2024

Orange County Water and Wastewater
Multi-Jurisdictional Hazard Mitigation Plan

Municipal Water District of Orange County
18700 Ward St, Fountain Valley, CA 92708
Director of Emergency Management Vicki Osborn
Email: weroc@mwdoc.com
Tel: 714.963.3058

WEROC

Contents

Annexes

Exhibits

SECTION 1: INTRODUCTION

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The impact to water and wastewater utilities and the individuals they serve can be immense and damages to their infrastructure can result in regional economic and public health consequences. The water and wastewater utilities are vulnerable to a variety of hazards that can result in damaged equipment, loss of power, disruption to services, contaminated water supply, and revenue losses. By planning for natural and human-caused hazards and implementing projects that mitigate risk, utilities can reduce costly damage and improve the reliability of service following a disaster.

As a best practice Orange County water and wastewater agencies have worked together for decades to improve regional and local reliability and resiliency through joint or collaborative capital improvement projects, planning processes, and emergency management practices. Throughout the county's history the need for, and development of, water and wastewater services has been driven by the principles of economies of scale, and limitations of risk by working together among the wholesale and retail water and wastewater agencies. Below is a brief history of this collaborative process that developed the framework for this multi-agency plan today.

- In 1921 the Orange County Joint Outfall Sewer (JOS) is formed. Santa Ana and Anaheim agree to construct an outfall extending into the Pacific Ocean.
- In 1928 the cities of Anaheim, Fullerton, and Santa Ana realized that groundwater supplies were insufficient to meet the demands of their growing communities, prompting them to join the Metropolitan Water District of Southern California (Metropolitan) in order to get access to water imported from the Colorado River.
- In 1931 local agencies again recognized the importance of economies in scale by forming the Orange County Water District (OCWD). One of the goals of OCWD is to protect Orange County's Santa Ana River water rights from upstream interest.
- Growth in Orange County continued into the 1940s and 1950s when it was realized that the next increment of supplies was needed. That is when portions of what is now Orange County (outside of those original three cities) joined Metropolitan. The Metropolitan was formed for much the same reason, in that it was more economical and less risky to pursue importation of water from the Colorado River and later Northern California as part of a large co-op rather than having each local entity rely on their own planning and development of water supplies.
- The supplemental water supplies of Metropolitan encouraged other Orange County water providers to collaborate, creating the Coastal Municipal Water District (Coastal) in 1941, and Orange County Municipal Water District (OCMWD) in 1951. OCMWD would go on to change its name to Municipal Water District of Orange County (MWDOC).
- Following a 1946 Board of Supervisor's Orange County Sewerage Survey Report, seven individual districts combine into the JOS. While individual cities continue to maintain sewage collection systems, county-wide collections and treatment became a regional operation. And after several reiterations, it became the Orange County Sanitation District (OC San).
- Later, as Orange County continued to develop and expand, these new developments were located further and further from the Metropolitan pipelines bringing water into Orange County. Economically it was again much more efficient, and less risky, for local members to band

together to participate in regional pipelines and jointly use the same water facilities to convey the Metropolitan water from where it was available to where it was needed. Even today, water reliability planning is conducted based on the needs of these original areas, each with its own supply reliability risk profile. The three areas are:

1. The Brea/La Habra service area receives approximately 80% of their supplies from Cal Domestic Water Company groundwater sources in San Gabriel Valley.
2. The OCWD service area receives approximately 75% of their supplies from groundwater sources.
3. The South Orange County service area has few local resources, thereby requiring the import of approximately 95% of their potable water demands.

- In 1983 the Volunteer Emergency Preparedness Organization (VEPO) was formed, creating a mutual aid agreement and communications system for Orange County's 33 water utilities to work together.
- Following the 1994 Northridge Earthquake and subsequent Standardized Emergency Management System in 1996, Orange County water agencies recognized the need to staff the VEPO program as a shared service to support its member agency's disaster readiness.
- VEPO was renamed to the Water Emergency Response Organization of Orange County (WEROC) in 1999 to better reflect its goal and purpose.
- The agency known today as the South Orange County Wastewater Authority (SOCWA) was formed in 2001 when the South East Regional Reclamation Authority (SERRA), Aliso Water Management Agency (AWMA), and South Orange County Reclamation Authority consolidated to meet the wastewater needs of more than 500,000 homes and businesses across South Orange County.
- In 2006, WEROC staff realized the importance of including wastewater agencies in its program, as many of its water utilities also provided wastewater services and because the sectors had similar resources that could support each other. With this change, the program welcomed in wastewater agencies and grew to support 37 agencies in total.
- In 2008, the internationally awarded Ground Water Replenishment System (GWR) was completed. This was a joint project of the OCWD and the OC San enhancing reliability for all of the county.
- In 2019, WEROC supported American Water Infrastructure Act (AWIA) compliance for nearly all agencies within the planning area to ensure timely and accurate completion of Risk Resilience Assessments (RRAs) and Emergency Response Plans (ERPs) in accordance with Environmental Protection Agency (EPA) requirements.
- In 2021, Orange County Local Agency Formation Commission (LAFCO) unanimously approved the annexation of the City of San Juan Capistrano water and wastewater facilities into the Santa Margarita Water District (SMWD), allowing SMWD to manage and operate water and wastewater services to customers within the City of San Juan Capistrano.

As has been demonstrated throughout the history of Orange County, the principles of banding together with neighboring interests to create joint regional infrastructure, connected systems, and

economies of scale has been applied time and time again. Working together to develop a Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) focused on the agencies (cities and special districts) that provide drinking water and wastewater services came from an already standing practice of regional planning and coordination to improve resiliency and response. Additionally, it gave the participating agencies the opportunity to focus on risk as it applies specifically to these joint considerations as well as their jurisdiction's individual services.

In 2005, WEROC started to work with its member agencies (MAs), the California Governor's Office of Emergency Services (Cal OES), and the Federal Emergency Management Agency (FEMA) to fund the first MJHMP through a Hazard Mitigation Planning Grant. In 2007, with the assistance of the Mitigation Grant, MWDOC along with 20 MAs prepared an MJHMP that identified critical water and wastewater facilities in the county and mitigation actions in the form of projects and programs to reduce the impact of natural and human-caused hazards on these facilities. The vision of this original MJHMP took into consideration regional and local infrastructure, how it worked together, and how it could be strengthened, while supporting other planning efforts such as the South Orange County Reliability Study and later the Orange County Reliability Study.

This plan builds on the original 2007 MJHMP and previous updates in 2012 and 2019. MWDOC was joined in this current update by 14 participating water and wastewater utilities (see **Section 1.2.2**), the current MAs, that serve communities in Orange County, California. The plan was prepared with input from county residents, Orange County emergency managers, and with the support of the Cal OES and FEMA. The process to develop the MJHMP update included two planning team meetings and coordination with representatives from MWDOC and each participating MA.

This MJHMP is a guide for MWDOC and the MAs over the next five years toward greater disaster resistance in harmony with the character and needs of the local community and the MAs. The plan focuses on participating water and wastewater facilities in the county and identifies mitigation actions to reduce the impact of natural and human-caused hazards on critical facilities. In addition, each agency will use current, approved planning documents that identify implementation strategies for capital improvement, risk reduction, system upgrades, and operations. These documents complement the MJHMP and include but are not limited to: Urban Water Management Plans, AWIA RRAs, All Hazards Standardized Emergency Management System (SEMS)/ National Incident Management System (NIMS) ERPs, Capital Improvement Plans (CIPs), and Asset Management Plans.

The MJHMP is a working document that will grow and change as our communities and MAs do. This means at times participating agencies may identify a higher priority than noted in this plan, or a redirection of goals based on current information or updated decisions. In consideration of this concept, there may be projects or policies that need to be considered that were not included in this document. These changes will be documented during the MJHMP implementation, and formal updates to the plan will be made every five years as required to maintain a valid plan and FEMA grant eligibility.

1.1 Purpose of the Plan and Authority

Federal legislation has historically provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) is the latest legislation to improve this planning process (Public Law 106-390). This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. As such, DMA 2000 establishes a pre-disaster hazard mitigation program and new requirements for the national post-

disaster Hazard Mitigation Grant Program (HMGP). The Pre-Disaster Mitigation Act of 2010 was signed into law in January of 2011 but does not impact the planning process. The 2010 Act reauthorizes the pre-disaster mitigation program.

Section 322 of DMA 2000 specifically addresses mitigation planning at the State and local levels. It identifies the requirements that allow HMGP funds to be used for planning activities and increases the amount of HMGP funds available to States that have developed a comprehensive, enhanced mitigation plan prior to a disaster. States and communities must have an approved mitigation plan in place prior to receiving pre- or post-disaster funds. Local mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities.

DMA 2000 is intended to facilitate cooperation between State and local authorities, prompting them to work together. It encourages and rewards local and State pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network is intended to enable local and State governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects.

FEMA prepared the Final Rule, published in the Federal Register on September 16, 2009 (Code of Federal Regulations [CFR] at Title 44, Chapter 1, Part 201 [44 CFR Part 201 and 206]), which establishes planning and funding criteria for states and local communities.

According to the updated FEMA Local Hazard Mitigation Policy Guide (FEMA 2022) and 44 CFR § 201.6(a)(4), local governments may work together to create a multi-jurisdictional plan. For multi-jurisdictional plans, one community should be designated as the lead jurisdiction. For this update MWDOC is acting as the lead jurisdiction and is responsible for ensuring each participating jurisdiction meets the requirements laid out in the guidance. MWDOC is also taking on the role of coordinating the plan submission and adoption by all participating jurisdictions (the 15 current MAs).

For Federal approval, the following criteria must be met during the planning process:

- Complete documentation of the planning process.
- Detailed risk assessment of hazard exposures in the community and water and wastewater infrastructure.
- Comprehensive mitigation strategy, describing goals and objectives, proposed strategies, programs, and actions to avoid long-term vulnerabilities.
- A planned maintenance process will describe the method and schedule for monitoring, evaluating, and updating the MJHMP , and the integration of the plan into other planning mechanisms.
- The formal adoption of the governing bodies of each participating jurisdiction.
- Plan review by both Cal OES and FEMA.

As the cost of recovering from natural disasters continues to increase, the MAs realize the importance of identifying effective ways to reduce vulnerability to disasters. HMPs assist communities in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction, while guiding and coordinating mitigation activities.

The Orange County Water and Wastewater MJHMP provides a framework for participating water and wastewater utilities to plan for natural and human-caused hazards in Orange County. The resources and information within the plan will allow participating jurisdictions to identify and prioritize future mitigation projects, meet the requirements of Federal assistance programs and grant applications, and encourage coordination and collaboration in meeting mitigation goals.

This MJHMP is intended to serve many purposes, including:

- **Enhance Public Awareness and Understanding.** To help county residents better understand the natural and human-caused hazards that threaten public health, safety, and welfare; economic vitality; and the operational capability of important facilities.
- **Create a Decision Tool for Management.** To provide information so that water and wastewater managers and leaders of local government may act to address vulnerabilities.
- **Enhance Local Policies for Hazard Mitigation Capability.** To provide the policy basis for mitigation actions that will create a more disaster-resistant future.
- **Integrate the HMP into Other Plans and Programs.** To provide an opportunity for MWDOC and the MAs to assess their current planning efforts associated with water supply management, infrastructure enhancement, and facilities master planning and to promote the integration of hazard mitigation into these activities.
- **Provide Inter-Jurisdictional Coordination of Mitigation-Related Programming.** To ensure that proposals for mitigation initiatives are reviewed and coordinated among MWDOC and MAs.
- **Promote Compliance with State and Federal Program Requirements**. To ensure that MWDOC and the MAs can take full advantage of State and Federal grant programs, policies, and regulations.

To qualify for certain forms of Federal aid for pre- and post-disaster funding, local jurisdictions must comply with the Federal DMA 2000 and its implementing regulations. The MJHMP has been prepared to meet FEMA and Cal OES requirements, thus making MWDOC and the participating MAs eligible for funding and technical assistance for State and Federal hazard mitigation grant programs.

DMA 2000 requires local HMPs, including this plan, to be updated every five years. This means that this MJHMP is designed to carry the MAs through the next five years, after which its assumptions, goals, and objectives will be revisited, updated, and resubmitted for approval.

1.2 Multi-Jurisdictional Participation

1.2.1 Overview of Water and Wastewater Systems in Orange County

Water distribution and wastewater collection and treatment in Orange County involves dozens of agencies and utilities working together, and relies on integrated, regional systems and facilities. There are several retail water and wastewater utilities in Orange County, each with its own distinct service area and sources of potable water. The retail water agencies include water districts and city water departments (not participating in this update).

The Municipal Water District of Orange County (MWDOC) is a wholesale water supplier and resource planning agency that serves all of Orange County (except Anaheim, Fullerton, and Santa Ana) through 28 retail water agencies. MWDOC purchases imported water from the Metropolitan

for distribution to its MAs, which provide retail water services to the public. Local supplies meet more than half of Orange County's total water demand. To meet the remaining demand, MWDOC purchases imported water from northern California (through the State Water Project) and the Colorado River. This water is provided by Metropolitan, which in addition to Orange County, also serves Ventura, Los Angeles, San Bernardino, Riverside, and San Diego counties (MWDOC 2015).

Local water supplies in Orange County vary regionally and include groundwater, recycled wastewater, and surface water. Water supply resources in MWDOC's service area include groundwater basins, which provide a reliable local source and are also used as reservoirs to store water during wet years and draw from storage during dry years. Recycled water and surface water provide an additional local source to some MWDOC retail agencies, with surface water captured mostly from Santiago Creek into Santiago Reservoir (MWDOC 2015).

The OCWD manages and replenishes the Orange County Groundwater Basin, ensures water reliability and quality, prevents seawater intrusion, and protects Orange County's rights to Santa Ana River water. The Orange County Groundwater Basin contains approximately 500,000 acre-feet (AF) of usable storage water and covers 270 square miles. The basin is a reliable source of water and provides approximately 75% of north and central Orange County's water supply, as South Orange County is virtually 100% dependent on imported water.

MWDOC and OCWD work cooperatively and continue to evaluate new and innovative programs, including seawater desalination, wetlands expansion, recharge facility construction, surface storage, new water use efficiency programs, and system interconnections for enhanced reliability.

Wastewater collection and treatment in Orange County is managed by two regional agencies: OC San and the SOCWA, which cover north and central Orange County and South Orange County, respectively. These districts are responsible for the trunk line collection, treatment, biosolids management, and ocean outfalls for treated wastewater disposal. OC San has two primary treatment facilities, and SOCWA has three primary treatment facilities. Their facilities treat wastewater from residential, commercial, and industrial sources. Costa Mesa Sanitary District (CMSD) is a smaller wastewater provider that primarily supports the City of Costa Mesa. With more than 200 miles of sewer mains, CMSD provides service to more than 47,000 connections within their service area.

1.2.1.1 Potable Water Supplies – Current and Future

Potable water demand for Orange County was about 427,700 acre-feet per year (AF/yr) in 2020. In 2020 MWDOC provided service to approximately 2.34 million residents of the Orange County population, and that number is projected to rise to approximately 2.41 million people by 2025 (3% increase). While potable water demand in 2025 is projected to increase to 486,747 (AF/yr). This constitutes an increase of approximately 145 over 2020 demand. However some of this increase may be attributed to removal of some of the water restrictions put in place due to the drought conditions experienced in Orange County.

With planned local water supply projects plus the continued availability of Metropolitan water to replenish the Orange County Groundwater Basin, demand projections show a 12% decrease in demand for imported, full-service Metropolitan water by 2025. If the local projects do not get built, produce less than planned, or are merely delayed, then additional Metropolitan water will be needed.

1.2.2 Participating Jurisdictions

Following is a list of the jurisdictions participating in the MJHMP update; refer to **Exhibit 1-1:**

- Municipal Water District of Orange County (MWDOC)
- Costa Mesa Sanitary District (CMSD)
- El Toro Water District (ETWD)
- Irvine Ranch Water District (IRWD)
- Laguna Beach County Water District (LBCWD)
- Mesa Water District
- Moulton Niguel Water District (MNWD)
- Orange County Sanitation District (OC San)
- Orange County Water District (OCWD)
- Santa Margarita Water District (SMWD)
- Serrano Water District
- South Coast Water District (SCWD)
- South Orange County Wastewater Authority (SOCWA)
- Trabuco Canyon Water District (TCWD)
- Yorba Linda Water District (YLWD)

It should also be noted that the cities participating in the previous version of the MJHMP (Buena Park, Garden Grove, La Habra, Newport Beach, Orange, and Westminster) are not participating in the latest update to the plan. However, both IRWD and CMSD are participating as MAs for the 2024 MJHMP update. The inclusion of IRWD involves the integration of their recently completed Local Hazard Mitigation Plan (LHMP) from 2021 into this document as an annex. In the case of CMSD, their annex is the first HMP that they have completed in conformance with DMA 2000.

Retailers can be grouped into the following regions based on the availability of local groundwater resources:

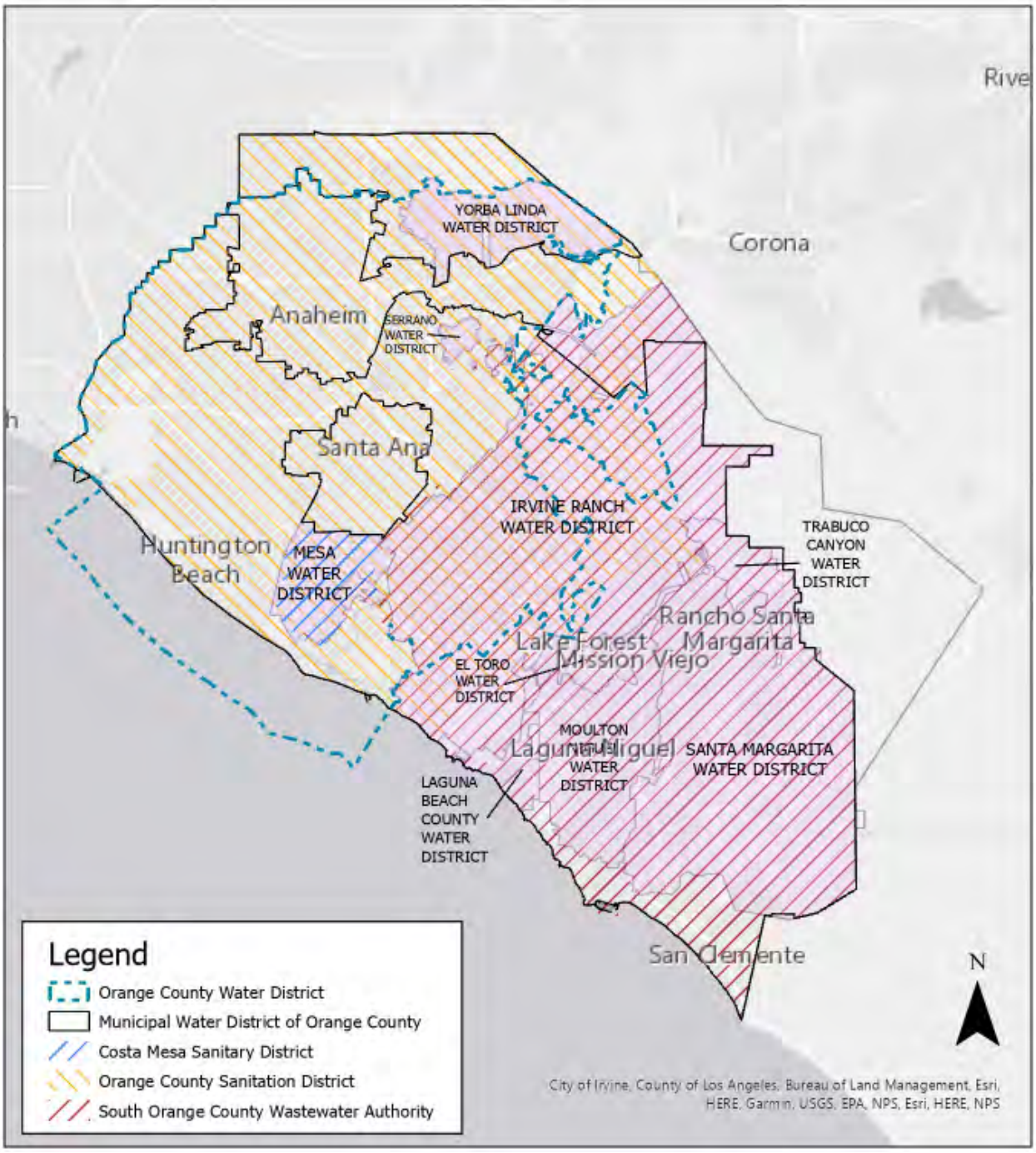
The Orange County Groundwater Basin provides approximately 75% of Orange County's north and central water supply. The rest of their supply is primarily imported water provided by Metropolitan; although Serrano Water District is partly served by local runoff captured in Irvine Lake. Participating MAs within the Orange County Groundwater Basin include the Mesa, Serrano, Yorba Linda, and Irvine Ranch Water Districts.

- South Orange County is almost 100% dependent on Metropolitan for its potable water supply. Parts of this area are within the San Juan Capistrano Groundwater Basin, which is managed by the San Juan Basin Authority. Local groundwater in the area is high in salts and accounts for less of the water supply than utilities in the Orange County Groundwater Basin. MAs include El Toro, Laguna Beach County, Moulton Niguel, Santa Margarita, South Coast, and Trabuco Canyon water districts.

Although located within Orange County, the participating MAs do not comprise or serve the entire county. In addition, the service areas for each of the MAs participating in the MJHMP do not necessarily align with incorporated or unincorporated boundaries or city boundaries. In many cases an MA may serve multiple cities and/or portions of cities/unincorporated areas. Profiles for each of the participating water and wastewater utilities are provided in the Jurisdictional Annexes. The MJHMP must be formally adopted by each jurisdiction's governing body, which may be the Board of Directors for each agency and district.

The resources and background information in the MJHMP are applicable county-wide, providing the groundwork for goals and recommendations for other local mitigation plans and partnerships. In the identification of shared action items, the plan fosters the development of partnerships and implementation of preventative activities. A unified MJHMP will ensure that any proposals for mitigation initiatives are reviewed and coordinated among the participating agencies and utilities.

Exhibit 1-1. Member Agency Plan Participants



1.3 What Is New/What Has Changed from the 2019 MJHMP

Several sections of the 2024 MJHMP have been modified from the previous plan. Changes made to specific sections of the plan are summarized below:

- **Section One:** This section text has been modified to clarify the multi-jurisdictional involvement and changes to MAs, update outdated or irrelevant information, and to streamline the section.
- **Section Two:** This section includes an updated description of the planning process conducted for this plan update. This section has been completely revised and updated to discuss the process for the MJHMP update, including the Hazard Mitigation Planning Team (Planning Team), meetings, public outreach, and overall process for this update.
- **Section Three:** This section comprises the risk assessment. The hazards have been confirmed with minor updates to better reflect hazards that affect the planning area, as determined by the Planning Team. This includes the addition of extreme heat, and cyber threats, as well as a reorganization of hazards under primary headings for easier reading. In addition, climate change was incorporated into all-hazard profiles instead of a stand-alone profile to better connect how climate change may exacerbate future hazards. Each of the hazard profiles were updated to reflect hazard occurrences (if any) since the 2019 MJHMP was prepared. During this MJHMP update, additional infrastructure analysis was completed for MAs that had built new assets or added assets from other agencies (annexation of one district into another) These new facilities were overlaid on top of the hazard layers to verify potential vulnerability.
- **Section Four.** This section documents the mitigation strategy, which includes overarching hazard mitigation goals for the planning area. It was determined through the Planning Team meetings that the existing mitigation goals are still relevant for all participating MAs, and therefore this set of goals was maintained with minor edits. Some participating MAs identified additional goals specific to their agencies, which have been included in the respective annex. Updated mitigation actions and capabilities assessments specific to each MA are included in their respective annexes. An overview of hazard mitigation is provided, including the methodology for identifying and prioritizing mitigation actions.
- **Section Five.** This section documents the MJHMP maintenance process and includes a reference to a Monitoring and Implementation Workbook developed as part of the update.
- **Section Six:** This section documents the MJHMP references and has been updated to reflect new references used in this 2024 MJHMP.
- **Jurisdictional Annexes:** The annexes have been updated to include new information, updated asset inventories and risk assessment, and updated mitigation strategies.

Appendices: The appendices have been completely updated to include 2024 MJHMP update materials.

