding cycles, increased urbanization encroaching on habitats, and riverine pollution. Three of species are particularly relevant to the District (given their proximity to the District's mountain-chapparal transitional terrain and the Seven Oaks Dam) are the Santa Ana River woolly-star, Santa Ana sucker, and the San Bernardino kangaroo rat. The Wooly Star Preservation Area was established in 1998 by USACE and covers 764 acres downstream of the Seven Oaks Dam to mitigate the effects of the dam.[195]

5.3.2 Cultural Resources

The Planning Team has identified no cultural resources within its owned properties and infrastructure. However, it does serve a variety of properties within the City of Highland, City of San Bernardino, and the Yuhaaviatam of San Manuel Nation that would be considered cultural

[191] "Bunker Hill Basin Facts". San Bernardino Valley Water Conservation District (n.d.). Archived on August 24, 2025. https://web.archive.org/web/20250824172531/https://www.sbvwcd.org/our-district/publications/fs-bunkerhill/?layout=file

[192] Further information about the San Bernardino National Forest is accessible through USFS (as of August 24, 2025): https://www.fs.usda.gov/r05/sanbernardino

[193] Buck-Diaz, J. & Evens, J. "Alluvial Scrub Vegetation of Southern California, A Focus on the Santa Ana River Watershed in Orange, Riverside, and San Bernardino Counties, California". California Native Plant Society, Riverside-Corona Resource Conservation District (September 2011). Archived on December 7, 2022. nps.org/wp-content/uploads/2018/03/alluvial_scrub-diaz_evans2011.pdf

[194] Information on each species is available through the Alliance's website (as of August 24, 2025): https://www.uppersarhcp.com/

[195] "Santa Ana River woolly-star". US Fish & Wildlife Service (n.d.). Archived on May 11, 2025. web.archive.org/web/2/https://www.fws.gov/media/santa-ana-river-woolly-star

resources within those jurisdictions. These include libraries, museums, religious institutions, and sports arenas. The Highland Historic District is completely within the service area and is on the National Register of Historic Places.

The lands that make up the service area were inhabited by Native Americans of the Serrano, Cahuillia, and Gabrieleno groups. No known archaeological sites from these cultures are present on District-owned lands. The General Plans of the Cities of Highland and San Bernardino acknowledge "several […] archaeologically sensitive areas with a high probability for discovery of archaeological resources if disturbed by development". However, these sites are not enumerated and are "widely spread" throughout the area.[196]

Further information about cultural resources within the service area may be found within the City of San Bernardino's 2005 General Plan, the City of San Bernardino's 2021-2029 Housing Element, the City of San Bernardino's 2024 LHMP, and the City of Highland's 2006 General Plan.

5.4 Vulnerability Assessment and Potential Loss

Each hazard of significant concern included within this LHMP was assessed for potential impact to facilities, infrastructure, pipelines, and staff. Where possible, the critical facilities and assets inventory was used to quantify assets at risk. The Planning Team used a combination of GIS technology, discussions with local stakeholders, and subject matter expertise to assign the following losses.

5.4.1 Climate Change

By its nature, climate change is a systemic hazard that will impact most if not all of the District's service area, infrastructure, buildings, and staff. While climate change does not have direct impacts, it will be indirectly felt through changes to the intensity and frequency of droughts, floods, heat waves, and severe storms. Likewise, all District staff are expected to be similarly impacted – especially for hazards that pose the strongest threats to human life and well-being such as droughts, severe storms, and wildfires per the District's disaster history. Given the long-term effects of climate change, potential losses may be interpreted as an increase in the baseline level of hazard present within the District.

5.4.2 Cyberattack

Cyberattacks on utilities often target control systems, such as SCADA. Cyberattacks will likely disrupt or damage technological infrastructure as opposed to the buildings themselves. The true monetary cost to the District (and population served) can be based on the extent of systems impacted, the proportion of lost services, and the total time the District is impacted by the cyberattack.

District staff are unlikely to be directly impacted since cyberattacks do not directly threaten life and health. Even in the case of significant or extended service loss, other temporary wastewater

[196] City of Highland General Plan (2006)

and solid waste collection services would be available in an emergency, such as mutual aid agreements with other Orange County sanitary districts.

A ransomware attack will likely incur additional costs if the District is unable to regain control of SCADA and/or administrative systems without paying the ransom. The ransom itself for utilities is often between $1 million and $2 million, as discussed in the hazard analysis.

This LHMP assumes that all critical assets are at risk to cyberattacks given they either incorporate telecommunications infrastructure that could be taken down (e.g. the headquarters building) or are tied to the District's SCADA systems for water and wastewater. All pipes and water/sewer devices are indirectly threatened due to backups or pressure increases that could occur if the SCADA system is compromised.

5.4.3 Dam Inundation

According to the Seven Oaks Dam's inundation map, the southern service area is at greatest risk of damage. Staff may be threatened if they are within this area during a dam break. Administrative staff at the headquarters building and SNRC would not be affected. Water and wastewater services might be impacted if the water pressure exceeds capacity. **Table 5-8** shows the water system assets at risk. **Appendix F** shows the dam inundation map overlaid with the District's service area, including the headquarters building.

Table 5-8: Water System Critical Assets at Risk due to Dam Inundation

Asset Category	Number At Risk	Number Not At Risk	Total Value at Risk
Buildings	3	0	$237,861,211
Electrical Facilities	1	0	$75,000
Plants	3	11	$1,650,000
Wells	3	0	$1,600,000
PRVs	1	5	$25,000
Total	***11***	***16***	***$241,211,211***

Table 5-9 summarizes water and wastewater pipelines that intersect with the inundation map. Note that the dam inundation map intersects with all of the District's East Trunk Sewer line.

Table 5-9: District Pipelines at Risk due to Dam Inundation

System Category	Diameter	Miles at Risk	Miles Not at Risk	Unit Cost ($/ft)	Total Pipe Value at Risk
Water	**¾"**	2.1	5.1	$60/ft	$642,676
	1"	27.6	67.8	$60/ft	$8,742,345
	2"	0.9	1.8	$75/ft	$346,565
	3"	0.2	1.1	$90/ft	$92,907
	4"	3.6	5.7	$113/ft	$2,136,748

Table 5-9: District Pipelines at Risk due to Dam Inundation					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
	5”	0.0[197]	0.01	$130/ft	$8,767
	6”	18.0	42.0	$150/ft	$14,211,800
	8”	19.5	45.3	$180/ft	$18,547,110
	10”	3.2	1.2	$200/ft	$3,385,603
	12”	9.4	25.9	$215/ft	$10,740,409
	14”	0.3	1.1	$240/ft	$299,315
	16”	3.9	9.3	$300/ft	$6,225,308
	18”	0.06	0.24	$375/ft	$108,350
	20”	2.1	2.9	$450/ft	$4,853,461
	21”	0	0.87	$505/ft	$0
	24”	2.4	0.4	$560/ft	$6,920,649
	30”	1.8	1.0	$615/ft	$5,803,829
	36”	1.7	3.4	$725/ft	$6,371,194
Wastewater	**3”**	0.0	0.12	$90/ft	$0
	4”	28.3	67.4	$113/ft	$16,916,919
	6”	5.7	15.1	$150/ft	$4,472,597
	8”	26.2	90.8	$180/ft	$24,939,652
	10”	2.7	3.3	$200/ft	$2,807,881
	12”	4.1	3.9	$215/ft	$4,631,153
	15”	2.5	3.8	$280/ft	$3,711,756
	16”	0	0.06	$300/ft	$0
	18”	1.6	0.4	$375/ft	$3,171,235
	21”	1.9	0.0	$505/ft	$5,208,876
	24”	2.2	0.0	$560/ft	$6,564,502
	27”	0.37	0.0	$590/ft	$1,112,672
	30”	0.25	0.0	$615/ft	$777,034
	33”	0.25	0.0	$670/ft	$875,591
	36”	0.25	0.0	$725/ft	$1,840,520
	39”	0.5	0.0	$780/ft	$983,413
	48”	1.6	0.0	$945/ft	$7,954,346
Total					***$175,405,183***

Table 5-10 shows the water and sewer system devices that intersect with the inundation map.

Table 5-10: Water and Sewer Devices at Risk due to Dam Inundation			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	4	3
	System Valves	1418	3423
	Pressure Valves	4	13
	Service Valves	1045	2313

[197] Value listed as 0.0 due to rounding to one significant digit. The number of modeled feet at risk is approximately 60 feet.

Table 5-10: Water and Sewer Devices at Risk due to Dam Inundation			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
	Hydrants	950	2149
	Flushings & Blow Offs	117	240
	Service Meters	7074	16,686
	Storage Units	8	24
	Minor Wells	22	8
	Sampling Devices	8	31
	Weirs	1	19
	Pumps	0	13
Wastewater	Pumps	1	0
	Service Connections	6004	14,497
	Cleanouts	99	239
	Manholes	1301	3891

5.4.4 Drought

Droughts are primarily defined by indirect impacts. Staff health and well-being would be indirectly impacted due to secondary impacts such as higher temperatures, as with the extreme heat hazard.

Droughts are unlikely to directly threaten buildings and infrastructure in the same way as destructive physical hazards such as earthquakes, though they are expected to stress pumps and increase maintenance costs. Quantified values on maintenance costs exclusively due to drought management are unavailable within the literature or District records; the Planning Team assumes that all pipes are nominally at risk.

Drought impacts on water utility infrastructure itself include reduced water pressure, reduced water quality (thereby requiring additional treatment), and reduced ability to access supplementary water sources. Therefore, this LHMP assumes that any water system facility or device directly involved in the storage, conveyance, and/or treatment of drinking water will be at risk to marginal costs based on drought-related maintenance. **Table 5-11** summarizes the water system critical assets potentially at risk.

Table 5-11: Water System Critical Assets at Risk due to Drought			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	0	3	$0
Electrical Facilities	0	1	$0
Plants	14	0	$26,737,500
Wells	3	0	$1,600,000
PRVs	6	5	$150,000
Total	***23***	***9***	***$28,487,500***

Droughts may also impact the District's operations through decreasing available water for transporting sewage. Decreased water flow can increase concentration of waste within the system and amplify the impacts of FOG obstructions. Shifting and compacted soils can create space around pipes that increases the risk of small shifts and cracks. With consideration of the discussion on water systems, **Table 5-12** below shows the water and sewer system devices potentially at risk. Again, only devices directly involved in the storage, conveyance, and/or treatment of drinking water are considered at risk.

Table 5-12: Water and Sewer Devices at Risk due to Drought

System Category	Asset Category	Number At Risk	Number Not At Risk
Water	Flow Control Valves	7	0
	System Valves	4841	0
	Pressure Valves	17	0
	Service Valves	3358	0
	Hydrants	3099	0
	Flushings & Blow Offs	0	357
	Service Meters	0	23,760
	Storage Units	0	32
	Minor Wells	30	0
	Sampling Devices	0	39
	Weirs	0	20
	Pumps	13	0
Wastewater	Pumps	1	0
	Service Connections	20,501	0
	Cleanouts	338	0
	Manholes	0	5192

5.4.5 Earthquakes and Seismic Events

Much District infrastructure is along seismically active fault zones within southern California. For example, the South San Andreas Fault runs directly through the northern service area. If a major earthquake (M7.0 or higher) were to impact the area, then the District may expect significant losses due to the destruction of facilities and pipelines – leading to major disruption of service provision and likely secondary impacts and hazards.

Many District buildings and much of its infrastructure lie within anticipated dangerous fault zones. The lives of all staff may be threatened by an M7.0 earthquake. District customers and residents within the service area would almost certainly experience massive disruptions to water and wastewater services due to pipelines breaking, building collapse, and fires.

Given the destructive potential of earthquakes and the District's location along the Southern San Andreas fault, all buildings and infrastructure owned by the District are considered at risk. **Appendix G** contains maps that overlay four earthquake scenarios at four different southern California fault zones. These maps are intended to be diagrammatical expositions on earthquake risk rather than discrete planning tools.

Table 5-13 shows the critical assets within Alquist-Priolo Fault Zones.

Table 5-13: Critical Assets within Alquist-Priolo Fault Zones			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	0	3	$0
Electrical Facilities	0	1	$0
Plants	8	6	$18,662,500
Wells	0	3	$0
PRVs	10	6	$0
Total	***8***	***19***	***$18,662,500***

Table 5-14 shows the waster and sewer system infrastructure that intersect with Alquist-Priolo Fault Zones.

Table 5-14: District Pipelines within Alquist-Priolo Fault Zones					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Water	**¾”**	0.06	7.14	$60/ft	
	1”	12.4	83.0	$60/ft	
	2”	0.3	2.4	$75/ft	
	3”	0.4	0.9	$90/ft	
	4”	0.3	9.0	$113/ft	
	5”	0	0.01	$130/ft	
	6”	6.0	54.0	$150/ft	
	8”	10.8	54.0	$180/ft	
	10”	0.6	3.8	$200/ft	
	12”	7.4	27.9	$215/ft	
	14”	0.2	1.2	$240/ft	
	16”	3.0	10.2	$300/ft	
	18”	0.19	0.11	$375/ft	
	20”	0.9	4.1	$450/ft	
	21”	0	0.87	$505/ft	
	24”	0.2	2.6	$560/ft	
	30”	0.5	2.3	$615/ft	
	36”	2.8	2.3	$725/ft	
Wastewater	**3”**	0	0.12	$90/ft	$0
	4”	11.0	84.7	$113/ft	$10,556,100
	6”	0.9	19.9	$150/ft	$1,199,141
	8”	22.1	94.9	$180/ft	$33,800,710
	10”	0.1	5.9	$200/ft	$134,191
	12”	0.1	7.9	$215/ft	$193,403
	15”	0	6.3	$280/ft	$0
	16”	0	0.06	$300/ft	$0
	18”	0	2.0	$375/ft	$0

Table 5-14: District Pipelines within Alquist-Priolo Fault Zones					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
	21”	0	1.9	$505/ft	$0
	24”	0	2.2	$560/ft	$0
	27”	0	0.37	$590/ft	$0
	30”	0	0.25	$615/ft	$0
	33”	0	0.25	$670/ft	$0
	36”	0	0.50	$725/ft	$0
	39”	0	0.25	$780/ft	$0
	48”	0	1.60	$945/ft	$0
Total					

Table 5-15 shows the water and wastewater devices that lie within Alquist-Priolo Fault Zones.

Table 5-15: Water and Sewer Devices within Alquist-Priolo Fault Zones			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	0	7
	System Valves	707	4134
	Pressure Valves	0	17
	Service Valves	481	2877
	Hydrants	432	2667
	Flushings & Blow Offs	67	290
	Service Meters	2773	20,987
	Storage Units	14	18
	Minor Wells	3	27
	Sampling Devices	9	30
	Weirs	7	0
	Pumps	13	0
Wastewater	Pumps	0	1
	Service Connections	2347	18,154
	Cleanouts	41	297
	Manholes	860	4332

5.4.6 Flooding

Riverine flooding would most likely impact infrastructure within the immediate 100-year floodplain (1 percent chance of annual occurrence). However, a 500-year flood could be catastrophic. Staff who are working within these buildings or are driving in vehicles as floodwaters rise are most likely to be threatened, especially during flash floods near channels in the northern foothills. According to the District’s RRA (Not For Public Release), several plants would have access cut-off if floods inundated service roads. **Appendix H** shows the District’s service area overlaid with FEMA’s flood zones per the area’s FIRM map.

Table 5-16 shows the critical assets at risk within the 100-year floodplain. **Table 5-17** shows the critical assets at risk within the 500-year floodplain.

Table 5-16: Critical Assets within the 100-year Floodplain			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	0	3	$0
Electrical Facilities	0	1	$0
Plants	1	13	$550,000
Wells	0	3	$0
PRVs	1	5	$25,000
Total	***2***	***25***	***$575,000***

Table 5-17: Critical Assets within the 500-year Floodplain			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	1	2	$25,000,000
Electrical Facilities	0	1	$0
Plants	4	10	$4,537,500
Wells	0	3	$0
PRVs	2	4	$50,000
Total	***7***	***20***	***$29,587,500***

Table 5-18 shows the water and sewer system infrastructure that intersect with the 100-year floodplain. **Table 5-19** shows the water and sewer system infrastructure that intersect with the 500-year floodplain.

Table 5-18: District Pipelines within the 100-year Floodplain					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Water	**¾”**	0.2	7.0	$60/ft	$55,418
	1”	8.7	86.7	$60/ft	$2,753,619
	2”	0.5	2.2	$75/ft	$188,734
	3”	1.9	1.1	$90/ft	$100,483
	4”	0.8	8.5	$113/ft	$469,572
	5”	0	0.01	$130/ft	$0
	6”	6.2	53.8	$150/ft	$4,911,177
	8”	7.5	57.3	$180/ft	$7,151,653
	10”	0.7	3.7	$200/ft	$710,829
	12”	6.0	29.3	$215/ft	$6,801,999
	14”	0.2	1.2	$240/ft	$288,274
	16”	3.3	9.9	$300/ft	$5,238,360
	18”	0.06	0.24	$375/ft	$108,350
	20”	2.4	2.6	$450/ft	$5,707,890
	21”	0.81	0.06	$505/ft	$2,095,649
	24”	0.8	2.0	$560/ft	$2,323,888
	30”	1.3	1.5	$615/ft	$4,143,984
	36”	1.1	4.0	$725/ft	$4,018,119

Table 5-18: District Pipelines within the 100-year Floodplain					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Wastewater	**3”**	0	0.12	$90/ft	$0
	4”	8.3	87.4	$113/ft	$4,954,280
	6”	1.8	19.0	$150/ft	$1,436,724
	8”	16.6	100.4	$180/ft	$15,756,613
	10”	1.0	5.0	$200/ft	$1,031,802
	12”	1.2	6.8	$215/ft	$1,313,615
	15”	1.9	4.4	$280/ft	$2,874,606
	16”	0.06	0.0	$300/ft	$70,615
	18”	0.9	1.1	$375/ft	$1,764,841
	21”	0.4	1.5	$505/ft	$1,110,085
	24”	0.9	1.3	$560/ft	$2,483,536
	27”	0.06	0.31	$590/ft	$122,940
	30”	0.06	0.19	$615/ft	$139,658
	33”	0	0.25	$670/ft	$0
	36”	0.25	0.25	$725/ft	$850,974
	39”	0	0.25	$780/ft	$0
	48”	1.4	0.2	$945/ft	$6,860,097
Total					***$87,838,384***

Table 5-19: District Pipelines within the 500-year Floodplain					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Water	**¾”**	0.3	6.9	$60/ft	$107,792
	1”	20.8	74.6	$60/ft	$6,589,216
	2”	0.7	2.0	$75/ft	$265,651
	3”	0.3	1.0	$90/ft	$129,397
	4”	2.6	6.7	$113/ft	$1,553,245
	5”	0.0	0.01	$130/ft	$0
	6”	12.8	47.2	$150/ft	$10,137,433
	8”	15.7	49.1	$180/ft	$14,920,192
	10”	1.0	3.4	$200/ft	$1,068,423
	12”	9.3	26.0	$215/ft	$10,530,355
	14”	0.8	0.6	$240/ft	$962,357
	16”	3.5	9.7	$300/ft	$5,537,993
	18”	0.1	0.2	$375/ft	$108,350
	20”	2.6	2.4	$450/ft	$6,059,468
	21”	0.81	0.06	$505/ft	$2,095,649
	24”	1.1	1.7	$560/ft	$3,182,204
	30”	1.3	1.5	$615/ft	$4,143,984
	36”	1.1	4.0	$725/ft	$4,046,945
Wastewater	**3”**	0.00	0.12	$90/ft	$0
	4”	19.3	76.4	$113/ft	$11,481,601
	6”	8.2	12.6	$150/ft	$6,482,869
	8”	32.0	85.0	$180/ft	$30,436,092

Table 5-19: District Pipelines within the 500-year Floodplain					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
	10”	2.0	4.0	$200/ft	$2,085,237
	12”	1.9	6.1	$215/ft	$2,110,499
	15”	3.0	3.3	$280/ft	$4,443,854
	16”	0.06	0.0	$300/ft	$70,615
	18”	1.2	0.8	$375/ft	$2,506,442
	21”	0.5	1.4	$505/ft	$1,388,753
	24”	1.4	0.8	$560/ft	$4,065,628
	27”	0.06	0.31	$590/ft	$122,940
	30”	0.06	0.19	$615/ft	$139,658
	33”	0.0	0.25	$670/ft	$0
	36”	0.25	0.25	$725/ft	$840,974
	39”	0.	0.25	$780/ft	$0
	48”	1.4	0.2	$945/ft	$6,860,097
Total					***$144,473,913***

Table 5-20 shows the water and sewer system devices that intersect with the 100-year floodplain.
Table 5-21 shows the water and sewer system devices that intersect with the 500-year floodplain.