1.4 Plan Organization

The Orange County Regional Water and Wastewater MJHMP is organized into the following sections:

- **Section One: Introduction.** Provides an overview of the plan, a discussion of the plan's purpose and authority, a description of the multi-jurisdictional participation, a summary of how this update differs from previous versions of the plan and describes the plan's organization.
- **Section Two: Planning Process Documentation.** Describes the MJHMP planning process, as well as the meetings and outreach activities undertaken to engage the MAs and the public.
- **Section Three: Risk Assessment.** Identifies and profiles the hazards that threaten the area served by the MAs and identifies the vulnerability and risk to critical water and wastewater infrastructure associated with each hazard. Due to the vast planning area associated with the MAs participating in the plan, this section addresses the entire geographic area served by the MAs. The Jurisdictional Annexes detail the hazards, risk assessments, and mitigation strategies specific to each MA.
- **Section Four: Mitigation Strategy.** Includes multi-jurisdictional goals for the 2024 update and summarizes the mitigation action plan process. Mitigation actions and capabilities specific to each MA are detailed in the Jurisdictional Annexes.
- **Section Five: Plan Maintenance.** Discusses how the 2024 MJHMP will be monitored, evaluated, and updated over the next five years.
- **Section Six: References.** Identifies the resources used in preparation of the 2024 update.
- **Appendices.** Provides the 2024 update materials.
- **Jurisdiction Annexes.** Provides a profile of the jurisdiction, describe the hazards of concern, assesses the vulnerabilities to the MA, describes the existing capabilities and proposed mitigation strategies specific to each MA.

Sections one through six plus the appendices comprise the primary MJHMP. It describes the MJHMP planning process and hazard mitigation planning requirements for each MA. The information in this primary MJHMP is applicable to all the MAs. The Jurisdictional Annexes provide hazard mitigation planning information specific to each MA and supplements the information contained in the primary document.

SECTION 2: PLANNING PROCESS DOCUMENTATION

This section describes each stage of the planning process used to update this 2024 MJHMP. The planning process provides a framework to document the plan's update and follows the FEMA-recommended steps. This update follows a prescribed series of planning steps, which includes organizing resources, assessing risk, updating the mitigation actions, updating the plan, reviewing and revising the plan, and adopting and submitting the plan for approval. Each step is described in this section.

Hazard mitigation planning in the United States is guided by the statutory regulations described in the DMA 2000 and implemented through 44 CFR Parts 201 and 206. FEMA's hazard mitigation plan guidelines outline a four-step planning process for the development and approval of HMPs. **Exhibit 2-1, DMA 2000 CFR Crosswalk**, lists the specific CFR excerpts that identify the requirements for approval.

Exhibit 2-1. DMA 2000 CFR Crosswalk

DMA 2000 (44 CFR 201.6)	2024 MJHMP Update Section
(1) Organize Resources	Section 2 (this section)
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	Section 3
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	Section 4
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	Section 5
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

As documented in the corresponding sections, the planning process for the 2024 MJHMP was consistent with the requirements for hazard mitigation planning with customizations, as appropriate. All basic Federal guidance documents and regulations were met through the customized process.

2.1 Organizing Resources

One of the first steps in the planning process involved organization of resources, including identifying the Project Management Team, convening the Planning Team, and performing document review.

2.1.1 Project Management Team

The Project Management Team was responsible for the day-to-day coordination of the update work program, including forming and assembling the Planning Team; scheduling Planning Team meetings; preparing, reviewing, and disseminating Planning Team meeting materials; coordinating, scheduling, and participating in community engagement activities and meetings; and coordinating document review. The Project Management Team was led by an emergency coordinator from the Water Emergency Response Organization of Orange County (WEROC), administered by the

MWDOC, who served as project manager and participated on the Planning Team. The project manager monitored planning progress and met with participating jurisdictions as needed to assist with obtaining and updating information for the plan.

The Project Management Team worked directly with the Consultant Project Management Team throughout development of the plan update. The Consultant Team, consisting of a variety of hazard mitigation/planning professionals, provided guidance and support to MWDOC and the Planning Team through facilitation of the planning process, data collection, community engagement, and meeting material and document development.

2.1.2 Planning Team

The planning process for the MJHMP involved 12 water districts, two regional wastewater agencies, and one sanitary district; a total of 15 special districts participated in the planning process. Representatives from participating MAs provided input into the MJHMP update process. Each MA provided at least one representative to participate on the Planning Team and attend meetings. Each MA local team, made up of staff/officials, met separately and provided additional local-level input to the Consultant Team for inclusion into the MJHMP. The MA participated in the planning process by exchanging information, providing feedback on prior plan progress, discussing planning strategies, sharing goals, resolving issues, and monitoring progress. The MA benefited from working closely together because many of the hazards identified are shared by neighboring jurisdictions and participants were involved in the discussion of potential mitigation actions. Jurisdictional representatives included but were not limited to utility engineers, planners, public information officers (PIOs), and emergency management staff.

The Planning Team worked together to ensure the success of the planning process and is responsible for its implementation and future maintenance. The Planning Team's key responsibilities included:

- Participation in Planning Team meetings.
- Coordination of jurisdiction-specific meetings to relay information and obtain input.
- Collection of valuable local information and other requested data.
- Decision on plan process and content.
- Development and prioritization of mitigation actions for the plan.
- Review and comment on plan drafts.
- Coordination and involvement in the public engagement process.

Exhibit 2-2, **Members of the Planning Team,** identifies the Planning Team members.

Exhibit 2-2. Members of the Planning Team

Name	Title/Position	Organization
Vicki Osborn	Director of Emergency Management	WEROC/MWDOC
Gabby Landeros	WEROC Specialist	WEROC/MWDOC
Janine Schunk	WEROC Coordinator	WEROC/MWDOC
Charles Busslinger	Principal Engineer	MWDOC
Harvey De La Torre	General Manager	MWDOC
Melissa Baum-Haley	Assistant Emergency Manager	MWDOC
Noelani Middenway	PIO	CMSD
Gina Terraneo	Senior Management Analyst	CMSD
Scott Carroll	General Manager	CMSD

Name	Title/Position	Organization
Mark Esquer	District Engineer	CMSD
Sherri Seitz	Public Relations/ Emergency Preparedness Administrator	El Toro Water District
Hannah Ford	Hannah Ford	El Toro Water District
Dennis Cafferty	General Manager/ District Engineer	El Toro Water District
Eric Akiyoshi	Engineering Manager	IRWD
Steve Choi	Director of Safety & Security	IRWD
Bryan Clinton	Operations Manager	IRWD
Robert Meripol	Safety & Security Supervisor	IRWD
Mitch Robinson	Senior Engineer	IRWD
Leo Lopez	Safety Officer	LBCWD
Christopher Regan	Assistant General Manager	LBCWD
Kaying Lee	Water Quality and Compliance Supervisor	Mesa Water District
Andrew Wiesner	District Engineer	Mesa Water District
Bob Mitchell	Water Operations Supervisor	Mesa Water District
Carrie Fesili	Water Operations Coordinator	Mesa Water District
Karyn Igar	Senior Civil Engineer	Mesa Water District
Tyler Jernigan	Water Operations Manager	Mesa Water District
Adrian Tasso	Assistant Director of Operations	MNWD
Cristina Garcia	Administrative Analyst	MNWD
Dan Horn	Water Distribution Supervisor	MNWD
David Larsen	Assistant Director of Engineering	MNWD
Kelsey Coleman	Communications Manager	MNWD
Len Barton	Safety and Emergency Manager	MNWD
Matthew Brown	Information Systems Officer	MNWD
Matthew Collings	Assistant General Manager	MNWD
Ronin Goodall	Assistant Director of Operations	MNWD
Rodney Woods	Director of Engineering	MNWD
Todd Dmytryshyn	Assistant Director of Engineering	MNWD
William Kidd	Information Systems Administrator	MNWD
Dan West	Superintendent of Operations	MNWD
John Frattali	Safety and Health Supervisor	OC San
Krystal Aleman	Security/ Emergency Planning Specialist	OC San
Paula Bouyounes	Risk and Safety Manager	OCWD
Chris Lopez	Safety Officer	SMWD
Daniel Peterson	Regulatory and Logistics Manager	SMWD
Eric Smith	Utilities Manager	SMWD
Jerry Vilander	General Manager	Serrano Water District
Blaise Bautsch	Safety and Health Program Manager	SCWD
Chris Newton	Operations Superintendent	SCWD
Kyle Gough	Transmission Main Manager	SCWD
Steve Dishon	Water Resources Manager	SCWD
Sunny Lee	Compliance and Risk Program Manager	SCWD
Sean Peacher	Environmental Compliance Safety Risk Manager	SOCWA
Ernie Leal	Chief Plant Operator	SOCWA
Jim Burror	Director of Operations	SOCWA
Amber Boone	Acting General Manager	SOCWA
Michael Perea	Assistant General Manager	TCWD
Lorrie Lausten	District Engineer	TCWD

Name	Title/Position	Organization
David Rodriguez	Engineering Support	TCWD
Alex Ramirez	Safety Officer	YLWD

Exhibit 2-3, Planning Team Roles, identifies each member's roles in the plan update.

Exhibit 2-3. Planning Team Roles

Member	Planning Team Role
Vicki Osborn, WEROC/MWDOC	Project Manager/Planning Team Representative – Organization of Planning Team and meetings, development of and participation in community outreach, hazard identification, capabilities assessment, goal development, mitigation actions and prioritization, plan coordination, and review.
Gabby Landeros, WEROC/MWDOC	Project Management Team – Historical knowledge and insight into 2012 plan, overall guidance on 2018 plan, hazard identification, capabilities assessment, goal development, mitigation actions and prioritization, plan review.
All Planning Team Members	Hazard identification, capabilities assessment, goal development, mitigation actions and prioritization, plan review.

It should be noted that through the Orange County Emergency Management Organization (OCEMO), the County of Orange, and all cities within the county were provided the opportunity to participate in the MJHMP development process, including dissemination of the draft plan to OCEMO's distribution list for review and comment. This included all Orange County's cities, colleges, school districts, special districts, water districts, State and county agencies, the hospital association, affiliates, and other approved agencies. Refer to **Appendix A** for outreach content and information.

MWDOC also provided an opportunity for State and county agencies and emergency services providers to be part of the Planning Team and provide comments. This occurred at the Orange County Emergency Management Organization, Orange County Operational Area Executive Board and WEROC Quarterly Meetings which included:

- State Water Resources Control Board, Division of Drinking Water
- Orange County Health Care Agency
- Orange County Fire Authority
- Orange County Sheriff's Department
- Orange County Public Works
- County of Orange, County Executive Office
- Orange County Department of Education
- Orange County Transportation Authority

Businesses, academia, and other private and non-profit interests were provided notification of the Draft MJHMP's availability via the MA email distribution, notification lists, and social media. Distribution documentation is provided in **Appendix A**.

The Planning Team held three meetings. The meetings were designed to aid the MA in completing a thorough review of the hazards within their jurisdictions, identifying capabilities, understanding and assessing vulnerabilities, and identifying mitigation strategies. **Exhibit 2-4, Planning Team Meeting Summary,** provides a summary of the meetings. Meeting agendas and pertinent materials are provided in **Appendix A.**

Exhibit 2-4. Planning Team Meeting Summary

Date	Meeting	Discussion
June 17, 2024	Planning Team Meeting #1	Introductions Project goals and objectives Roles and responsibilities Data/information needs Plan update and requirements Preliminary discussion of community engagement strategy Hazard identification and prioritization Meeting schedule
July 16, 2024, through July 30, 2024	Planning Team Meetings #2	Review of Compiled Data Tool that discusses hazards of concern, hazard priorities, additional critical facilities, capabilities assessment updates, and mitigation actions status.
October 16, 2024, through November 8, 2024	Planning Team Meetings #3	Review of the Administrative Draft HMP documents (the base plan and annexes) with MAs requesting assistance.
Date TBD	Planning Team Meetings #4	Meeting with specific MA to address comments from FEMA, as necessary.

In addition to the regularly scheduled meetings, Planning Team members coordinated individually with the plan update project manager, as necessary, to resolve any questions or discuss information requested at the Planning Team meetings. This was typically accomplished via telephone or email. Any MA that missed a scheduled planning meeting coordinated with the project manager separately to review what was discussed in the meeting and to obtain jurisdiction-specific information.

2.1.3 Public Outreach

A public outreach and engagement strategy was developed to inform the public and maximize public involvement in the plan-update process. The public outreach strategy included posting information on the MA websites, email and social media distribution, a community survey, and presentations at individual Board meetings and OCEMO meetings, as described below. Refer to **Appendix A.**

Member Agency Websites

Information regarding the MJHMP update was made available on each MA website. The webpages provided information on the plan, the plan update process, and how the public can be involved in the planning process, including a link to the community survey (discussed below). A link to the Draft MJHMP was also made available for review and comment.

Social Media

Social media notifications regarding the MJHMP's update, including a link to the community survey were sent to MA social media accounts.

Community Survey

A community survey was developed to obtain input from the community about various hazard mitigation topics. The survey was designed to help the MA gauge the level of knowledge the community has about natural disaster issues and to obtain input about areas of Orange County

that may be vulnerable to various types of natural disasters. The information provided was used to identify and coordinate projects focused on reducing the risk of injury or damage to property from future hazard events. A link to the survey was provided on each of the MAs' websites, as well as information shared via social media and through newsletters and other communications.

Based on the distribution across all 15 MAs' social media platforms over XXX,XXX impressions were obtained via social media outreach and 51 surveys were completed. Results from survey participants are provided in **Appendix A.**

Stakeholder Outreach

Water Board Meeting Presentations – Various Dates (Exhibit 2-5)

Between July 30, 2024, and November 25, 2024, the MWDOC Project Management Team attended Board of Directors meetings to discuss the MJHMP update and provide additional information to decision makers regarding the update process and what to expect when the plan is ready for final approval. The following are a list of in-person meetings attended where this information was shared:

Exhibit 2-5. MA Meetings

Date	Agency	Meeting Type
8/15/2024	South Orange County Wastewater Authority	Engineering
8/26/2024	Orange County Grand Jury	Briefing
8/26/2024	Costa Mesa Sanitary District	Board
9/5/2024	South Orange County Wastewater Authority	Board
9/19/2024	Municipal Water District of Orange County Managers	General Meeting
9/23/2024	Serrano Water District	Board
10/3/2024	Orange County Emergency Managers Organization	General Meeting
10/24/2024	South Coast Water District	Board
11/13/2024	Operational Area Executive Board	
11/13/2024	Citizen Advisory Committee Meeting	Citizen Advisory Committee
11/18/2024	WEROC Quarterly Meeting	Meeting open to WEROC member agencies and any other members of Orange County planning partners

A copy of the presentation provided at these meetings is included in **Appendix A.**

Orange County Emergency Management Organization – October 3, 2024

The plan update project manager presented to the OCEMO during their monthly meeting. OCEMO is a subcommittee comprised of the County of Orange and all subdivisions that ensure the cooperative maintenance of the Operational Area Emergency Operations Plan, policies and procedures, training, and exercises. The presentation included information about hazard mitigation, the planning process, hazards affecting Orange County water and wastewater infrastructure, and the importance of OCEMO's involvement in the development process. As noted previously, the Draft MJHMP was disseminated to OCEMO's distribution list for review and comment. Refer to **Appendix A** for outreach materials and information shared during the planning process**.**

Public Review Draft Hazard Mitigation Plan

The public review Draft MJHMP was made available for review and comment for a 15-day period beginning November 8, 2024, and concluding on November 23, 2024. The draft plan was made available on the MAs' webpages and at the MAs' offices and/or front counters. An online form was created allowing reviewers to easily submit comments and feedback to the Project Management Team.

2.1.4 Review and Incorporate Existing Information

The Planning Team and each MA local team reviewed and assessed existing plans and studies available from Federal, State, and local sources during the planning process. The types of documents reviewed and incorporated as part of the MJHMP update are listed in **Exhibit 2-6, Existing Plans and Studies.** Due to the number of MAs involved in the plan update, similar plans and studies specific to each district were reviewed and incorporated in the 2024 MJHMP. A complete list of references is included in **Section 6, References.**

Exhibit 26. Existing Plans and Studies

Existing Plans and Studies	Relevant Topic
Orange County Water & Wastewater Multi-Jurisdictional HMP	Hazard Profiles; Capabilities Assessment; Mitigation Strategy
State of California Multi-Jurisdictional HMP (2023)	Hazard Profiles
Agency Urban Water Management Plans	Hazard Profiles; Capabilities Assessment
FEMA Hazard Mitigation How-to Guides	Plan Development; Plan Components
FEMA Local Mitigation Planning Handbook (May 2023)	Plan Development; Local Plan Integration Methods
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (September 2021)	Mitigation Strategy Development
Orange County Water and Wastewater GIS Layers with Critical Infrastructure Facilities	Hazard Profiles; Risk/Vulnerability Assessments; Mitigation Strategy
Seismic Hazard Assessment, Orange County Seismic Vulnerability, Mitigation and Recovery Planning Study (August 28, 2015)	Hazard Profiles; Risk/Vulnerability Assessments; Mitigation Strategy
Agency-Specific Reliability Studies	Hazard Profiles; Risk/Vulnerability Assessments; Mitigation Strategy
Agency-Specific Risk and Resilience Assessments	Hazard Profiles, Risk/Vulnerability Assessments, Mitigation Strategy

2.2 Assess Risks

In accordance with FEMA requirements, the Planning Team identified and prioritized the hazards affecting Orange County and assessed the associated vulnerability from those hazards. Results from this phase of the planning process aided subsequent identification of appropriate mitigation actions to reduce risk from these hazards (refer to **Section 3**).

2.2.1 Identify/Profile Hazards

The Planning Team reviewed the hazards profiled in the 2019 MJHMP as well as a list of FEMA-identified hazards to determine which hazards had the potential to impact Orange County and thus should be profiled as part of the plan update. This 2024 MJHMP continues to include natural and human-caused hazards that may threaten all or a portion of the county and individual MAs. It was noted that some location-specific hazards would not be applicable to every MA, but still warranted

identification. Through discussions of the hazards, including the probability, location, maximum probable extent, and potential secondary impacts, a list of hazards was developed and prioritized. Content for each hazard profile is provided in **Section 3.** A key update to these hazard profiles is the integration of climate change into each hazard discussion. This approach was agreed upon by the Planning Team to ensure climate change was adequately addressed in relation to the hazards profiled.

2.2.2 Assess Vulnerabilities

Hazard profiling exposes the unique characteristics of individual hazards and begins the process of determining which areas within Orange County are vulnerable to specific hazard events. The vulnerability assessment included input from the Planning Team and a refinement of the GIS overlaying method previously used for hazard risk assessments in the 2019 MJHMP. Using these methodologies, water and wastewater infrastructure impacted by the profiled hazards was identified and potential loss estimates were updated. Detailed information on the vulnerability assessments for each hazard is provided in **Section 3.**

2.3 Develop Mitigation Plans

The 2024 MJHMP was prepared in accordance with DMA 2000 and FEMA's latest HMP guidance documents. This plan provides an explicit strategy and blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and the MAs ability to expand on and improve existing tools. Developing the mitigation plan involved identifying goals, assessing existing capabilities, and identifying mitigation actions. This step of the planning process is detailed in **Section 4** and summarized below.

2.3.1 Identify Goals

The Planning Team reviewed the goals identified in the 2019 MJHMP and determined that the existing goals in the plan were still relevant and meaningful to MWDOC and its MAs. Only minor modifications were included in the 2024 MJHMP goals, which focused on refinement of language. The Mitigation Goals are presented in **Section 4.2**. For some MAs, it was determined that additional goals specific to their agency were still warranted and are included in the Jurisdiction Annexes, where applicable.

2.3.2 Develop Capabilities Assessment

A capabilities assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to the MA to implement the mitigation actions that are prescribed in the MJHMP. The Planning Team reviewed planning, regulatory, administrative, technical, financial, educational, and outreach capabilities to implement mitigation actions. Each MA reviewed capabilities information from the 2019 MJHMP and worked with their local teams to identify and updated the capabilities assessment specific to their agency. This review also identified potential improvements to better support future mitigation. The capabilities assessments for each MA are included in the Jurisdiction Annexes.

2.3.3 Identify Mitigation Actions

As part of the planning process, the Planning Team worked to identify and develop mitigation actions to address the profiled hazards. The mitigation actions in the 2019 MJHMP were reviewed to determine whether they had been achieved, were still relevant, or were no longer relevant due to

changing circumstances. Each MA considered the hazards applicable to their agency and identified and prioritized mitigation actions. The mitigation actions for each MA are included in the Jurisdiction Annexes.

2.3.4 Plan Review and Revisions

Once the Draft MJHMP was completed, a public review period was provided from November XX, 2024, through November XX, 2024, to allow public review and comments. Comments received on the draft plan were reviewed and the plan was revised, as appropriate.

2.3.5 Plan Adoption and Submittal

Upon completion of the public review period this 2024 MJHMP was submitted to Cal OES on (insert date upon completion). On (insert date), Cal OES approved the plan for transmittal to FEMA for review. FEMA completed their review and provided MWDOC and MAs with an Approvable Pending Adoption letter on (insert date). Final Board adoption by MWDOC and MAs occurred on or after (insert date). **Appendix B** includes copies of the resolutions of adoption from all participating MAs.

2.3.6 Plan Maintenance

Plan maintenance procedures, found in **Section 5**, include the measures each MA will take to ensure the 2024 MJHMP's continuous long-term implementation. The procedures also include the manner in which the plan will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document. **Appendix C** includes a "Progress Report Worksheet" intended to support future plan maintenance and implementation by MWDOC and MAs.

SECTION 3: RISK ASSESSMENT

Risk assessment requires the collection and analysis of hazard-related data to enable local jurisdictions to identify and prioritize appropriate mitigation actions and strategies that will reduce losses from potential hazards. FEMA's LHMP How-to Guide recommends four steps for conducting a risk assessment:

1. Describe hazards that pose a threat to the planning area;
2. Identify community assets (for the purposes of this MJHMP this includes water and wastewater infrastructure) in the planning area;
3. Analyze risks associated with the hazards, including describing the potential impacts and estimating losses for each hazard; and
4. Summarize vulnerability to understand the most significant risks and vulnerabilities associated with the identified hazards.

The risk assessment must result in an evaluation of potential impacts and overall vulnerability for each participating jurisdiction to develop specific mitigation actions. The following identifies the hazards for the entire planning area and notes if the hazard is applicable to all jurisdictions or is unique to specific jurisdictions. Hazards applicable to all jurisdictions are described in this section and are not described separately in the Jurisdictional Annexes. Hazards unique to a jurisdiction are further discussed in the Jurisdictional Annexes.

3.1 Hazard Identification and Prioritization

3.1.1 Hazard Identification

Hazard identification is the process of identifying hazards that threaten an area including both natural and human-caused events. A natural event causes a hazard when it harms people or property. Such events would include floods, earthquakes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. Human-caused hazard events are caused by human activity and include technological hazards and malevolent acts such as terrorism. Technological hazards are generally accidental and/or have unintended consequences (for example, an accidental hazardous materials release). Terrorism is defined by the CFR as "…unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." Natural hazards that have harmed Orange County in the past are likely to happen in the future; consequently, the process of identifying hazards includes determining if the hazard has occurred previously.

The Planning Team reviewed the list of FEMA-identified hazards, the 2019 MJHMP, and other relevant information to determine the extent of hazards with the potential to affect the planning area; refer to **Exhibit 2-5, Existing Plans and Studies**. A discussion of potential hazards during the first Planning Team meeting resulted in the identification of the natural and human-cause hazards that pose a potential risk to all or a portion of the planning area and MAs. **Exhibit 3-1, Hazard Identification,** summarizes the Planning Team's discussion and identification of the hazards included in this 2024 MJHMP.