Table 5-20: Water and Sewer Devices within the 100-year Floodplain			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	0	7
	System Valves	111	4730
	Pressure Valves	1	16
	Service Valves	89	3269
	Hydrants	76	3023
	Flushings & Blow Offs	28	329
	Service Meters	174	23,586
	Storage Units	0	32
	Minor Wells	5	25
	Sampling Devices	1	38
	Weirs	0	20
	Pumps	0	13
Wastewater	Pumps	0	1
	Service Connections	110	20,391
	Cleanouts	4	334
	Manholes	78	5114

Table 5-21: Water and Sewer Devices within the 500-year Floodplain			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	5	2
	System Valves	1029	3812

Table 5-21: Water and Sewer Devices within the 500-year Floodplain			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
	Pressure Valves	2	15
	Service Valves	750	2608
	Hydrants	709	2390
	Flushings & Blow Offs	82	275
	Service Meters	4820	18,940
	Storage Units	8	24
	Minor Wells	13	17
	Sampling Devices	5	34
	Weirs	0	20
	Pumps	0	13
Wastewater	Pumps	1	0
	Service Connections	4248	16,253
	Cleanouts	120	218
	Manholes	1217	3975

5.4.7 Hazardous Materials Release

HAZMAT incidents could either impact storage and fueling facilities or incur costs due to sewer main breaks. HAZMAT incidents are primarily a threat to staff who are either responding to the incident onsite or those in the immediate vicinity of the release. Explosive releases that substantially injure staff are a negligible risk.

Per **Figure 4-14**, the District's service area does not intersect with the Newmark Groundwater Contamination Site, but it does intersect with the northernmost part of Norton Air Force Base. This intersection is relatively minimal. No critical assets are located at or near the Superfund sites. The few assets that do overlap with the EPA-designated site boundaries are on the site's borders, with the exceptions of some lateral lines and some sections of center line.

All water/wastewater assets and pipeline lengths within or along the Norton Air Force Base site boundaries are summarized in **Table 5-22**. For parsimony, only the assets and pipelines crossing the official site boundary are listed. No critical assets were identified.

Table 5-22: Water/Wastewater Assets and Pipelines in Superfund Site		
System Category	**Asset Category**	**Number/Length Within Site**
Water	System Valves	2
	Service Valves	6
	Hydrants	3
	Service Meters	17
	Flushings and Blow Offs	2
	¾" pipe	26.3 feet
	1" pipe	268.9 feet
	2" pipe	236.9 feet

Table 5-22: Water/Wastewater Assets and Pipelines in Superfund Site		
System Category	**Asset Category**	**Number/Length Within Site**
	3” pipe	54.7 feet
	4” pipe	86.6 feet
	6” pipe	1360.4 feet
	8” pipe	844.5 feet
	24” pipe	106.7 feet
Wastewater	Service Connections	2
	Manholes	1
	4” pipe	126.2 feet
	8” pipe	5742.2 feet

Table 5-23 below identifies critical assets at risk due to HAZMAT incidents precluding Superfund contamination. Theoretically, any pipeline owned and operated by the District is at risk of breakage, so all are considered nominally at risk (cf. sanitary sewer spills). The SNRC Administration Building is considered at risk due to storage of HAZMAT onsite.

Table 5-23: Water System Critical Assets at Risk due to HAZMAT Release			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	2	1	$212,865,211
Electrical Facilities	0	1	$0
Plants	14	0	$26,737,500
Wells	0	3	$0
PRVs	0	6	$0
Total	***16***	***11***	***$26,737,500***

Table 5-24 below identifies water and sewer system devices at risk due to HAZMAT incidents. Note that this risk assessment conservatively estimates the assets at risk and only considers those assets involved in the direct storage, conveyance, and/or treatment of HAZMAT, including biological waste. Significant pipeline failures or HAZMAT releases that occur near any discrete asset would naturally threaten that asset, but that risk is not quantifiable with current data.

Table 5-24: Water and Sewer Devices at Risk due to HAZMAT Release			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	0	7
	System Valves	0	4841
	Pressure Valves	0	17
	Service Valves	0	3358
	Hydrants	0	3099
	Flushings & Blow Offs	0	357
	Service Meters	0	23,760
	Storage Units	32	0

Table 5-24: Water and Sewer Devices at Risk due to HAZMAT Release			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
	Minor Wells	0	30
	Sampling Devices	0	39
	Weirs	0	20
	Pumps	0	13
Wastewater	Pumps	1	0
	Service Connections	20,501	0
	Cleanouts	338	0
	Manholes	0	5192

5.4.8 Heat Wave

Heat waves are regional hazards by definition. Impacts are likely to be similar to droughts in that heat waves will primarily be defined by impacts on staff and unlikely to harm buildings. All District staff are at risk of heat wave health impacts, especially those who work outside, work in maintenance, and/or transport solid waste in vehicles.

Given that heat waves can increase evaporation and may be accompanied by low humidity, there may be some short-term stress to pumps and increased maintenance costs. This is especially relevant to HVAC systems within administrative buildings and facilities or vehicles potentially exceeding operating temperatures. Since heat waves are transitory events that last several days at most and without the long-term climactic impacts to soil and water quality that droughts have, this LHMP assumes that financial risks to water/sewer critical assets, devices, and pipelines are negligible.

5.4.9 Landslide

The District's risk to landslides was calculated using data from the USGS Landslide Susceptibility Index. This index examines slope-relief, soil/bedrock stability, gullies/runouts, and previous occurrences of landslides to determine a relative landslide risk. The index ranges from a relative risk of 0 to 81. Assets and infrastructure were identified as "at risk" if the index was 64 or greater, which the developers indicated as the highest bucket of landslide risk.[198]

Appendix I shows the raster data from the index overlaid with the District's boundaries. The northeastern edge of the District has the greatest risk given its proximity to the San Bernardino Mountains and foothills. No critical assets were identified as at risk to landslides

Table 5-25 below shows the pipeline infrastructure at risk.

[198] Mirus, B., Belair, G., Wood, N., Jones, J., & Martinez, S. "Parsimonious High-Resolution Landslide Susceptibility Modeling at Continental Scales". *AGU Advances*, 5 (2024). doi: 10.1029/2024AV001214

Table 5-25: District Pipelines at Risk to Landslides					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Water	**¾”**	0	7.2	$60/ft	$0
	1”	0.1	95.3	$60/ft	$47,300
	2”	0*	2.7	$75/ft	$0
	3”	0	1.3	$90/ft	$0
	4”	0*	9.3	$113/ft	$0
	5”	0	0.01	$130/ft	$0
	6”	0*	60.0	$150/ft	$0
	8”	0.2	64.6	$180/ft	$183,962
	10”	0	4.4	$200/ft	$0
	12”	0.1	35.2	$215/ft	$86,362
	14”	0*	1.4	$240/ft	$0
	16”	0.2	13.0	$300/ft	$317,584
	18”	0	0.3	$375/ft	$0
	20”	0	5.0	$450/ft	$0
	21”	0	0.87	$505/ft	$0
	24”	0*	2.8	$560/ft	$0
	30”	0*	2.8	$615/ft	$0
	36”	0.4	4.7	$725/ft	$1,339,256
Wastewater	**3”**	0	0.12	$90/ft	$0
	4”	0.01	95.6	$113/ft	$30,570
	6”	0	20.8	$150/ft	$0
	8”	0.3	116.7	$180/ft	$213,925
	10”	0	6.0	$200/ft	$0
	12”	0	8.0	$215/ft	$0
	15”	0	6.3	$280/ft	$0
	16”	0	0.06	$300/ft	$0
	18”	0	2.0	$375/ft	$0
	21”	0	1.9	$505/ft	$0
	24”	0	2.2	$560/ft	$0
	27”	0	0.37	$590/ft	$0
	30”	0	0.25	$615/ft	$0
	33”	0	0.25	$670/ft	$0
	36”	0	0.50	$725/ft	$0
	39”	0	0.25	$780/ft	$0
	48”	0	1.6	$945/ft	$0
Total					***$2,218,959***

*Total pipe length at risk was under 0.05 miles and not reported.

Table 5-26 below shows the water and sewer devices at risk.

Table 5-26: Water and Sewer Devices at Risk to Landslides			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	0	7

Table 5-26: Water and Sewer Devices at Risk to Landslides			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
	System Valves	19	4822
	Pressure Valves	0	17
	Service Valves	5	3353
	Hydrants	6	3093
	Flushings & Blow Offs	0	357
	Service Meters	28	23,732
	Storage Units	2	30
	Minor Wells	0	30
	Sampling Devices	0	39
	Weirs	2	18
	Pumps	0	13
Wastewater	Pumps	0	1
	Service Connections	10	20,491
	Cleanouts	0	338
	Manholes	8	5184

5.4.10 Power Loss

Power failures and PSPS primarily concern pump stations, administrative buildings, and water treatment plants. As with cyberattacks, power failures/PSPS may impact infrastructure but will not directly impact staff except in the case of massive, multi-day power losses – which are extremely rare even in fire-prone southern California. Long-lasting power failures are more likely to occur as a secondary impact due to a major disaster such as an earthquake.

Table 5-27 shows the critical assets at risk. These assets were determined by assessing locations that require power to operate and do not have backup power available onsite.

Table 5-27: Water System Critical Assets at Risk due to Power Loss			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	1	2	$25,000,000
Electrical Facilities	0	1	$0
Plants	6	8	$8,162,500
Wells	0	3	$0
PRVs	0	6	$0
Total	***7***	***20***	***$33,162,500***

Theoretically, all pipelines are at risk to power loss in the case of backups caused by a plant, conveyance system, or treatment center going offline. In practice, the pipes most likely to be impacted would be those directly connected to these facilities/systems and therefore experiencing the greatest amount of pressure. As this would be a very short pipe length, the LHMP does not model the value of pipelines at risk. Additionally, the District's wastewater system is entirely

gravity-fed and does not rely on pumps. The Planning Team acknowledges that this assumption might underestimate the true risk.

Table 5-28 below shows the water and sewer devices at risk to power loss. This table assumes only those devices that rely on power and a constant connection to the SCADA system to operate will be at risk to systemic power failures.

Table 5-28: Water and Sewer Devices at Risk to Power Loss

System Category	Asset Category	Number At Risk	Number Not At Risk
Water	Flow Control Valves	0	7
	System Valves	0	4841
	Pressure Valves	17	0
	Service Valves	0	3358
	Hydrants	0	3099
	Flushings & Blow Offs	0	357
	Service Meters	0	23,760
	Storage Units	0	32
	Minor Wells	0	30
	Sampling Devices	0	39
	Weirs	0	20
	Pumps	13	0
Wastewater	Pumps	1	0
	Service Connections	0	20,501
	Cleanouts	0	338
	Manholes	0	5192

5.4.11 Severe Storms

By definition, severe storms will have regional impact. Large thunderstorms are most likely to impact the power grid by blowing down power lines as opposed to directly harming District facilities or underground infrastructure. Pipelines are unlikely to be directly impacted by severe storms though indirect impacts may still occur, such as after flash floods. Please see the risk assessments for the Flood and Power Loss hazards for more information.

None of the District's facilities were identified as being more or less likely to be impacted by severe storms than others; all should be considered at equal levels of risk. Staff and customers are assumed to be at risk if they are caught traveling during the storm or if staff are performing outside maintenance.

5.4.12 Wildfires

The District's service area is almost entirely at elevated risk to wildfires. Infrastructure within the northern section is at particular risk given proximity to the heavily forested foothills and gullies with historical fire danger. Maintenance staff at pump stations, water treatment stations, and administrative buildings may likewise be threatened by fast-moving fires. **Figure 4-20** within the hazard analysis exhibits the District's intersection with Fire Hazard Severity Zones (FHSZs).

Table 5-29 shows critical assets at risk within FHSZs. Note that the District's boundaries exclusively cross "Very High" FHSZs, representing the highest level of wildfire risk.

Table 5-29: Water System Critical Assets within "Very High" FHSZs			
Asset Category	**Number At Risk**	**Number Not At Risk**	**Total Value at Risk**
Buildings	0	3	$0
Electrical Facilities	0	1	$0
Plants	11	3	$22,150,000
Wells	0	3	$0
PRVs	0	6	$0
Total	***11***	***16***	***$22,150,000***

Table 5-30 shows District pipelines within FHSZs.

Table 5-30: District Pipelines within "Very High" FHSZs					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
Water	**¾"**	0.1	7.1	$60/ft	$19,006
	1"	18.2	77.2	$60/ft	$5,762,497
	2"	0.4	2.3	$75/ft	$161,031
	3"	0.4	0.9	$90/ft	$172,754
	4"	0.4	8.9	$113/ft	$268,309
	5"	0.0	0.01	$130/ft	$0
	6"	6.7	53.3	$150/ft	$5,308,284
	8"	14.3	50.5	$180/ft	$13,566,823
	10"	0.4	4.0	$200/ft	$420,166
	12"	9.0	26.4	$215/ft	$10,166,778
	14"	0.1	1.3	$240/ft	$147,282
	16"	4.9	8.4	$300/ft	$7,629,997
	18"	0.2	0.1	$375/ft	$314,773
	20"	1.4	3.6	$450/ft	$3,218,227
	21"	0	0.87	$505/ft	$0
	24"	0.8	2.1	$560/ft	$2,198,818
	30"	0.4	2.4	$615/ft	$1,488,054
	36"	3.4	1.7	$725/ft	$12,760,112
Wastewater	**3"**	0	0.12	$90/ft	$0
	4"	16.1	79.6	$113/ft	$9,603,756
	6"	0.8	20.0	$150/ft	$616,930
	8"	25.4	91.6	$180/ft	$24,105,484
	10"	0.1	5.9	$200/ft	$87,343
	12"	1.2	1.2	$215/ft	$1,400,867
	15"	0.0[199]	6.3	$280/ft	$40,628
	16"	0	0.06	$300/ft	$0

[199] Value listed as 0.0 due to rounding to one significant digit. The number of modeled feet at risk is 233.5.

Table 5-30: District Pipelines within "Very High" FHSZs					
System Category	**Diameter**	**Miles at Risk**	**Miles Not at Risk**	**Unit Cost ($/ft)**	**Total Pipe Value at Risk**
	18"	0	2	$375/ft	$0
	21"	0	1.9	$505/ft	$0
	24"	0	2.2	$560/ft	$0
	27"	0	0.37	$590/ft	$0
	30"	0	0.25	$615/ft	$0
	33"	0	0.25	$670/ft	$0
	36"	0	0.5	$725/ft	$0
	39"	0	0.25	$780/ft	$0
	48"	0	1.6	$945/ft	$0
Total					***$99,457,919***

Table 5-31 below shows the water and sewer devices within FHSZs.

Table 5-31: Water and Sewer Devices within "Very High" FHSZs			
System Category	**Asset Category**	**Number At Risk**	**Number Not At Risk**
Water	Flow Control Valves	0	7
	System Valves	926	3915
	Pressure Valves	0	17
	Service Valves	653	2705
	Hydrants	610	2489
	Flushings & Blow Offs	95	262
	Service Meters	4071	19,689
	Storage Units	19	13
	Minor Wells	4	26
	Sampling Devices	18	21
	Weirs	16	4
	Pumps	13	0
Wastewater	Pumps	0	1
	Service Connections	3520	16,981
	Cleanouts	22	316
	Manholes	1063	4129

SECTION 6: MITIGATION STRATEGY

Federal regulations require local mitigation plans to identify goals for reducing long-term vulnerabilities to the identified hazards in the planning area, called “hazard mitigation actions” (Section 201.6(c)(3)(i)).

FEMA REGULATION CHECKLIST: MITIGATION STRATEGY

44 CFR § 201.6(c)(3): The plan must include mitigation strategies that provide “the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.”
44 CFR § 201.6(c)(3)(i): The plan must include “a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.”
44 CFR § 201.6(c)(3)(ii): The plan must include “a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.”

Element:
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))
C3-a: Does the plan include goals to reduce the risk from the hazards identified in the plan?

C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))
C4-a: Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?
C4-b: Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan’s risk assessment?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool*, June 2025

A hazard mitigation plan’s primary focus is the mitigation strategy. It represents the efforts selected by the District to reduce or prevent potential losses. The mitigation strategy consists of the following steps:

- Identify and profile **hazards and risk** within the District.
- Identify projects and activities that can **prevent or mitigate damage and injury** to District staff, buildings, and infrastructure.
- Develop a **mitigation strategy** to implement the mitigation actions.

- Develop and implement the **mitigation action plan** to prioritize, implement, and administer the mitigation actions.

The Planning Team developed mitigation goals and actions based on the capability assessment, hazard analysis, and risk assessment. The Planning Team also developed a process to prioritize, implement, and administer the mitigation actions to reduce risk to existing facilities and new development.

6.1 Hazard Mitigation Statement

The 2026 LHMP represents the District's commitment to create a safer, more resilient community by taking actions to reduce risk and by committing resources to lessen the effects of hazards on the people and property of the District.

6.2 Hazard Mitigation Goals and Objectives

Mitigation goals are guidelines that represent what the community wants to accomplish through the mitigation plan. These are broad statements that represent a long-term, community-wide vision. The Planning Team reviewed the example goals and objectives from the previous LHMP and determined which goals best met the District's objectives. **Table 6-1** lists the goals for the 2026 LHMP.

Table 6-1: Hazard Mitigation Goals (2026)
Goal 1: Protect life and property, and reduce potential injuries from natural, technological, and human-caused hazards including those identified in the hazard analysis.
Goal 2: Improve public understanding, support of, and need for hazard mitigation measures.
Goal 3: Promote disaster resilience for the District's natural, existing, and future built environment.
Goal 4: Strengthen partnerships and collaboration to implement hazard mitigation activities.
Goal 5: Enhance the District's ability to effectively and immediately respond to disasters.

6.3 Mitigation Actions/Projects and Implementation Strategy

The requirements for prioritization of mitigation actions, as provided in the federal regulations implementing the Stafford Act as amended by DMA 2000, are described below.

FEMA REGULATION CHECKLIST: MITIGATION STRATEGY

44 CFR § 201.6(c)(3)(iii): The mitigation strategy section shall include "an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs."

Element:

C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
C5-a. Does the plan describe the criteria used for prioritizing actions?
C5-b. Does the plan provide the position, office, department, or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

Based on these criteria, the District prioritized potential mitigation projects and included them in the action plan discussed below in **Table 6-4**. The mitigation action plan developed by the Planning Team includes the action items that the District intends to implement during the next five years, assuming funding availability.

6.3.1 Previous Mitigation Actions/Projects Assessment

FEMA REGULATION CHECKLIST: PLAN UPDATE

44 CFR § 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Element:
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

The 2020 LHMP contained 35 mitigations actions. Many of the mitigation actions were completed or carried out to some degree or are considered ongoing. None were either not addressed during the time period or were not feasible to accomplish. Some of the mitigation actions were generic or duplicative and others were better categorized as emergency preparedness or recovery activities. Many of these actions were consolidated for this update. **Table 6-2** provides the status of mitigation actions from the 2020 LHMP.

Table 6-2: Mitigation Actions 2020 Status

#	Hazard	Activity	Status
1	All	Continually understand and measure impacts, including consequence and vulnerability, on critical assets from all hazards.	Ongoing. Included in Plan Maintenance process.

Table 6-2: Mitigation Actions 2020 Status			
#	**Hazard**	**Activity**	**Status**
2	All	Periodically provide state and local agencies with updated information about hazards, vulnerabilities, and mitigation measures.	Ongoing. Included in Plan Maintenance process.
3	All	Comply with all applicable local codes and standards while ensuring the protection of life, property, and continuity of service.	Ongoing. Revise and consolidate with other generic activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
4	All	Ensure that all District investment in high-risk areas is protected by mitigation measures that improve safety and protect infrastructure.	Ongoing. Revise and consolidate with other generic activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
5	All	Identify and mitigate all imminent threats to life safety.	Ongoing. Revise and consolidate with other generic activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
6	All	Establish partnerships with all levels of government and the business community to improve and implement methods to protect level of service.	Ongoing. Revise and consolidate with other generic activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
7	All	Educate District employees and customers of the risks, mitigation actions, and contingency plans established to enhance safety.	Ongoing. This is a preparedness activity
8	Drought	Identify and secure new water sources to increase diversity, redundancy, and reliability in the water supply.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
9	Drought	Improve operational efficiency and transfers by maintaining water production and distribution to ensure reliable service to customers.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
10	Drought	Reduce water demand by prioritizing water use for health and safety purposes.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
11	Drought	Focus on water conservation measures that reduce nonessential water use.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.

Table 6-2: Mitigation Actions 2020 Status			
#	**Hazard**	**Activity**	**Status**
12	Drought	Adhere to State drought level regulation updates.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
13	Earth-quakes	Pursue funding for retrofit programs to bring non-compliant structures up to code. These codes help water utilities design and construct reservoirs, pump stations, groundwater wells, and pipelines that resist the forces of nature and ensure safety.	Ongoing. Identify specific facilities. Address steps required to achieve concrete results such as structural assessments, design, permitting, environmental compliance and construction.
14	Earth-quakes	Design new District facilities to withstand an 8.0 earthquake. This area of Southern California is a high earthquake risk and exists on the fault zone.	Ongoing. Identify specific new facilities in the CIP. Address steps required to achieve concrete results such as structural assessments, design, permitting, environmental compliance and construction.
15	Wildfire	Increase the capacity of the District to respond to wildfires, including preparedness activities such as interagency planning.	Ongoing. Revise and consolidate with other preparedness activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
16	Wildfire	Require identification of critical facilities in need of improvement, and alternatives for mitigation.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
17	Wildfire	Implement improvements and upgrades to existing and new facilities in wildfire hazard areas.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
18	Flooding	Require identification of critical facilities at risk and alternatives for mitigation.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
19	Flooding	Implement floodproofing measures and upgrade critical facilities in flood hazard areas.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
20	Flooding	Continually increase the District's understanding of flood hazards as it relates to critical facilities.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.

Table 6-2: Mitigation Actions 2020 Status			
#	**Hazard**	**Activity**	**Status**
21	Land Subsi-dence	Support the San Bernardino Valley Municipal Water District efforts for responsible basin management.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
22	Physical Adversary	Maintain headquarter evacuation preparedness with staff.	Ongoing. Revise and consolidate with other preparedness activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
23	Physical Adversary	When applicable, implement physical protective features into the design of the building to heighten security measures.	Ongoing. Revise and consolidate with other security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
24	Cyber-attack	Expand staff education and training for cyber security, including manual operations in case of system failure.	Ongoing. Revise and consolidate with other security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
25	Cyber-attack	Increase resources to prevent compromises to cybersecurity.	Ongoing. Ongoing. Revise and consolidate with other security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
26	Cyber-attack	Develop a contingency strategy or recovery plan if the system is compromised.	Ongoing. Revise and consolidate with other preparedness activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
27	Power Loss	Maintain an accurate inventory of the District's critical spares.	Ongoing.
28	Power Loss	Identify vendors or establish Memoranda of Understanding (MOUs) to access critical supplies in case of an event.	Ongoing.
29	Power Loss	Ensure accessibility to supply critical spares in the event of a disaster.	Ongoing.
30	Power Loss	Continually collaborate with other utility companies to expand knowledge base of alternative energy sources.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
31	Power Loss	Identify alternative sources of power.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.

Table 6-2: Mitigation Actions 2020 Status			
#	Hazard	Activity	Status
32	Power Loss	Identify facilities in need of retrofit or improvement to allow for alternative energy sources.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
33	Power Loss	Maximize State Water Project resource while maintaining reliable alternate and redundant water sources by developing a strategy and set benchmarks to annually bank State Water Project credits.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
34	Proximity Hazards	Actively monitor ground wells.	Ongoing. Revise and consolidate with other water security activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.
35	Proximity Hazards	Leverage regional working groups, such as ERNIE, to discuss and collaborate on proximity hazards that may impact water quality.	Ongoing. Revise and consolidate with other activities to produce specific, measurable, attainable, realistic and time bound (SMART) activities.

The Planning Team collaboratively identified and prioritized mitigation strategies for the identified hazards. The prioritization efforts looked at the risks and threats from each hazard, financial costs and benefits, technical feasibility, and community values. Hazards were prioritized for specific mitigation actions based on the CPRI, Planning Team members' input, and expediency for successful District operations.

The Planning Team evaluated potential mitigation actions using the STAPLE/E Method, which assesses the Social, Technical, Administrative, Political, Legal, Economic, and Environmental feasibility of potential projects. Some of the questions that inform STAPLE/E are described in **Table 6-3** below. The full STAPLE/E analysis of each mitigation action may be found within **Appendix D.**

Table 6-3: STAPLE/E Method	
Issues	**Criteria**
Social	• Is the action socially acceptable to community members? • Would the action mistreat some individuals? • Is there a reasonable chance of the action causing a social disruption?

Table 6-3: STAPLE/E Method	
Issues	**Criteria**
Technical	• Is the action likely to reduce the risk of the hazard occurring, or will it reduce the hazard's effects? • Will the action create new hazards or make existing hazards worse? • Is the action the most useful approach for the District to take, given the District and community members' goals?
Administrative	• Does the District have the administrative capabilities to implement the action? • Are there existing District staff who can lead and coordinate the measure's implementation, or can the District reasonably hire new staff for this role? • Does the District have enough staff, funding, technical support, and other resources to implement the action? • Are there administrative barriers to implementing the action?
Political	• Is the action politically acceptable to District officials and other relevant jurisdictions and political entities? • Do community members support the action?
Legal	• Does the District have the legal authority to implement and enforce the action? • Are there potential legal barriers or consequences that could hinder or prevent the implementation of the action? • Is there a reasonable chance that the implementation of the action would expose the District to legal liabilities? • Could the action reasonably face other legal challenges?
Economic	• What are the monetary costs of the action, and do the costs exceed the monetary benefits? • What are the start-up and maintenance costs of the action, including administrative costs? • Has the funding for action implementation been secured, or is a potential funding source available? • How will funding the action affect the District's financial capabilities? • Could the implementation of the action reasonably burden the District's economy or tax base? • Could there reasonably be other budgetary and revenue impacts to the District?

Table 6-3: STAPLE/E Method	
Issues	**Criteria**
Environmental	• What are the potential environmental impacts of the action? • Will the action require environmental regulatory approvals? • Will the action comply with all applicable federal, state, regional, and local environmental regulations? • Will the action reasonably affect any endangered, threatened, or otherwise sensitive species of concern?

To meet the cost estimation requirements of the hazard mitigation planning process, the Planning Team identified relative cost estimates based on their understanding of the mitigation action intent and their experience in developing identical or similar programs/implementing projects. Three cost categories based on the District's typical cost criteria were used for budgeting purposes:

- **Low cost ($):** $100,000 or less
- **Medium cost ($$):** $100,001 to $999,999
- **High cost ($$$):** Greater than $1,000,000

The Planning Team also identified general timeframes for each project assuming successful funding. These timelines were defined as a certain number of years or one of the following categories:

- **Ongoing (Annually):** Actions within this timeframe are the types of actions that District staff would conduct on an annual basis.
- **Ongoing (As Needed):** Actions within this timeframe include activities that District staff would conduct in response to a request by internal (e.g., District departments) or external (e.g., City of Highland) parties.
- **Future Planning Process:** Actions identified within this timeframe are considered low-priority actions that the District would like to continue to track but does not feel they would be able to implement in the current planning implementation timeframe.

6.3.2 2026 LHMP Mitigation Actions

Mitigation actions are more specific than goals or objectives. They include a mechanism, such as an assigned time period, to measure success and ensure the actions are accomplished.

The District is the sole responsible party for implementing all hazard mitigation actions, projects, and activities. The Human Resources & Risk Management department is responsible for keeping and maintaining the list of hazard mitigation actions and coordinating with the responsible departments to ensure completion. Each mitigation action's responsible department is included in **6.3.3 Supplementary Material for Mitigation Actions**.

Based on the criteria and evaluation processes used during LHMP development, the Planning Team prepared a prioritized list of 20 mitigation actions to improve the District's resilience to

hazard events. These mitigation actions include a broad range of approaches to hazard mitigation such as retrofitting, public education, increased staff training and awareness, development of redundant facilities, and others.

Some mitigation actions were considered but not chosen for inclusion in this LHMP. Many of these were projects identified within the 2019 WSMP and SSMP and were since obviated due to changes in priorities or project completion. These actions are summarized below:

- **Conduct seismic assessments on District buildings and infrastructure that are rated "Fair" or "Poor" within the District's RRA and/or are known not to be at current earthquake seismic code:** Excluded given no building with human occupancy exceeded “fair” or “poor”. The only structures with these designations were wells that are already in the process of being refurbished.
- **Perform critical asset hardening on the water storage and treatment system by upgrading concrete tanks to steel tanks:** Excluded due to a lack of high priority and the concrete tanks noted as being in “excellent” condition within the RRA. Additionally, the District’s Engineering department noted that concrete was the preferred material for certain storage locations due to ease of maintenance, among other factors.
- **Conduct a feasibility study on upgrading water system plans that serve the Yaamava’ Resort & Casino at San Manuel:** Excluded given that the next iteration of the WSMP addresses deficiencies within this system, if needed. Additionally, the tribal government has their own water reservoirs for fire protection.
- **Develop plans and/or source a contractor to construct a temporary water supply system within the Canal 3 Zone:** This action was inspired by the 2019 WSMP’s concern that Plant 140 cannot be rehabilitated due to a lack of temporary supply and Plant 137 was reported as not having enough volume to take up the slack. However, the Engineering department stated that the Plant 140 rehabilitation plans are actually complete and construction started in November 2025.
- **Conduct a feasibility study and building survey on building out District emergency water supply systems to increase baseline resilience to hazards, especially if reservoirs or wells are compromised:** Excluded given this feasibility study will already be included within the next WSMP update.
- **Replace sewer system pipes via installing pipe sleeves and sliplining pipes for pipes rated a 4 or 5 for structural quality to reduce I/I:** Excluded given the District does not have any pipes rated a 4 or 5 as of the most recent dataset.
- **Augment the District's Continuity of Operations Plan (COOP) to include contingencies in the event of a cyberattack involving loss of control of plants, power, or SCADA**: Excluded given this information is already present within the most recent COOP.
- **Integrate the District into the San Bernardino County Flood Control District’s EOP for the Seven Oaks Dam:** Excluded due to the District already being within the EOP’s emergency contact tree.

- **Develop a Floodplain Management Plan to increase resiliency and ensure construction conforms to FEMA 100-year planning guidelines:** Excluded due to not being applicable given the District already conforms to these guidelines with any new construction or refurbishment.
- **Design and construct an additional production well at Plant 129 per the mitigation actions outlined within the District's Drought Contingency Plan (DCP):** This mitigation action was inspired by the 2019 WSMP. It was excluded given the project is already underway.
- **Develop a priority list for seismically retrofitting inlet/outlet lines owned by the District:** The Engineering department recommended excluding this mitigation action given it was considered duplicative of Mitigation Action #12.
- **Conduct a feasibility study for the installation of concrete or steel open-type check dams within gullies that have elevated landslide or debris flow risk:** Excluded due to being outside the scope of the District's operations.
- **Conduct drainage assessments at District-owned properties within the 100-year and 500-year floodplains, then conduct any identified erosion control methods:** Excluded due to being outside the scope of the District's operations.
- **Maintain, repair, and improve culverts, waterbars, and other water conveyance systems to reduce the impacts of floods and heavy rains:** Excluded due to being outside the scope of the District's operations.
- **Conduct an assessment on the capacities of existing foundation drainage systems within District wastewater facilities:** Excluded as foundation drainage has not been a problem during any historical floods or severe storms.
- **Conduct an inventory of HAZMAT stored throughout the District's facilities including type, quantity, and location. Attach the appropriate SDS to every applicable storage and/or conveyance system:** Recommended exclusion by the Operation & Maintenance department given all chemicals are inventoried and permitted through the San Bernardino County Fire Protection District. All HAZMAT inventories with volumes of 200 gallons and above have the appropriate SDS.
- **Refurbish and maintain HVAC systems within offices, garages, and workshops to reduce the impact of heat waves on staff:** Excluded because the Operation & Maintenance department did not identify any facilities that lack proper HVAC, nor are any HVAC units deficient in maintenance.
- **Engage with Cal Fire and other local agencies to identify trees, telephone poles, power lines, and/or other objects that could threaten the District's buildings and infrastructure during severe storms:** Excluded as this was already performed following the 2024 Line Fire.

Table 6-4 lists the mitigation actions. Supplementary material (e.g., implementing department, technical specifications) is included in the following subsection. Note that the potential funding sources confirm to the financial capabilities and resources identified in **Table 4-3**.

The mitigation action plan assigns the primary responsibility for each action item to an implementing department. The implementing department is the controlling department that will assign funding and oversee activity implementation, monitoring, and evaluation. The prioritization of projects in the LHMP provides a basis for implementing the mitigation strategies, but all new mitigation actions and projects will be formally prioritized and selected by the respective implementing department.

Table 6-4: Mitigation Actions							
#	**Action Description**	**Mitigation Goal(s)**	**Related Hazard(s)**	**Estimated Cost**	**Potential Funding**	**Priority Level**	**Timeframe**
1	Integrate the LHMP's mitigation actions into forthcoming updates to the capital improvements section of the Fiscal Year Budgets for each budget period throughout the next five-year cycle.	1,3,5	All Hazards	$	General Fund	High	Ongoing (Annually)
2	Add the most frequently used water system PRVs to the District's SCADA system to facilitate monitoring pressure changes and to increase response efficacy during sudden pressure changes.	1,3,5	All Hazards	$	General Fund Bonds HMGP	High	1 year
3	Install pressure loggers at key points within the water system to facilitate surveillance of pressure differentials within the District's sewers. Connect the pressure loggers to the SCADA systems.	3,5	All Hazards	$$	General Fund Bonds HMGP BOR	Medium	1-2 years
4	Maintain inventories of critical spares. Establish Memoranda of Understanding (MOUs) with local vendors to access critical supplies during major emergencies.	3,4,5	All Hazards	$	General Fund Bonds SCAG	High	Ongoing (Annually)
5	Develop a public messaging campaign about water conservation to address drought and water management concerns.	2	All Hazards	$	General Fund Bonds SCAG	Medium	Ongoing (As Needed)

Table 6-4: Mitigation Actions							
#	**Action Description**	**Mitigation Goal(s)**	**Related Hazard(s)**	**Estimated Cost**	**Potential Funding**	**Priority Level**	**Timeframe**
6	Update SCADA systems with the latest security patches to reduce vulnerabilities to cyberattacks. Engage with the SCADA vendor and other software developers on an annual basis to ensure compliance with security standards and knowledge of current threats.	1,3	Cyberattack	$$	General Fund SCAG Riverside UASI	Medium	Ongoing (Annually)
7	Conduct routine training for staff on cybersecurity and phishing to reduce the risk of social engineering leading to successful cyberattacks.	1,3	Cyberattack	$	General Fund SCAG Riverside UASI	Low	Ongoing (Annually)
8	Institute multi-factor authentication among all staff, thereby reducing the risk of a cyberattack or other incident in the case of a cracked or stolen password.	1,3	Cyberattack	$	General Fund SCAG Riverside UASI	High	Ongoing (As Needed)
9	Implement network segmentation throughout the District to reduce network vulnerabilities	1,3	Cyberattack	$	General Fund SCAG Riverside UASI	Medium	Ongoing (As Needed)
10	Conduct pipe replacement and seismic mitigation within the water main infrastructure along Dwight Way and Sterling Avenue in the City of Highland.	3	Dam Inundation Earthquake Flood Landslide Severe Storms Wildfire	$$$	General Fund Bonds HMGP BOR CWSRF DWSRF WIFIA	Medium	3-4 years

Table 6-4: Mitigation Actions							
#	Action Description	Mitigation Goal(s)	Related Hazard(s)	Estimated Cost	Potential Funding	Priority Level	Timeframe
11	Identify pipelines that cross known faults. Where appropriate, install flexible piping and fortified connections at Alquist-Priolo Fault Zones.	3	Earthquake	$	General Fund Bonds HMGP BOR CWSRF DWSRF WIFIA	Low	5 years
12	Retrofit water system tanks with seismic valves to reduce risk to earthquakes as a part of the Seismic Retrofit of Seven Reservoir project.	3	Earthquake	$$	General Fund Bonds HMGP BOR CWSRF DWSRF WIFIA	Medium	1 year
13	Retrofit the tank at Plant 140 to increase resilience to earthquakes and seismic hazards.	3	Earthquake	$$$	General Fund Bonds HMGP BOR DWSRF	High	1-2 years
14	Add a fifth membrane bioreactor at the SNRC to improve operational flexibility and facilitate handling fluctuating flows.	1,3	HAZMAT Release	$$$	General Fund Bonds HMGP BOR CWSRF	Medium	1-3 years

Table 6-4: Mitigation Actions							
#	Action Description	Mitigation Goal(s)	Related Hazard(s)	Estimated Cost	Potential Funding	Priority Level	Timeframe
15	Identify and clear any hazard trees remaining following the 2024 Line Fire on or near District properties.	1,3	Landslide Wildfire	$$$	General Fund Bonds SCAG DWR EWP EQIP CCI SFAP	Medium	1-2 years
16	Conduct a feasibility study on pre-treating raw water entering Plant 134 from the Santa Ana River.	1,3	Landslide Wildfire	$$	General Fund Bonds HMGP BOR DWSRF	Low	1 year
17	Identify the power needs for water treatment and sewer system plants/pumps without back-up generators. Install back-up generators that fulfill these power needs to increase resilience to PSPS/power failures.	3,5	Power Failure	$$$	General Fund Bonds HMGP SCAG Riverside UASI DWR	Medium	3 years

Table 6-4: Mitigation Actions							
#	**Action Description**	**Mitigation Goal(s)**	**Related Hazard(s)**	**Estimated Cost**	**Potential Funding**	**Priority Level**	**Timeframe**
18	Establish and reinforce defensible spaces around District facilities, water tanks, and other major infrastructure – especially those within or near FHSZs.	1,3,5	Wildfire	$$	General Fund Bonds HMGP SCAG CCI SFAP	Medium	Ongoing (Annually)
19	Replace any flammable roofing and/or tiling at District buildings and infrastructure with fire-resistant materials in compliance with the National Fire Protection Association Standards (NFPA 2020).	1,3,5	Wildfire	$$$	General Fund Bonds HMGP SCAG	Medium	3-5 years
20	Monitor dry vegetation, deadfall, and accumulated debris on District property and within the service area (as appropriate). Conduct vegetation abatement and engage with local stakeholders to ensure proper forest management and fuel reduction actions are taken.	1,3,5	Wildfire	$$	General Fund Bonds HMGP SCAG CFIP CCI SFAP	High	Ongoing (As Needed)

6.3.3 Supplementary Information for Mitigation Actions

This section contains additional technical information to accompany some mitigation actions.

Mitigation Action #1: This mitigation action will encourage a culture of preparedness throughout all levels of the District's planning. Additionally, it will increase the likelihood that the mitigation actions are included within capital improvement planning, thereby aligning efforts between various planning mechanisms rather than sequestering projects.