Exhibit 3-1. Hazard Identification

Hazards	Included in 2019 MJHMP?	Included in 2024 MJHMP?	Discussion Summary
Avalanche	No	No	Not applicable. Snowfall is not a typical occurrence in Orange County and there is no historical record of this hazard in the region.
Climate Change	Yes	Yes	Climate change is a phenomenon that could exacerbate hazards. Climate change and how it can potentially affect the severity, intensity, and frequency of a hazard is discussed in each individual hazard profile.
Coastal Erosion	Yes	Yes	Coastal erosion and storms occur within the coastal communities, which include development along the coast. These hazards are combined in **Section 3.2.1, Coastal Hazards** (Coastal Erosion, Coastal Storm, Sea Level Rise, and Tsunami).
Coastal Storm	Yes	Yes	Coastal erosion and storms occur within the coastal communities within the planning area. These hazards are combined in **Section 3.2.1, Coastal Hazards**.
Contamination/ Saltwater Intrusion	Yes	Yes	Water supplies are susceptible to contamination from human activities. In addition, saltwater intrusion is a concern within the planning area as it has occurred previously due to groundwater extraction. This hazard has been combined in **Section 3.2.5, Human-Caused Hazards**.
Cyber Threats (Terrorism)	No	Yes	The growing threat of cyber security and data breaches has increasingly become a potential hazard concern for jurisdictions throughout the planning area. Due to the potential effect on key infrastructure functions this hazard has been included in the plan update.
Dam/Reservoir Failure	Yes	Yes	Several dams and reservoirs are located throughout Orange County or in areas that could impact the county in the event of a failure. Infrastructure located within inundation areas could be impacted. This hazard includes dams and reservoirs.
Disease/Pest Management	No	No	Not applicable. Disease/pest management is not a hazard that impacts water/wastewater facilities and infrastructure.
Drought	Yes	Yes	Water supplies are dependent on groundwater and imported surface water, both of which are susceptible to drought. The county has experienced historical droughts, including the most recent State-declared drought emergency (2014-2017). See **Section 3.2.7, Severe Weather.**
Earthquake Fault Rupture	Yes	Yes	Alquist-Priolo fault zones occur within Orange County. The county has a long history of earthquakes, some resulting in considerable damage. This topic has been in **Section 3.2.6, Seismic Hazards,** which address Fault Rupture, Seismic Shaking, and Liquefaction.
Expansive Soils	Yes	Yes	Expansive soil conditions occur within portions of Orange County and can be exacerbated by periods of rain and drought. This topic is combined in **Section 3.2.4,**

Hazards	Included in 2019 MJHMP?	Included in 2024 MJHMP?	Discussion Summary
			Geological Hazards, which includes Expansive Soils, Land Subsidence, Landslides, and Mudflow.
Extreme Heat	No	Yes	Extreme heat is a hazard that typically affects all of Southern California. Recently portions of Orange County have experienced extreme heat events causing concern. In addition, climate change is anticipated to increase temperatures throughout the planning area. This hazard has been included in this MJHMP and is discussed in **Section 3.2.7, Severe Weather Hazards**, which includes Drought, Extreme Heat, and Windstorms.
Flood	Yes	Yes	Portions of Orange County are located within floodplains and have experienced historic flooding. More localized flooding also occurs during rainstorms.
Geological Hazards	Yes	Yes	Orange County is located in an area of geological hazards, including seismic activity. This topic has been combined to include Expansive Soils, Land Subsidence, Landslides, and Mudflow.
Hailstorm	No	No	Not applicable. Hailstorms rarely occur within Orange County and there is no historical record of this hazard causing significant damage to the planning area.
Hazardous Materials	Yes	Yes	Water supplies could be compromised by accidental or intentional release of hazardous materials. This hazard is addressed in **Section 3.2.5, Human-Caused Hazards**.
Human-Caused Hazards	Yes	Yes	Human-caused hazards are a concern throughout the planning area and Southern California. This category has been expanded to include Contamination/Saltwater Intrusion, Hazardous Materials, Power Outage, Terrorism (Cyber Threat), and Terrorism (Mass Casualty Incident).
Hurricane	No	No	Not applicable.
Land Subsidence	Yes	Yes	Land subsidence conditions occur within Orange County. This topic is addressed in **Section 3.2.4, Geological Hazards.**
Landslide and Mudflow	Yes	Yes	Areas of the county are susceptible to landslides and mudflow, which can be exacerbated by other hazards including seismic ground shaking, drought conditions, and wildfires. See **Section 3.2.4, Geological Hazards.**
Lightning	No	No	Not applicable. Although lightning sometimes occurs during storm events, it is limited within the region and there is no historical record of this hazard significantly impacting the planning area.
Liquefaction	Yes	Yes	Liquefaction zones occur within Orange County. This topic has been combined in **Section 3.2.6, Seismic Hazards,** which includes Fault Rupture, Seismic Shaking, and Liquefaction.
Mass Casualty Incident (Terrorism)	Yes	Yes	Mass casualty incidents and terrorism have been identified as potential hazards of concern for the planning area. This hazard is addressed in **Section 3.2.5, Human-Caused Hazards.**

Hazards	Included in 2019 MJHMP?	Included in 2024 MJHMP?	Discussion Summary
Power Outage	Yes	Yes	Although typically associated with other hazards, power outages can directly impact water and wastewater systems and have been added to **Section 3.2.5, Human-Caused Hazards.**
Sea Level Rise	Yes	Yes	Sea level rise has been identified as a hazard affecting some of the coastal communities. This hazard has been included in the Coastal Hazards profile within this 2024 Multi-Jurisdictional HMP. **See Section 3.2.1, Coastal Hazards.**
Seismic Shaking	Yes	Yes	Orange County has a long history of earthquakes, some resulting in considerable damage. This topic is included the seismic hazards discussion, which includes Fault Rupture, Seismic Shaking, and Liquefaction. **See Section 3.2.6, Seismic Hazards.**
Severe Winter Storm	No	No	Not applicable. Severe winter storms are not common in Orange County, and there are no historical records of this hazard in the region.
Tornado	Yes	No	Tornadoes are not a typical occurrence in Orange County. This topic has been removed from this 2024 MJHMP.
Tsunami	Yes	Yes	Portions of the Orange County coastline are located within tsunami inundation areas. This topic is discussed in **Section 3.2.1, Coastal Hazards.**
Urban Fire	No	Yes	The potential for damage to key facilities and infrastructure has been identified as a potential threat within the planning area. It has been included in **Section 3.2.8, Wildland/Urban Fire.**
Volcano	No	No	Not applicable. There are no active volcanoes in Orange County or the surrounding area.
Wildfire	Yes	Yes	Portions of Orange County are located within fire hazard zones, which are adjacent to existing urban development. Due to the proximity of both development and critical infrastructure to fire hazard zones, this hazard has been profiled in this plan. **See Section 3.2.8, Wildland/Urban Fire.**
Wind	No	No	Regular wind is not a typical occurrence and does not cause severe damage within the area. High winds/Santa Ana winds are common throughout Orange County and are addressed in **Section 3.2.7, Severe Weather.**
Windstorm	Yes	Yes	High Winds/Santa Ana winds are a common occurrence in the planning area and can impact critical infrastructure and services that support water/wastewater operations, see **Section 3.2.7, Severe Weather.**

3.1.2 Hazard Prioritization

The Planning Team used a Microsoft Excel-based tool to prioritize the identified hazards by assigning each hazard a ranking based on probability of occurrence and the potential impact. These rankings were assigned based on a group discussion, knowledge of past occurrences, and familiarity with each MA's vulnerabilities. Four criteria were used to establish priority:

- Probability (likelihood of occurrence)
- Location (size of potentially affected area)
- Maximum Probable Extent (intensity of damage)
- Secondary Impacts (severity of impacts to community)

A value from 1 to 4 was assigned for each criterion. The four criteria were then weighted based on the Planning Team's opinion of each criterion's importance. **Exhibit 3-2, Hazard Rankings,** presents the results of the hazard rankings for the planning area.

Exhibit 3-2. Hazard Rankings

Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Affected Area	Primary Impact	Secondary Impact		
Human-Caused Hazards: Power Outage	4	3	4	4	57.6	High
Wildfire	4	3	3	4	52.0	High
Human-Caused Hazards: Terrorism (Cyber Threat)	4	3	3	2	44.0	High
Seismic Hazards: Seismic Shaking	3	3	4	4	43.2	High
Seismic Hazards: Liquefaction	3	3	4	4	43.2	High
Severe Weather: Windstorm	4	4	2	1	40.8	Medium
Severe Weather: Extreme Heat	3	3	3	3	36	Medium
Severe Weather: Drought	4	4	1	1	35.2	Medium
Dam/Reservoir Failure	2	3	4	4	28.8	Medium
Flood	3	3	2	1	25.8	Medium
Coastal Hazards: Coastal Storm	3	2	2	2	24.0	Medium
Coastal Hazards: Coastal Erosion	3	1	2	2	19.2	Medium
Seismic Hazards: Earthquake Fault Rupture	2	1	4	2	18.4	Medium
Geological Hazards: Landslide and Mudflow	2	2	2	3	18	Medium
Coastal Hazards: Sea Level Rise	3	1	2	1	16.2	Medium
Human-Caused Hazards: Contamination/Saltwater Intrusion	1	2	3	4	11.4	Low
Human-Caused Hazards: Terrorism (MCI)	1	1	3	3	8.8	Low
Human-Caused Hazards: Hazardous Materials	1	1	2	3	7.4	Low
Urban Fire	1	1	2	1	5.4	Low
Geological Hazards: Land Subsidence	1	1	1	2	5	Low
Geological Hazards: Expansive Soils	1	1	1	2	5	Low

Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Affected Area	Primary Impact	Secondary Impact		
Coastal Hazards: Tsunami	1	1	1	1	4	Low

*Scores are based on a scale from 1 to 4, where 4 is the highest score and 1 is the lowest. The total score is based on an equation that weights categories by importance. Refer to **Exhibit 3-3** for additional information.*

Exhibit 3-3, Hazard Ranking Methodology, provides additional detail regarding how the probability, affected area, and impact categories are weighted and how the total score is calculated for the hazard rankings.

Exhibit 3-3. Hazard Ranking Methodology

Probability: Importance 2.0

Based on estimated likelihood of occurrence from historical data.

Probability	Score
Unlikely (less than 1% probability in next 100 years or has a recurrence interval of greater than every 100 years)	1
Somewhat Likely (between 1% and 10% probability in next year or has a recurrence interval of 11 to 100 years)	2
Likely (between 10% and 100% probability in next year or has a recurrence interval of 10 years or less)	3
Highly Likely (near 100% probability in next year or happens every year)	4

Affected Area: Importance 0.8

Based on size of geographical area of community affected by hazard.

Affected Area	Score
Isolated	1
Small	2
Medium	3
Large	4

Primary Impact: Importance 0.8

Based on percentage of damage to typical facility in community.

Impact	Score
Negligible – less than 10% damage	1
Limited – between 10% and 25% damage	2
Critical – between 25% and 50% damage	3
Catastrophic – more than 50% damage	4

Secondary Impacts: Importance 0.5

Based on estimated secondary impacts to community at large.

Impact	Score
Negligible – no loss of function, downtime, and/or evacuations	1
Limited – minimal loss of function, downtime, and/or evacuations	2
Moderate – some loss of function, downtime, and/or evacuations	3
High – major loss of function, downtime, and/or evacuations	4

Total Score Probability x Impact, where:

Probability = (Probability Score x Importance)

Impact = (Affected Area + Primary Impact + Secondary Impacts), where:

Affected Area = Affected Area Score x Importance

Primary Impact = Primary Impact Score x Importance

Secondary Impacts = Secondary Impacts Score x Importance

Hazard Planning Consideration

Total Score	Range	Distribution	Hazard Level
0.0	20.0	7	Low
20.1	42.0	10	Medium
42.1	64.0	5	High

The probability of each hazard is determined by assigning a level, from unlikely to highly likely, based on the likelihood of occurrence from historical data. The total impact value includes the affected area, primary impact, and secondary impact levels of each hazard. Each level's score is reflected in the matrix. The total score for each hazard is the probability score multiplied by its importance factor times the sum of the impact

level scores multiplied by their importance factors. Based on this total score, the hazards are separated into three categories based on the hazard level they pose to the communities: High, Medium, and Low.

It should be noted that climate change was not prioritized for the planning area. Instead a discussion regarding climate change considerations has been added to each hazard profile. Regardless of the prioritization (low, medium, or high), it was determined by the Planning Team that all the hazards identified in **Exhibit 3-2** would be profiled. Due to the vast geography and hazards that impact the various MAs, it was recognized by the Planning Team that some hazards that ranked low overall, may be a high priority depending upon the MA.

3.2 Hazard Profiles

This section contains profiles for the hazards identified in **Exhibit 3-2**. Due to the nature of the hazards, some hazards were combined for purposes of the profiles as noted in **Exhibit 3-2**. Information was obtained from various Federal, State, and local sources, as well as the Planning Team. A detailed list of references is provided in **Section 6.**

The service areas for each of the MAs participating in the MJHMP update do not always align with incorporated city or unincorporated county boundaries. In many cases, an MA may serve multiple cities and/or portions of cities/unincorporated areas. For the purposes of this MJHMP , the planning area refers to Orange County, since the MAs provide services and infrastructure throughout most of the county. Because much of the available hazard data is provided by jurisdictional boundary (county or city), it is not always possible to obtain or delineate data specific to the MA jurisdictional (service) boundary. The Jurisdictional Annexes detail the hazards, risk assessments, and mitigation strategies specific to each jurisdiction.

Each hazard profile addresses the following:

- **Description (Nature) of the Hazard:** Describes the hazard and its characteristics.
- **History/Past Occurrences:** Provides a history of the hazard and identifies previous occurrences. Where an occurrence is specific to an MA, this information is provided.
- **Location/Geographic Extent:** Describes the location (geographic) area affected by the hazard. If the hazard affects the entire planning area, it is noted. For geographically specific hazards, the specific MAs affected by the hazard are identified and discussed further in the Jurisdictional Annexes.
- **Magnitude/Severity:** Describes the extent (magnitude or severity) of each hazard. If a hazard has a uniform extent for all the MAs, it is noted. For geographically specific hazards, mapping is provided that illustrates the extent of the hazard for the entire planning area. Mapping for applicable hazards specific to an MA are provided in the Jurisdictional Annexes.
- **Probability of Future Occurrences:** Provides a discussion of the probability of future occurrences of the hazard based on the history of past occurrence, location, and severity. If the likelihood of occurrence is the same for all jurisdictions or varies amongst the jurisdictions, it is noted.
- **Climate Change Considerations:** Provides a discussion regarding the potential effects climate change may have on a specific hazard. In some instances there may be no obvious and direct effect, while in other instances, significant information is available regarding the connections between climate change and the hazard of concern.

3.2.1 Coastal Hazards (Coastal Erosion, Coastal Storms, Sea Level Rise, Tsunamis)

The Coastal Hazards profile includes discussions regarding coastal erosion, coastal storms, sea level rise, and tsunamis.

3.2.1.1 Nature of Hazard

Coastal Erosion/Storms

Erosion is a naturally occurring phenomenon all along California's coastline. Erosion can be severe during winter storms, which are often accompanied by high surf, particularly during El Niño events. Rising sea levels caused by climate change will increase coastal erosion by exacerbating the impact of high tides and waves. Climate change is also expected to increase the frequency and severity of storms. As a result, even areas that have not experienced significant erosion in the past may be at risk in the future.

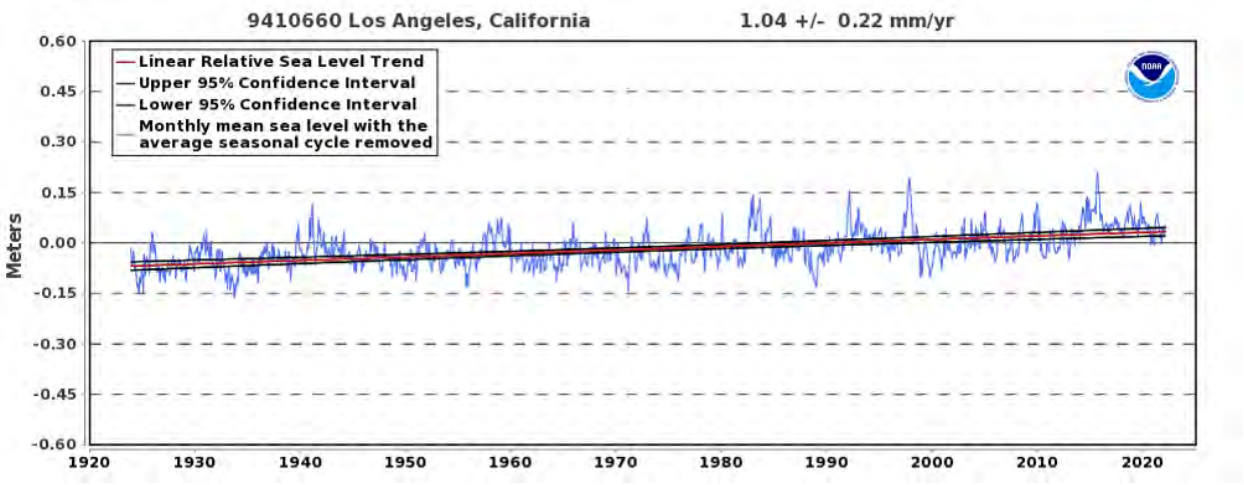
Erosion can also be affected by engineered structures that impede the deposit of new sediment at beaches; these include inland dams, channelized rivers, harbors, jetties, and seawalls/revetments (MWDOC 2019). This has been the case in Orange County, where the channelization of the Santa Ana River has reduced the amount of sediment reaching the coast, while the construction of jetties at Anaheim Bay and breakwaters at Long Beach have changed deposit patterns (MWDOC 2019). This led to the formation of several chronic erosion hotspots along the county's coastline. In some cases, long-term beach replenishment efforts and management plans have been able to counteract or reverse some of these trends.

In addition to the gradual narrowing of sandy beaches, storms and erosion can damage steep coastal bluffs and cliffs. Landforms that appear to have been stable for years may retreat several feet in just a few hours. In either case, erosion can cause considerable damage to coastal infrastructure and property. As Orange County's beaches are centers for recreation and tourism, loss of land has economic consequences, as well.

Sea Level Rise

Sea level rise is the increase in the average height of the ocean's surface. It occurs when global temperatures rise and melt land ice, such as glaciers and the polar ice caps that have formed over land masses. The meltwater runs into the world's oceans, causing a global increase in ocean levels. Additionally, because most materials expand in size when they become warmer, increased temperatures cause ocean water to expand, further raising the height of the ocean's surface. **Exhibit 3-4** shows the sea level trend over the past 100 years.

Exhibit 3-4. Sea Level Trend (1920-2020)



Source: NOAA, 2024b

While sea level rise can happen naturally, such as at the end of an ice age, the driver of sea level rise at present is global climate change. Unlike many other hazards, sea level rise is very gradual and occurs over the course of decades. Sea level rise itself poses both indirect and direct threats. Indirectly, a higher average sea level means that there is less of a buffer between the ocean and coastal structures or facilities. This can make it easier for coastal flooding, which can occur during storms, high surf, or particularly strong tides, to affect coastal properties since the distance between the ocean and these properties is smaller. Similarly, sea level rise can exacerbate coastal erosion, as discussed above. If sea level rise becomes severe enough, low-lying coastal areas can be semi-permanently or permanently underwater, rendering these areas uninhabitable.

Tsunamis

The phenomenon we call “tsunami” is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. In the deep ocean, the tsunami waves move across the deep ocean with a speed exceeding 500 miles per hour, and a wave height of only a few inches. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down, and the water can pile up into a wall of destruction up to 30 feet or more in height. The effect can be amplified where a bay, underwater features, or harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 100 feet. Even tsunamis 1 to 3 feet high can be very destructive and cause many deaths and injuries.

There are many causes of tsunamis, but the most prevalent is earthquakes. In addition, landslides, volcanic eruptions, explosions, and even the impact of meteorites can generate tsunamis. Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean and cause vertical movement of the sea floor over a large area, hundreds or thousands of square miles. By far the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor. The amount of vertical and horizontal motion of the sea floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the

efficiency with which energy is transferred from the earth's crust to the ocean water are all part of the tsunami generation mechanism. The sudden vertical displacements over such large areas disturb the ocean's surface, displace water, and generate destructive tsunami waves. Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Rim region.

Tsunami waves can travel at the speed of a commercial jet plane, over 500 miles per hour, moving from one side of the Pacific Ocean to the other in less than a day. This great speed makes it important to be aware of the tsunami as soon as it is generated. Scientists can predict when a tsunami will arrive at various locations by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the sea floor along the path to the shore from the point of origin.

Offshore and coastal features can determine the size and impact of tsunami waves. Reefs, bays, entrances to rivers, undersea features and the slope of the beach all modify the tsunami as it converges on the coastline. People living near areas where large earthquakes occur may find that the tsunami waves can reach their shores within minutes of the earthquake. For these reasons, the tsunami threat to many areas such as Alaska, the Philippines, Japan, and the U.S. West Coast can be immediate (as tsunamis from nearby earthquakes take only a few minutes to reach coastal areas) or less urgent (as tsunamis from distant earthquakes take from 3 to 22 hours to reach coastal areas). When a tsunami reaches the coastline and moves inland, the water level can rise several feet, flooding homes, businesses, and infrastructure from several thousand feet to miles inland, depending on the topography.

Scientists cannot accurately predict when earthquakes will occur, and as a result they cannot determine exactly when a tsunami will be generated or how destructive it will be. However, past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

3.2.1.2 History/Past Occurrences

Coastal Erosion/Storms

Problems with chronic erosion in Orange County have been recognized since at least 1945, when beach nourishment operations were undertaken to shore up the eroding Surfside-Sunset shoreline (MWDOC 2019). A 2006 U.S. Geological Survey (USGS) assessment of the entire California coast found that, between Los Angeles Harbor and Dana Point, the shoreline had receded since the early 1970s for 35% of the 29-miles coastline. Beach nourishment projects prevented further observable erosion during this period.

California typically experiences the most erosion during significant El Niño events. The three strongest El Niño events on record were during the winters of 1982-1983, 1997-1998, and 2015-2016. Historic erosion was reported all along the West Coast in 2015-2016, according to the USGS (USGS 2017b). While the winter storms brought extreme wave action to California's shores, they featured surprisingly little rainfall. With California in the midst of a major drought, less sediment was washed to the ocean to replenish beaches. Portions of beaches in San Clemente and Laguna Beach were temporarily closed to the public due to hazardous conditions (Connelly 2016).

Sea Level Rise

NASA reports that the global average sea level has risen almost 7 inches in the last 100 years. Rising sea levels have been observed in Orange County, as well. Measurements taken at Newport Beach since 1955 show that the sea level there has risen an average of 2.22 millimeters, or 0.09 inches, per year (MWDOC 2019). This is also expected to accelerate as more polar ice melts due to rising global temperatures.

King tides have flooded Orange County coastal communities, including Seal Beach, Huntington Beach, Balboa Peninsula and Balboa Island in Newport Beach, and Sunset Beach in the past (OCR 2017). In the last 10 years, the National Centers for Environmental Information (NCEI) Storm Events Database reports four coastal flooding incidents that affected Orange County: in October and November of 2015 and in May and October of 2017. It is difficult to say how higher sea levels may have affected the severity of these events. The independent organization Climate Central estimates that La Jolla, California, located south of Orange County, experienced 60 days of coastal flooding between 2005 and 2014, based on observed impacts such as flooded roads. Of those events, only four would have occurred without climate-linked sea level rise (Climate Central n.d.).

Tsunamis

Tsunamis can be categorized as Pacific-wide or "local." Typically, a Pacific-wide tsunami is generated by a major vertical shift in the ocean floor creating a wave that includes the entire column of water that has the potential to travel long distances. A "local" tsunami can be a component of a Pacific-wide tsunami in the immediate area of the earthquake or a wave that is confined to the area of generation, such as a landslide within a bay or harbor. Worldwide, tsunamis have resulted in the loss of thousands of lives, billions of dollars in damages, and the closure of many local economies.

All of the coastal areas in Orange County are susceptible to tsunamis, although most tsunamis have occurred in Northern California. The Channel Islands were impacted by a tsunami in the early 1800s. In the 1930s, four tsunamis struck the Los Angeles, Orange County, and San Diego coastal areas. In Orange County the tsunami wave reached heights of approximately 20 feet above sea level. In 1964, following the Alaska 8.2 earthquake, tidal surges of approximately 4 feet to 5 feet battered Huntington Harbor causing moderate damage.

According to the OC San Emergency Management Division, the following events generated response by their office (Ethan Miller Brown, OC San Emergency Management Division, pers. comm. Email correspondence. September 5, 2017):

- **April 1, 2014**. An 8.2 earthquake off the coast of Chile had the potential to generate a tsunami that could impact the Orange County coastline. The event was monitored, but no watch, advisory, or warning was issued for the county.
- **September 16, 2015.** An 8.3 earthquake off the coast of Chile triggered a Tsunami Advisory for the Orange County coastline. The Orange County Emergency Operations Center (EOC) was activated, and beaches were closed as a precaution; no evacuation orders were issued, and no damages occurred.
- **January 15, 2022.** A volcanic eruption near the Tonga Islands of the South Pacific generated a tsunami triggering a Tsunami Advisory for Orange County beaches, harbors, and piers. (NGDC 2024)

The National Oceanic and Atmospheric Administration (NOAA) reports one tsunami event in Orange County (MWDOC 2019):

- **September 16-17, 2015.** As described above, an 8.3 magnitude earthquake off the coast of Chile led the National Tsunami Warning Center to issue a tsunami advisory for a portion of California, including Orange County. All beaches, harbors, piers, and marinas in the cities of Seal Beach, Huntington Beach, Newport Beach, Laguna Beach, Dana Point, and San Clemente, including county and State beaches were closed. Tsunami wave heights were observed to be just under 1 foot along the Orange County coast. The Orange County EOC reported no significant coastal flooding, but to be aware of the high likelihood of strong currents and waves dangerous to persons in or near the water.