Responsible Agency: Finance

Mitigation Action #2: This mitigation action aligns with capital improvement projects identified within the 2019 WSMP. The WSMP specifically mentioned the importance of adding these PRVs to the SCADA system to improve the reliability of the WSMP's hydraulic model. Additionally, hazard responses such as firefighting can strongly increase demand on the water system. Earthquakes could also result in broken water mains that cause low pressure. Both of these problems can be ameliorated by PRV integration.

Further information may be found within the 2019 WSMP. As of this LHMP's approval date, there are four such stations that are SCADA-controlled: Stations 33, 40, 108, and 127. Updates to the distribution system will be reflected in the next iteration of the WSMP.

Responsible Agency: Operation & Maintenance

Mitigation Action #3: Pressure loggers record and monitor pressure at various points within the water distribution system. These tools can be used to better anticipate pressure changes and make more efficient use of PRVs, especially during significant pressure fluctuations as described in Mitigation Action #2. The locations of these key points are not currently identified by the District but may potentially include the borders of each pressure zone, areas near or within FHSVs (given the likelihood of a firefighting response needing high water pressure), areas near Alquist-Priolo Fault Zones, and areas of known heavy use (e.g., Patton State Hospital).

Responsible Agency: Operation & Maintenance

Mitigation Action #4: Critical spares are defined as any specialized equipment needed to operate water and wastewater services that are especially vulnerable to hazards and have uses that cannot be replicated by similar devices. For example, surface water treatment equipment at Plant 134, earthquake valves at reservoirs, and generators. While supply chains are currently not anticipated to be a problem for the District's equipment, establishing and maintaining MOUs will increase resilience in case of a large-scale disaster that hampers the ability for rapid equipment replacement or repair (such as a major earthquake).

The critical spares inventory maintained by the District is not for public release.

Responsible Agency: Human Resources & Risk Management

Mitigation Action #5: The District currently performs outreach at several yearly community events and at quarterly meetings with the CAC. There are also resources concerning water conservation (especially regarding drought and climate change) on the District's website. However, this hazard mitigation action would support the District in developing more continuous public messaging. Examples include water shortage/prolonged service outage, water quality issues, sanitary overflows, and/or wastewater spills.

Responsible Agency: Public Affairs

Mitigation Action #6: The District's Information Technology department defines SCADA as "the telemetry and control of water/sewer flow".[200] The SCADA system is separate from the business network, and data does not pass between the two networks. The District sources a private vendor (ATSI) for SCADA services. The system is only accessible by granted internal accounts on a local network. SCADA systems can be vulnerable to malware attacks, ransomware, DDoS, and remote access insecurities.

The District's SCADA system has Virtual Private Network (VPN) capabilities, in which external users are allowed access to the system through a firewall and non-public website. This access point does not grant direct access to the internal SCADA network. By the end of 2025, the District will remove radio communication from all sites connected to the SCADA system in favor of next generation firewalls and redundant cell service gateways. The District will also incorporate and maintain multi-factor authentication (MFA) among staff with access, which is described in Mitigation Action #8.

Responsible Agency: Information Technology

Mitigation Action #7: Currently, the Information Technology department sends routine phishing campaign emails once per month with the goal of sending 1200 simulations to staff each fiscal year. If a staff member fails a phishing campaign, then a training course and review of cybersecurity threats is sent directly to them. Currently, no process is in place to ensure that the staff member actually reviews the course material.

Responsible Agency: Information Technology

Mitigation Action #8: MFA is a software tool that increases cybersecurity. MFA operates by requiring users to input a passcode sent to their phone upon logging into their account. This passcode can be texted directly to the user's phone or displayed on an authenticator app that might require its own log-in. MFA reduces the risk that a stolen password will give access to a staff member's account. The District's MFA provider will be Cisco Duo via Microsoft Security.

[200] Sourced from conversations held in early October 2025 with the Information Technology department.

If the MFA passcode is unavailable or not input by the user within a specific amount of time (often a few minutes or less), then access is not granted. The District will not require a contractor or consultant to have MFA when accessing the District's network, however their user account will be restricted to a specific domain that does not grant all privileges and will be disabled after project completion.

Responsible Agency: Information Technology

Mitigation Action #9: Network segmentation is defined as classifying and categorizing information technology assets, data, and personnel into specific groups called Virtual Local Area Networks (VLANs) and then reducing access between those groups. Access to one VLAN does not guarantee access to any other resources hosted through another network. Network segmentation is the best practice to prevent network leaks.

Responsible Agency: Information Technology

Mitigation Action #10: Though all pipes are considered at high risk to seismic shaking, the Dwight Way and Sterling Avenue pipes were identified within the FY 25-26 Budget as being particularly "vulnerable". According to the FY 25-26 Budget, the project will cost approximately $17 million and replace 34,700 linear feet of pipes within a 0.4 square mile project area over a two-year project timeline.

The design of this project is complete and was funded via a previous cycle. Further information about seismic retrofits of pipes and mains may be found through the ALA's *Seismic Design and Retrofit of Piping Systems* white paper.

Responsible Agency: Engineering

Mitigation Action #11: As described within the hazard analysis, the District is located on top of the San Andreas Fault Zone. Many District assets and infrastructure are within Alquist-Priolo Fault Zones. **Table 5-14** within the risk assessment shows the total mileage and approximate value of the water and sewer lines that intersect with the zones. The overwhelming majority of these pipes serve single-family residential homes or are connected to water plants.

The pipes will be designed according to the specifications listed in the ALA's *Seismic Design and Retrofit of Piping Systems*. General recommendations include steel pipes with welded joints, high-density polyethylene pipes with fused joints, ductile iron with seismic joints, and/or molecularly-oriented polyvinyl chloride pipes with restrained joints.

Responsible Agency: Engineering

Mitigation Action #12: "Seismic valves" are valves that automatically shut off water into areas that experience a significant drop in pressure (as in a breakage) during an earthquake. They can be triggered upon sensing the rapid lateral movement associated with seismic shaking or upon

detecting the drop in pressure. Most commercial seismic valves will operate upon detection of an M5.0-5.4 earthquake. According to the 2019 WSMP, Plant 134 has a seismic valve in operation.

The Seismic Retrofit of Seven Reservoir project includes retrofitting the reservoirs at Plants 33, 39, and 129. The initial engineering phase was completed in early 2025 through HMGP funding and is awaiting award for the next phase.

Responsible Agency: Engineering

Mitigation Action #13: Plant 140's tank is the highest-priority tank for rehabilitation. It has a capacity of two million gallons and is one of the District's largest tanks. The District has estimated a cost of $1,500,000 for recoating and rehabilitating the tank.

Responsible Agency: Operations & Maintenance

Mitigation Action #14: Membrane bioreactors are used in wastewater treatment to separate water from waste. They combine aspects of conventional biological treatments (e.g., activated sludge process) with membrane filtration to separate liquids and solids. Membrane bioreactors tend to produce higher-quality effluent, less sludge, and longer solid retention times.

The SNRC currently has four membrane bioreactors online. A fifth membrane bioreactor would increase plant flow capacity and reduce the risk of sewer system backups.

Responsible Agency: Engineering, Operations & Maintenance

Mitigation Action #15: FEMA defines "hazard trees" as "any tree that presents an immediate threat to lives, public health and safety, or improved property" under these criteria:[201]

- The tree's diameter is 6 inches or greater, measured 4.5 feet above ground level;
- The tree is a distance less than 1.5 times the tree height from a structure, such as improved infrastructure, a neighboring home; or if the tree presents a hazard to debris removal; and
- The tree is dead or will die within 5 years based on an evaluation by an International Society of Arboriculture certified arborist with Tree Risk Assessment Qualification

Hazard trees can pose long-lasting threats to staff and infrastructure. The trees can fall on maintenance staff, reduce soil cohesion (thereby causing landslides), increase the destructive potential of debris flows, and provide fuel/ignition for other wildfires. **Figure 6-1** on the next page shows the perimeter of the Line Fire and its intersection with District boundaries, showing the close proximity of the fire to much of the District's facilities.

Responsible Agencies: Engineering, Operation & Maintenance

[201] "Southern Wildfires Debris Recovery 2025 – Hazard Trees Defined". USACE (2025). Archived October 14, 2025. https://web.archive.org/web/20251014152653/https://www.spl.usace.army.mil/Portals/17/Hazard%20Trees_Combined.pdf

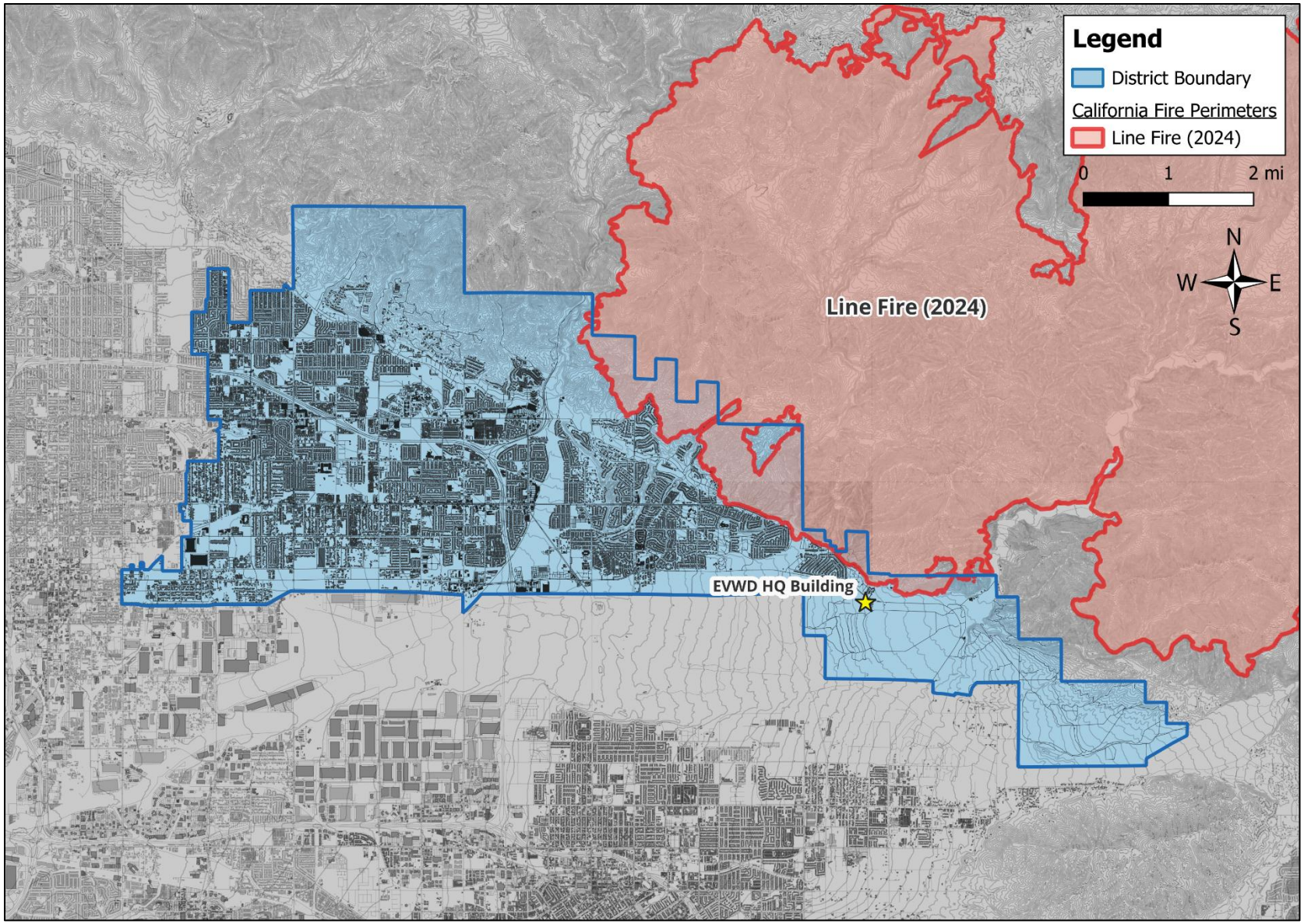

Figure 6-1: Line Fire (2024) Perimeter and District Boundaries

Mitigation Action #16: Plant 134 is located near City Creek on the District's north end. It is the main surface water treatment plant and part of the Upper Zone. Per the FY 25-26 Budget, the District will prioritize this project in its goal to optimize District water and energy resources. The proposed budget is $100,000 and will focus on "effective strategies and technologies to remove excess sediment, organic material, and other constituents commonly found in river water". If feasible, pre-treated water can reduce maintenance costs within Plant 134.

Pre-treating water is especially important in context of wildfires given the strongly diminished water quality in streams and reservoirs within burned areas. Per the WERT summary of findings for the 2024 Line Fire, fire-induced damage to soil "is a primary influence on increased runoff and sediment generation". Additionally, 70 percent of the Line Fire's footprint was at moderate or high soil burn severity.[202]

Given a significant portion of the Santa Ana River watershed is within both the burned area and the District, pre-treating water could facilitate Plant 134's future resiliency. The RRA reflects that changes to the quality of source water could require a "significant increase in treatment time" that could impair the plant's ability to meet peak demand.

Responsible Agency: Engineering

Mitigation Action #17: Details on the water facilities without backup power come from the RRA. Accordingly, the SNRC administrative building and six plants do not have backup power. Power loss contingencies are currently described within the Continuity of Operations Plan. The District uses diesel fuel.

While particularly important for power failures occurring due to supply issues from the power grid (e.g., high demand during heat waves), backup power is also necessary in case of severe power infrastructure damage following earthquakes or wildfires.

Responsible Agencies: Engineering, Operation & Maintenance

Mitigation Action #18: As described within the hazard analysis, the State of California requires property owners to establish a defensible space around buildings and infrastructure. These are landscape buffers in which flammable vegetation and debris are removed to reduce the risk of wildfire ignition or spread, especially within areas defined by a Very High FHSZ. Defensible spaces are also vital around areas near steep slopes and valleys as strong winds can funnel sparks onto flammable structures. A defensible space must have 100 feet between the structure and potential fuel loads, removal of dead/dry vegetation within 30 feet of the structure, and removal of all combustible material within five feet of the structure.

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[202] "Watershed Emergency Response Team (WERT): 2024 Line Fire". Cal Fire, California Department of Conservation, & CGS (November 6, 2024). CA-BDF-012520. Archived on June 28, 2025. https://web.archive.org/web/2/https://www.conservation.ca.gov/cgs/documents/publications/wert/11062024_Line_Fire_WERT_Final_ADA.pdf

Considering the impacts of the 2024 Line Fire, it is even more important for the District to reinforce defensible spaces around facilities, water tanks, and exposed infrastructure. While the law only applies to inhabited structures, establishing defensible space around non-inhabited structures is vital to the District's resiliency given the loss of water plants (as an example) could seriously impair the District's ability to serve customers.

Responsible Agencies: Engineering, Operation & Maintenance

Mitigation Action #19: As described within the hazard analysis, NFPA standards are not legally binding but are strongly recommended for mitigating urban fires and wildfires. This mitigation action would include the identification of any flammable roofing and/or tiling.

Potentially applicable standards include:

- NFPA 1 – Fire Code
- NFPA 13 – Standard for the Installation of Sprinkler Systems
- NFPA 80A – Recommended Practice for Protection of Buildings from Exterior Fire Exposures
- NFPA 1140 – Standard for Wildland fire Protection
- NFPA 5000 – Building Construction and Safety Code

Responsible Agencies: Engineering, Operation & Maintenance

Mitigation Action #20: Notable dry vegetation, deadfall, and accumulated debris will be identified as a part of this mitigation project. Ideally, this will occur at the same time as Mitigation Action #13 to reduce cost. As with that mitigation action, this is vital for reducing future wildfire risk within Very High FHSZs.

Responsible Agency: Operation & Maintenance

SECTION 7: PLAN MAINTENANCE

FEMA REGULATION CHECKLIST: PLAN MAINTENANCE

44 CFR § 201.6(c)(4): The mitigation strategy section shall include "a plan maintenance process" that includes:
44 CFR § 201.6(c)(4)(i): "A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle."
44 CFR § 201.6(c)(4)(ii): "A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate."
44 CFR § 201.6(c)(4)(iii): "Discussion on how the community will continue public participation in the plan maintenance process."

Element:
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?

D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* June 2025

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This section details the process that the District will use to monitor, update, and evaluate the plan within the five-year hazard mitigation cycle to ensure the LHMP remains an active and relevant document. The format of the plan aligns with the regulation checklist and is divided into sections of information. Data can easily be located and incorporated into future updates, keeping the plan relevant.

The information collected within this document is based on the most recent and available information, input, and resources. The District's Strategic Plan, SSMP, WSMP, UWMP, and

various other policy documents are integral for proper implementation of this LHMP. Many of the ongoing recommendations identified in the mitigation activities are recommended by extant District plans, such as the Capital Improvement Plan.

Each department was given the opportunity to provide input during development. This philosophy will continue for future plan revisions through evaluations, maintenance, and updates of data, processes, and programs. The Planning Team will convene annually to review the LHMP and its implementation. It will include representatives from residents, citizen groups, partner agencies, and stakeholders within the planning area.

If members can no longer serve on the Planning Team, the Director of Administrative Services will assign another staff person to be on the Planning Team so that every District department is represented.

7.1 Monitoring and Evaluation

The hazard mitigation plan includes a range of action items intended to reduce losses from hazard events. Together, the action items provide a framework for activities that the District can choose to implement over the next five years. The effectiveness of the plan depends on the incorporation of the action items into existing plans, policies, and programs. Although the Human Resources & Risk Management department has the primary responsibility for the LHMP, all departments will facilitate continual review, coordination, and promotion, plan implementation, and evaluation.

The Director of Administrative Services within the Human Resources & Risk Management department and District department supervisors will be jointly responsible for the plan's implementation and maintenance through existing District programs. Department supervisors will be responsible for implementing mitigation strategies and actions specific to their department operations. The Director of Administrative Services will assume the lead responsibility for facilitating plan maintenance and coordinating the Planning Team.

Each April, the Planning Team will begin the process of reviewing the LHMP and the mitigation actions to develop an annual progress report. This process can also assist the budget review process by providing information on mitigation projects and activities that have been completed or implemented. The annual progress report process will serve to align annual reviews of the hazard mitigation plan and to incorporate information. As updates to the LHMP are completed, the public will be made aware of the changes to the LHMP and make recommendations or comments. This report will include:

- A summary of any hazard events that occurred during the prior year and their impact on the planning area.
- A review of successful mitigation initiatives identified in the 2025 plan.
- A brief discussion about the targeted strategies that were not completed.
- A re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended, and the reason for the amendment (e.g., funding issues).
- Any recommendations for new projects.

- Any changes in or any potential for new funding options (e.g., grant opportunities).
- Any impacts of other planning programs or initiatives that involve hazard mitigation.

The progress report will be provided to the District's budget team for review. The hazard mitigation plan progress report will also be posted on the District website on the page dedicated to the hazard mitigation plan and presented in the form of a report to the District Board. The Planning Team will strive to complete the progress report process by March of each year.

7.2 Plan Update

Section 201.6(d)(3) of 44 Code of Federal Regulations requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act. The District intends to update its LHMP on a five-year cycle.

Based on needs identified by the Planning Team, the update will, at a minimum, include the following elements:

- The hazard risk assessment will be reviewed and updated using the most recent information and technologies.
- The action plan will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment.
- Any new District policies identified under other planning mechanisms, as appropriate.
- An LHMP update that will be sent to appropriate agencies and organizations for comment.
- Opportunities for the public to comment on the updated version prior to adoption.
- Documentation of District Board approval.

At a minimum of 12 months before the expiration date of this LHMP, the Planning Team will implement a plan revision schedule. The plan will be revised using the latest FEMA hazard mitigation guidance documents, such as the Mitigation Planning Tool and Regulation Checklist, to ensure compliance with current hazard mitigation planning regulations. The LHMP may be updated earlier than the five-year cycle if the District experiences a State/federal-declared disaster or if a hazard event results in loss of life.

The overall success of the LHMP is through implementation of the plan's hazard mitigation strategy and activities to reduce the effects of hazards, protect people and property, and improve the District's efforts to respond to and recover from disasters. Members of the public and the District will ultimately benefit from the implementation of the LHMP and must be given the opportunity to provide input to the continuous cycle of LHMP planning.

7.3 Continued Public Involvement

The District will strive to keep the public aware of hazard mitigation projects and involved in the LHMP update process. Information will be released through press releases, website

announcements, public hearings (as required), Board meetings, social media, and the District's e-news blast to subscribers.

Projects that mitigate hazards will continue to be included in the District's annual budget planning process. The public is made aware of the planning through District Board meetings and press releases during this time. The budget planning process will serve as an annual opportunity to conduct outreach to the public on updates to the hazard mitigation planning process.

A survey may be conducted to gather input on community opinion about the progress being made on LHMP activities. The District will regularly provide press releases and information about hazard mitigation projects to the public. At a minimum, the public will be engaged to learn about current LHMP activities and given the opportunity to provide comments and information on an annual basis to update and maintain the LHMP. The District's Public Affairs Department will be tasked with public outreach and responsible for ensuring the public is involved in the annual public plan update and outreach.

Table 7-1 summarizes proposed activities for public involvement and dissemination of information that shall be pursued whenever possible and appropriate.

Table 7-1: Past and Proposed Continued Public Involvement Activities or Opportunities Identified by the District

Department	Public Involvement Activity or Opportunity	
	PAST	PROPOSED
All	N/A	Place more emphasis on the risks associated with natural and manmade hazards at public awareness campaigns conducted by various District departments. Consider developing and distributing public education materials for natural hazards.
Administration	N/A	Conduct annual surveys to be completed online and at the annual Open House Event
Human Resources & Risk Management	N/A	Lorem ipsum
Lorem Ipsum	N/A	Lorem ipsum

SECTION 8: PLAN APPROVAL AND ADOPTION

TBD.

APPENDIX A: LOCAL MITIGATION PLAN REVIEW TOOL

TBD.

APPENDIX B: PLANNING TEAM MEETING DOCUMENTATION

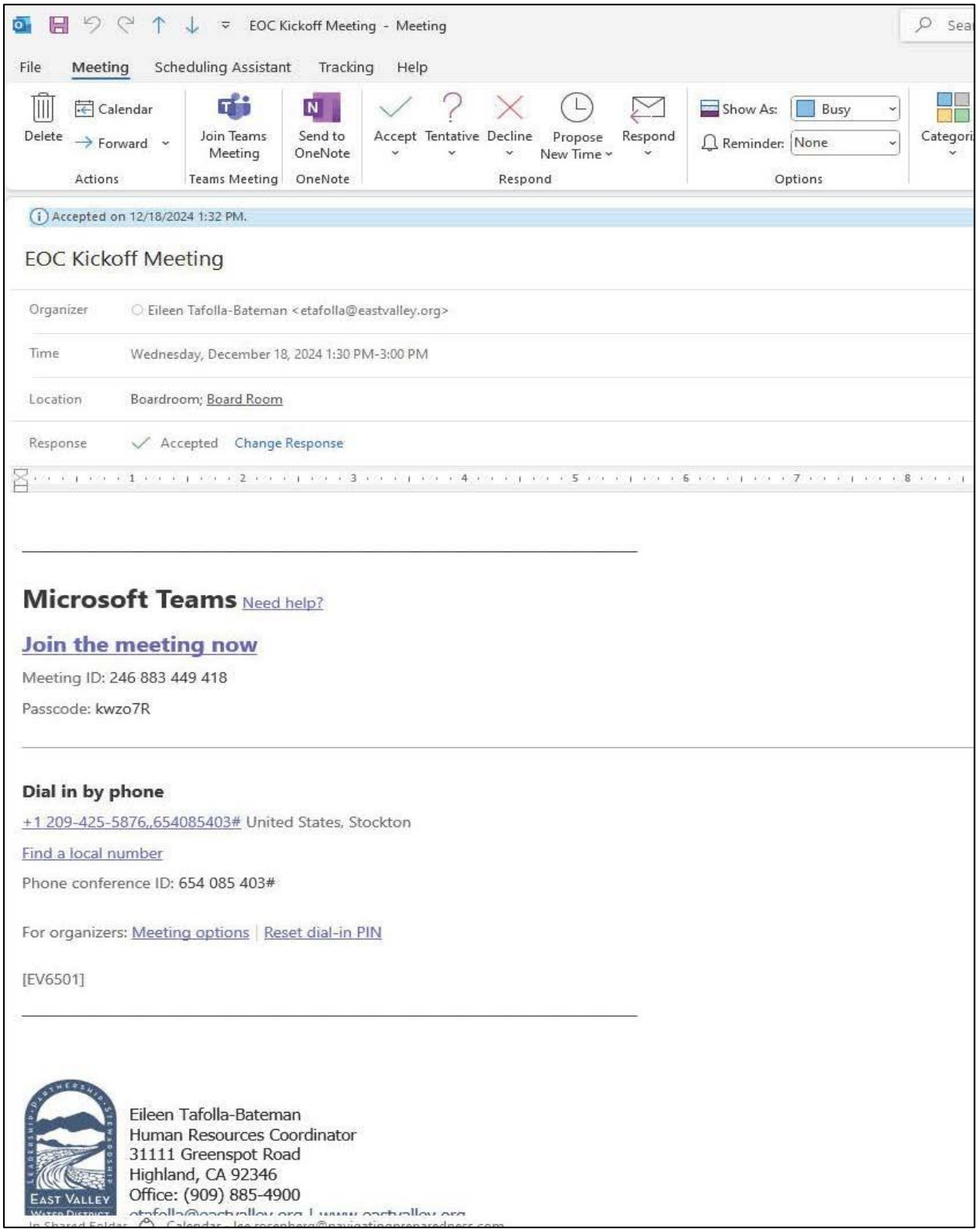
Appendix B contains documentation of the planning process for the LHMP Planning Team, including meetings, presentations, emails, etc. **Table B-1** summarizes the documentation therein.

Table B-1: Planning Meeting Documentation

Meeting Date	Meeting Title	Materials
12/18/2024	Project Kickoff Meeting & Planning Team Meeting #1	Invitation Sign-in sheet (virtual) Presentation (cover only) Meeting minutes
10/8/2025	Planning Team Meeting #2	Invitation to stakeholders Sign-in sheet Presentation (cover only) Meeting minutes
TBD	Planning Team Meeting #3	Invitation to stakeholders Sign-in sheet Presentation (cover only) Meeting minutes

Meeting #1 – Internal LHMP Project Kickoff Meeting

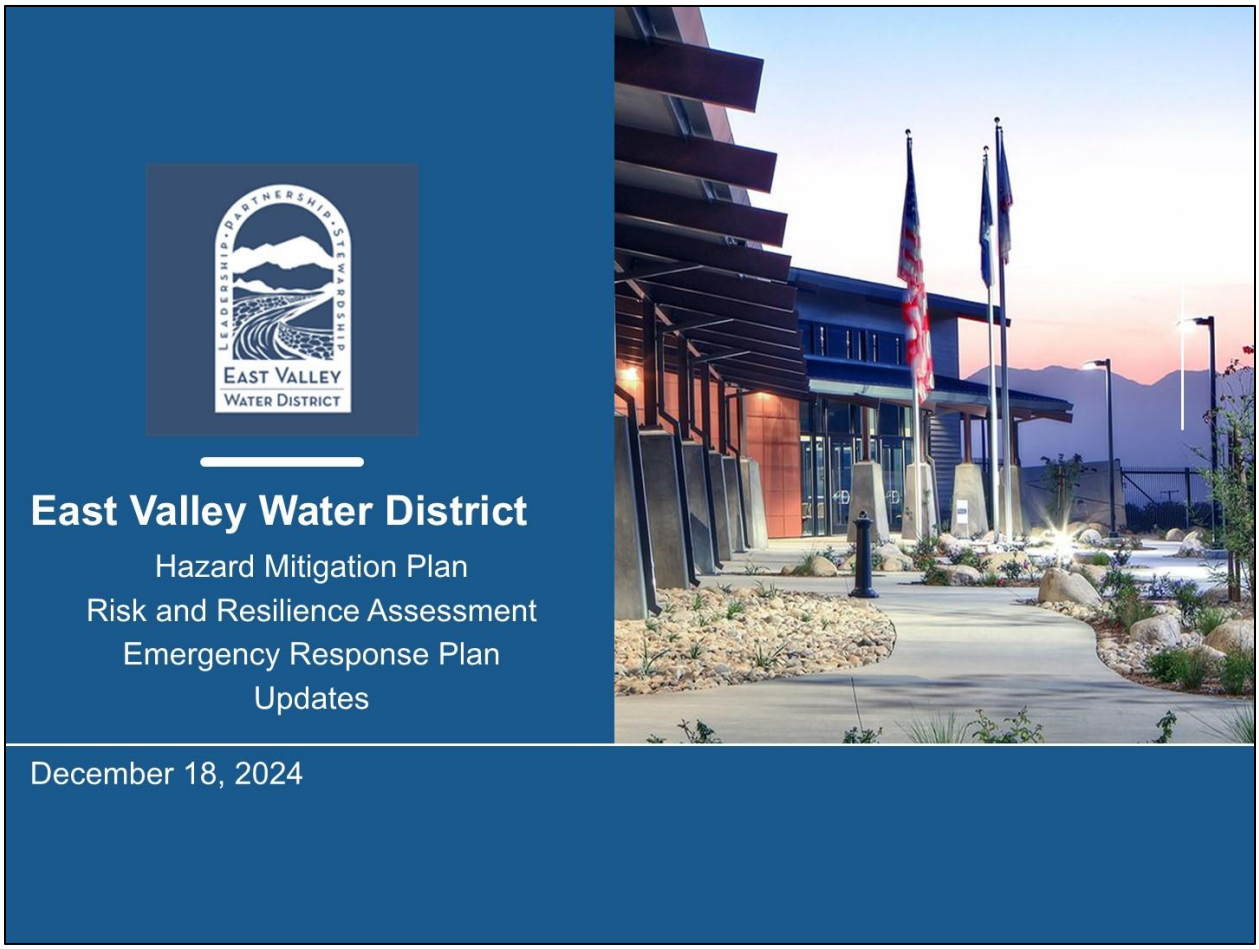
Invitation:



Sign-in Sheet:

EVWD Planning Meeting #1: Participants		
Name	**Position**	**Agency**
Patrick Milroy	Operations Manager	EVWD
Manny Moreno	Water Reclamation Manager	EVWD
Ray Roybal	Water Reclamation Supervisor	EVWD
Jon Peel	Water Maintenance Supervisor	EVWD
Dale Barlow	Facilities Supervisor	EVWD
Jason Wolf	Senior Engineer	EVWD
Nathan Carlson	Senior Engineer	EVWD
William Ringland	Public Affairs/Conservation Manager	EVWD
Roxana Morales	Public Affairs Supervisor	EVWD
Ryan Ritualo	IT Manager	EVWD
Kerrie Bryan	Director of Administrative Services	EVWD
Eileen Tafolla-Bateman	Human Resources Coordinator	EVWD
Lee Rosenberg	Consultant	NPA

Presentation:



Notes:

December 22, 2024
To: Kerrie Bryan
From: Lee Rosenberg

Planning Team Meeting #1

East Valley Water District (East Valley) hosted an in-person Planning Team Meeting with East Valley staff and Navigating Preparedness Associates (NPA) on December 18, 2024, at 1:30 PM.

Attendees

Attendee	Organization/Division
Patrick Milroy	Operations Manager
Manny Moreno	Water Reclamation Manager
Ray Roybal	Water Reclamation Supervisor
Jon Peel	Water Maintenance Supervisor
Dale Barlow	Facilities Supervisor
Jason Wolf	Senior Engineer
Nathan Carlson	Senior Engineer
William Ringland	Public Affairs/Conservation Manager
Roxana Morales	Public Affairs Supervisor
Ryan Ritualo	IT Manager
Kerrie Bryan	Director of Administrative Services
Eileen Tafolla-Bateman	Human Resources Coordinator
Lee Rosenberg	Navigating Preparedness Associates

Summary of Discussion

Kerrie Bryan kicked off the meeting. Lee Rosenberg introduced the project and gave an overview of why the Planning Team is here. Meeting attendees introduced themselves. Attendees are listed above.
NPA provided a presentation that addressed the LHMP update process, project management implementation, project schedule and project data needs. The group reviewed the following items:

- LHMP Planning Team Organization
- Scope of Work
- New Challenges in the LHMP Development Process and NPA's solutions
- Project Management Plan
- Next Steps

The group discussed data needs for updating the LHMP. Key information required is listed below:

- History of emergencies since the last LHMP update
- Status of completion of mitigation action items in previous LHMP
- Comprehensive listing of East Valley owned infrastructure with value estimates
- Contact points for community outreach focusing on underserved communities
- GIS layers to support hazard mapping process

The group discussed the importance of the public outreach process. NPA will provide a draft public outreach plan for review. Key public outreach activities include:

- Public survey on the East Valley website with advertising on social media accounts. The survey will be translated into Spanish and one other language
- Up to two public meetings. The meetings need to be scheduled in conjunction with ongoing activities to increase participation.
- Opportunities at other public events to set up a booth that provides information on the LHMP update process and requests input
- Board meetings including a meeting to formally adopt the LHMP

The group discussed creating new mitigation actions that focus on improving infrastructure resilience. This is particularly relevant because East Valley has a new wastewater treatment plant.

Action Items

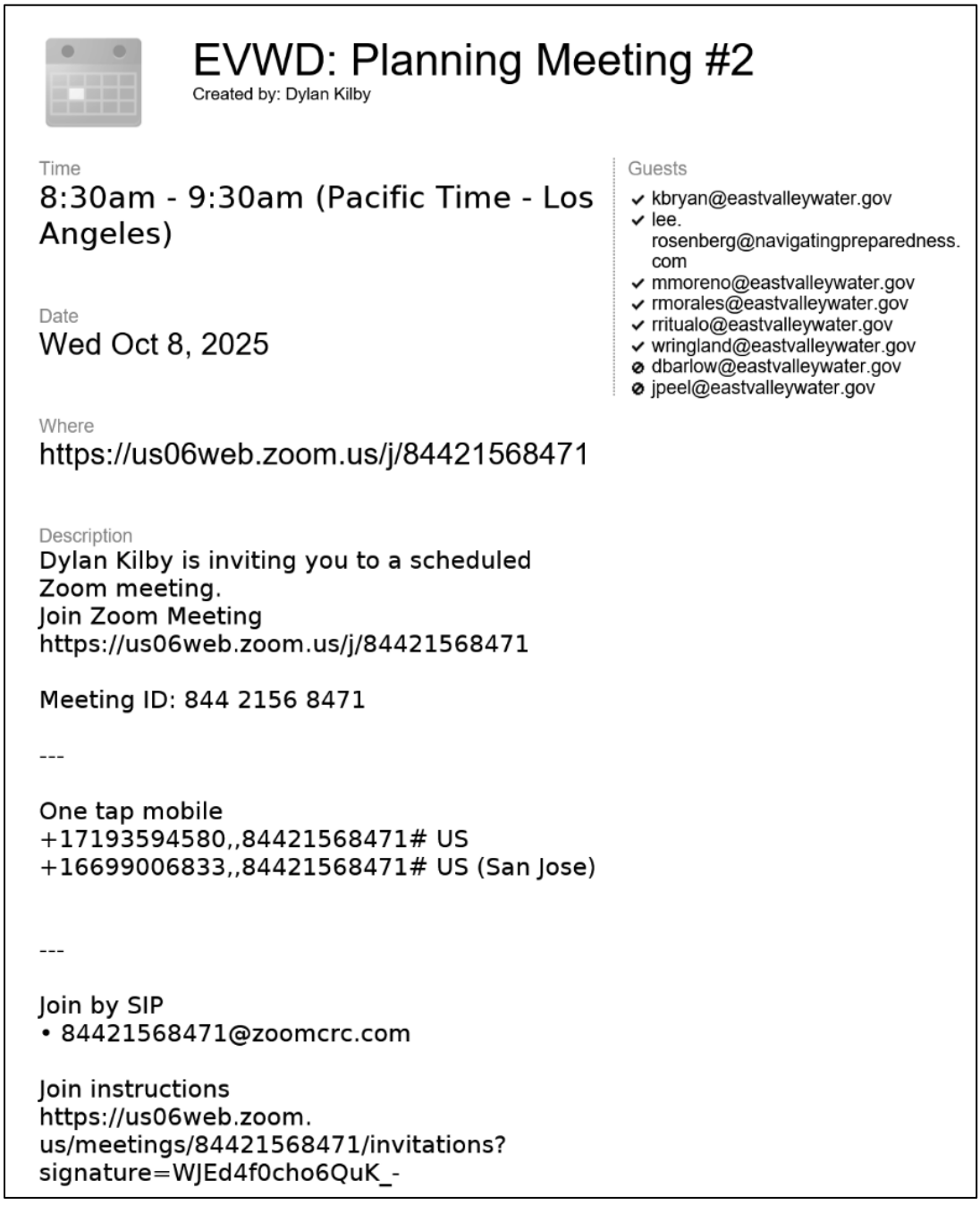
Action Item	Responsible Party	Due Date	Status
NPA to provide a list of requested GIS layers from the District.	NPA	Friday, January 20	Open
Verify facilities in current Risk and Resilience Assessment	NPA/East Valley	Friday, December 17	Open
Deliver draft public outreach plan	NPA	Friday, January 17	Open
Deliver public outreach survey and other advertising material	NPA East Valley provide language requirements)	Friday, January 31	Open
Provide list of East Valley owned facilities with values	East Valley Risk Management	Friday, January 31	Open
Provide status of previous LHMP activities	East Valley	Friday, January 31	Open

Points of Contact

For concerns or questions regarding these notes, please contact:
Lee Rosenberg, (925) 381-0583 or lee.rosenberg@navigatingpreparedness.com

Meeting 2 – LHMP Planning Team Meeting #2

Invitation:



EVWD: Planning Meeting #2

Created by: Dylan Kilby

Time
8:30am - 9:30am (Pacific Time - Los Angeles)

Date
Wed Oct 8, 2025

Guests
- ✔ kbryan@eastvalleywater.gov
- ✔ lee.rosenberg@navigatingpreparedness.com
- ✔ mmoreno@eastvalleywater.gov
- ✔ rmorales@eastvalleywater.gov
- ✔ rritualo@eastvalleywater.gov
- ✔ wringland@eastvalleywater.gov
- ⊘ dbarlow@eastvalleywater.gov
- ⊘ jpeel@eastvalleywater.gov

Where
https://us06web.zoom.us/j/84421568471

Description
Dylan Kilby is inviting you to a scheduled Zoom meeting.
Join Zoom Meeting
https://us06web.zoom.us/j/84421568471

Meeting ID: 844 2156 8471

One tap mobile
+17193594580,,84421568471# US
+16699006833,,84421568471# US (San Jose)

Join by SIP
• 84421568471@zoomcrc.com

Join instructions
https://us06web.zoom.us/meetings/84421568471/invitations?signature=WJEd4f0cho6QuK_-

Sign-in sheet:

EVWD Planning Meeting #2: Participants		
Name	**Position**	**Agency**
Patrick Milroy	Operations Manager	EVWD
Manny Moreno	Water Reclamation Manager	EVWD
Jason Wolf	Senior Engineer	EVWD
Nathan Carlson	Senior Engineer	EVWD
William Ringland	Public Affairs/Conservation Manager	EVWD
Roxana Morales	Public Affairs Supervisor	EVWD
Ryan Ritualo	IT Manager	EVWD
Kerrie Bryan	Director of Administrative Services	EVWD
Lee Rosenberg	Consultant	NPA
Dylan Kilby	Consultant	NPA

Presentation:

Notes:

October 8, 2025

Planning Meeting #2 – Notes

ATTENDEES/INVITEES

1. EVWD Representatives
    - Kerrie Bryan
    - Ryan Ritualo
    - Patrick Milroy
    - Manny Moreno
    - William Ringland
    - Roxana Morales
    - Jason Wolf
    - Nathan Carlson
2. NPA Representatives
    - Lee Rosenberg
    - Dylan Kilby

MEETING NOTES

Note: These notes are supplementary to the PowerPoint slides.