3.2.1.3 Location/Geographic Extent

Coastal Erosion/Storms

Orange County's coastline includes sand and cobble beaches, rocky cliffs and coastal bluffs, and intertidal areas. In general, beach erosion is more of an issue along Orange County's northern coast, while bluff retreat is a greater concern along the southern portion.

Beginning in 1964, the Orange County Erosion Control Project targeted Surfside-Sunset and West Newport Beach as locations in need of restoration. The U.S. Army Corps of Engineers spearheaded efforts to import sand and install retention devices in these areas.

A 2006 USGS study found that West Newport Beach had the largest measurable erosion rate in Orange County between the early 1970s and 1998.

As part of the Coastal Storm Modeling System (CoSMoS), data available from the USGS shows the projected location of the California shoreline under various scenarios of sea level rise. The Coastal Storm Modeling System (CoSMoS-COAST) shows that with a 3.3-foot rise in sea levels, Huntington State Beach will see the greatest erosion, followed by parts of Huntington City Beach, West Newport Beach, Surfside, and Bolsa Chica State Beach.

Sea Level Rise

Sea level rise presents a risk for all coastal communities with low-lying areas. In Orange County, Huntington Beach is particularly vulnerable. A 2017 report by the Union of Concerned Scientists, "When Rising Seas Hit Home," includes a mapping tool that shows what coastal areas will experience flooding at least 26 times a year under various sea level rise scenarios. Under a moderate scenario of a 4-foot rise, the area of north Orange County roughly bounded by the Santa Ana River and State Route 22 will see 14% of its land chronically inundated by 2100, even with existing levees. With a rise of 6 feet, 24% of the land will be chronically inundated. Affected areas include neighborhoods in Seal Beach, Huntington Beach, and Newport Beach.

NOAA offers another mapping tool to visualize areas vulnerable to flooding due to climate change. Its Sea Level Rise Viewer projects that, with a 1-foot rise in sea levels, there will be flooding through many parts of southeastern Huntington Beach, including neighborhoods between the Talbert Chanel and Huntington Beach Channel. A 2-foot rise will also start to affect parts of Sunset Beach and Balboa Island in Newport Beach, as well as less developed areas of Upper Newport Bay and Bolsa Chica Ecological Reserve.

Tsunamis

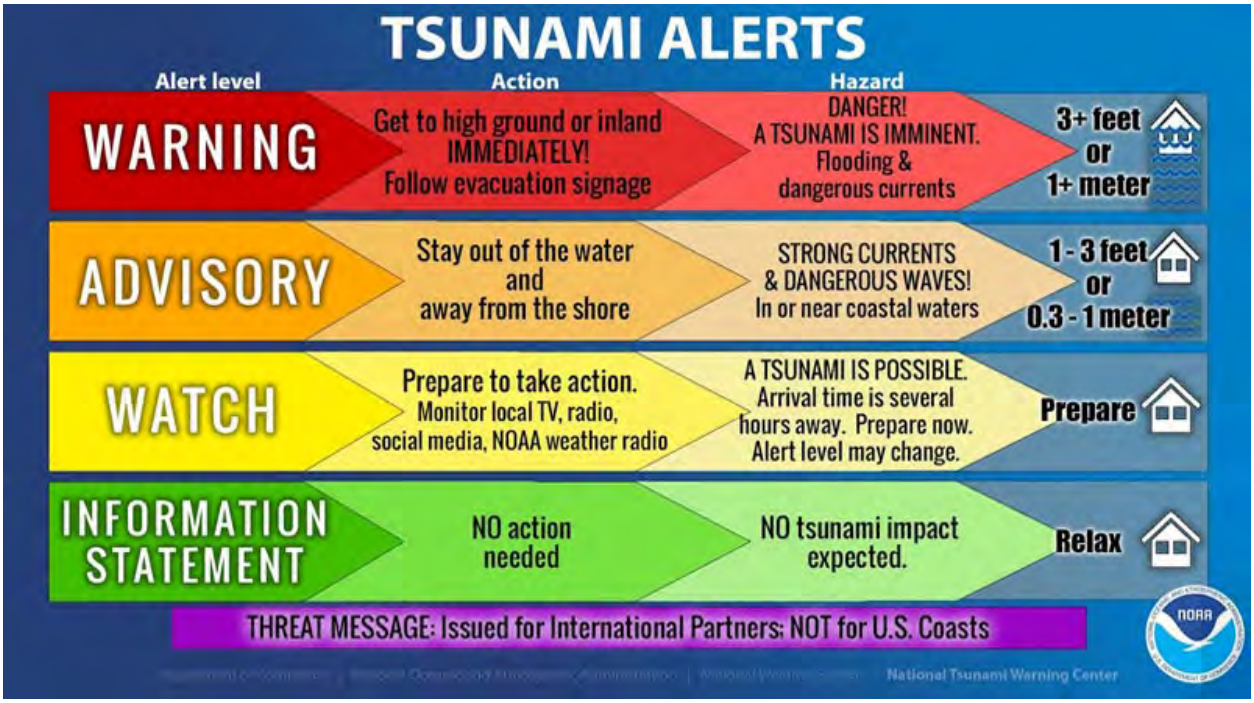
Exhibit 3-5 illustrates the portions of the planning area within a tsunami hazard zone. Tsunami inundation maps are provided by the California Geological Survey and represent a combination of the maximum considered tsunamis for each area.

As illustrated on **Exhibit 3-5**, tsunami inundation areas are contained to the coastal areas of the planning area, extending into the areas of Seal Beach, Huntington Beach, Newport Beach, Laguna Beach, Dana Point, and San Clemente.

To better understand the severity of a tsunami event, NOAA provides an alert scale (**Exhibit 3-6**) that provides four alert levels each with an information statement, watch, advisory, and warning. These levels are based on the hazard level and actions necessary in response to the type of alert provided.

Exhibit 3-5. Tsunami Hazard Zones

Exhibit 3-6. Tsunami Alerts Scale



3.2.1.4 Magnitude/Severity

Coastal Erosion/Storms

Erosion is usually described in terms of how much the beach width deceases per year. The 2006 USGS study, for example, found that erosion at West Newport Beach was at a rate of -2.2 meters per year. Overall, the shoreline of Los Angeles Harbor and Dana Point grew by an average of 0.5 meters per year, the highest rate in all of California, due largely to beach nourishment projects. Among those sections that did experience erosion, it happened at an average rate of -0.5 meters per year.

The volume of sand used to fight erosion can also indicate the magnitude of the problem. For example, from 1945 to 2009, more than 20 million cubic yards of sediment has been added to Surfside-Sunset Beach (Everest 2013).

In November 2023, the U.S. Army Corps of Engineers announced a new beach nourishment project that will dredge roughly 1.2 million cubic yards of sand off the coast of Surfside and Sunset beaches. These dredged materials will be deposited south of the Naval Weapons Station Seal Beach, allowing for sediment to be transported naturally to the Huntington, Bolsa Chica, and Newport Beaches.

Sea Level Rise

Sea level is measured by local tide gauges and satellite. Sea level rise describes projected changes in those measurements based on different climate models. NOAA's Sea Level Rise Viewer projects that the sea level at Newport Bay will rise by at least 0.75 feet and as much as 2.72 feet by 2050, based on different global scenarios. By 2100, the level may rise by as much as 10.14 feet under the most extreme scenario.

Tsunamis

The magnitude/severity of a tsunami would be dependent on the severity and location of the event causing the tsunami. The California Geological Survey tsunami inundation maps (refer to **Exhibit 3-5**) identify the maximum extent of the tsunami inundation area within Orange County, which is primarily contained to the coastline. However, the inundation areas extend into several coastal communities with the largest potential inundation areas occurring within the cities of Seal Beach, Huntington Beach, Newport Beach, and Dana Point.

3.2.1.5 Probability of Future Occurrences

Coastal Erosion/Storm

Climate change all but ensures that the entire Orange County coast will experience some degree of erosion through the end of the century. The amount will depend on how much sea levels rise, which is contingent on global efforts to curb greenhouse gas emissions. An online mapping tool produced by Our Coast Our Future, a collaborative effort of 15 organizations including the USGS and California Coastal Commission, used CoSMoS data to predict that very few sections of the county's shoreline will maintain their current position assuming a 3.3-foot rise in sea level, even with the continuation of current beach nourishment efforts.

A new study released in 2017 using CoSMoS data found that, without human intervention, 31% to 67% of Southern California beaches may be completely eroded by 2100 if sea levels rise by 1 to 2 meters (USGS 2017a).

Sea Level Rise

According to the 4th Climate Change Assessment, thermal expansion was the largest contributor to sea level rise followed by melting ice from glaciers, ice caps, and loss of ice sheets covering Greenland and Antarctica. While the rate of sea level rise has been slow along the Orange County coast in the past, it is expected to accelerate in the future. According to the 4th Climate Change Assessment, by 2050 sea levels could be approximately 1 foot higher than they are now, and by 2100 sea levels could 5.5 feet higher or more (Hall et al. 2018).

Independent of all other factors, sea level rise is expected to cause temporary inundation of large sections of the planning area's beaches, particularly near the piers, during high wave events. However, no substantial permanent inundation is expected at this time. However, the effect of sea level rise is much greater in combination with various flood events, including coastal flooding and extreme high tides.

Climate Central's Surging Sea Risk Finder attempts to estimate the probability that coastal floods will reach elevations above the local high tide line. The tool does not have estimates for every tide gauge, and estimates for Orange County are based on data from the gauge at Los Angeles' Outer Harbor. It shows that, while there is currently less than a 1% chance of coastal flooding reaching areas 3 feet above the tide line in any given year, those chances increase to 6% annually by 2040 under a medium sea level rise scenario. By 2070, these areas will be flooding every year. Under an extreme scenario, annual flooding will happen as soon as 2040.

Tsunamis

The historic record indicates that there is a low probability of occurrence of a major tsunami in Orange County. However, there is the potential for future tsunami events to impact water and

wastewater infrastructure located within a tsunami inundation area. This probability is similar for each of the jurisdictions located within these areas.

3.2.1.6 Climate Change Considerations

Coastal Erosion/Storms

Coastal erosion is caused primarily by tides and wave action from storms. While tides are not affected by climate change, some studies suggest that climate change is expected to cause a 10% to 20% increase in the intensity of the severe storms that affect Southern California, as discussed in greater detail in **Section 3.2.3, Flood** (Oskin 2014). This means that the significant wave events that already cause substantial erosion along low-lying coastal areas may become more intense, causing greater loss of beaches and coastal bluffs during these events. Sea level rise, which is caused by climate change, may exacerbate the issue. As the surface of the ocean becomes higher, wave and tidal action will be able to reach farther onto land. As a result, wave and tide events that currently do not reach far enough to cause any erosion may be able to do so in the future, and wave and tide events that already cause erosion will be able to affect areas farther from the water line.

Sea Level Rise

Sea level rise is a direct consequence of climate change and would likely not exist to any substantial degree if climate change was not occurring. Climate change does not create any particular considerations for sea level rise, as the hazard itself is a result of climate change.

Tsunamis

The displacement events that cause tsunamis are geologic in nature and unaffected by climate change to any known degree. However, as sea level rise increases the average height of the ocean, this will allow tsunami waves to reach farther inland. Even though climate change is not expected to affect the severity of tsunamis, sea level rise is likely to create the potential for tsunamis to cause greater damage.

3.2.2 Dam/Reservoir Failure

3.2.2.1 Description (Nature) of the Hazard

Dam failures can result from several natural or human-caused threats such as earthquakes, erosion of the face or foundation, improper silting, rapidly rising flood waters, malicious events, and structural/design flaws. Seismic activity can also compromise dam regulating structures, resulting in catastrophic flooding. A dam failure can cause loss of life, damage to property, the displacement of persons, and other ensuing hazards along the inundation path. Damage to electricity-generating facilities and transmission lines could also impact life support systems in communities outside of the immediate hazard areas.

In the event of a major dam failure, mutual aid from all levels of government would be required for an extended period. Recovery efforts would include the removal of debris, clearing roadways, demolishing unsafe structures, assistance in reestablishing public services, and providing continued care and welfare for the affected population.

There are 33 dams in Orange County with ownership ranging from the Federal Government to homeowners' associations. These dams hold billions of gallons of water in reservoirs. The major

reservoirs are designed to protect Southern California from flood waters and to store domestic and recycled water.

In addition to reservoirs with dams in Orange County, there are many water storage tanks that are potentially susceptible to failure or damage by natural or human-caused events. These water tanks contain millions of gallons of water each and provide an important source of water storage. Their capacity is large enough to cause substantial damage down slope from a tank should one fail. Correspondingly, the history of failure of water storage tanks is considered.

Because dam failure can have severe consequences, FEMA and Cal OES require all dam owners to develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. Although there has been extensive coordination with Orange County officials in the development of an Orange County Response Plan, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner.

3.2.2.2 History/Past Occurrences

Orange County has never experienced a major dam failure, but there have been two deadly incidents involving dams built to supply water for the City of Los Angeles. In addition, the failure of a water tank caused considerable damage within the City of Westminster in 1998. These three disasters are detailed below.

St. Francis Dam, Disaster of 1928

In Los Angeles, the failure of the St. Francis Dam, and the resulting loss of over 500 lives was a scandal that resulted in the almost complete destruction of the reputation of its builder, William Mulholland. It was he who proposed, designed, and supervised the construction of the Los Angeles Aqueduct, which brought water from the Owens Valley to the city. The St. Francis Dam, built in 1926, was 180 feet high and 600 feet long. It was located near the City of Saugus in San Francisquito Canyon.

The dam failed on March 12, 1928 three minutes before midnight. Its waters swept through the Santa Clara Valley toward the Pacific Ocean about 54 miles away. The valley was devastated before the water finally made its way into the ocean between Oxnard and Ventura. At its peak the wall of water was said to be 78 feet high. At the time the water flowed through Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed: livestock, structures, railways, bridges, and orchards. In the end Ventura County lay below 70 feet of mud and damage estimates topped $20 million.

Baldwin Hills Dam, Disaster of 1963

The Baldwin Hills Dam collapse sent a 50-foot wall of water down Los Angeles' Cloverdale Avenue on December 14, 1963. Five people were killed. Sixty-five hillside houses were ripped apart, and 210 homes and apartments were damaged. The flood swept northward in a V-shaped path roughly bounded by La Brea Avenue, Jefferson Boulevard, and La Cienega Boulevard.

The earthen dam that created a 19-acre reservoir to supply drinking water to West Los Angeles residents ruptured at 3:38 p.m. A pencil thin crack widened to a 75-foot gash allowing 292 million gallons to surge out in 77 minutes. The cascade caused an unexpected ripple effect that is still being felt in Los Angeles and beyond. It prompted the end of urban-area earthen dams as a major element of water storage systems, and a tightening of the Division of Safety of Dams control over reservoirs throughout the State.

Westminster Water Tank Failure, Disaster of 1998

In September of 1998, a 5-million-gallon municipal water storage tank in the City of Westminster ruptured because of corrosion and construction defects. There was no loss of life, but damage was extensive. The flow of water from the 32-year-old tank destroyed most of the storage facility as well as several private residences. Additionally, there were approximately 30 more homes inundated with water and silt. Through the Public Works Mutual Aid Agreement, the Orange County Public Works Department assisted the City of Westminster in the cleanup and temporary repair of the streets.

City employees, the Orange County Fire Authority, neighboring fire services, and the Red Cross were onsite for days assessing the damage and assisting residents. Water storage for the city was non-existent following this event while the other 5-million-gallon tank of similar age and construction was removed from service as a precautionary measure.

A new reservoir facility began providing services in March 2003, consisting of two 8-million-gallon water storage tanks, a 17-million-gallon-per-day booster station, and a new groundwater well with a capacity of 3,000 gallons per minute. All new construction has passed rigorous inspections and has obtained the required permits from the California Department of Public Health.

3.2.2.3 Location/Geographic Extent

Exhibit 3-7 lists the larger reservoirs and dams in Orange County and their owners/operators.

Exhibit 3-7. Orange County Large Reservoirs and Dams

Name of Facility	Owner/Operator
Santiago Creek Dam/Reservoir (Irvine Lake)	IRWD
Villa Park Dam	County of Orange
Sulphur Creek Dam	County of Orange
Peters Canyon Dam	County of Orange
Walnut Canyon Dam/Reservoir	City of Anaheim
San Joaquin Dam/Reservoir	IRWD
Sand Canyon Dam/Reservoir	IRWD
Rattlesnake Canyon Dam/Reservoir	IRWD
Big Canyon Dam/Reservoir	City of Newport Beach
Lake Mission Viejo	Lake Mission Viejo Association
El Toro R-6 Dam/Reservoir	ETWD
El Toro Reservoir/Rossmoor #1 Dam	ETWD
Diemer Filtration Plant	Metropolitan Water District of Southern California
Palisades Bradt Dam/Reservoir	SCWD
Portola Dam/Reservoir	SMWD
Syphon Canyon Dam/Reservoir	The Irvine Company
Trabuco Dam/Reservoir	TCWD
Dove Canyon Dam	Dove Canyon Master Association/TCWD
Upper Oso Dam/Reservoir	SMWD
Upper Chiquita Dam/Reservoir	SMWD
Brea Dam	U. S. Army Corps of Engineers
Fullerton Dam	U. S. Army Corps of Engineers
Carbon Canyon Dam	U. S. Army Corps of Engineers
Prado Dam	U.S. Army Corps of Engineers

As mentioned above, the responsibility for developing maps showing areas that would be inundated in the event of a failure is the responsibility of the dam's owner. Not all of the dams and reservoirs in **Exhibit 3-7** would impact the planning area. Those that could impact the planning area, should they fail, are described below.

Big Canyon Reservoir is a 600-AF potable water storage facility constructed in 1959 and owned by the City of Newport Beach. It is in the San Joaquin Hills overlooking Newport Bay. Big Canyon Reservoir is retained on three sides by a homogenous earth-filled embankment dam, while the east side was formed by a slope cut. At its maximum section the dam embankment is 65 feet high. The spillway is an ungated concrete lined overflow structure located on the west side of the reservoir. The bottom of the reservoir and the cut slopes are lined with minimum 5-foot-thick clay blanket, and the entire inside surface, including the embankments and cut slopes, is overlain with a 3-inch-thick porous asphalt pavement. The reservoir is covered with a reinforced polypropylene weight-tensioned floating cover that was installed in 2004.

Dove Canyon Dam is an earth-filled dam completed in 1990. The dam is in the Dove Canyon residential community within the City of Rancho Santa Margarita, Orange County. The dam is owned by the Dove Canyon Master Association (DCMA). DCMA owns and operates recreational facilities situated immediately downstream of the dam crest on compacted backfill. The recreational facilities were included in the construction documents for the dam and approved by the State Division of Safety of Dams. The impounded reservoir is located on land owned by the TCWD and is used to store up to about 415 AF of runoff. TCWD and DCMA have an agreement to operate and maintain the dam and reservoir. TCWD utilizes storage in the reservoir to supplement its recycled water demands for landscape irrigation. The impounded water can be stored to an elevation of 1,090 feet, approximately 11 feet below the top of the dam crest's elevation of 1,101 feet above mean sea level (MSL).

El Toro Reservoir is an embankment-type dam owned and operated by ETWD. The reservoir is located in the City of Mission Viejo. The impounded reservoir has a storage capacity of 275 million gallons (850 AF) with a surface area of approximately 20.6 acres. The bottom and internal slopes of the reservoir are lined, and the reservoir surface has a floating cover. There is no surface water influent to the reservoir. The reservoir includes an emergency spillway and drainage facilities. Storage capacity in the El Toro Reservoir is owned through a regional partnership between ETWD, SMWD, and MNWD.

Rossmoor #1 Dam is an embankment type dam, with a height of 36 feet and a length of approximately 305 feet. The dam is located in the City of Laguna Woods. The impounded Holding Pond is used to provide emergency storage of secondary effluent from the ETWD Water Recycling Plant and has a storage capacity of 14 million gallons (43 AF). The reservoir includes an emergency spillway and drainage facilities.

Palisades Bradt Reservoir provides up to 48 million gallons of potable water storage with a 146-foot-high, zoned, earthen embankment dam constructed in 1963. The bottom and internal slopes of the reservoir are lined, and the reservoir surface has a floating cover. The dam has a low-level outlet, an emergency outlet, and an emergency spillway. The upstream watershed that contributes inflow to the reservoir has an area of 19 acres.

Peters Canyon Dam is an earth-filled structure owned by Orange County that has a capacity of 626 AF at the spillway pipe elevation of 537 feet above MSL. Water storage varies from 200 AF to 600 AF depending on seasonal rain amounts. Alerting would come primarily from the Park Ranger

at Peters Canyon Regional Park who would notify the Sheriff's Department, Control One of dam failure or possible dam failure.

Prado Dam is owned and operated by the Army Corps of Engineers and provides flood control and water conservation storage for Orange, Riverside, and San Bernardino counties. Prado Dam is a major component of the Santa Ana Mainstem Project, which extends from the upper canyon in the San Bernardino Mountains downstream to the Pacific Ocean at Newport Beach, some 75 miles along the Santa Ana River. The entire system is designed to provide various levels of flood protection ranging from 100 to 190 years for areas most susceptible to damage from flooding. The dam collects upstream water releases from storage facilities and runoff from uncontrolled drainage areas. It primarily benefits Orange County by reducing the potential for flood-induced damage and by providing water conservation storage. The Prado Dam has been undergoing major improvements including raising the embankment and spillway, increasing the maximum discharge capacity, constructing new levees and dikes, relocating and protecting utility lines, increasing reservoir area, and increasing impoundment.

Portola Dam is located near the northern end of Canada Gobernadora in southern Orange County, within the Coto de Caza gated community. Canada Gobernadora flows north to south and confluences with San Juan Creek approximately 7.5 miles upstream of the Pacific Ocean. Portola Dam is an earth-filled structure situated about 8 miles north of San Juan Creek with a maximum recycled water (or domestic water blend) storage capacity of 586 AF and a high-water elevation of 936 feet.

The Canada Gobernadora valley channel area between the dam and San Juan Creek has been developed with a golf course and lined on each side by thousands of homes positioned just at or above the 100-year flood plain. If a Portola Dam break occurred, the flow would likely destroy streets crossing the flood plain; damage the water, sewer, and recycled water pipeline infrastructure in them; and affect some or many home locations near the stream channel. Streets in Coto de Caza certain to be affected are: Trigo Trail, Via Pajaro, Via Conejo, Vista Del Verde, San Miguel, Cantamar, and South Bend. Along with the golf course and the equestrian center, additional SMWD facilities that are anticipated to be damaged or destroyed by a dam break in Coto de Caza and farther downstream are:

- Coto Lift Station and force main
- South Ranch Lift Station and force main
- South county pipeline
- Ortega Lift Station (Talega) force mains
- Talega recycled water transmission main
- Chiquita Land Outfall pipeline

Per the compliance report, after entering San Juan Creek, the dam break inundation flood area would be about the same as the 100-year flood plain all the way down to the Pacific Ocean.

Santiago Creek Dam is an earth-fill dam with a 25,000 AF capacity reservoir (Irvine Lake). The dam is owned by IRWD. **Villa Park Dam** is a flood control dam located downstream from Santiago Dam. It is an earth-fill structure with a capacity of 15,600 AF and is owned by the Orange County Flood Control District. Initial alerting is expected from dam keepers who are on duty at both Santiago Creek Dam and Villa Park Dam.

Trabuco Dam is an earth-filled dam completed in 1984. The dam is located adjacent to the Robinson Ranch residential community within the City of Rancho Santa Margarita, Orange County. The dam and impounded reservoir is owned and operated by the TCWD. TCWD utilizes the reservoir to store up to approximately 135 AF of reclaimed water produced from the Robinson Ranch Wastewater Treatment Plant located adjacent to the reservoir. The reclaimed water can be stored to an elevation of 1,274 feet, approximately 6 feet below the top of the dam crest's elevation of 1,280 feet above MSL.

Upper Oso Reservoir (UOR) and Dam are located within the Cities of Mission Viejo and Rancho Santa Margarita near the northern end of the Oso Creek Watershed in southern Orange County. Upper Oso Dam is an earth-filled structure situated between El Toro Road and Los Alisos Boulevard nearly 10 miles north of the Trabuco Creek confluence point. UOR has a high-water elevation of 953 feet and stores up to 4,000 AF of recycled water for landscape irrigation that is mainly used within SMWD and MNWD.