1. **Hazard Mitigation Process Review**
    - "Hazard mitigation": process by which threats/hazards to facilities, infrastructure, and staff are identified and evaluated. Financial risk is applied to the hazards, and then mitigation actions are identified by the jurisdiction that will reduce risk.
2. **Updates on Plan Completion**
    - The majority of the plan is complete. Remaining tasks include drafting the hazard mitigation actions, the public engagement documentation, and any necessary technical details or supplementary information.
    - Next Planning Team meeting (roughly December) will discuss the Cal OES/FEMA submission and review process.
3. **Hazards Review**
    - Identified hazards include climate change, cyberattack, dam failure/inundation, drought, earthquakes/seismic events, flooding, HAZMAT

incidents, heat waves, landslides, power loss/PSPS, severe storms, and wildfires.

- Hazards within the 2020 LHMP but were removed for this cycle include land subsidence, loss of critical spares, and physical adversary.
    - Land Subsidence: removed due to lack of evidence in geologic surveys that land subsidence threatens water/wastewater infrastructure.
    - Loss of Critical Spares: removed due to not being appropriate for LHMPs and the types of grants that LHMPs facilitate.
    - Physical Adversary: removed due to unlikelihood of terrorism or tampering in addition to not being appropriate for the types of grants that LHMPs facilitate.
        - Note that "cyberattack" remained within the LHMP.
- Top four most salient hazards are (in order) earthquakes/seismic events, wildfire, power loss/PSPS, and drought.

4. Risk Assessment Process Review

- The risk assessment assigns financial valuations to critical assets and infrastructure (e.g., pipelines) and then assesses risk from each hazard.
    - Pipeline risk based on replacement costs per foot by each pipe diameter from the Risk & Resilience Assessment completed earlier this year.
    - Water and sewer devices (e.g., manholes) also included but financial valuations not assigned due to different ages, sizes, types, etc.
- When appropriate, GIS technology was used to assess where and how hazards intersected with District facilities and infrastructure.
    - E.g., overlying dam inundation maps with District assets.
    - In our experience, FEMA and Cal OES have appreciated maps for clarity.
- Systemic hazards such as power failures and droughts were assessed qualitatively through narratives that describe impact.

5. Public Outreach Process – Survey

- The public engagement survey has been drafted and reviewed.
- The open dates will be October 13th through 31st.
- The results of the survey will be summarized and included within the LHMP as an appendix.
    - We do not expect many surprises in the responses.
- EVWD has social media graphics, a QR code, and a link to the open survey.

- NPA has sole access to the survey data. All responses will be anonymous. EVWD will only have access to the summary data, not individual responses.

6. **Public Outreach Process – LHMP Draft**
   - The public review draft is an important component of the public engagement process.
     - Members of the public (including EVWD staff) will be able to review the full plan and email NPA comments for consideration/inclusion.
     - There is *no* requirement for number of responses or comments. A good faith effort for public outreach is the requirement, not that comments were received. We cannot force people to respond.
   - FEMA/Cal OES want to see who received the draft, what the comments were, and how comments were incorporated into the LHMP.
     - NPA will develop comments to accompany the public review draft.
     - NPA will send EVWD a spreadsheet of organizations, points-of-contact, emails, etc. to send the LHMP directly. It is important that notable stakeholders (e.g., large businesses, academic institutions, other users of the Bunker Hill Groundwater Basin) have had a chance to receive and review the plan.
   - NPA recommends publishing a download link on the EVWD website through which members of the public can download the draft.
     - EVWD to send NPA screenshots of posts.
   - EVWD will receive an internal review draft two weeks prior to publishing the public review draft.
7. **Mitigation Strategies/Actions Process**
   - "Mitigation strategies" are any projects, actions, etc. that reduce risk to hazards.
   - NPA recommends including as many ideas as possible. FEMA/Cal OES want to see what projects were considered but not included.
   - Will include potential funding opportunities and applicable grants to each hazard.
   - Each hazard identified in the LHMP *must* be represented within the mitigation actions.
8. **Mitigation Strategies/Actions Review**
   - The Hazard Mitigation Tool spreadsheet was sent out on September 23rd and comments were received this week. Dylan Kilby is in the process of compiling notes and suggested actions.
   - The identified actions will be placed within the LHMP.

- Dylan will be in contact with EVWD through Kerrie Bryan for follow-up on any supplementary or technical information that might be needed.

9. October-December LHMP Schedule

- **October 13-31:** Public engagement survey will be available for responses from the general public via the SurveyMonkey platform.
- **October 15:** The next draft of the hazard mitigation actions will be sent to the Planning Team for input.
- **November 1:** The internal review draft of the LHMP will be sent out to the Planning Team.
- **Mid-November:** The public review draft will be open for comments.
- **November 18th:** The community advisory committee will hold their quarterly meeting at which the LHMP will be presented for EVWD.
- **December 10:** EVWD Board meeting at which the LHMP will be presented.

10. Action Items – NPA

- *Action Item:* Submit to EVWD the updated mitigation actions by October 15th, along with supplementary materials.
- *Action Item:* Submit to EVWD the public survey results and internal review draft by November 1st.
- *Action Item:* Collate any comments from the internal review draft and update the LHMP by November 14th and send to EVWD.
- *Action Item:* Support EVWD with any needs during the internal and public review draft process (ongoing).
- *Action Item:* Compile public outreach documentation (ongoing)
- *Action Item:* Prepare to present the completed LHMP with public review comments to the EVWD Board on December 10th.

11. Action Items – EVWD

- *Action Item:* Review the updated mitigation actions by October 27th (conditional on receiving the document from NPA on October 15th).
- *Action Item:* Review the internal review draft by November 12th (conditional on receiving the document from NPA on November 1st).
- *Action Item:* Send NPA screenshots, social media comments, and any other outreach documentation (ongoing)
- *Action Item:* Respond to NPA requests for information (ongoing).

Meeting 3 – LHMP Planning Team Meeting #3

Invitation:

TBD

Sign-in Sheet:

TBD

Presentation:

TBD

Notes:

TBD

APPENDIX C: PUBLIC ENGAGEMENT DOCUMENTATION

Appendix C contains documentation of the planning process including meetings, presentations held for the stakeholders and public, and other stakeholder/public outreach efforts. **Table C-1** summarizes the various activities undertaken.

Table C-1: Stakeholder & Public Engagement Activities

Activity Date	Meeting Audience/ Activity	Documentation
10/13/2025 – 10/31/2025	Survey posted on EVWD website with links provided in social media accounts.	Documentation 1: Survey Documentation 2: Posting on District Facebook Account Documentation 3: Posting on District Instagram Account Documentation 4: Emails Sent to Selected Stakeholders
10/13/2025 – 10/31/2025	Public hazard mitigation survey conducted.	Documentation 5: Survey Results
12/1/2025	NPA representative attended a Finance/HR Committee meeting and provided information on the LHMP.	Documentation 6: Copy of Finance/HR Committee PowerPoint Presentation
XX/XX/XXXX	Draft LHMP provided for public review.	TBD
XX/XX/XXXX	Draft LHMP sent to various public stakeholders for review and comment.	TBD

Documentation 1: Survey

East Valley Water District Hazard Mitigation Plan - Public Survey

East Valley Water District (EVWD) is updating their **Local Hazard Mitigation Plan (LHMP)**. LHMPs help EVWD build resilience and reduce vulnerabilities. They identify natural and human-caused disasters such as floods, wildfires, and cybersecurity attacks. LHMPs then list actions that can reduce the threats that these hazards pose to our water and sewer systems. Finally, up-to-date LHMPs allow EVWD to be eligible for State and federal grants.

This survey is an opportunity for you to share your opinions and **participate in the planning process.** We want to make sure that this update represents the needs of our communities. Any information that you can provide will help us better understand our communities' concerns.

EVWD is sending this survey to you through the SurveyMonkey platform. The survey contains **14 questions** and will take **5-10 minutes** to complete. The survey will last from **October 13, 2025, to October 31, 2025.**

If you have any questions about the content of this survey - or if you would prefer to fill out a paper form - then please email Dylan Kilby of Navigating Preparedness Associates at **dylan@navigatingpreparedness.com**.

Confidentiality: Responses to this survey are confidential. They will only be used to enhance mitigation planning efforts. No member of EVWD will have access to your personal or location information.

East Valley Water District Hazard Mitigation Plan - Public Survey

1. **What community do you live or work in? Check all that apply.**

- [ ] City of Highland
- [ ] City of San Bernardino
- [ ] Yuhaaviatam of San Manuel Nation
- [ ] Unincorporated San Bernardino County
- [ ] I prefer not to answer.
- [ ] Other (please specify)

2. **What property type are you responding on behalf of?**

- ◯ Residential (Single-Family)
- ◯ Residential (Apartment or Multi-Family)
- ◯ Commercial (Retail)
- ◯ Commercial (Food/Drink)
- ◯ Commercial (Other)
- ◯ Industrial
- ◯ Public and/or Utilities
- ◯ Hospital and Healthcare
- ◯ I prefer not to answer.
- ◯ Other (please specify)

East Valley Water District Hazard Mitigation Plan - Public Survey

3. **How concerned are you about your water and wastewater services being impacted by a natural or manmade disaster?**

- ◯ Strongly concerned
- ◯ Somewhat concerned
- ◯ Not concerned

4. **Have you ever experienced or been impacted by a natural or manmade disaster while living in San Bernardino County?**

- ◯ Yes
- ◯ No
- ◯ I don't know.

5. **From the following list, please select the types of disasters you have experienced while living or working in San Bernardino County.**

- [ ] Cyberattack
- [ ] Dam Failure and/or Inundation
- [ ] Drought
- [ ] Earthquake (and similar events)
- [ ] Flooding
- [ ] HAZMAT Incident
- [ ] Heat Wave
- [ ] Landslide
- [ ] Power Loss/Public Safety Power Shutoff (PSPS)
- [ ] Severe Storms and/or Winds
- [ ] Wildfire
- [ ] I have not experienced a disaster while living or working in San Bernardino County.
- [ ] Other (please specify)

East Valley Water District Hazard Mitigation Plan - Public Survey

6. **Have you ever experienced a disruption to your water or wastewater services due to a disaster?**

- ◯ Yes
- ◯ No
- ◯ I don't know.

7. **Please select the *TOP THREE* disasters you think pose the *GREATEST THREAT* to your community.**

- [ ] Cyberattack
- [ ] Dam Failure and/or Inundation
- [ ] Drought
- [ ] Earthquakes (and similar events)
- [ ] Flooding
- [ ] HAZMAT Incident
- [ ] Heat Wave
- [ ] Landslide
- [ ] Power Loss/Public Safety Power Shutoff (PSPS)
- [ ] Severe Storms and/or Winds
- [ ] Wildfire
- [ ] Other (please specify)

East Valley Water District Hazard Mitigation Plan - Public Survey

8. **Please select your *TOP THREE* concerns regarding threats to EVWD's water and wastewater services.**

- [ ] Sewer and waste issues due to flooding
- [ ] Fires harming infrastructure
- [ ] Power losses at plants and conveyance systems
- [ ] Changing land use within San Bernardino County
- [ ] Cybersecurity incidents affecting operations
- [ ] Service disruption due to earthquakes
- [ ] Aging pipes and infrastructure
- [ ] Water or sewer treatment plant failure
- [ ] Development within San Bernardino Valley
- [ ] Other (please specify)

9. **Have you ever received information from San Bernardino County or EVWD on how to make your household or organization safer from disasters?**

- ◯ Yes, from San Bernardino County
- ◯ Yes, from EVWD
- ◯ Yes, from both
- ◯ No

East Valley Water District Hazard Mitigation Plan - Public Survey

10. **Please select the ***TOP THREE*** organizations you would ***MOST TRUST*** to provide you with information about disasters in your area concerning water and wastewater.**

- ☐ EVWD
- ☐ San Bernardino County Office of Emergency Services
- ☐ National Weather Service
- ☐ Your community's social media pages (e.g., Facebook, NextDoor, Reddit)
- ☐ Online newspapers
- ☐ Traditional news media (e.g., print newspapers, television news, radio)
- ☐ American Red Cross (and similar non-profits)
- ☐ Neighbors, friends, and family members
- ☐ Insurance agencies
- ☐ Universities and other research institutions
- ☐ Other (please specify)

East Valley Water District Hazard Mitigation Plan - Public Survey

11. **Do you believe that EVWD is adequately preparing to deal with natural and manmade disasters concerning water and wastewater?**

- ◯ Yes
- ◯ No
- ◯ I don't know.

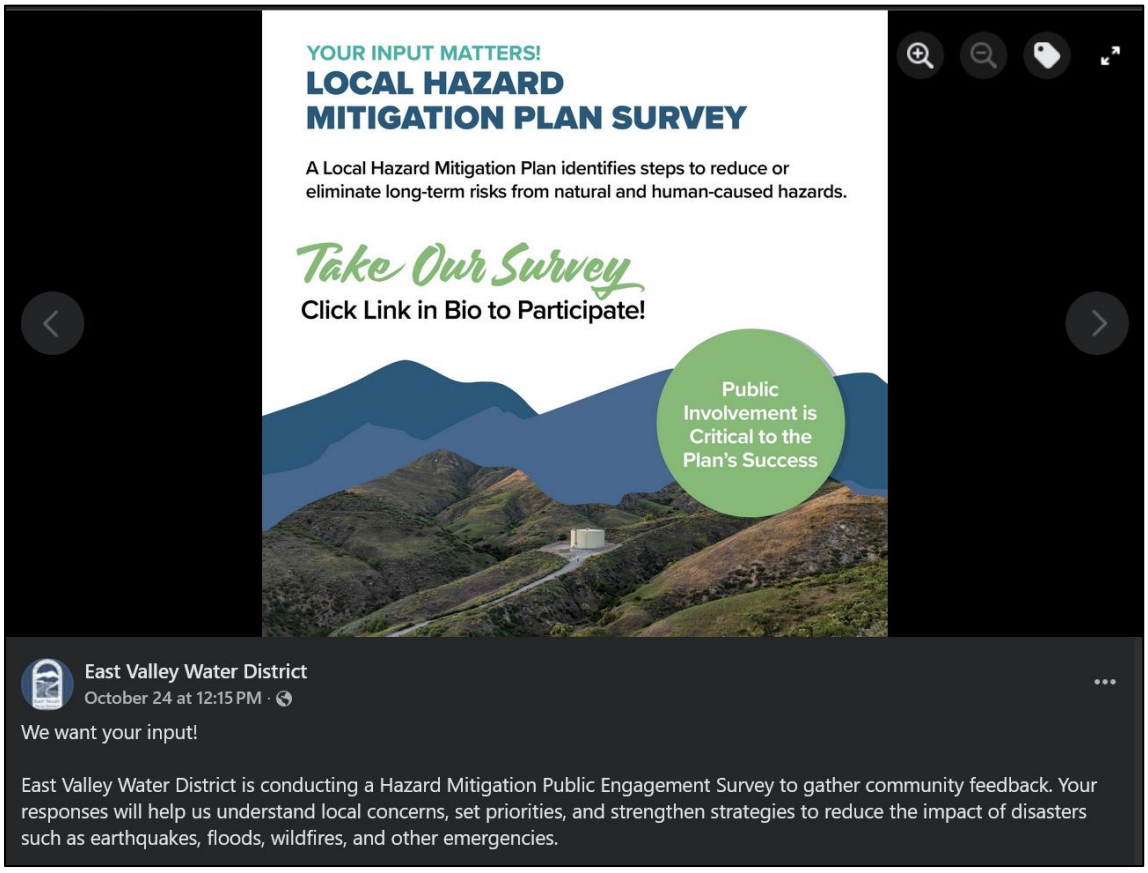
12. **Please explain your answer to the question above.**

13. **In your opinion, what are some steps that EVWD can take to reduce risk to disasters?**

East Valley Water District Hazard Mitigation Plan - Public Survey

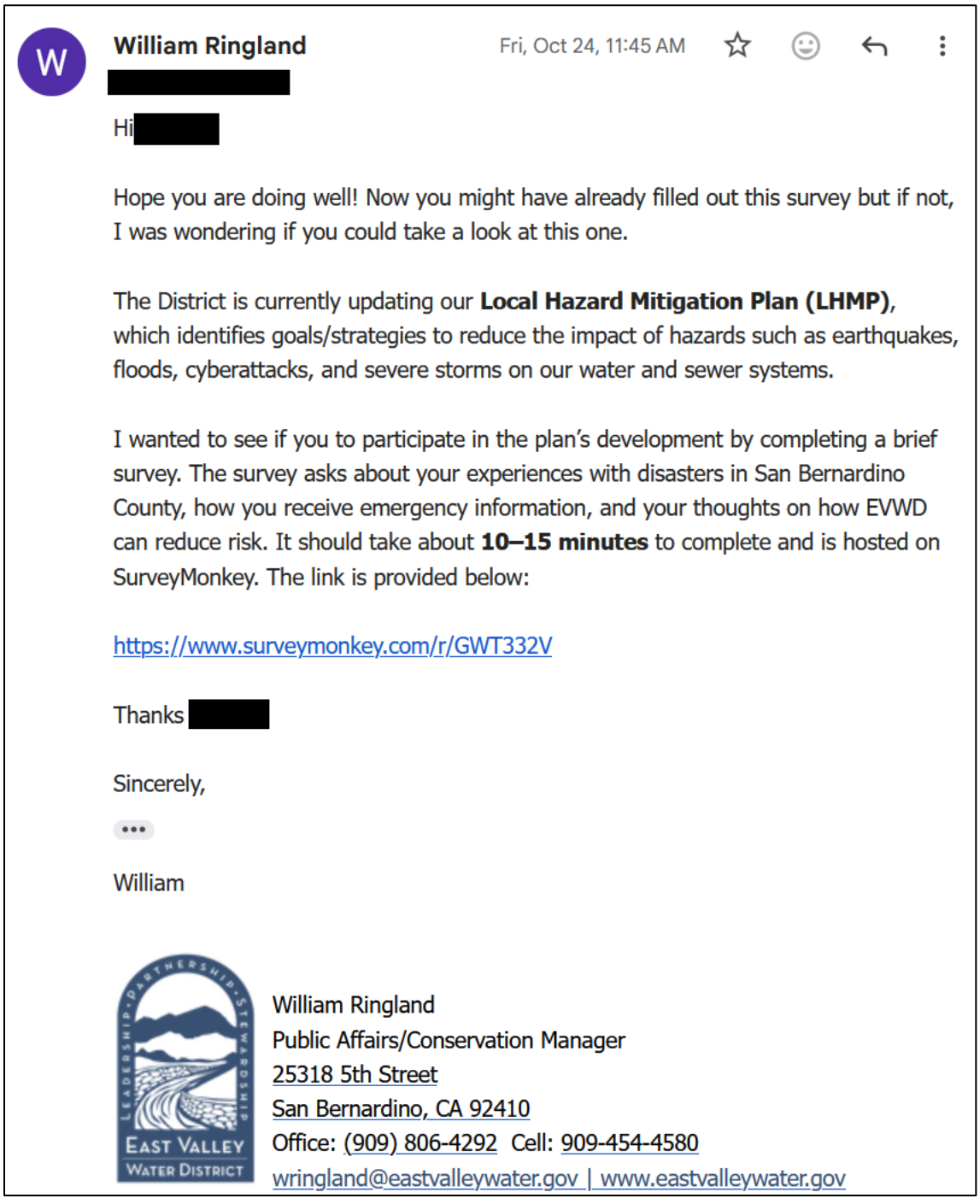
14. **Please use the text box below to provide any additional information that you would like us to know. Thank you!**

Documentation 2: Posting on District Facebook Account



Documentation 3: Posting on District Instagram Account

Documentation 4: Emails Sent to Selected Stakeholders



William Ringland Fri, Oct 24, 11:45 AM

[redacted]

Hi [redacted]

Hope you are doing well! Now you might have already filled out this survey but if not, I was wondering if you could take a look at this one.