Immediately downstream of the Upper Oso Dam, a long bridge for State Route 241 crosses the flood channel and may not experience problems during a major flood event. Just upstream of Los Alisos Boulevard, some commercial property lies adjacent to the Oso Creek channel and may be affected. About 3 miles downstream on Oso Creek and upstream of Olympiad Road, a large basin area was created (now a sports park) to capture and attenuate major discharges from UOR before they enter **Lake Mission Viejo (LMV).**

LMV is created by a dam lying under Alicia Parkway. An Upper Oso Dam breach may also overflow LMV and damage the dam to point where it could release stored water and create a catastrophic flood hazard all the way to the Pacific Ocean.

Downstream of LMV, two golf courses have been developed within the Oso Creek channel area and numerous commercial properties are on adjacent sides. Housing tracts have been built above the 100-year flood plain, but, if a dam break occurred, the flow from UOR and LMV would likely destroy streets crossing the flood plain and damage the water, sewer, and recycled water pipeline infrastructure in them. In addition to the many pipelines crossing the flood plain, SMWD facilities that are anticipated to be damaged or destroyed by an Upper Oso Dam break are:

- Eastbrook Recycle Water Pump Station
- Lakeside Pump Station
- South County Pipeline
- Oso Creek Water Reclamation Plant
- Oso Creek Trunk Sewer
- Oso Barrier RW Pump Station and Pipelines

Due to proximity and elevation, a considerable number of the residential and commercial properties in many areas close to the banks of Oso Creek and farther downstream would likely be flooded for a short period of time and damaged. Streets in Mission Viejo and farther south likely to be affected by a dam failure are Los Alisos Boulevard, Santa Margarita Parkway, Olympiad Road, Alicia Parkway, Jeronimo Road, Marguerite Parkway, Casta del Sol, La Paz Road, Oso Parkway, Interstate 5, Camino Capistrano, Del Obispo Street, Stonehill Drive, and Pacific Coast Highway.

Upper Chiquita Reservoir (UCR) was constructed by SMWD to provide the South Orange County region with substantial new water reserves to meet customer demand during disruptions of water deliveries. These interruptions can be unanticipated, like the break of the Allen McColloch Pipeline

in 1999, or planned, like the shutdowns of the Diemer Filtration Plant in Yorba Linda to complete improvements or maintenance and repairs.

The UCR consists of an earth-fill dam structure and a covered, domestic water reservoir with a storage volume of 750 AF. The reservoir footprint is approximately 19.7 acres with a surface area of approximately 15.4 acres and has a High-Water Level (HWL) of 860 feet.

In addition to the dam and reservoir, the site contains the following facilities:

- Floating cover
- Access roads
- Spillway and drainage facilities
- Inlet/outlet facilities and pipelines
- Pump station
- Disinfection equipment
- Pipeline connection to the South Orange County Pipeline

The UCR site is located on the western side of Chiquita Canyon north of Oso Parkway and west of the current terminus of State Route 241 (SR-241) within the City of Rancho Santa Margarita, east of the community of Las Flores in southern Orange County.

A portion of the site is encumbered within the Transportation Corridor Agency's Chiquita Canyon Perimeter Conservation Easement. The closest developed areas are the Tesoro High School campus (located across Oso Parkway and south of the reservoir site) and the residential community of Las Flores (approximately 0.8-mile west of the site). Additional land uses in the proximity to the reservoir site include a neighborhood park, Crestview Park, located just over 300 feet west of the site, and the SMWD Las Flores Reservoir, located approximately 250 feet west of the site.

Under an extreme catastrophic dam failure scenario, the flood zone would exceed the FEMA 100-year floodplain in the Canada Chiquita Channel. Under this extreme scenario, land use categories that would be affected include the Oso Parkway, SR-241, and the Tesoro High School. Once the flood waters reach the San Juan Creek the flood flows would be less than the FEMA 100-year flood.

The UCR is located on the western slope of Chiquita Canyon, just north of Oso Parkway in the City of Rancho Santa Margarita. Completed in October 2011, the 244 million-gallon UCR is the largest domestic water reservoir built in South Orange County in nearly 45 years. The UCR has:

- A storage capacity of approximately 244 million gallons of domestic water (750 AF) contained in a lined and covered reservoir.
- A surface area of approximately 17.8 acres.
- A regional partnership between SMWD (lead agency) and MNWD, City of San Juan Capistrano, City of San Clemente, and SCWD (storage owners).
- A service base of approximately 168,000 families receiving approximately 200 gallons of fresh water a day for one week.
- A reservoir design that conforms to the rigorous standards set forth by the State of California.
- Safety features, including piezometers (moisture sensors), to continually monitor water levels and test for irregularities.

- An earthen embankment that significantly reduces any visual impacts while traveling west along Oso Parkway near Highway 241.
- A location that is not visible from homes in local neighborhoods, including Las Flores and Wagon Wheel.

The UCR was included in the South Orange County Natural Community Conservation Plan, which designates habitat conservation and species protection measures to ensure an environmentally sensitive design.

3.2.2.4 Magnitude/Severity

Orange County's reservoirs range in capacity from 18 to 196,235 AF of water storage. Inundation maps and studies, when available, indicate the area that would be flooded and can be used to gauge the severity of a dam failure.

A compliance analysis and inundation study report was prepared for Upper Oso Dam in 1979 to allow for construction permitting by the State of California. This study indicated that if the dam was breached, a potential maximum flow rate exceeding 250,000 cubic feet per second may be expected when the water surface elevation drops to about 935 feet. Should such an event occur, the UOR could potentially empty in about a half hour.

A similar report for Portola Dam was done in 1980. This study indicated that if the dam was breached, a potential maximum flow rate of 22,645 cubic feet per second may be expected after about 3 hours once the water surface elevation is at elevation 920 feet. Should such an event occur, Portola Dam would potentially empty in just over 6 hours.

Failure of a reservoir or a dam could extend throughout most of the planning area, depending upon the size of the facility and associated failure.

3.2.2.5 Probability of Future Occurrences

There has been just one incident involving a water storage structure in the 110 years since construction of the first contemporary dam in Orange County. It is expected that future events will remain highly unlikely, with a less than 1% chance of happening in any given year. However, such occurrences have the potential to be highly destructive.

In the more than 50 years since the collapse of the Baldwin Hills Dam, there have been very few incidents in California due to stringent standards, regulations, and regular inspections. The near-catastrophic failure of the main spillway of the Oroville Dam in Northern California in 2017 is a reminder of the ongoing risk presented by dams.

3.2.2.6 Climate Change Considerations

While climate change is not expected to directly affect the risk of dam failure, the risk could increase due to an expected rise in the number of intense storms as a result of climate change, as discussed in **Section 3.2.3, Flood.** For example, an increase in the number of intense storms in the Santa Ana River Basin could place stress on the effectiveness of Prado Dam. More storms could lead to increased usage of the dams by necessity, and potentially require infrastructure to hold back larger amounts of water. As intense storms caused a near-failure of Prado Dam in 2005, it is possible that increases in the number of intense storms may increase the risk of similar events in the future. This scenario can be applied to many of the dams and reservoirs located within the

planning area. An increase in both the frequency and intensity of storms could potentially cause failure of the current infrastructure in place.

3.2.3 Flood

3.2.3.1 Description (Nature) of the Hazard

Flooding may result from heavy rains raising water levels in rivers and streams; storms, tides, and weather patterns pushing ocean water into coastal areas; and when debris blocks normal storm water drainage systems. Other causes are discussed in more detail elsewhere in this plan, including sea level rise in **Section 3.2.1** and dam/reservoir failure in **Section 3.2.2**. Flooding can happen fast and with little warning, or water levels may rise slowly over the course of several days.

Orange County's terrain makes it naturally susceptible to flooding. Many of the rivers, creeks, and streams flow through natural floodplains on their way to the ocean. The county's rapid growth and transformation from an agricultural community to an urban community has changed flood control practices in the region. Drainage is managed through reservoirs, dams, diversion structures, and developed plains. In addition, seven pump stations (Huntington Beach, Cypress, Seal Beach, Los Alamitos, Rossmoor, Harbor-Edinger, and South Park) regulate storm water discharge to flood control channels. Although there is a county-wide system of flood control facilities, many of these are not designed for or capable of conveying runoff from major storms.

Orange County also has a warning system in place to detect potential flooding. The county began installing its ALERT (Automated Local Evaluation in Real Time) system in 1983. Operated by the county's Environmental Resources Section of the Resource Development and Management Department (RDMD) in cooperation with the National Weather Service, ALERT uses remote sensors located in rivers, channels, and creeks to transmit environmental data to a central computer in real time. Sensors are installed along the Santa Ana River, San Juan Creek, Arroyo Trabuco Creek, Oso Creek, Aliso Creek, as well as flood control channels and basins. The field sensors transmit hydrologic and other data (e.g., precipitation data, water levels, temperature, wind speed) to base station computers for display and analysis.

3.2.3.2 History/Past Occurrences

Residents reported damaging floods caused by the Santa Ana River as early as 1770 (as recorded by explorer and missionary Father Juan Crespi). Major floods in Orange County along the Santa Ana River occurred in 1810, 1815, 1825, 1862, 1884, 1891, 1916, 1927, 1938, 1969, 1983, 1993, 1995, 1998, 2005, 2010, and 2017. Often these events involved additional hazards, such as landslides, mud flows, and high winds. **Exhibit 3-8, Presidential Disaster Declarations for Flooding in Orange County Since 1969,** lists Presidential Disaster Declarations since 1969 that involved flooding and affected Orange County.

Exhibit 3-8. Presidential Disaster Declarations for Flooding in Orange County Since 1969

Disaster Number	Incident Type	Title	Incident Begin Date	Incident End Date
3592	Flood	Severe winter storms, flooding, landslides, and mudslides.	3/9/2023	7/10/2023
3591	Flood	Severe winter storms, flooding, and mudslides.	1/8/2023	1/31/2023
4305	Flood	Severe winter storms, flooding, and mudslides.	1/18/2017	1/23/2017
1952	Flood	Severe winter storms, flooding, and debris/mud flows.	12/17/2010	1/4/2011

Disaster Number	Incident Type	Title	Incident Begin Date	Incident End Date
1585	Severe Storm(s)	Severe storms, flooding, landslides, and mud/debris flows.	2/16/2005	2/23/2005
1577	Severe Storm(s)	Severe storms, flooding, debris flows, and mudslides.	12/27/2004	1/11/2005
1203	Severe Storm(s)	Severe winter storms and flooding.	2/2/1998	4/30/1998
1046	Severe Storm(s)	Severe winter storms, flooding landslides, mud flow.	2/13/1995	4/19/1995
1044	Severe Storm(s)	Severe winter storms, flooding, landslides, mud flows.	1/3/1995	2/10/1995
979	Flood	Severe winter storms, mudslides, landslides, and flooding.	1/5/1993	3/20/1993
935	Flood	Rain/snow/wind storms, flooding, mudslides.	2/10/1992	2/18/1992
812	Flood	Severe storms, high tides, and flooding.	1/17/1988	1/22/1988
677	Coastal Storm	Coastal storms, floods, mudslides, and tornadoes.	1/21/1983	3/30/1983
615	Flood	Severe storms, mudslides, and flooding.	1/8/1980	1/8/1980
547	Flood	Coastal storms, mudslides, and flooding.	2/15/1978	2/15/1978
253	Flood	Severe storms and flooding.	1/26/1969	1/26/1969

The most significant flood events to affect the county are summarized below:

- **Great Flood of 1862.** The flood of January 1862, called the Noachian Deluge of California, was unusual in two ways: 1) the storm causing the flood occurred during a very severe drought spanning 1856 to 1864; and 2) the flood lasted 20 days, which is considered an extremely long duration. Under normal circumstances, major floods last only a few days. The only structure left standing along this portion of the Santa Ana River was the Aqua Mansa Chapel and residents gathered on a small point of high-land to take refuge from the storm. Miraculously, there were no recorded deaths.
- **Great Flood of 1916.** On January 27, 1916, flood waters inundated a large area along the Santa Ana River, including Main Street in downtown Santa Ana, where the water was 3 feet deep. Adjacent farm lands, which later became the City of Westminster, also flooded. Three vehicular bridges and three railroad bridges were washed away by the flood and four people drowned.
- **Great Flood of 1938.** The flood of 1938 is considered the most devastating flood to occur in Orange County during the 20th Century and affected all of Southern California. The storm began on February 27 and lasted until March 3. In the Santa Ana Basin, 34 people died, and 182,300 acres were flooded. All buildings in Anaheim were damaged or destroyed. Two major railroad bridges, seven vehicular bridges, and the town of Atwood were destroyed. The Santa Ana River inundated the northwestern portion of Orange County and train service to and from Santa Ana was cancelled. The maximum discharge on March 3, 1938, was 46,300 cubic feet per second (cfs), with a gauge height at 10.20 feet. Damage exceeded $50 million.
- **Great Flood of 1969.** The floods of January and February 1969 were the most destructive on record in Orange County. Previous floods had greater potential for destruction, but the county was relatively undeveloped when they occurred. During the flood of 1969, rain fell almost continuously from January 18 to January 25, resulting in widespread flooding. Orange County was declared a national disaster area on February 5. A second storm hit on February 21 and

lasted until February 25 bringing rain to the already saturated ground. This second storm culminated in a disastrous flood on February 25. The storm resulted in the largest peak outflow from Santiago Reservoir since its inception in 1933. The reservoir at Villa Park Dam reached its capacity for the first time since its construction in 1963; the dam had a maximum inflow of 11,000 cfs. The outlet conduit was releasing up to 4,000 cfs yet the spillway overflowed at 1:30 p.m. and continued for 36 hours. The maximum peak outflow from the dam reached 6,000 cfs. Although the safety of the dam was never threatened, the outflow caused serious erosion downstream in the cities of Orange and Santa Ana and in some parks and golf courses. A Southern Pacific Railroad bridge, water and sewer lines, a pedestrian over crossing, and three roads washed out. Approximately 2,000 Orange and Santa Ana residents were evacuated from houses bordering Santiago Creek.

- **Great Flood of 1983.** An intense downpour and high tides associated with El Niño (due to the presence of a low pressure system) caused intense shoreline flooding. Meanwhile the Santa Ana River crested its sides near the mouth of the ocean, creating a disaster for the low-lying areas of Huntington Beach. Floodwaters were 3 to 5 feet deep.
- **1992 Coastal Storms.** In 1992, several coastal storms affected many coastal utilities' storm drain and sewage treatment processes. SOCWA reported significant cracks and damage to its Aliso Creek Ocean outfall.
- **Great Floods of 1993.** An intense storm was concentrated in the Laguna Canyon Channel area extending from Lake Forest to downtown Laguna Beach. In spite of a valiant effort to save downtown merchants by sandbagging, the stores were flooded. Laguna Canyon Road was damaged extensively, as well as homes and small businesses in the Laguna Canyon Channel. There were no fatalities reported.
- **Great Flood of 1995.** A disaster was declared in Orange County after extremely heavy and intense rains exceeded the storm runoff capacity of local drainage systems in many Orange County cities and regional Flood Control District systems. As a result, widespread flooding of homes and businesses occurred throughout these cities. There were approximately 1,000 people evacuated, and extensive damage sustained to both private and public property.
- **Great Floods of 1997/1998.** El Niño storms that occurred during this period created extensive storm damage to private property and public infrastructure, with damages reaching approximately $50 million. Storm conditions caused numerous county-wide mudslides, road closures, and channel erosion. Hillside erosion and mudslides forced the continual clearing of roads of fallen trees and debris. Protective measures, such as stabilizing hillside road slopes with rock or K-rail at the toe of slopes, were taken to keep the normal flow of transportation. Harbors, beaches, parks, and trails also sustained substantial storm damage.
- **2010/2011 Winter Storms.** On January 26, California received Presidential Declaration for the severe winter storms, flooding, and debris and mudflows that occurred December 17, 2010, through January 4, 2011. At the time of the declaration the State of California incurred well over $75 million in damages, while Orange County sustained more than $36 million in damages. Orange County sustained extensive damage to private and public property, as well as critical infrastructure.
- **2017 Winter Storms.** Southern California experienced three storms over six days starting on January 18, 2016. The heavy rains, combined with already saturated soil, produced flash

flooding across much of Orange County. Streets flooded with 1 to 3 feet of water in Huntington Beach, Santa Ana, and Newport Beach. Responders conducted rescue operations on the Santa Ana River in the cities of Orange and Huntington Beach. The storms resulted in a Presidential Disaster Declaration for 16 counties throughout the State (MWDOC 2019; Swegles 2017).

- **2019 Winter Storms.** In January 2019 Southern California experienced intense and heavy rainstorms over the course of a week, bringing with it large amounts of rain to the region and planning area. A nearly 3-mile stretch of Pacific Coast Highway in both directions between Warner Avenue and Seapoint Street in Huntington Beach was closed due to flooding. Seal Beach, Huntington Beach, and Fountain Valley each reported roughly 2 inches of rain in 2 hours. Laguna Beach residents were advised to raise floodgates and place sandbags to divert water flow. Sandbags were made available to all residents at Orange County Fire Authority stations and at most cities' public works yards (Fausto 2019).
- **2021 Winter Storms.** On January 28 and 29, 2021, a powerful winter storm and atmospheric river brought heavy rain. A total of 1.5 inches of rain fell across Santiago Canyon in eastern Orange County. Many areas flooded, including Santiago Canyon where mud and debris flows covered roads and damaged homes (Weather.gov 2024).
- **2023 Winter Storms.** On January 14 and 16, 2023, widespread heavy rainfall came in two waves, with the first occurring the afternoon of January 14 into early January 15, and the second occurring the night of January 15 through 16. Rainfall in the first wave ranged from 1 to 2 inches for the coast, 1 to 2.5 inches in the valleys, 2 to 5 inches in the mountains and up to a half inch of rain in the deserts. The second, colder system again produced widespread moderate to heavy rainfall. There were impressive totals for both waves: 2 to 4 inches at the coast, 2 to 5 inches for the inland valleys and 3 to 8 or more inches for the mountains. A lot of flooding occurred in Orange County, San Diego County, and Riverside County (Weather.gov 2024).

3.2.3.3 Location/Geographic Extent

Orange County covers 789 square miles, and its landscape varies from mountainous terrain (in the northeast and southeast) to floodplains (in the central and western section). **Exhibit 3-9** identifies the 100- and 500-year FEMA floodplains within Orange County. A sizable portion of north Orange County, including some of the county's most densely populated areas, is within a 500-year floodplain, which denotes areas with a 1-in-500, or 0.2%, chance of flooding in any given year.

The Santa Ana River, flowing through the heart of Orange County to the Pacific Ocean, is the county's greatest flood threat. Other areas subject to flooding during severe storms include areas adjacent to Atwood Channel, Brea Creek Channel, Fullerton Creek Channel, Carbon Creek Channel, San Juan Creek Channel, and East Garden Grove-Wintersburg Channel. Areas adjacent to Santiago Creek and Collins Channel in the central portion of the county and large portions of the San Diego Creek Watershed in the City of Irvine and unincorporated areas of the county are also subject to inundation. In the southern portion of the county, canyon areas are subject to flooding. The continued development in these areas has made the flood hazard even greater.

According to the 2014 National Climate Assessment Report, as is common in coastal areas, many roads and bridges, high-priced homes, and wastewater systems are located in low-lying areas near the ocean. Increases in storm water runoff have the potential to overwhelm the capacity of wastewater and drainage systems, flood control channels, and pump stations.

3.2.3.4 Magnitude/Severity

Flood severity is often described in terms of a 100-year flood, describing an event that is likely to occur once in a 100-year period. In other words, there is a 1% probability of an event this severe occurring in any given year. Flood Insurance Rate Map (FIRM) panels produced by FEMA identify areas subject to this level of risk as being within the 100-year floodplain. **Exhibit 3-9** shows these locations throughout Orange County, as well as a 500-year floodplain, which indicates a 0.2% annual chance of flooding.

Floods can also be measured in terms of data collected by U.S. Geological Survey through a nationwide system of stream gauges. The primary gauge on the Santa Ana River is in the City of Santa Ana. During the Great Flood of 1938, this gauge measured a water level of 10.2 feet, compared to a normal height of about 1.44 feet. During both of the two most recent flood events in 2010/2011 and 2017, the river reached 7.6 feet.

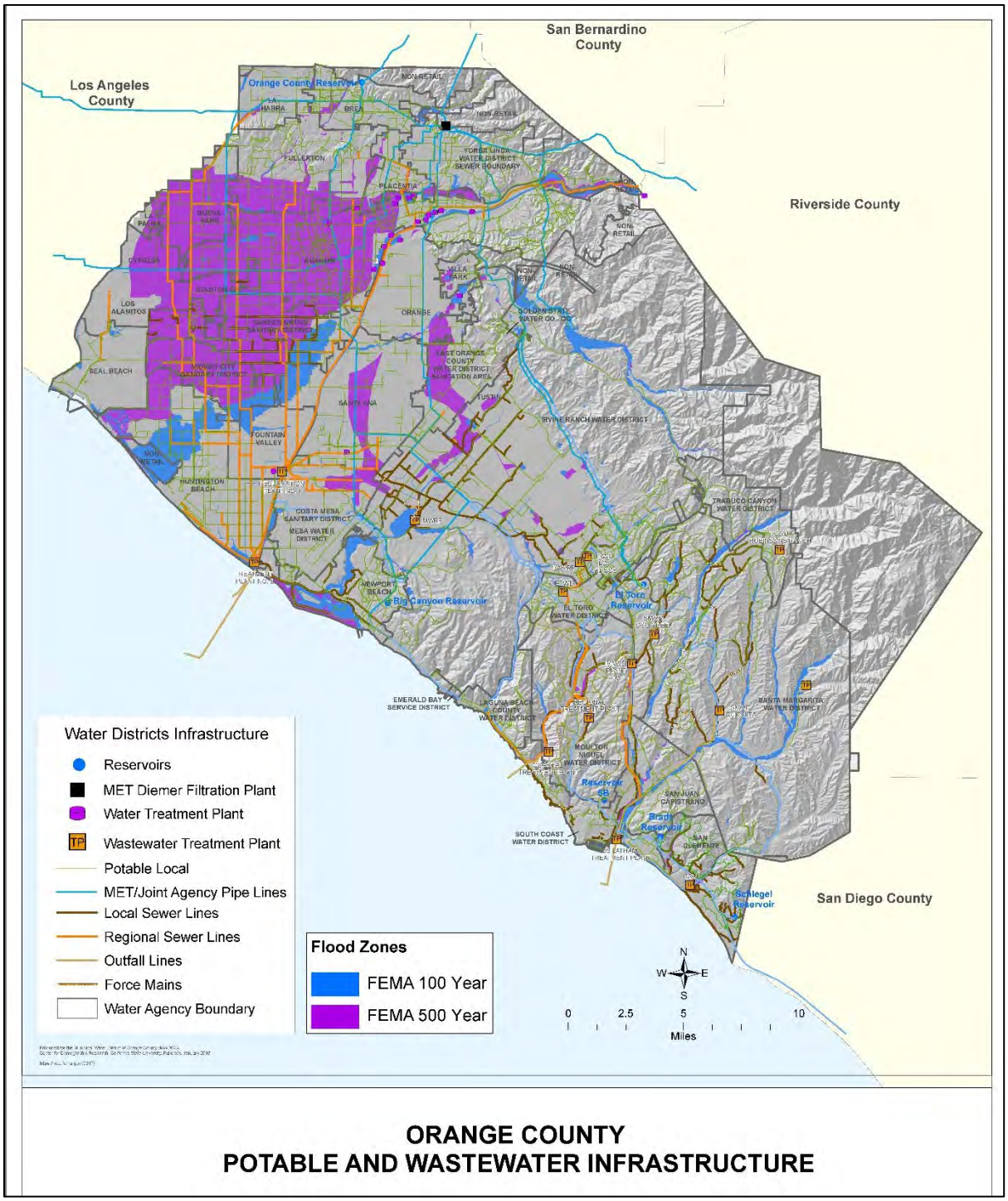
The greatest flood in terms of water flow occurred in 1862, when the Santa Ana River saw an estimated flow rate of 317,000 cfs. This flood was three times greater than the Great Flood of 1938, which had an estimated flow of 110,000 cfs. Peak discharges measured on the Santa Ana River during declared flood disasters since 1993 have ranged from 8,220 to 31,700 cfs.

On December 22, 2010, during the peak of that winter's floods, a weather station in Silverado Canyon recorded more than 7 inches of rain in a single day, according to NOAA climate data. During other flood events in the last 25 years, the maximum daily rainfall recorded within Orange County has ranged from 2 to 4 inches.

3.2.3.5 Probability of Future Occurrences

As mentioned in **Section 3.2.3.4,** FIRM panels depict areas that have a 1% chance of flooding in any given year, identified as a 100-year floodplain, as well as a 0.2% chance, or a 500-year floodplain. Such areas within Orange County are depicted in **Exhibit 3-9.**

Exhibit 3-9. Flood Zones



3.2.3.6 Climate Change Considerations

Climate change is expected to affect California's precipitation patterns, likely influencing future flood events. A 2017 study found that the number of very intense precipitation days in California is projected to more than double by the end of the century, increasing 117%, making it likely that flood events will become more frequent (Polade et al. 2017). More flood events could increase the

frequency of maintenance and repair activities and require operational changes in the planning area functions. Portions of the infrastructure may require modification and retrofit to better accommodate changes anticipated from climate change. As a result, significant investment in future infrastructure may become necessary.

In contrast to the Atlantic and Gulf coasts, where coastal flooding is mainly associated with major storms, flooding along the Pacific Coast is the result of a number of more subtle factors, including tidal cycles, the El Niño climate pattern, distant wind-generated ocean swells, local storms, and the time of year.

3.2.4 Geological Hazards (Expansive Soils, Land Subsidence, Landslide and Mudflow)

3.2.4.1 Description (Nature) of the Hazard

Expansive Soils

According to a scientific paper published in the Journal of Geotechnical Engineering (Day 1994), "expansive soil is a worldwide problem that causes extensive damage to civil engineering structures." Expansive soils are particularly problematic in the southwestern United States and especially in Southern California where there are large clay deposits compounded by "alternating periods of rainfall and drought." The problem with constructing on expansive soils is that the clay, often referred to as adobe, expands rapidly during the rainy season and contracts gradually during the dry season causing "shrink-swell." Shrink-swell is particularly problematic for "slab-on-grade" foundations, which can be placed directly on expansive soil that is constantly in a state of movement as the soil expands and contracts causing the foundation to fatigue and crack. Buildings with balloon frame construction are also susceptible to bowing and cracking when built on expansive soils. Shrink and swell can affect water/wastewater facilities particularly buildings or structures built using slab-on-grade or balloon frame construction techniques.

Expansive soil is also known to "creep" on unstable slopes eventually leading to landslides. Typically, this is found when expansive soil underlies compact topsoil. As the expansive soil expands-contracts, the compact topsoil slides or creeps downhill. Facilities built on unstable slopes with underlying expansive soils are prone to movement and can be damaged or destroyed in extreme circumstances.

Land Subsidence

The United States Geological Survey (USGS) defines land subsidence as a gradual settling or sudden sinking of the ground surface because of subsurface movement of underlying geologic units. Scientists at the USGS have determined that nearly 17,000 square miles in 45 states have been directly affected by land subsidence, caused by aquifer-system compaction, drainage of organic soils, underground mining, hydro-compaction, natural compaction, sinkholes, and thawing permafrost. More than 80% of land subsidence is caused by overuse of groundwater, and the increasing development of land and water resources threatens to worsen existing land subsidence problems (while initiating) new ones (USGS 2024).

Land subsidence in California is mainly caused by groundwater pumping in areas where aquifer recharge is exceeded. Known as "over-drafting," the dewatering of aquifers has led to lower water tables and subsidence, resulting in damage to infrastructure and water quality, and in coastal areas has resulted in the intrusion of seawater. USGS notes "the compaction of unconsolidated aquifer systems that can accompany excessive groundwater pumping is by far the single largest

cause of subsidence" and "the overdraft of such aquifer systems has resulted in permanent subsidence and related ground failures," thus "the extraction of this resource for economic gain constitutes 'groundwater mining' in the truest sense of the term" (USGS 2024). Over-drafting is further exacerbated in hot geographic regions with a large population; this includes much of Southern California.

Landside/Mudflow

Landslide is a general term for a falling mass of soil or rocks. Mudflow consists of material that is wet enough to flow rapidly and contains at least 50% sand, silt, and clay-sized particles. The primary effects of landslides/mudflows can include:

- Abrupt depression and lateral displacement of hillside surfaces over distances of up to several hundreds of feet.
- Disruption of surface drainage.
- Blockage of flood control channels and roadways.
- Displacement or destruction of improvements such as roadways, buildings, and water wells.

Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses events such as rock falls, topples, slides, spreads, and flows. Landslides can be initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance, and change of a slope by man-made construction activities or any combination of these factors. Landslides can occur underwater, causing tidal waves and damage to coastal areas. These landslides are called submarine landslides (USGS 2000).

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

A debris or mud flow is a river of rock, earth, and other materials, including vegetation that is saturated with water. This high percentage of water gives the debris flow a very rapid rate of movement down a slope. This high rate of speed makes debris flows extremely dangerous to people and property in its path. Earthquakes often trigger flows. Debris flows normally occur when a landslide moves down slope as a semi-fluid mass scouring, or partially scouring, soils from the slope along its path. Flows typically move rapidly and also tend to increase in volume as they scour out the channel. Flows often occur during heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances.

Wildland fires on hills covered with chaparral are often a precursor to debris flows in burned out canyons. The extreme heat of a wildfire can create a soil condition in which the earth becomes impervious to water by creating a waxy-like layer just below the ground surface. Since the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil into a sheet of mud and debris. Debris flows can often originate miles away from unsuspecting persons and approach them at a high rate of speed with little warning.

Natural processes can cause landslides or re-activate historical landslide sites. The removal or undercutting of shoreline-supporting material along bodies of water by currents and waves produces countless small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause additional failure (lateral spreading) that can occur on gentle slopes above steep streams and riverbanks.

3.2.4.2 History/Past Occurrences

Expansive Soils

In 1980, Krohn and Slosson (1980) made an assessment and cost estimate of the damage caused by expansive soils throughout the United States. They estimated that approximately $7 billion in property damage was reportedly attributed to construction on expansive soils. While no recent figures have been identified, the increase in construction activity in areas of expansive soil, especially in Southern California, will undoubtedly cause this number to increase. J. David Rogers of the University of Missouri found that "expansive soils are the second leading cause of property damage in the United States."

There are no reported occurrences of expansive soils causing considerable damage within Orange County; although expansive soils are known to exist. Typically, expansive soils would be identified at a local level on a site-by-site or area basis and are addressed as part of the development review process.

Land Subsidence

The relationship between subsidence and groundwater pumping was not fully recognized until 1928, when O. E. Meinzer, scientist with the United States Forest Service (USFS), realized that aquifers were compressible (Meinzer 1928). By the 1950s, the USGS made a concerted effort to measure the amount of ground subsidence. In 1952, Joseph Poland studied large discrepancies between the U.S. Coast and Geodetic Survey for the Santa Clara and San Joaquin valleys. Poland noted that the increased use of groundwater correlated with the amount of ground subsidence. Poland's work led to the verification of "consolidation theory" or compressible aquifers, as well as leading to the development of "definitions, methods of quantification, and confirmation of the interrelationship among hydraulic-head declines, aquitard (clay) compaction, and land subsidence" (Poland 1972).

Subsidence has historically occurred in Orange County associated with groundwater pumping and from peat decomposition. The areas of historic subsidence associated with groundwater pumping are illustrated in **Exhibit 3-10**. Localized subsidence possibly due to peat decomposition has also been reported in scattered areas inland from the coast between Sunset and Newport Beaches.

Landside/Mudflow

The following identifies some of the more major landslide occurrences within Orange County. There have been no disaster declarations within Orange County associated with landslides/mudflows.

- **1978 Bluebird Canyon, Orange County.** The cost of recovery was $52.7 million (in 2000 dollars) with 60 houses destroyed or damaged. Unusually heavy rains in March of 1978 may have contributed to initiation of the landslide. Although the 1978 slide area was approximately 3.5 acres, it is suspected to be a portion of a larger, ancient landslide.

- **1980 Southern California Landslides.** The damage was estimated at $1.1 billion in 2000 dollars. Heavy winter rainfall in 1979-1980 caused damage in six Southern California counties. In 1980, the rainstorm started on February 8 with five days of continuous rain and 7 inches of precipitation. Slope failures were beginning to develop by February 15, and then very high-intensity rainfall occurred on February 16. As much as 8 inches of rain fell in a 6-hour period in many locations. Records and personal observations in the field on February 16 and 17 showed that the mountains and slopes literally fell apart on those two days.
- **1983 San Clemente, Orange County.** The damage to California Highway 1 was estimated at $65 million in 2000 dollars. Litigation at that time involved approximately $43.7 million (in 2000 dollars).
- **1994 Northridge, California Earthquake Landslides.** As a result of the magnitude 6.7 Northridge, California, earthquake, more than 11,000 landslides occurred over an area of 10,000 square kilometers. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. They destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. It caused deaths from Coccidioidomycosis (valley fever) due to spores released from the soil by the landslide activity and blown toward the populated coastal areas.
- **1995 Los Angeles and Ventura Counties, Southern California.** Above normal rainfall triggered damaging debris flows, deep-seated landslides, and flooding. Several deep-seated landslides were triggered by the March storms, the most notable was the La Conchita landslide, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 kilometers west of Ventura. There also was widespread debris flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire 2 years before.
- **1998 Laguna Niguel and Orange County Landslide.** During the 1997/1998 El Niño season, heavy rainfall increased movement on the site of an ancient landslide in Laguna Niguel. The storms in December 1997 had accelerated the landslides' movement and in early 1998, a crumbling hillside forced the evacuation of 10 hilltop homes and more than 10 condominium units resting below. Ultimately four of the hilltop homes collapsed, falling down the hillside into the void created by the slide area. The condominium complex has since been demolished and the site remains open space.
- **2005 Blue Bird Canyon, Laguna Beach, Orange County Landslide.** On June 1, 2005, Bluebird Canyon in Laguna Beach experienced a landslide. Exceptionally heavy rainfall during the winter period was the underlying cause of the instability in an ancient landslide. A 30-acre piece of hillside between 50 to 60 feet deep broke free and fell on the homes below; 15 homes were destroyed, and 32 others had varying levels of damage. The approximate cost of damage was about $35 million.
- **2005 SCWD Landslide Impact to the Joint Regional Transmission Line.** Following a year of heavy rainfall, a slope failure occurred in Laguna Niguel in an area that included a section of the Joint Regional Transmission Pipeline. The pipeline had to be shut down and a temporary pipeline was routed around the slide area while evaluations of the stability of the area were made. Ultimately, the pipeline will be rerouted around the unstable area or located back in the slope after it has stabilized. Because the problem occurred in the winter/spring period and there are other pipelines into South Orange County, no water shortages were experienced.

- **2018 Cannon Cliff, Dana Point, Orange County Rockslide.** Approximately 18 tons of rocks, including a two-ton boulder dropped from the cliff area under Cannons Restaurant and struck a public restroom across from Baby Beach at the north end of Dana Point Harbor. The rocks are part of a 4-to-5-million-year-old rock formation called the Capistrano Formation.
- **2021 Silverado Canyon, Orange County Mudflow.** A powerful storm contained a heavy burst of rain in eastern Orange County that struck the Bond Fire burn scar in Silverado Canyon. In 15 minutes, 0.20 inch of rain fell. A debris flow went over roads and into homes, damaging six homes and eight vehicles in Silverado. The flow also closed a stretch of Silverado Canyon Road.

Rain-induced landslides were reported in Santa Margarita in 1980, 1993, 1995, and 2005. In 1980 rains washed out an access road in Coto de Caza uncovering an 8-inch water line. The same series of storms also exposed a 21-inch trunk sewer line along the Oso Creek in Mission Viejo resulting in damages of $300,000. In 1993, bank failures caused many pipelines to break that had to be replaced, relocated, or re-protected at a cost of nearly $2.1 million. A slope failure in 1995 caused pipeline failures costing nearly $30,000, and in 2005 a reservoir slope failure in Talega Valley cost $350,000. Landslides, resulting in erosion along Aliso Creek, affected the SOCWA's Aliso Creek Effluent Transmission Main (a 36-inch pipeline carrying treated wastewater).

3.2.4.3 Location/Geographic Extent

Expansive Soils

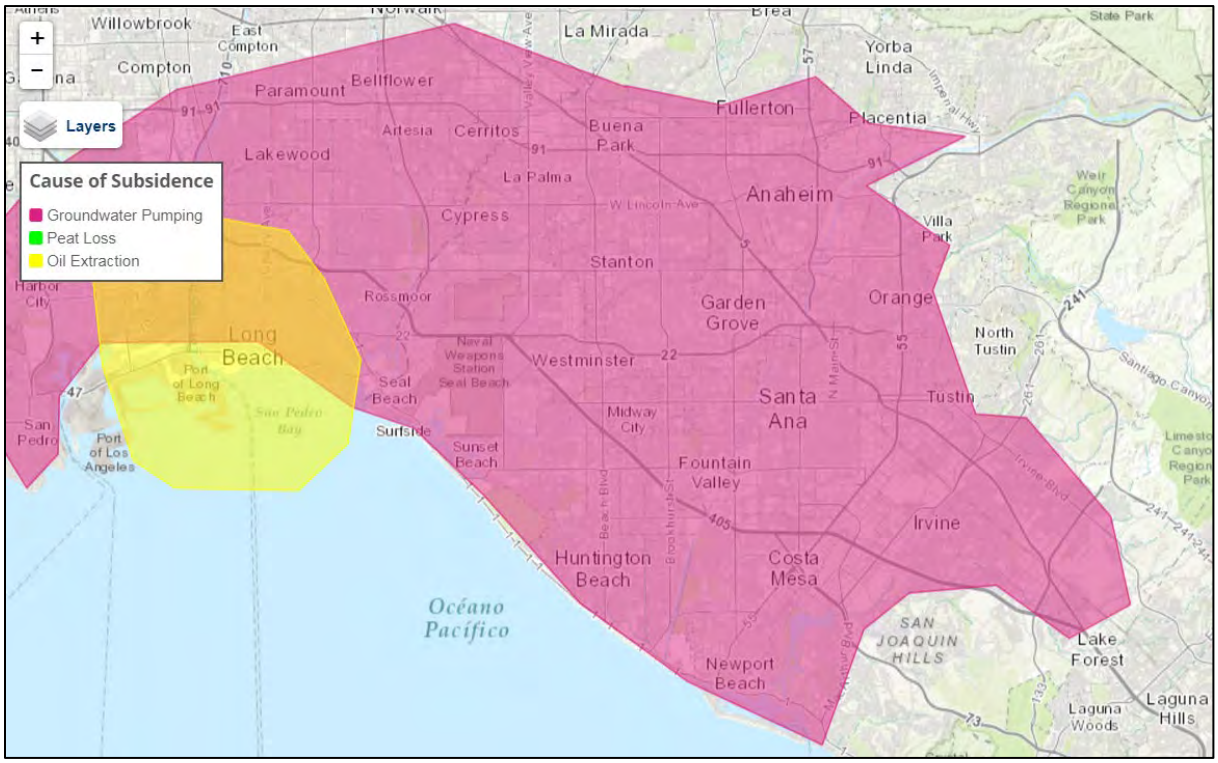
According to the County of Orange General Plan Safety Element (Orange County, 2015), much of Orange County is covered by soil that may cause cracking in concrete foundations. The most prevalent problems occur from clay or "expansive" soils that contract and expand. Problems attributed to expansive soils are usually related to improperly designed or constructed foundations. Due to the diversity of soil conditions, structures are not completely safe from cracking, slipping, or sinking to some degree. Expansive soils are typically mitigated through structural and design regulations as well as through soil treatment techniques. The California Building Code specifically addresses expansive soils in Sections 1804.4, 1806.5, and 1815. The California Health and Safety Code Section 17954 states, "If the preliminary soil report indicates the presence of critically expansive soils or other soil problems which, if not corrected, would lead to structural defects, such ordinance shall require a soil investigation of each lot in the subdivision" and "The soil investigation shall be prepared by a civil engineer who is registered in this state." Expansive soils can impact the entire planning area.

Land Subsidence

Currently, land subsidence affects much of the west coast. The area most affected by land subsidence in Orange County is between Newport Beach and Huntington Beach and 5 miles inland from this point. Referred to as Talbert Gap, this area formed a millennia ago from alluvial deposition from the Santa Ana River.

According to the USGS online map viewer, areas starting from Newport Beach up to Seal Beach, and out east to Placentia, experience subsidence impacts due to groundwater pumping. **Exhibit 3-10** shows the areas impacted by subsidence.

Exhibit 3-10. Subsidence



Landside/Mudflow

Exhibit 3-11 illustrates the portions of the planning area susceptible to landslides based upon topography, surface and subsurface geology, borehole data, historical groundwater levels, existing landslide features, slope gradient, rock-strength measurements, geologic structure, and probabilistic earthquake shaking estimates. These areas are primarily comprised of the southern coastal communities and the communities containing steeper topography or located adjacent to mountain areas.

The extent of landslides/mudflows varies throughout Orange County depending on the location and contributing conditions, such as an earthquake, heavy rain, or recent fires. Earthquake-induced landslides are relatively shallow falls and slides, in which highly disrupted masses of rock and soil travel down slopes at high speed. The Northridge earthquake, in Los Angeles County, triggered more than 11,000 landslides in an area of 6,200 square miles. Most slides were shallow, brittle failures of surficial rock and soil.

Deep-seated landslides are triggered by cumulative rainfall during long periods (weeks to years). Resulting landslides are relatively deep earth flows and translational or rotational earth slides and rock slides. Translational landslides are typically a few meters to tens of meters deep, and rotational slides range in depth from several meters to tens of meters. Deep-seated translational and rotational landslides, including rock slides, tend to fail a little at a time and move more slowly than debris flows, but a few do accelerate to rapid movement. A previous landslide within Orange County due to oversaturated soils resulted in a 40-foot landslide below a 5-million-gallon water tank. Other landslides in the county have measured approximately 3.5 acres and 25 acres.

Similarly, short-duration, intense rainfall, and generally greater than 0.5 inch per hour precipitation has the potential to trigger post-fire debris flows. These flows can extend several miles. Documented debris flows from burned areas in Southern California and the western United States have ranged in volume from as small as 600 cubic meters to as much as about 300,000 cubic meters. This larger volume is enough material to cover a football field with mud, rocks, and debris to about 65 meters deep.

3.2.4.4 Magnitude/Severity

Expansive Soils

Damages to property due to erosion and deposition are usually classified as cosmetic, functional, or structural. Cosmetic damage refers to slight problems where only the physical appearance of a structure is affected (e.g., cracking in plaster or drywall). Functional damages refer to situations where the use of a structure has been impacted due to subsidence. Structural damages include situations where entire foundations require replacement due to subsidence-caused cracking of supporting walls and footings.

Buildings and infrastructure across Orange County are vulnerable to the impacts of soil expansion, instability, and erosion-related hazards. Cities in Southern California have established guidelines for construction in areas of expansive soils. The MAs generally conduct soil surveys prior to construction of water and wastewater facilities and take the specific circumstances into consideration during design and construction. The magnitude and severity of expansive soils are similar throughout the planning area.

Land Subsidence

The Talbert Gap, as described above, has sustained nearly a century of underground water aquifer pumping, which was used to sustain intensive grazing and agriculture practices. By 1956 the water table had lowered to below sea level allowing saltwater from the Pacific Ocean to intrude through the Talbert Gap. Because of studies identifying subsidence and saltwater intrusion in Orange County, OCWD began a massive management program to minimize the loss of aquifer-stored water and reduce saltwater intrusion. Although subsidence is a concern within Orange County, programs have been implemented to address subsidence issues. The MAs within the portion of the planning area identified as having historic subsidence could continue to be impacted if it is not monitored and addressed.

Landside/Mudflow

Factors included in assessing landslide magnitude/severity include population and property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. The California Geological Survey landslide maps prepared as part of the Seismic Hazard Program (refer to **Exhibit 3-11**) indicate the extent of landslide susceptibility within Orange County, which includes the southernmost coastal areas and eastern areas of the county. These areas would also be more likely to experience mudflows due to the topography of the areas.

Exhibit 3-11. Landslide Susceptibility

3.2.4.5 Probability of Future Occurrences

Expansive Soils

Expansive soils will continue to occur throughout the planning area. Potential impacts associated with these hazards will need to be addressed through site design and development review, including preparation and adherence to geotechnical constraints recommendations.

Land Subsidence

In areas that have experienced decreased precipitation in the summer months and reduced surface water supplies, communities are often forced to pump more groundwater to meet their needs. Orange County has historically experienced long-term droughts, especially in recent years. Although specific areas of excessive pumping, such as Talbert Gap, have been addressed, there is still a high probability that communities within the planning area will continue to experience impacts of these events.

It is important that these communities consider future mitigation actions that will address this hazard, particularly in newly developing areas near water. In areas where groundwater pumping has caused subsidence, switching to surface water supplies can be instrumental. Changing climate norms are expected to affect soil resources and especially during hot, dry years annual grasses that stabilize and protect topsoil often fail to germinate or do not grow well. This leaves soil surfaces highly vulnerable to erosion from wind and precipitation and can further exacerbate the consequences of soil expansion and subsidence.

Landside/Mudflow

A study conducted by Nature Geoscience in 2015 indicated that the projected upsurge of El Niño and La Niña events will increase the likelihood that coastal communities will experience erosion and flooding (Barnard, 2015). This is separate from sea level rise, which has also been identified as a cause of future hazard vulnerabilities. In addition to erosion and flooding, the onset of El Niño and La Niña events will also increase the magnitude and severity of mudflow events. The more recent wildfires also contribute to the probability of mudflows in the event of more intense rainfall over a short duration. Earthquakes of magnitude 4.0 and greater have been known to trigger landslides. The potential for an earthquake to induce a landslide is highly dependent on the location of the earthquake and magnitude in relation to a landslide area. Based on previous landslide and mudflow incidents, along with studies predicting future occurrences, it is reasonable to state that these hazards will continue to impact the jurisdictions identified within the landslide susceptibility areas of Orange County. According to the Planning Team ranking, landslides and mudflows are somewhat likely—having between a 1% and 10% probability in next year or a recurrence interval of 11 to 100 years.

3.2.4.6 Climate Change Considerations

Expansive Soils

It is possible that expansive soils may be affected by climate change, as climate change is expected to bring about more frequent drought conditions and contribute to more intense storms, like El Niño. These extreme conditions could further increase the effects of expansive soils on structures since there could be a change in the physical expansion and contraction of soils in affected areas, potentially increasing damage to structures and infrastructure.

Land Subsidence

As temperatures increase so too will the demand for water usage. The potential that precipitation events could decrease in frequency, while experiencing a potential increase in intensity, could result in less water being recharged into the aquifer/basin. If lower water levels occur within the groundwater aquifer the potential for land subsidence could increase within the affected parts of Orange County.

Landside/Mudflow

Due to the wide variety of factors that can lead to landslides and mudflows, it is possible that climate change could indirectly affect the conditions for landslides and mudflows. Increased frequency and more intense storms may cause more moisture-induced landslides. Warmer temperatures and more frequent drought conditions may lead to more fires, destabilizing soil on slopes, and making future landslide and mudflow events more likely.

3.2.5 Human-Caused Hazards (Contamination/Saltwater Intrusion, Hazardous Materials, Power Outage, Terrorism [Cyber Threat], Terrorism [Mass Casualty Incident])

3.2.5.1 Description (Nature) of the Hazard

Human-caused hazards are distinct from natural hazards in that they result directly from the actions of people. Two types of human-caused hazards include: non-malicious and malicious. Non-malicious hazards refer to incidents that can arise from human activities such as the manufacturing, storage, transport, and use of hazardous materials, which include toxic chemicals, radioactive materials, and infectious substances. Non-malicious hazards are assumed to be accidental and their consequences unintended. Malicious, on the other hand, encompasses intentional and criminal acts involving weapons of mass destruction (WMD) or conventional weapons. WMD can involve the deployment of biological, chemical, nuclear, and radiological weapons with the result of affecting a significant percentage of the population either directly or indirectly. Conventional weapons and techniques include the use of arson, incendiary explosives, armed attacks, intentional hazardous materials release, and cyber terrorism (attack via computer). Typically, conventional weapons have a very specific target and are limited in scope and effect.

Groundwater Contamination

Groundwater contamination occurs when pollutants are released to the ground, navigate through the soil, and ultimately end up in the groundwater. Human activity is almost always the underlying cause of groundwater contamination. In areas where population density is high and human use of land is intensive, groundwater is especially vulnerable. Virtually any activity whereby chemicals or wastes may be released to the environment, either intentionally or accidentally, has the potential to pollute groundwater.

Saltwater Intrusion

When fresh water is withdrawn from aquifers at a faster rate than it is replenished, a draw-down of the water table occurs with a resulting decrease in the overall hydrostatic pressure. When this happens near a coastal ocean area, saltwater from the ocean can intrude into the freshwater aquifer. The result is that freshwater supplies become contaminated with saltwater.