The District is currently updating our **Local Hazard Mitigation Plan (LHMP)**, which identifies goals/strategies to reduce the impact of hazards such as earthquakes, floods, cyberattacks, and severe storms on our water and sewer systems.

I wanted to see if you to participate in the plan's development by completing a brief survey. The survey asks about your experiences with disasters in San Bernardino County, how you receive emergency information, and your thoughts on how EVWD can reduce risk. It should take about **10–15 minutes** to complete and is hosted on SurveyMonkey. The link is provided below:

https://www.surveymonkey.com/r/GWT332V

Thanks [redacted]

Sincerely,

William

William Ringland
Public Affairs/Conservation Manager
25318 5th Street
San Bernardino, CA 92410
Office: (909) 806-4292 Cell: 909-454-4580
wringland@eastvalleywater.gov | www.eastvalleywater.gov

Documentation 5: Survey Results

Given the low number of responses (12), the survey results are not statistically significant. Nonetheless, responses are summarized below.

Q1: What community do you live in?

All but 1 respondent reported they lived within the City of Highland.

Q2: What property type are you responding on behalf of?

All but 1 respondent reported they were responding on behalf of a single-family residential property.

Q3: How concerned are you about your water and wastewater services being impacted by a natural or manmade disaster?

7 respondents stated that they were “strongly concerned” and 4 respondents stated they were “somewhat concerned”. No respondents stated they were “not concerned”. 1 skipped the question.

Q4: Have you ever experienced or been impacted by a natural or manmade disaster while living in San Bernardino County?

7 respondents stated “yes”, and 3 stated “no”. 2 skipped the question.

Q5: From the following list, please select the types of disasters you have experienced while living or working in San Bernardino County.

The number of reports of each disaster are as follows:

- Cyberattack: 1
- Dam Failure/Inundation: 0
- Drought: 7
- Earthquake (and similar events): 7
- Flooding: 6
- HAZMAT Incident: 1
- Heat Wave: 6
- Landslide: 3
- Power Loss/PSPS: 8
- Severe Storms and/or Winds: 6
- Wildfire: 8
- None: 0

Q6: Have you ever experienced a disruption to your water or wastewater services due to a disaster?

2 respondents stated “yes”, and 9 stated “no”. 1 skipped the question.

Q7: Please select the TOP THREE disasters you think post the GREATEST THREAT to your community.
The topmost three disasters were earthquake (9), cyberattack 96), and power loss/PSPS (5).

Q8: Please select your TOP THREE concerns regarding threats to EVWD's water and wastewater services.
The topmost three issues all received 7 answers: power losses at plants and conveyance systems, service disruption due to earthquakes, and aging pipes and infrastructure.

Q9: Have you ever received information from San Bernardino County or EVWD on how to make your household or organization safer from disasters?
2 respondents stated they received information from only EVWD, 5 stated both the County and EVWD, and 4 said they did not receive information from either organization.

Q10: Please select the TOP THREE organizations you would MOST TRUST to provide you with information about disasters in your area concerning water and wastewater.
Respondents overwhelmingly selected EVWD and the San Bernardino County Office of Emergency Services, with 11 each.

Q11: Do you believe that EVWD is adequately preparing to deal with natural and manmade disasters concerning water and wastewater?
6 respondents stated "yes", 5 "I don't know", and no respondents stated "no".

Q12: Please explain your answer to the question above.
Respondents reflected that the District is being proactive in projects and community engagement, especially in informing the public about potential threats.

> *"EVWD is taking the lead on preparing the community in case of natural or manmade disaster by asking these questions and taking action."*

Q13: In your opinion, what are some steps that EVWD can take to reduce disasters?
Respondents stated that they want the District to update their emergency response plans, prepare as strongly as possible for earthquakes, conduct exercises, and continue with plants to update and repair infrastructure.

> *"Conduct simulations and exercises that would allow us to measure the likelihood and consequences of specific disasters. Harden our physical security and all facilities. Continual cybersecurity enhancements. Improve community outreach and education relative to disasters."*

Q14: Please use the text box below to provide any additional information you would like us to know. Thank you!
Respondents asked that the District share the results of the survey with the community and to further engage organizations such as the CAC in preparing for disasters and communicating with

the public.

> *"I would also like to add, to use CAC members as neighborhood watch partners in the event of a natural disaster. Equip them with CERT training and tools so that they can also help other community members in the event a natural disaster happens. In addition, have some way of communication via 2-way radios with CAC members during their service terms. (Optional to each member.)"*

Documentation 6: Copy of Finance/HR Committee PowerPoint Presentation

APPENDIX D: MITIGATION ACTION PRIORITIZATION (STAPLE/E)

TBD.

APPENDIX E: ACRONYMS

ALA	American Lifelines Alliance
APEFZ	Alquist-Priolo Earthquake Fault Zone
APG	California Adaptation Planning Guide
APT	Advanced Persistent Threat
ASCE	American Society of Civil Engineers
AWIA	America Water Infrastructure Act
BAER	Burned Area Emergency Response
CAC	Community Advisory Commission
Cal Fire	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
CCI	California Climate Investments
CDAA	California Disaster Assistance Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFIP	California Forest Improvement Grant Program
CFR	Code of Federal Regulations
CGS	California Geological Survey
CIFP	Capital Improvement and Financial Plan
CISN	California Integrated Seismic Network
CPRI	Calculated Priority Risk Index
CPUC	California Public Utilities Commission
COOLR	Cooperative Open Online Landslide Repository
CWC	California Water Code
CWSRF	Clean Water State Revolving Fund
DCP	Drought Contingency Plan
DDoS	Direct Denial of Service
DMA 2000	Disaster Mitigation Act of 2000
DRA	Drought Risk Assessment
DSAC	Dam Safety Action Classification
DSoD	Division of Safety of Dams
DWR	Department of Water Resources
DWSRF	Drinking Water State Revolving Fund
EFZ	Elsinore Fault Zone
EIA	Energy Information Administration

EID	Emerging Infectious Disease
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERP	Emergency Response Plan
EVWD	East Valley Water District
EWP	Emergency Watershed Protection Program
EZRI	Earthquake Zones of Required Investigation
FEMA	Federal Emergency Management Agency
FHSZ	Fire Hazard Severity Zone
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance Grant Program
FOG	Fats, Oils, and Grease
FY	Fiscal Year
GIS	Geographic Information Systems
HAZMAT	Hazardous Materials
HMGP	Hazard Mitigation Grant Program
HVAC	Heating, Ventilation, and Air Conditioning
I/I	Infiltration and Inflow
LFO	Local Forecasting Office
LHMP	Local Hazard Mitigation Plan
MED(s)	Major Event Day(s)
MFA	Multi-Factor Authentication
MMI	Modified Mercalli Intensity Scale
MMS	Moment Magnitude Scale
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
NFDRS	National Fire Danger Rating System
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NID	National Inventory of Dams
NIDIS	National Integrated Drought Information System
NOAA	National Oceanic and Atmospheric Administration
NPA	Navigating Preparedness Associates
NRCS	Natural Resources Conservation Service
NRI	National Risk Index

NWS	National Weather Service
PDSI	Palmer Drought Severity Index
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
PRV	Pressure Release Valve
PSPS	Public Safety Power Shut-off
RDII	Rainfall-derived inflow and intrusion
RFC	Repetitive Flood Claims Program
Riverside UASI	Riverside Urban Area Security Initiative
RL	Repetitive Loss
RRA	Risk and Resilience Assessment
SAFZ	San Andreas Fault Zone
SAIDI	System Average Interruption Duration Index
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCEDC	Southern California Earthquake Data Center
SDS	Safety Data Sheet
SDWA	Safe Drinking Water Act
SFAP	State Fire Assistance Program
SFHA	Special Flood Hazard Area
SHMA	Seismic Hazards Mapping Act
SHMP	State Hazard Mitigation Plan
SJFZ	San Jacinto Fault Zone
SMART	Specific, Measurable, Attainable, Relevant, and Timebound
SNRC	Sterling Natural Resource Center
SRL	Severe Repetitive Loss
SSMP	Sewer System Master Plan
THIRA	Threat and Hazard Identification and Risk Assessment
UCERF3	Third Uniform California Earthquake Rupture Forecast
USACE	US Army Corps of Engineers
USGS	US Geological Survey
UWMP	Urban Water Management Plan

VARs	Values-at-risk
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WERT	Watershed Emergency Response Team
WIFIA	Water Infrastructure Finance and Innovation Act
WPP	Watershed Protection Program
WRCOG	Western Riverside Council of Governments
WRFP	Water Recycling Funding Program
WSMP	Water System Master Plan
WUI	Wildland Urban Interface

APPENDIX F: DAM INUNDATION EXHIBIT

Figure F-1 below overlays the dam inundation map for the Seven Oaks Dam with District boundaries.

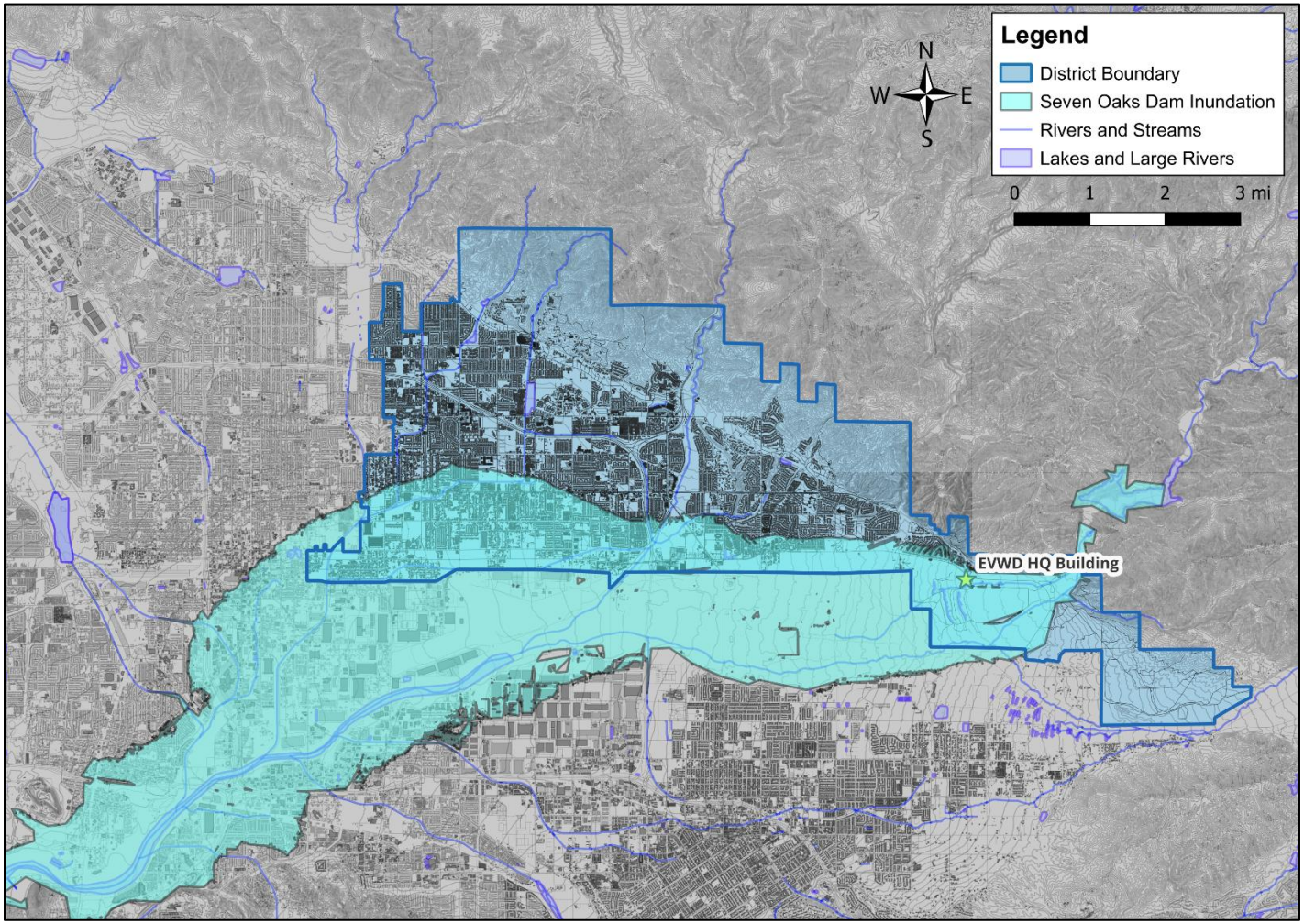


Figure F-1: Seven Oaks Dam Inundation Map with District Boundaries

APPENDIX G: EARTHQUAKE & SEISMIC HAZARD EXHIBIT

Figures G-1, G-2, G-3, and **G-4** overlay damage contours of four earthquake scenarios (i.e., planning tools and not real events) along various faults in southern California.