Hazardous Materials

Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. The State of California defines a hazardous material as a substance that is toxic, ignitable, or flammable or reactive and/or corrosive. An extremely hazardous material is defined as a substance that shows high acute or chronic toxicity, carcinogenicity, bio-accumulative properties, persistence in the environment, or is water reactive (California Code of Regulations, Title 22). "Hazardous waste," a subset of hazardous materials, is material that is to be abandoned, discarded, or recycled and includes chemical, radioactive, and bio-hazardous waste (including medical waste). An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. With respect to water or wastewater systems, concerns arise regarding exposure to these materials via contact or ingestion of drinking water and or discharge of contaminated water into the ocean where exposure to the marine environment and public would be of concern.

Non-malicious hazards can occur because of human carelessness, technological failure, and natural hazards. When caused by natural hazards, these incidents are known as secondary hazards, whereas intentional acts are terrorism. Hazardous materials releases, depending on the substance involved and type of release, can directly cause injuries and death and contaminate air, water, and soils. While the probability of a major release at any facility or at any point along a known transportation corridor is relatively low, the consequences of releases of these materials can be very serious.

The most common sources of contamination to water supply systems are naturally occurring chemicals and minerals (i.e., arsenic, radon, and uranium), local land use practices (i.e., fertilizers and pesticides), manufacturing processes, sewer overflows, and malfunctioning wastewater treatment systems (i.e., nearby septic systems). Although these contaminants present an environmental and human health risk concern, the EPA holds regulations in place to ensure water supply systems do not contain elevated levels of contaminants.

Some hazardous materials also present a radiation risk. Radiation is any form of energy propagated as rays, waves, or energetic particles that travel through the air or a material medium. Radioactive materials (e.g., uranium, plutonium, radium, and thorium) are composed of unstable atoms. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is radiation. The process by which an atom changes from an unstable state to a more stable state by emitting radiation is called radioactive decay or radioactivity.

Radiological materials have many uses including:

- Use by doctors to detect and treat serious diseases,
- Use by educational institutions and companies for research,
- Use by the military to power large ships and submarines, and
- Use as a critical base material to help produce the commercial electrical power that is generated by a nuclear power plant.

Radioactive materials, if handled improperly, or radiation accidentally released into the environment can be dangerous because of the harmful effects of certain types of radiation on the human body and the human environment. The longer a person is exposed to radiation and the closer the person is to the radiation source, the greater the risk. Although radiation cannot be

detected by the senses, scientists can easily detect it with sophisticated instruments that can detect even the smallest levels of radiation. Under extreme circumstances, an accident or intentional explosion involving radiological materials can cause very serious problems. Consequences may include death, severe health risks to the public, damage to the environment, and extraordinary loss of, or damage to, property.

Power Outage

A power outage typically occurs during a natural hazard such as extreme weather conditions, earthquakes, flood, fire, or severe winds. An outage can result in damaged power equipment or equipment failures and can affect multiple counties for hours. This type of event can range from a moderate event to a catastrophic regional event that may threaten human life, safety, and health, or interferences with vital services. An outage may occur as a secondary effect of another hazard, or as the result of construction, an accident, or terrorism. Severe winds and flood can bring down trees and tree limbs onto power lines. And these types of events can cause serious safety hazards to the public and emergency responders.

Terrorism (Cyber Threat)

Cyber threats are when an individual or a group threatens or attempts to disrupt the operations and functioning of computer systems belonging to private citizens, religious groups, educational institutions, government agencies, or businesses. These threats include online harassment, hacking, or in-person tampering with electronic equipment. Successful cyber threats can lead to service disruptions, infrastructure damage, and theft and may cause injury or death in severe instances. All of Orange County's water utilities Supervisory Control and Data Acquisition (SCADA) systems, which operate over telecommunication lines and/or radio systems. These systems are vulnerable to hacking and leave utilities open to malicious acts.

Terrorism (Mass Casualty Incident)

Following several serious international and domestic terrorist incidents since the early 2000s, citizens across the United States have paid increased attention to the potential for deliberate, harmful terrorist actions by individuals or groups with political, social, cultural, and religious motives. There is no single, universally accepted definition of terrorism, and it can be interpreted in a variety of ways. However, terrorism is defined in the CFR as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR § 0.85). The Federal Bureau of Investigation further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences. Terrorists can utilize a wide variety of agents and delivery systems.

Water supplies and infrastructure, such as dams, in Orange County are considered as potential terrorist targets. The weapon most likely used could include explosives with the goal of collapsing the dam. Such an event would result in a dam failure and an inundation event with little or no warning. The potential of using other types of weapons such as chemical or biological are considered low due to the large amount of material that would be required to contaminate the water system. This scenario would only apply to those dams where the reservoirs are used for drinking water.

A mass casualty incident describes an incident within the United States where emergency medical services resources, such as personnel and equipment, are overwhelmed by the number and severity of casualties. The more commonly recognized events of this type include building collapses, train and bus collisions, plane crashes, earthquakes, and other large-scale emergencies. The most common types are generally caused by terrorism, mass transportation accidents, or natural disasters. Events such as the Oklahoma City bombing in 1995, the September 11 attacks in 2001, and the 2017 Las Vegas Shooting are well-publicized examples of mass casualty incidents.

3.2.5.2 History/Past Occurrences

Groundwater Contamination

Over the last several decades, Orange County's North Basin has experienced industrial solvent spills and leaks from manufacturing, metals processing businesses, and dry-cleaning facilities. As a result, a contamination plume several miles long and over a mile wide currently exists under the cities of Fullerton, Anaheim, and Placentia. The Orange County Groundwater Basin is a source of drinking water for the region, providing most of the water used in 22 cities. The contamination plume has already taken five wells off line, including three of Fullerton's 12 total wells. Those wells draw water from shallower sources closer to the surface and consequently are closer to the pollution. According to the EPA, they have completed the "first phase of the Comprehensive (site-wide) RI/FS, which involved the installation of additional monitoring wells to further characterize the entire site. This report is expected to be completed in December of 2024" (EPA Superfund n.d.).

Saltwater Intrusion

In Orange County, by 1956, years of heavy pumping to sustain the region's agricultural economy had lowered the water table by 15 feet below sea level and saltwater from the Pacific Ocean had encroached as far as 5 miles inland. The area of intrusion is primarily across a 4-mile front between the cities of Newport Beach and Huntington Beach known as the Talbert Gap. The mouth of an alluvial fan formed millions of years ago by the Santa Ana River, the Talbert Gap has since been buried along the coast by several hundred feet of clay. In 1976, the Water Factory 21 Direct Injection Project, operated by OCWD, began injecting highly treated recycled water into the aquifer to prevent saltwater intrusion, while augmenting the potable groundwater supply. This system was shut down to make way for the Groundwater Replenishment System (GWRS) Project, which began operation in 2008. The GWRS provides highly treated water for injection into the seawater barrier system to prevent seawater intrusion into the Orange County Groundwater Basin. As of September 17, 2024, more than 444 billion gallons of water have been successfully treated and injected into the seawater barrier system.

Hazardous Materials

Numerous facilities in Orange County generate hazardous waste in addition to storing and using large numbers of hazardous materials. Although the scale is usually small, emergencies involving the release of these substances can occur daily at both fixed sites and on Orange County's streets and roadways. Facilities that use, manufacture, or store hazardous materials in California must comply with several Federal and State regulations. The Superfund Amendments and Reauthorization Act (SARA Title III), which was enacted in 1986 as a legislative response to airborne releases of methyl isocyanides at Union Carbide plants in Bhopal, India, and in Institute, West Virginia. SARA Title III, also known as the Emergency Planning and Community-Right-To-Know Act

(EPCRA), directs businesses that handle, store, or manufacture hazardous materials in specified amounts to develop ERPs and report releases of toxic chemicals. Additionally, Section 312 of Title III requires businesses to submit an annual inventory of hazardous materials to a State-administering utility. The California legislature passed Assembly Bill 2185 in 1987, incorporating the provisions of SARA Title III into a State program. The EPCRA requirements keep communities abreast of the presence and release of hazardous wastes at individual facilities.

Additional information about the chemicals handled by manufacturing or processing facilities is contained in the EPA's Toxic Release Inventory (TRI) database. The TRI is a publicly available EPA database that contains information on toxic chemical emissions and waste management activities reported by certain industry groups as well as Federal facilities. This inventory was established under EPCRA and expanded by the Pollution Prevention Act of 1990. Facilities that exceed threshold emissions levels must report TRI information to the EPA, which is the Federal enforcement agency for SARA Title III.

Over the past several decades, industrial activities have contaminated Orange County's North Basin, which provides much of the water used in 22 Orange County cities, including parts of Fullerton, Anaheim, and Placentia. Over 5 square miles of contaminants, mostly volatile organic compounds (VOCs), have migrated through the soils and are now leaching into the underlying groundwater. These VOCs have impacted nearby water supply wells causing four of them to be taken out of service. The OCWD, under EPA oversight, is currently conducting an interim remedial investigation and feasibility study to determine the extent of groundwater contamination. The report is expected in December 2024 (EPA Superfund n.d.).

Chemical air emissions, surface water discharges, underground injections, and releases to land are considered chemical releases. The release of a biological agent capable of causing illness in people is considered an infectious release. The only known release of radiological agents into the air in Orange County was the result of an accident at San Onofre Nuclear Generating Station (SONGS). In 1981, an accidental "ignition" of hydrogen gases in a holding tank of the SONGS caused an explosion which bent the bolts of an inspection hatch on the tank, allowing radioactive gases in the tank to escape into a radioactive waste room. From there, the radioactive material was released into the atmosphere. The plant was shut down for several weeks following the event (MWDOC, 2019). This incident occurred during operation of the plant's Unit 1 generator, which has since been decommissioned. No serious injuries occurred.

On February 3, 2001, another accident occurred at SONGS when a circuit breaker fault caused a fire that resulted in a loss of offsite power. Published reports suggest that rolling blackouts during the same week in California were partially due to the shutdown of the SONGS reactors in response to the 3-hour fire. Although no radiation was released, and no nuclear safety issues were involved, the Federal Nuclear Regulatory Commission sent a Special Inspection Team to the plant to investigate the accident.

In June 2013, SONGS permanently closed after faulty replacement steam generators were installed at the nuclear facility. SONGS is currently undergoing the process to decontaminate and dismantle the nuclear facility. As of August 2017, a court settlement requires the operators of SONGS, Southern California Edison (SCE), to relocate the 3.55 million pounds of nuclear waste to another facility. One of the possible sites is the Palo Verde Nuclear Generating Station in Arizona, located approximately 330 miles away. Transportation of nuclear waste poses a concern of environmental and human health risk if radiation is released into the environment.

Power Outage

Orange County has experienced many power outages in the past. There have been small to moderate incidents and several extreme incidents that have lasted hours in certain areas. Power outages are most commonly seen in Southern California when Santa Ana wind conditions occur.

One of the most severe events occurred in September 2011 and is referred to as the 2011 Southwest Blackout. This event affected southern Orange County, the San Diego-Tijuana area, Imperial Valley, Mexicali Valley, Coachella Valley, and parts of Arizona. The incident is known to have been an 11-minute system disturbance which led to cascading outages and 2.7 million customers left without power, some for up to 12 hours. The hardest hit areas of San Diego-Tijuana, experienced street gridlock due to loss of traffic signals, school and businesses closing, flights and public transportation delays, and water and sewage pumping station power loss.

In 2013, a blackout resulted in approximately 123,000 homes and businesses losing power for several hours. Faulty circuits affected people in a number of Orange County communities including Mission Viejo, Laguna Niguel, Ladera Ranch, Coto de Caza, Ortega, San Clemente, Talega, San Juan Capistrano, Dana Point, and Capistrano Beach.

Terrorism (Cyber Threat)

Exhibit 3-12 displays a list of water and wastewater utilities, jurisdictions, and local agencies located in Southern California that were victims of cyber threat events since 2019.

Exhibit 3-12. Southern California Cyber Threat Events

Date of Event	Target Organization	Description of Event
3/11/2019	OC San	OC San was the victim of a phishing data breach. More than 1,000 employee records were accessed as part of the breach through the OC San deferred compensation plan.
10/14/2019	Cucamonga Valley Water District	Cucamonga Valley Water District disclosed a data breach that occurred between August 26, 2019, and October 14, 2019. The breach occurred on a server that is used to accept one-time credit card payments from customers.
12/24/2019	City of Seal Beach	City of Seal Beach was the victim of a ransomware attack that affected city computer systems. The attack was targeted at the city's Information Technology service provider, which allowed the hackers to encrypt city computers with the malware, primarily impacting city email and voicemail functions.
4/23/2023	San Bernardino County Sheriff's Department	The San Bernardino County Sheriff's Department was hit with a cyberattack when a hyperlink loaded with malicious malware was clicked, which resulted in the sudden encryption of many of the department's systems and subsequent ransom demand to restore functionality. San Bernardino County paid a $1.1 million ransom to the hacker, approximately half of which was covered by insurance as Orange County had anticipated the possibility of such an attack.
8/3/2023	California's Prospect Medical Holdings	A California-based company's medical facility services throughout the United States were disrupted by cyber threat event. Seven hospitals in Orange and Los Angeles counties including two behavioral health facilities and a 130-bed acute care hospital in Los Angeles were effected.

Date of Event	Target Organization	Description of Event
11/20/2023	Orange County District Attorney's Office	The Orange County District Attorney's Office was targeted by a cyberattack, prompting a shutdown of its information technology system. The District Attorney's Office immediately coordinated with partner agencies, including all law enforcement entities in Orange County, including the Orange County Sheriff's Department. It was unclear exactly what type of information may have been accessed by hackers.

Exhibit 3-13 displays a list of water and wastewater utilities throughout the United States that were victims of a cyber threat event since 2019.

Exhibit 3-13. U.S. Water and Wastewater Utilities Cyber Threat Events

Date of Event	Target Organization	Description of Event
3/14/2019	Fort Collins Loveland Water District	Fort Collins Loveland Water District and South Fort Collins Sanitation District are the victims of a ransomware attack that occurred on February 11, 2019.
3/27/2019	Post Rock Rural Water District	Kansas Waste Water System (WWS) was hacked by a former employee able to use credentials to remotely tamper with facility processes and threaten safety of drinking water.
6/12/2020	Texarkana Water Utility	Texarkana Water Utility was the victim of a ransomware attack.
8/2/2020	Water facility in the city of Oldsmar	Hackers broke into the computer system of a facility that treats water for the City of Oldsmar, Florida. They tried to increase the concentration of sodium hydroxide (NaOH).
1/3/2021	Nevada Water and Wastewater System	Nevada-based WWS was a victim of an unknown ransomware variant that infected its SCADA system.
4/30/2021	Mount Desert Sewage Treatment Plant	A sewage treatment plant in rural Maine suffered a ransomware attack shutting down the control computer.
5/24/2021	WSSC Water	WSSC Water, which provides water to 2 million customers, was hit with a ransomware attack on its non-essential business systems.
1/7/2021	Maine Water and Wastewater System	Maine-based WWS was targeted with ZuCaNo ransomware on its SCADA computer.
1/8/2021	California Water and Wastewater System	California-based WWS was hit with a Ghost variant ransomware attack.
8/4/2021	Limestone Sewage Treatment Plant	A sewage treatment plant in rural Maine suffered a ransomware attack that shut down its control computer.
7/15/2022	Narragansett Bay Commission	The Narragansett Bay Commission, a Rhode Island sewer system operator, was hit with a ransomware attack.
7/26/2023	Johnstown Regional Sewage	Federal and local law enforcement agencies investigated an alleged phishing scam perpetrated against Johnstown Regional Sewage.
11/1/2023	St. Johns River Water Management District	St. Johns River Water Management District, a regulatory agency in Florida that oversees the long-term supply of drinking water, confirmed that it responded to a cyberattack after the Cyber Av3ngers said it attacked the organization, providing samples of what it stole.
11/25/2023	Municipal Water Authority of Aliquippa	The Municipal Water Authority of Aliquippa reported being hacked by the Cyber Av3ngers Iranian-backed cyber group.
11/28/2023	North Texas Municipal Water District	The North Texas Municipal Water District (NTMWD) had a cyber security incident that caused operational issues. The Daixin

Date of Event	Target Organization	Description of Event
		ransomware gang said it was behind the attack, adding NTMWD to its list of victims and claiming to have stolen more than 33,000 files containing customer information.
1/19/2024	Veolia North America	Veolia North America, a subsidiary of transnational conglomerate Veolia, disclosed a ransomware attack that impacted systems in its Municipal Water Division and disrupted its bill payment systems.
2/29/2024	Chelan County Public Utility District	The Chelan County Public Utility District was impacted by a cyber security event that kept a nationwide vendor from mailing and emailing statements.
3/1/2024	Muscatine Power and Water	Muscatine Power and Water warned the public of a ransomware attack discovered on January 26.
3/15/2024	Encina Wastewater Authority (EWA)	Encina Wastewater Authority (EWA) was hit by the BlackByte ransomware group.

Terrorism (Mass Casualty Incident)

While Orange County has not experienced any high-profile attacks by groups or individuals associated with international terrorist organizations, Orange County has several groups for advisory notification, investigation, and analysis of terrorist events and activities. These groups include:

- **Orange County Joint Terrorism Task Force (OCJTTF).** The OCJTTF was formed by the Orange County Sheriff's Department, FBI, and other local police agencies. The OCJTTF is one of 66 joint terrorism task force groups across the United States and the third largest in the Nation. Team members are tasked with collecting, analyzing, and sharing critical information and intelligence involving matters related to any terrorism investigation occurring in or affecting the Orange County area.
- **Orange County Private Sector Terrorism Response Group (PSTRG).** The PSTRG was formed in December 2001 to create a private sector partnership with the Terrorism Early Warning Group to effectively address private sector safety, incident management, employee education, and public health consequences of potential attacks on the critical infrastructure within Orange County. Two large groups involved with PSTRG are the Orange County Business Council, of which 80% of the major businesses in Orange County are members, and TechNet, a consortium of 28 high-tech firms. The objectives of the PSTRG include physical resource sharing, information exchange, virtual reach-back capabilities, and subject/industry matter experts cross-utilization. The PSTRG is an instrument that allows the Sheriff's Department to maximize all resources and prepare community members for the potential of terrorism and recovery in its aftermath.
- **Orange County Intelligence Assessment Center (OCIAC).** The OCIAC was built on the foundation established by the Orange County Sheriff Department's Terrorism Early Warning Group (TEWG) from 2001 to 2007 and is an Operational Area asset governed by the Orange County Chiefs and Sheriff's Association (OCCSA). The OCIAC is a proactive multi-agency, multi-discipline collaborative that provides comprehensive analysis, intelligence, timely information sharing, and infrastructure protection. Within the OCIAC, the Critical Infrastructure Protection Unit uses a multi-disciplinary team comprised of law enforcement, fire, medical, and private sector experts to conduct vulnerability assessments and provide relevant security

updates and training resources to our public and private sector partners in a combined effort to protect Orange County's assets against terrorist attack, criminal activity, and natural disasters.

- **Law Enforcement Mutual Aid.** Orange County law enforcement has long recognized the need for a standardized, uniform, organized response on the part of public safety providers involved in major multi-discipline and multi-jurisdictional incidents. The collaborative efforts of Orange County law enforcement leaders over the past six decades have forged a collective voice in mutual assistance and mutual aid. All major components tasked with public safety (law, fire, health, emergency management) are actively involved in developing emergency plans and insuring emergency preparedness.

3.2.5.3 Location/Geographic Extent

Groundwater Contamination

Groundwater contamination may occur county-wide by means of intentional or accidental spillage to groundwater.

Saltwater Intrusion

Conversely, the coastal area of the Orange County Groundwater Basin is vulnerable to seawater intrusion due to geologic features and increased pumping from inland municipal wells to meet consumer demands. The susceptible locations in the basin are the Talbert, Bolsa, Sunset, and Alamitos Gaps.

Hazardous Materials

Human-caused hazards may affect a specific location or multiple locations, each of which may be a disaster scene, a hazardous scene, and/or a crime scene simultaneously. Accidental hazardous materials release can occur wherever hazardous materials are manufactured, stored, transported, or used. In Orange County, a hazardous material event is most likely to occur within Orange County's industrial areas.

Power Outage

A power outage can cause impacts at the local level and potentially the regional level. As seen from previous occurrences, a severe outage can easily impact several counties at a time. All jurisdictions within the planning area have the potential to be impacted should an event occur; either directly or indirectly. Highly developed communities may see more outage occurrences if a heat wave should occur, due to the number of cooling systems running at once. Water and wastewater facilities with backup generators or alternate power sources are less likely to experience severe losses or disruption.

Terrorism (Cyber Threat)

Since computers are so ubiquitous, a cyber threat could appear in virtually any part of Orange County. In extreme circumstances, a threat could impact the entire county. Cyber threats vary in their length and severity of impact. A minor threat could cause computer systems to slow down for a few minutes and not behave as responsively. On the other hand, a major cyber threat could cause a complete shutdown of critical systems, including those used by banks, healthcare institutions, universities, major businesses, and city governments.

Terrorism (Mass Casualty Incident)

One of the special considerations in dealing with the terrorist threat is that it is difficult to predict. The Department of Homeland Security's National Planning Scenario identifies the possible terrorist strike locations it views as most plausible. Places at risk include cities that have economic and symbolic value, places with hazardous facilities, and areas where large groups of people congregate, such as an office building, sports arena, or amusement park. As such, Anaheim (Disneyland, Angels Stadium, Honda Center), Buena Park (Knott's Berry Farm), and San Clemente (SONGS) are viewed as potential targets.

3.2.5.4 Magnitude/Severity

Groundwater Contamination

The 1974 Safe Drinking Water Act requires the EPA set standards for contaminants in drinking water that may pose health risks to humans. The EPA standard for lifetime exposures in drinking water, the maximum contaminant level (MCL), is the highest amount of a contaminant allowed in drinking water supplied by municipal water systems (EPA Drinking Water n.d.). In Orange County more than 700 monitoring wells assess water quality conditions (OCWD 2015). Thus, it is unlikely that human consumption of contaminated groundwater will occur. A large environmental spill could result in contamination of groundwater; however, the extent and the severity cannot be predicted. Based on historical occurrences, a contamination in the groundwater basin could extend several miles and result in water wells being unavailable.

Saltwater Intrusion

Massive seawater intrusion has been prevented in Orange County by the Orange County Groundwater Basin management programs. However, the threat of saltwater intrusion along the coast is still present. To prevent further intrusion and to provide basin management flexibility, OCWD operates a hydraulic barrier system. A series of 23 multi-point injection wells 4 miles inland delivers fresh water into the underground aquifers to form a water mound, blocking further passage of seawater. Continued injection of recycled water into the aquifer is essential to keep saltwater from intruding into the groundwater table and contaminating a major source of the county's potable water. OCWD maintains the Coastal Aquifer Mergence Zones and Chloride Concentration map, which indicates a 250 mg/L Chloride Concentration Contour. This contour is used to indicate the approximate leading edge of seawater intrusion. OCWD monitors the movement of the chloride contour to provide an indication of whether seawater intrusion is worsening or improving in a given area.

Hazardous Materials

Human-caused hazards have the potential to directly impact water and wastewater systems. A hazardous material spill could be localized and, depending upon when the spill is identified and addressed, may be contained with limited to no impact on water supplies and systems. However, there is the potential for a hazardous material spill to severely impact water supplies due to groundwater intrusion and direct contamination of a water source. The magnitude and severity of the hazard would be highly dependent upon the type of hazardous material spill, location, and the extent to which the hazardous material extends into the water system. Similarly, an act of terrorism could cause a significant impact to water and wastewater systems depending upon the type of event and whether it occurs at a primary source or is focused to a specific area or system. Human-

caused hazards can have a direct impact on water supplies and the ability to provide water services to communities, potentially resulting in significant health and safety issues.

Power Outage

A power outage has the potential to directly impact water and wastewater systems. Disruption of water utilities and systems often requires notification of the public and businesses to curtail usage, boil available water, use bottled water, etc. Firefighting capabilities may also be impacted if an outage causes disruption to water supplies. In areas where telephone service is provided by above-ground lines that share poles with electrical distribution lines, telecommunications providers may not be able to make repairs to the telephone system until electrical utilities restore power lines to a safe condition. This could impact response times to a water or wastewater incident. The impacts of electric utility disruptions are felt most significantly by Southern California communities during the summer months due to cooling demands from higher heat. Any extended electric disruption can also lead to local economic losses when computers, lighting, refrigeration, gas pumps, and other equipment are without power during business hours. A severe power outage also can cause cascading impacts such as transportation incidents, civil unrest, and disease. The magnitude/severity of a power outage would be the same for all jurisdictions within the planning area.