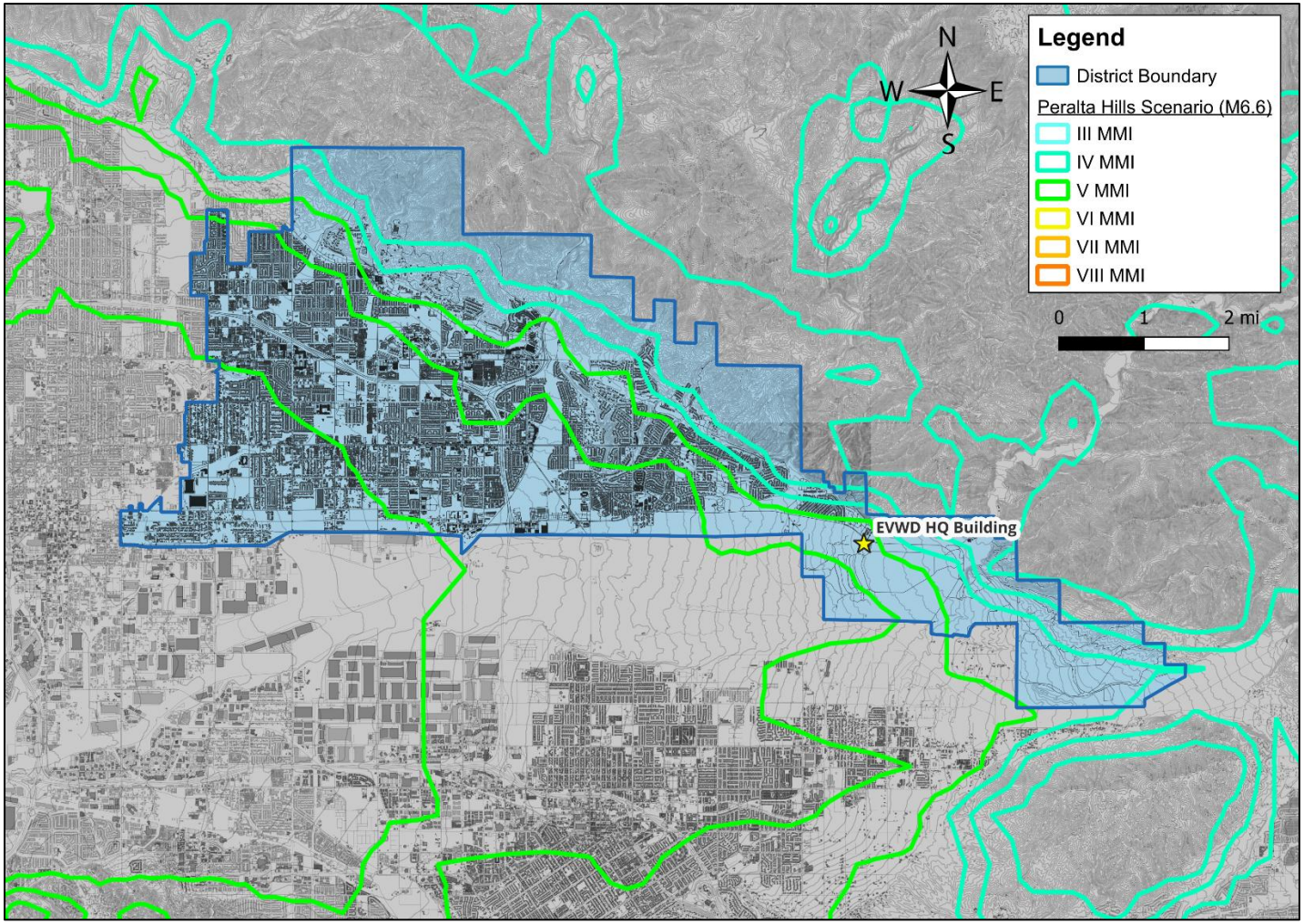


Figure G-1: Contour Map for M6.6 Earthquake Along the Peralta Hills Fault

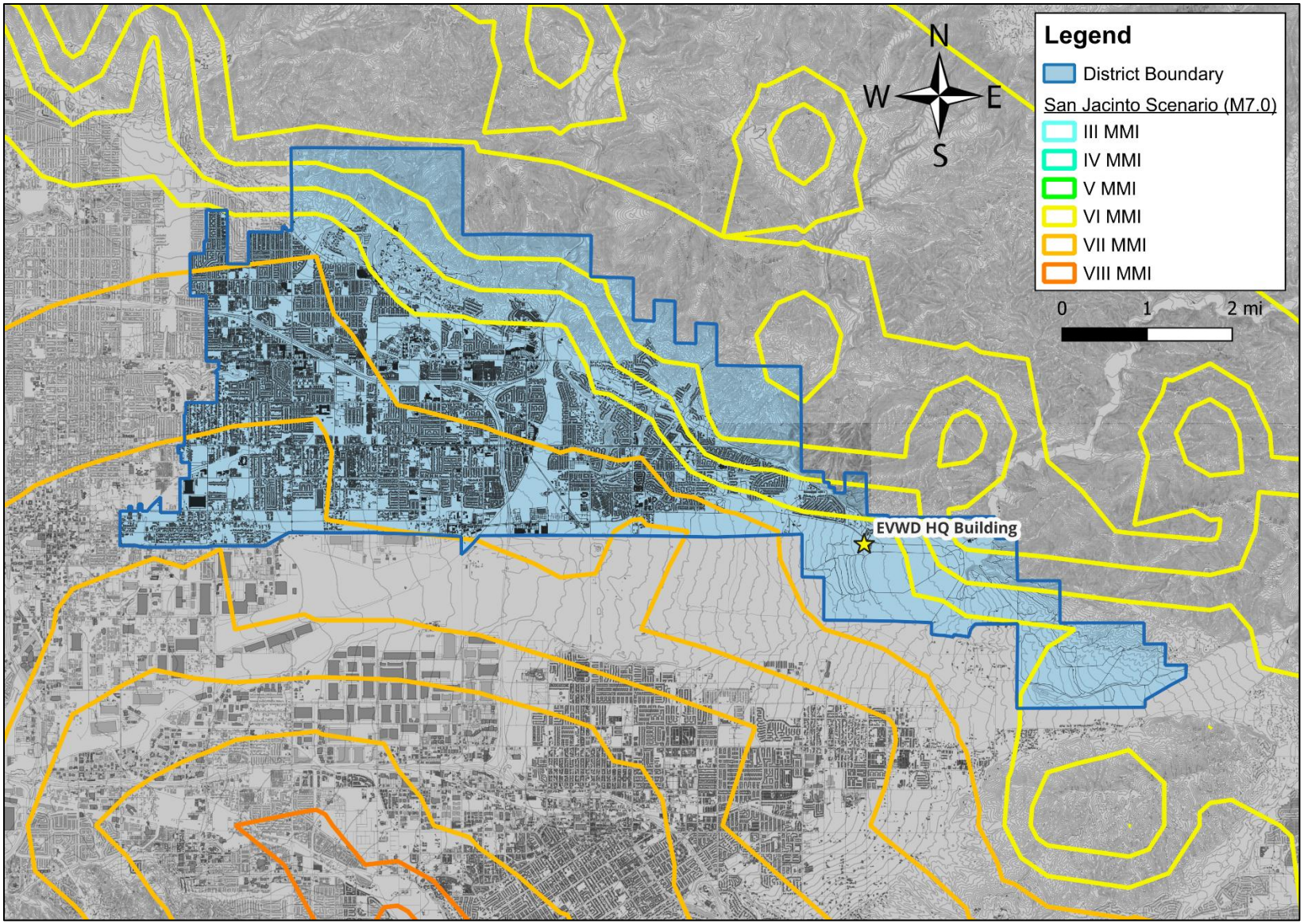


Figure G-2: Contour Map for M7.0 Earthquake Along the San Jacinto Fault

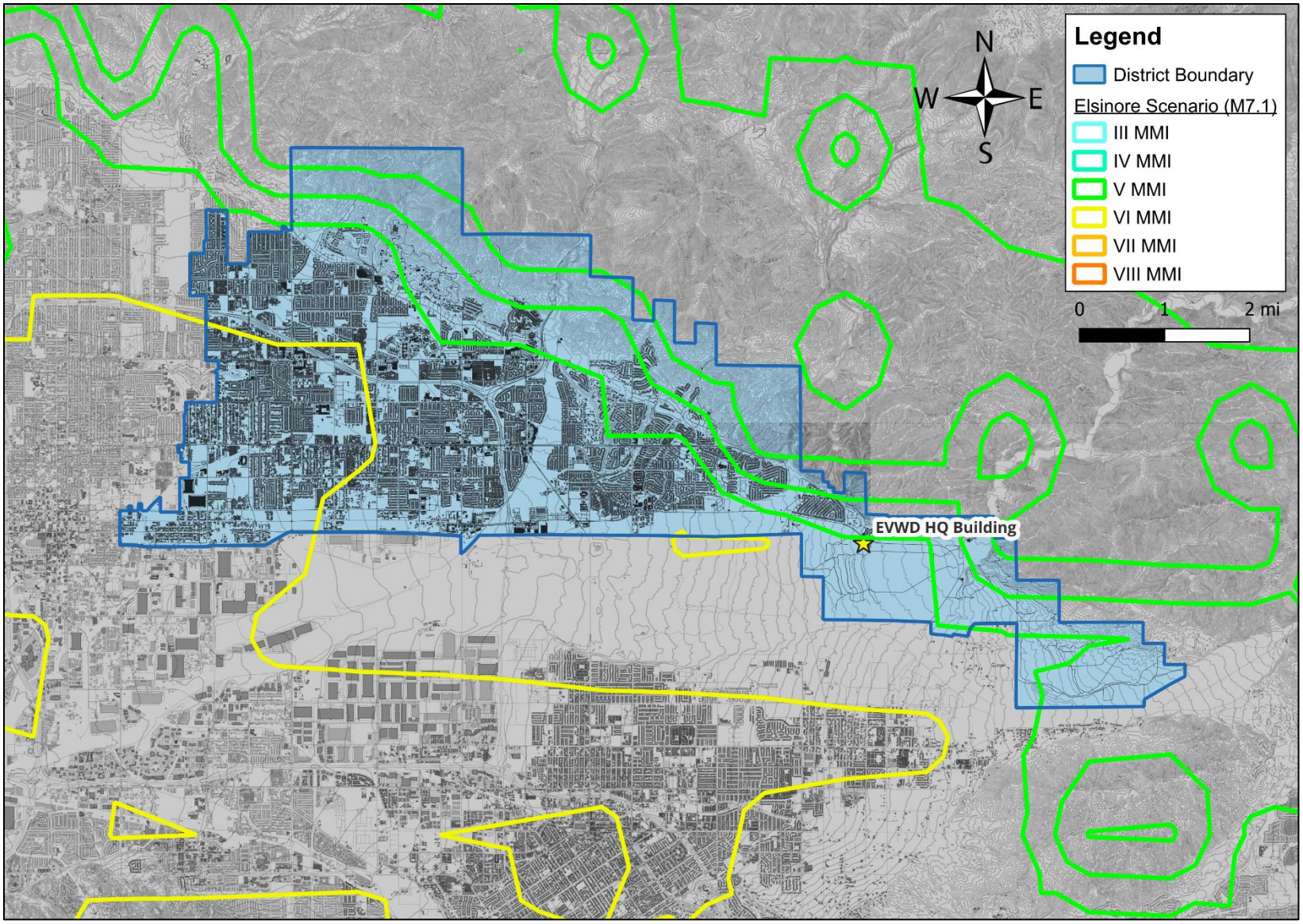


Figure G-3: Contour Map for M7.1 Earthquake Along the Elsinore Fault

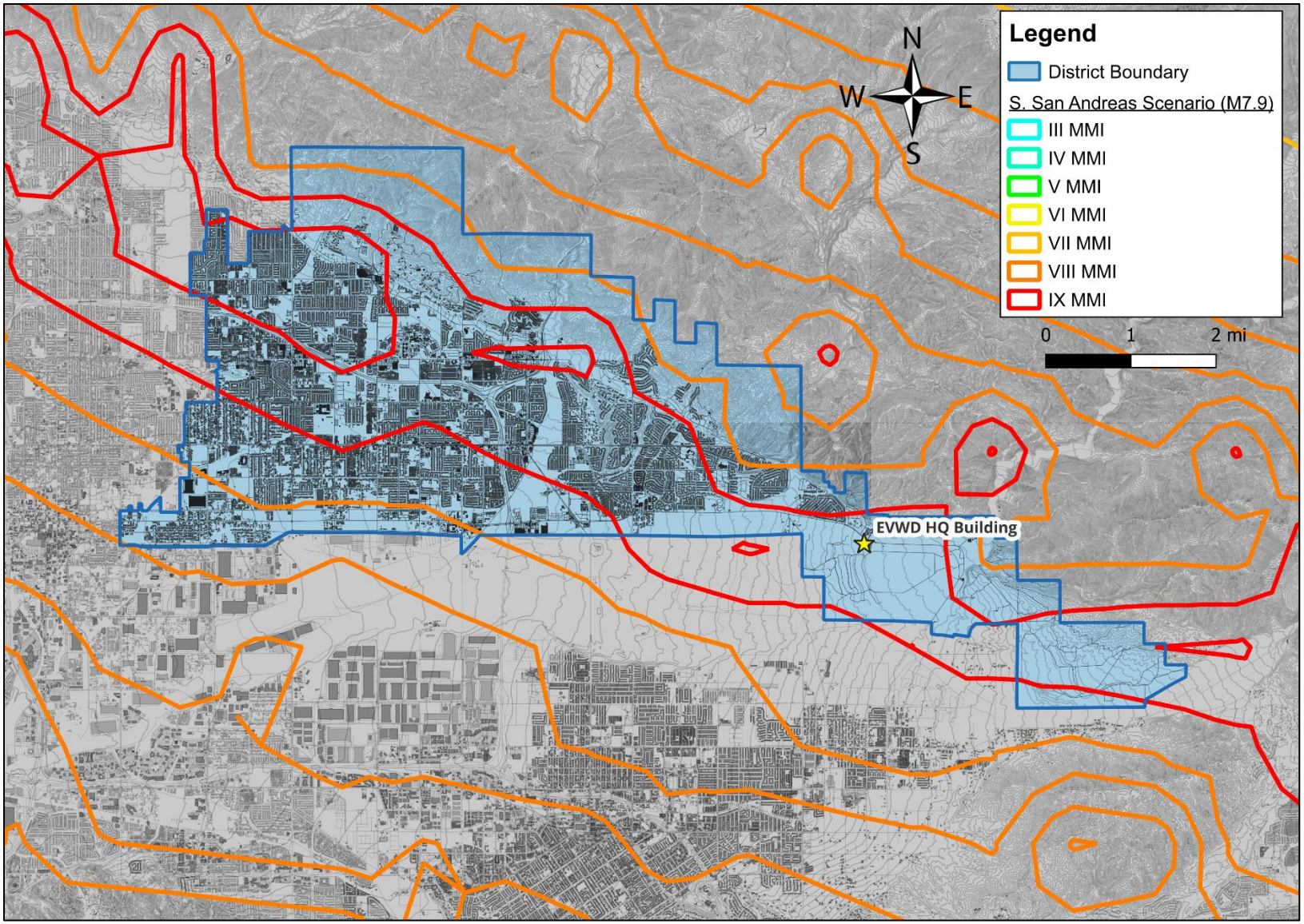


Figure G-4: Contour Map for M7.9 Earthquake Along the South San Andreas Fault

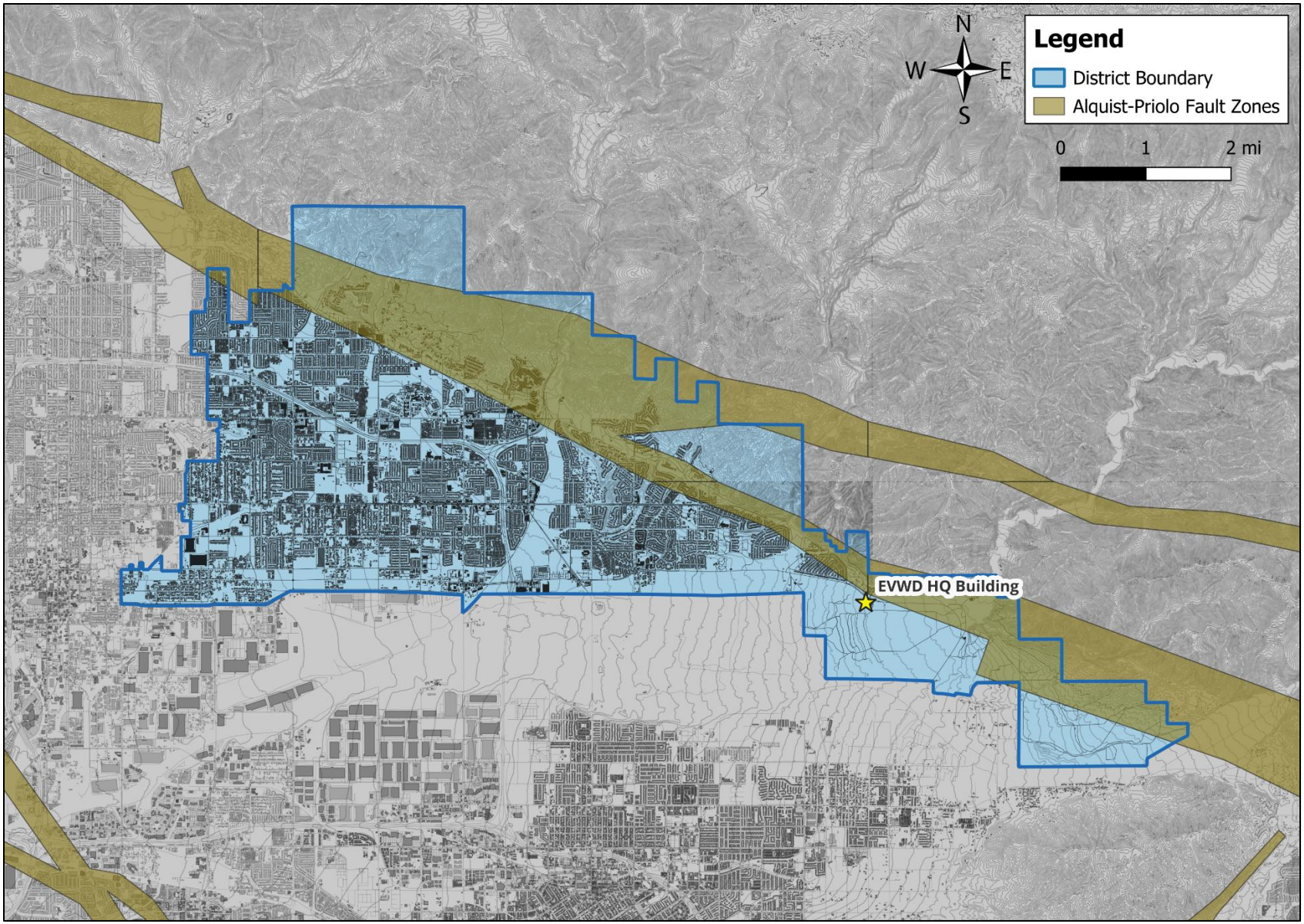


Figure G-5: Alquist-Priolo Fault Zones within the District

APPENDIX H: FLOOD HAZARD EXHIBIT

Figure H-1 below shows the FIRM data for the service area overlaid with service area boundaries, rivers, streams, and lakes.

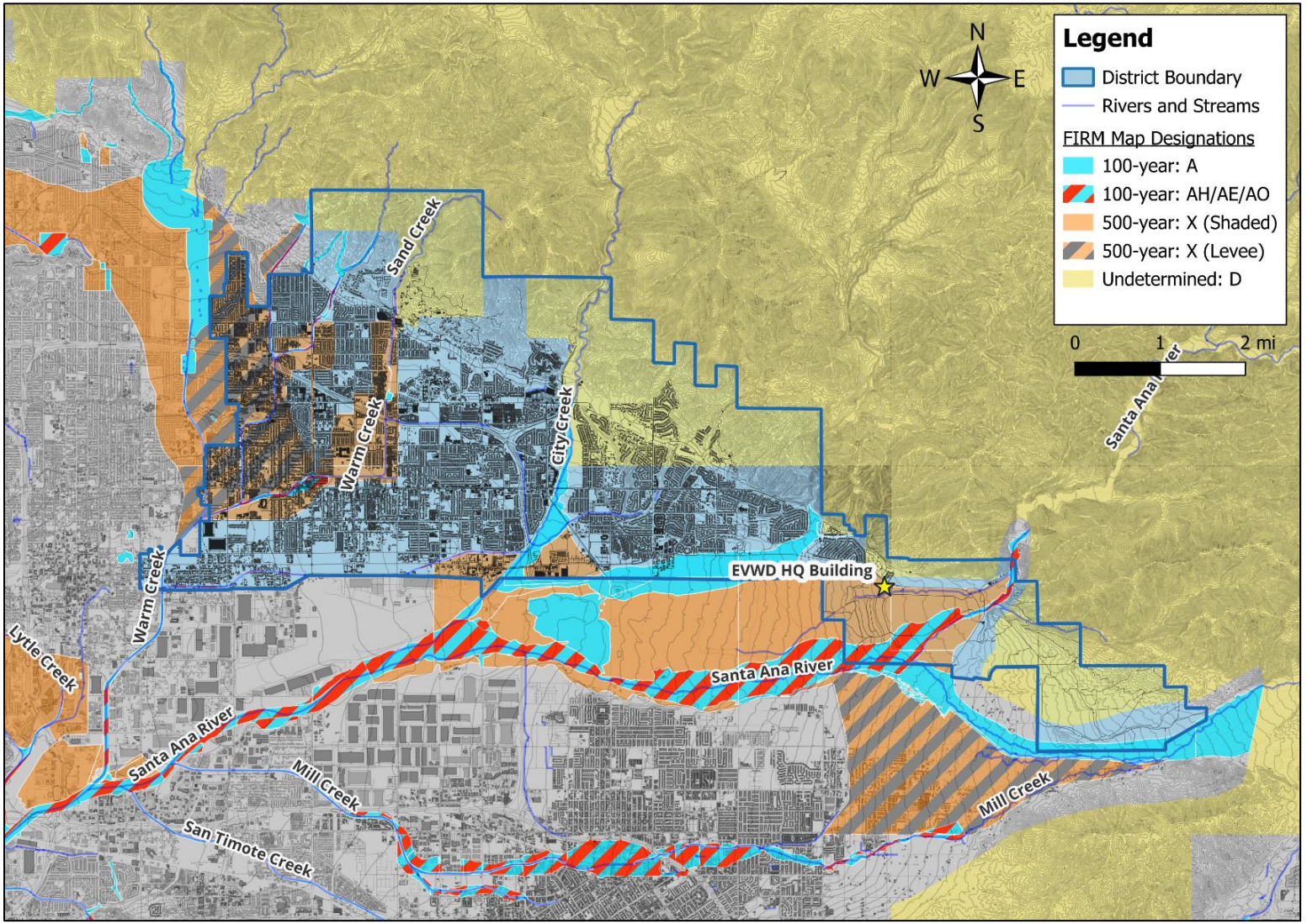


Figure H-1: FEMA FIRM Overlaid with District Boundaries (2008, 2016 FIRMs)

APPENDIX I: LANDSLIDE SUSCEPTIBILITY EXHIBIT

Figure I-1 below shows the USGS raster data for landslide susceptibility overlaid by the District's boundaries.

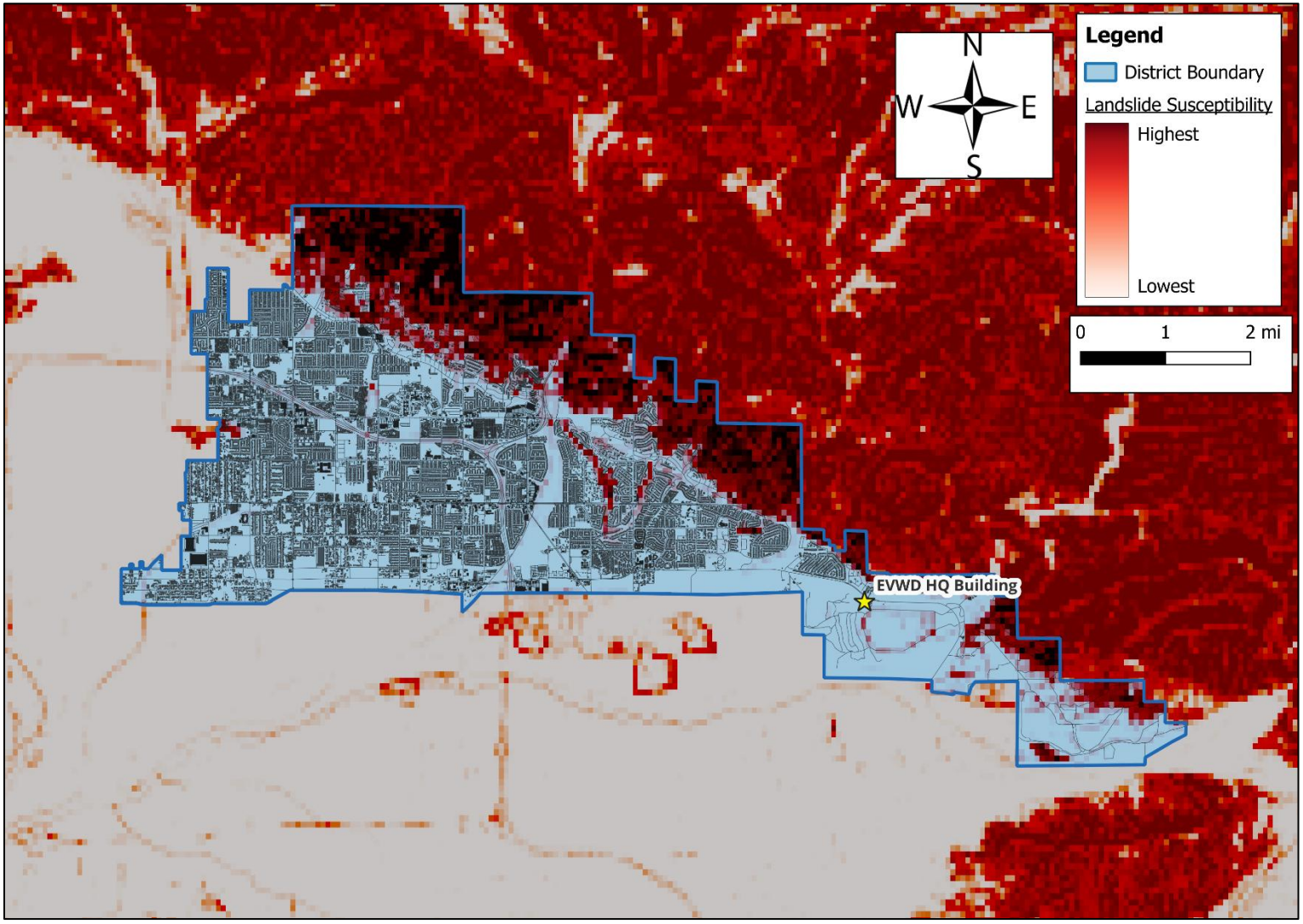


Figure I-1: USGS Landslide Susceptibility Map Overlaid with District Boundaries