Terrorism (Cyber Threat)

Cyber threats are not measured on any scale, but they can be assessed by determining:

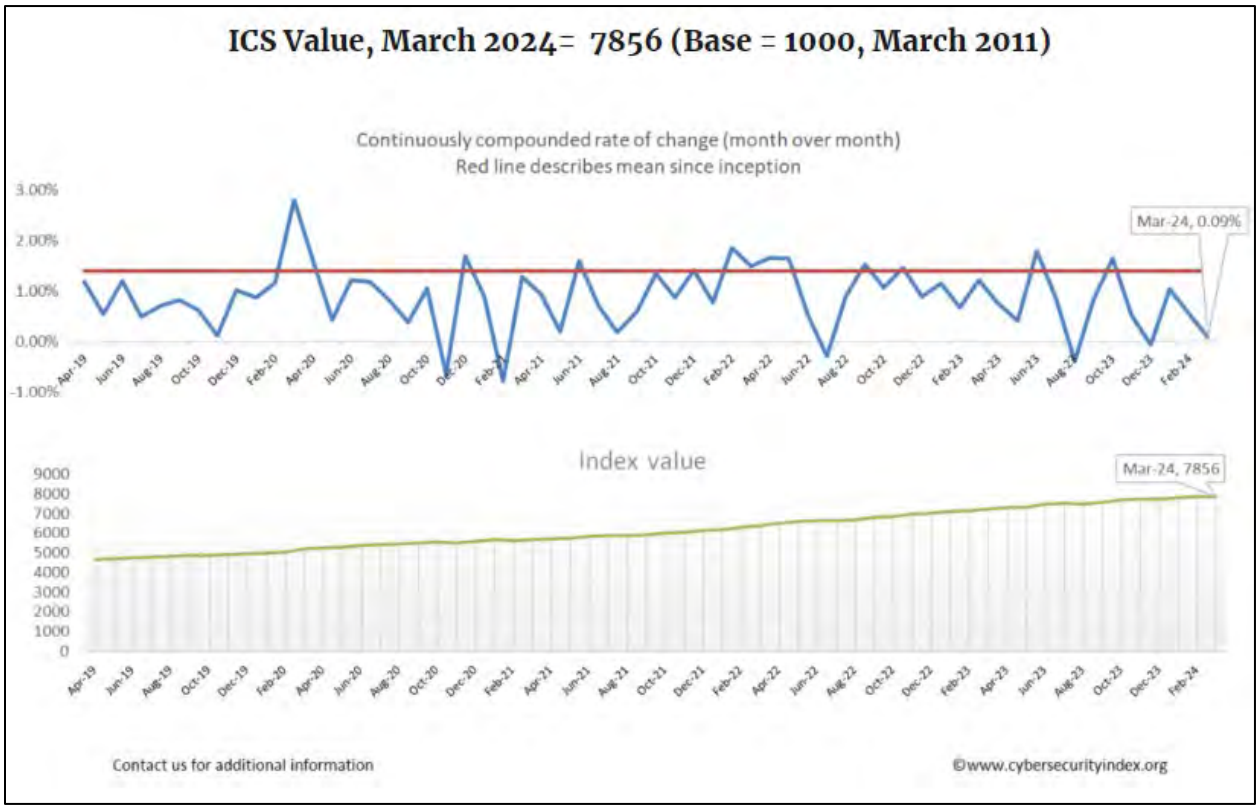
- The type of incident (website defacement, denial of service, unauthorized surveillance)
- The use of malicious software
- The level of security countermeasures that failed to prevent the cyber threat
- The duration of the cyber threat (a few hours, a few days, several weeks, etc.) (Mateski 2012)

Globally, cyber threats are increasing and becoming more sophisticated. The most common types of attacks include:

- Phishing
- Ransomware
- Intellectual Property Theft
- Spyware/Malware
- Unpatched Software

The Index of Cyber Security (NYU 2024) **Exhibit 3-14** can be referenced to understand the status of cyber threats, which identifies the measure of perceived risk. Since 2015, this index has trended upward and appears to have doubled in this timeframe.

Exhibit 3-14. Index of Cyber Security



Source: NYU, 2024

Terrorism (Mass Casualty Incident)

Possible locations that may attract acts of terrorism were discussed in **Section 3.2.5.3**; however, the perpetrators may also choose high-value targets such as electricity-generating facilities, water treatment plants, dams or reservoirs, railroads, highways, and other facilities that could impact governmental operations and services. Mass casualty incidents and acts of terrorism are typically measured by the fatalities, injuries, and destruction they cause, but there is no universally used scale for measuring these events.

3.2.5.5 Probability of Future Occurrences

Groundwater Contamination

Due to the amount and types of urban development that occur within Orange County and the transportation systems that allow for the movement of hazardous materials through the county and greater region, future groundwater contamination is likely. However, as a result of groundwater monitoring and protection systems, human consumption of contaminated groundwater is unlikely.

Saltwater Intrusion

Due to the successful operation of the Orange County Groundwater Basin management programs, the probability of saltwater intrusion in the future is unlikely.

Hazardous Materials

According to the Cal OES, hazardous materials have been released approximately 1,517 times (incidents that were reported to Cal OES) into the environment between the years of 2019 and 2024 in Orange County, for an average of approximately 253 times a year during that period. Thus, the probability of future contamination of the environment is likely. However, human consumption of contaminated groundwater is unlikely due to the constant monitoring of more than 700 wells across Orange County (OCWD 2015).

Power Outage

Power outages are a normal part of life and are unpredictable; they happen for many reasons and can be expected to continue in the future. Water and wastewater systems are most susceptible to failure during extreme weather conditions, fires, and earthquake events. Regional power outages can threaten human life, particularly when outages affect water supply, hospitals, and other healthcare facilities. As both population and climate variability increase across Southern California and puts more pressure on aging distribution systems, it is likely that power outage events will continue to occur. Due to the nature and extent of power outages, the probability for future occurrences would be the same for all jurisdictions in the planning area.

Terrorism (Cyber Threat)

Due to the integrated nature of technology into the everyday lives of residents, businesses, and government operations, it is possible that a cyber incident could emerge in the future as these threats occur on a daily basis across the planning area.

Terrorism (Mass Casualty Incident)

Because of the dynamic nature of the terrorist threat and the open nature of California society, all jurisdictions within California are vulnerable to terrorist attack. One must know the minds and capabilities of various terrorists and terrorist groups; these are characteristics terrorist organizations strive to conceal. Because all terrorists are not the same, the calculation is even more difficult. From the perspective of hazard mitigation, the most often used weapon of terrorists is bombs, and the greatest potential for loss is from weapons of mass destruction (WMDs).

3.2.5.6 Climate Change Considerations

Groundwater Contamination

Climate change can cause more frequent and intense precipitation, which can lead to increased instances of flooding. Flooding can potentially mobilize contaminants in soil, which can then be transported to aquifers. While more intense precipitation events are anticipated, they could be followed by or preceded by droughts, which can potentially cause groundwater levels to decline. As groundwater levels fall, a greater concentration of contaminants occurs, impacting the ability to provide safe potable water to customers. Rising sea levels can lead to an increase in saltwater intrusion, which can contaminate groundwater aquifer/basins in coastal areas. Rising temperatures can increase the temperature of groundwater, which can potentially affect the levels and concentrations of undesirable substances in the water. Increased rainfall (both in intensity and frequency) can lead to more runoff of nutrients into water bodies, which can cause harmful algal blooms. Climate change may also lead to changes in human activities, such as increased pumping, irrigation, or land use, which can also impact groundwater quality and exacerbate other issues associated with groundwater supplies.

Saltwater Intrusion

Climate change has led to an increase in sea levels. When this is combined with increased groundwater pumping, the potential for saltwater intrusion can increase. Sea level rise may also lead to larger areas of coastal lands becoming inundated. With additional areas inundated, the potential for additional seawater displacing fresh water increases. Saltwater intrusion into groundwater aquifers can increase treatment costs for drinking water facilities or render groundwater wells unusable. As sea levels rise, the "salt front" (location of the freshwater-saltwater line) may progress further upstream. This encroachment may be further exacerbated by drought, reduced rainfall, or changes in water use and demand. Saltwater intrusion can result in the need for water utilities to increase treatment, relocate water intakes, or develop alternate sources of fresh water.

Hazardous Materials

Climate change itself has no direct effect on hazardous material releases. However, climate change may increase the frequency or severity of other hazard types, which may result in a hazardous material release as an indirect effect. For example, climate change is expected to cause a 10% to 20% increase in the average intensity of the strong storms that affect Orange County during the winter. An increase in the intensity of these storms increases the chance that such a storm may damage or destroy a hazardous material storage tank, cause a vehicle crash involving hazardous materials, or lead to an incident that results in the release of hazardous materials.

Power Outage

As temperatures increase, so will the increases in demand for utility/energy providers to produce larger quantities of reliable energy to power cooling equipment in homes and businesses. This could cause an increased strain on the current infrastructure and production facilities, possibly leading to an increase in power shortages and a decrease in the current energy grid reliability.

Terrorism (Cyber Threat)

Climate change is not likely to impact cyber threats in the future within Orange County.

Terrorism (Mass Casualty Incident)

Climate change has no direct impact on terrorism, as acts of terror are not directly caused by climate conditions. However, national security experts have raised concerns as early as 2003, if not before, that climate change indirectly affects terrorism by causing food, water, and resource shortages, potentially triggering migrations and economic upheaval that could cause some individuals to commit acts of terror (Schwartz and Randall 2003). More recently, a report prepared by the U.S. Department of Defense (DoD) repeated and expanded upon the connection between climate change and national security, referring to climate change as a "threat multiplier" that can "enable terrorist activity and other forms of violence" (DoD 2015).

3.2.6 Seismic Hazards (Fault Rupture, Seismic Shaking, and Liquefaction)

3.2.6.1 Description (Nature) of the Hazard

Earthquakes are considered a major threat to Orange County, especially when focusing on water and wastewater facilities and pipelines that run throughout the county. A significant earthquake along one of the major faults could cause substantial casualties, extensive damage to

infrastructure, fires, and other threats to life and property. Significant damage and outages of water and wastewater facilities could also occur. The effects could be aggravated by aftershocks and by secondary effects such as fire, landslides, and dam failure. A major earthquake could be catastrophic in its effects on the population and could exceed the response capability of the local communities and even the State.

Following major earthquakes, 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. In the event of a truly catastrophic earthquake, identification and burial of the dead would pose difficult problems. Mass evacuation may be essential to save lives. 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. With damage to critical water and wastewater infrastructure there will be significant public health concerns, such as dehydration or exposure to contaminated water, and the potential for reduced fire protection due to limited sources of water. Facilities at greatest risk from severe earthquakes are dams and pipelines. Additionally, damage to water and sewer lines that service commercial and industrial areas could have a significant impact on the economy of the region. Extensive mutual aid for an extended period may be required to bring water and wastewater services back online.

Earthquakes strike with little to no warning, and they can have multiple impacts on an area. After-effects from an earthquake may include impacted roadways, downed power and communication lines, fires, and damages to structures (especially poorly built structures or those already in disrepair). Should a major event occur, major damages and losses should be expected to pumping systems and wastewater treatment infrastructure. Earthquakes are not a seasonal hazard, and thus can be experienced year-round. This fact presents its own set of planning and preparedness concerns.

Seismic-specific building codes can provide MAs with reasonable guidance for structural mitigation. As maintenance and potentially new building occurs within the planning area, seismic retrofitting is highly recommended to prevent extensive damage to essential infrastructure.

For decades, partnerships have flourished between the United State Geological Survey (USGS), Cal Tech, the California Geological Survey (CGS), and California universities to share research and educational efforts with Californians. Tremendous earthquake mapping and mitigation efforts have been made in California in the past two decades, and public awareness has risen remarkably during this time. Major Federal, State, and local government utilities and private organizations support earthquake risk reduction. These partners have made significant contributions in reducing the adverse impacts of earthquakes.

Fault Rupture

Fault rupture occurs when the Earth's surface shifts and cracks along a fault line during a seismic event. While this phenomenon is not especially dangerous in natural environments, issues arise when structures are built near or on top of an active fault. Per the California Geological Survey (CGS), an active fault has experienced surface movement in the past 11,700 years. (CGS, n.d.A)

The shifting and movement of the Earth's tectonic plates are responsible for seismic events. These tectonic plates can pull away from, move toward, or pass by each other. As they do, the plates sometimes lock together. This inability to move creates tension, which is eventually released like a

springboard. The tension dissipates into the Earth's crust. The location at which two tectonic plates join is called a fault line. Fault lines are sometimes visible on the Earth's crust as sudden rifts or anomalies in the landscape's continuity. California's major north-south fault line is the San Andreas Fault, where the North American and Pacific Plates meet. However, constant friction between the two plates over the millennia has caused the areas where the two plates intersect to become fragmented, creating new, smaller faults.

The area near a fault line is at risk of damage due to the potential for a fault rupture—the deformation or displacement of land on either side of the fault—and may move a few inches to several feet in opposite directions. Buildings or infrastructure near a fault line could be severely damaged or destroyed. The fault rupture's direction depends on the fault type: dip-slip faults produce vertical shearing, strike-slip faults produce horizontal shearing, and oblique-slip faults produce both vertical and horizontal shearing. A fourth kind of fault, called a "blind" fault, produces virtually no visible land displacement. Some faults have emerged recently in geologic history. Quaternary faults have developed between the Holocene Era and the present (within the last 1.8 million years). These faults are especially concerning since they are the most likely to be active and cause future earthquakes. (CGS, n.d.B)

Seismic Shaking

Seismic shaking is the motion felt on the Earth's surface caused by an earthquake. In most cases, earthquakes are not powerful enough to cause the feeling of shaking. However, particularly powerful earthquakes can generate significant shaking, causing widespread destruction resulting in property damage.

Liquefaction

Liquefaction is the phenomenon that occurs when ground shaking causes groundwater to mix with the soil. The mixture temporarily becomes a fluid and loses its strength. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to settle and/or collapse from weakened foundations. Liquefaction can also occur independently of an earthquake, if any sudden and significant stress causes the mixing of groundwater and soil. The risk of liquefaction depends on several factors, including the height of the groundwater table and the types of soil in the area. (CGS, n.d.C)

3.2.6.2 History/Past Occurrences

Fault Rupture

There have not been any reports of fault rupture within the planning area, despite some large seismic events in the past. However, the presence of active faults underlying the area make it a very real possibility should a major earthquake occur. The seismic shaking section highlights some of the larger earthquakes that have recently occurred within the planning area.

Seismic Shaking

Southern California and Orange County have experienced several powerful earthquakes. The earliest recorded earthquake in California occurred in Orange County in 1769. To better understand the potential for damaging earthquakes in Southern California, the scientific community has reviewed historical records and conducted extensive research on faults that are

the sources of the earthquakes occurring in Southern California. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, historic records of past earthquakes are based on observations and the level of information is often dependent upon population density in the area of the earthquake. Since California was sparsely populated in the 1800s, detailed information on pre-instrumental earthquakes is relatively sparse. However, two very large earthquakes, the Fort Tejon in 1857 (magnitude 7.9) and the Owens Valley in 1872 (magnitude 7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. Other notable earthquakes that have impacted Southern California include the 1910 Glen Ivy Hot Springs Earthquake (Elsinore Fault Zone, magnitude 6.0), the 1933 Long Beach Earthquake (Newport-Inglewood Fault Zone, magnitude 6.4), the 1952 Kern County and Lander earthquakes (magnitude 7.3), the 1971 San Fernando Earthquake (San Fernando Fault Zone, magnitude 6.6), the 1987 Whittier Earthquake (Whittier Fault Zone, magnitude 5.9), and the 1994 Northridge Earthquake (Pico Thrust, magnitude 6.7). The 1987 Whittier Earthquake caused damage to the Puente Hills Reservoir in La Habra and after inspection the reservoir was found to have cracks in the concrete lining.(MWDOC 2019)

Damage from some of these earthquakes was limited because they occurred in areas that were sparsely populated at the time they occurred. However, developed areas were much more severely affected. 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. Earthquakes of great magnitudes have caused lasting effects in developed regions.

The most recent significant earthquake event affecting Southern California was the 1994 Northridge Earthquake. At 4:31 a.m. on Monday, January 17, 1994, a moderate, but very damaging earthquake with a magnitude of 6.7 struck the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures. In this earthquake, 57 people were killed and more than 1,500 people seriously injured. For days afterward, thousands of homes and businesses were without electricity, tens of thousands had no gas, and nearly 50,000 had little or no water. Out of the approximately 66,000 structures inspected, approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Extensive damage was caused by ground shaking, but the earthquake triggered liquefaction, and dozens of fires also caused additional severe damage. The extremely strong ground motion felt in sizable portions of Los Angeles County resulted in record economic losses. The fact that the earthquake occurred early in the morning on a holiday considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into the tens of billions of dollars. Clearly, no community in Southern California is beyond the reach of a damaging earthquake. The historical earthquake events that have affected Southern California are listed below in **Exhibit 3-15.**

Exhibit 3-15. Magnitude 5.0 or Greater Earthquakes in the Southern California Region

Date Location (Magnitude)	
1769 Los Angeles Basin (6.0)	1952 Kern County (7.7)
1800 San Diego Region (6.5)	1954 West of Wheeler Ridge (5.9)
1812 Wrightwood (7.0)	1971 San Fernando (6.5)

Date Location (Magnitude)	
1812 Santa Barbara Channel (7.0)	1973 Point Mugu (5.2)
1827 Los Angeles Region (5.5)	1979 Imperial Valley (6.5)
1855 Los Angeles Region (6.0)	1986 North Palm Springs (6.0)
1857 Great Fort Tejon (8.3)	1987 Whittier Narrows (5.8)
1858 San Bernardino Region (6.0)	1990 Upland (5.7)
1862 San Diego Region (6.0)	1991 Sierra Madre (5.6)
1892 San Jacinto or Elsinore Fault (6.5)	1992 Landers (7.3)
1893 Pico Canyon (5.8)	1992 Big Bear (6.2)
1894 Lytle Creek Region (6.0)	1994 Northridge (6.7)
1894 E. of San Diego (5.8)	1999 Hector Mine (7.1)
1899 Lytle Creek Region (5.8)	2004 San Luis Obispo (magnitude unknown)
1899 San Jacinto and Hemet (6.4)	2008 Greater Los Angeles Area (5.5)
1907 San Bernardino Region (5.3)	2008 Borrego Springs (5.4)
1910 Glen Ivy Hot Springs (5.5)	2009 El Centro/Baja, Ca (5.9)
1916 Tejon Pass Region (5.3)	2010 El Centro/Baja, Ca (7.2)
1918 San Jacinto (6.9)	2010 El Centro/Baja, Ca (5.7)
1923 San Bernardino Region (6.0)	2014 La Habra (5.1)
1925 Santa Barbara (6.3)	2019 Ridgecrest (6.4)
1933 Long Beach (6.3)	2019 Ridgecrest (7.1)
1941 Carpentaria (5.9)	

Liquefaction

Comprehensive, historic accounts of damage to structures from liquefaction are not readily available. Some damage caused by the Northridge Earthquake of 1994, such as damage to the King Harbor area of Redondo Beach in Los Angeles County, was due to liquefaction, as opposed to ground shaking.

3.2.6.3 Location/Geographic Extent

Fault Rupture

The area at risk of fault rupture is limited to areas in the immediate vicinity of a fault. California began extensive mapping of earthquake faults with the Alquist-Priolo Earthquake Fault Zoning Act of 1972. **Exhibit 3-16** shows both the fault zones in Orange County that have been mapped through the act. The Whittier Fault Zone near the county's northern border passes through part of the YLWD. The Newport-Inglewood Fault Zone parallels the coast in western Orange County.

Exhibit 3-16. Alquist-Priolo Rupture Zones

There are many additional large faults that could affect Orange County in addition to the Whittier and Newport-Inglewood-Rose Canyon faults. These include the Elsinore Fault, Peralta Fault, Puente Hills Fault, San Andreas Fault, and San Jacinto Fault. Smaller faults include the Norwalk Fault and the El Modena Faults. In addition, newly studied thrust faults, such as the San Joaquin Hills Fault could also have a significant impact on Orange County. Each of the major fault systems

are described briefly below and are presented in alphabetical order. This order does not place more danger on one fault over another; it is simply for organizational purposes.

- **Elsinore Fault Zone/Whittier Fault/Chino Fault.** Located in the northeast part of the county, the Elsinore Fault Zone follows a general line easterly of the Santa Ana Mountains into Mexico. The main trace of the fault zone is about 112 miles long. The last major earthquake on this fault occurred in 1910 (magnitude 6.0), and the interval between major ruptures is estimated to be about 250 years. Southern California Earthquake Center (SCEC) reports probable earthquake magnitudes for the main trace of the Elsinore Fault to be in the range of 6.5 to 7.5. At the northern end of the Elsinore Fault zone, the fault splits into two segments: the 25-mile-long Whittier Fault (probable magnitudes between 6.0 and 7.2), and the 25-mile-long Chino Fault (probable magnitudes between 6.0 and 7.0). The location of the Whittier Fault makes it especially critical to the Diemer Filtration Plant in Yorba Linda and pipelines bringing water into Orange County and/or from the Diemer Plant, which is located very near this fault.
- **Newport-Inglewood-Rose Canyon Fault Zone.** This fault zone extends from the Santa Monica Mountains in a southeast direction through the western part of Orange County, then continues offshore (not more than 4 miles from the coast) down to San Diego Bay. Originally, this was thought to have been two separate systems; the Newport-Inglewood Fault and the Rose Canyon Fault Line. However, a study prepared in March 2017 found that they are in fact one continuous fault line with three main stepovers. This fault line was the source of the destructive 1933 Long Beach earthquake (magnitude 6.4), which caused 120 deaths and considerable property damage. SCEC reports probable earthquake magnitudes for the Newport-Inglewood Fault to be in the range of 6.0 to 7.4.
- **Peralta Hills Fault.** Limited information is available to paleo seismically characterize the fault and no studies have been undertaken to determine the timing of earthquakes. There is a strong geomorphic expression along Lincoln Boulevard west of Tustin Avenue in the City of Orange. Some believe the fault is not active while others believe it is active. Ongoing research has linked the fault as a back thrust with the Elsinore Fault, with a potential magnitude of 6.8.
- **Puente Hills Thrust Fault.** This is another recently discovered blind thrust fault that runs from northern Orange County to downtown Los Angeles. It is now known to be the source of the 1987 Whittier Narrows Earthquake. Recent studies indicate that this fault has experienced four major earthquakes ranging in magnitude from 7.2 to 7.5 in the past 11,000 years, but that the recurrence interval for these large events is on the order of several thousand years.
- **San Andreas Fault Zone.** As the dominant active fault in California, it is the main element of the boundary between the Pacific and North American tectonic plates. The longest and most publicized fault in California, it extends approximately 650 miles from Cape Mendocino in northern California to east of San Bernardino in Southern California and is approximately 35 miles northeast of Orange County. This fault was the source of the 1906 San Francisco earthquake, which resulted in some 700 deaths and millions of dollars in damage. It is the southern section of this fault that is currently of greatest concern to the scientific community. Geologists can demonstrate that at least eight major earthquakes (Richter Magnitude 7.0 and larger) have occurred along the southern San Andreas Fault in the past 1,200 years with an average spacing in time of 140 years, plus or minus 30 years. The last such event occurred in 1857 (Fort Tejon Earthquake). Based on that evidence and other geophysical observations, the Working Group on California Earthquake Probabilities (Field, 2013) has estimated the probability of a similar rupture (magnitude 7.8) in the next 30 years (1994 through 2024) to be

about 50%. The range of probable magnitudes on the San Andreas Fault Zone is reported to be 6.8 to 8.0.

- **San Jacinto Fault Zone.** The San Jacinto Fault Zone is located approximately 30 miles north and east of the county. The interval between ruptures on this 130-mile-long fault zone has been estimated by SCEC to be between 100 and 300 years, per segment. The most recent event (1968 M6.5) occurred on the southern half of the Coyote Creek segment. SCEC reports probable earthquake magnitudes for the San Jacinto Fault Zone to be in the range of 6.5 to 7.5.
- **San Joaquin Hills Fault.** This fault is a recently discovered southwest-dipping blind thrust fault originating near the southern end of the Newport-Inglewood Fault close to Huntington Beach, at the western margins of the San Joaquin Hills. Rupture of the entire area of this blind thrust fault could generate an earthquake as large as magnitude 7.3. In addition, a minimum average recurrence interval of about 1,650 and 3,100 years has been estimated for moderate-sized earthquakes on this fault (Bender, 2000).

In addition to the major faults described above, the rupture of several smaller faults could potentially impact Orange County, including the Norwalk Fault (located in the north of the county in the Fullerton area) and the El Modeno Fault (located in the City of Orange area).

In 2005, MWDOC hired Earth Consultants International to prepare specific ground acceleration and shaking maps for five fault earthquake scenarios in Orange County (Earth Consultants 2005). **Exhibit 3-17, Characteristics of Important Geologic Faults in Orange County**, summarizes the characteristics of these five major geologic faults. Earthquake maps for the individual jurisdictions are included in the Jurisdictional Annexes.

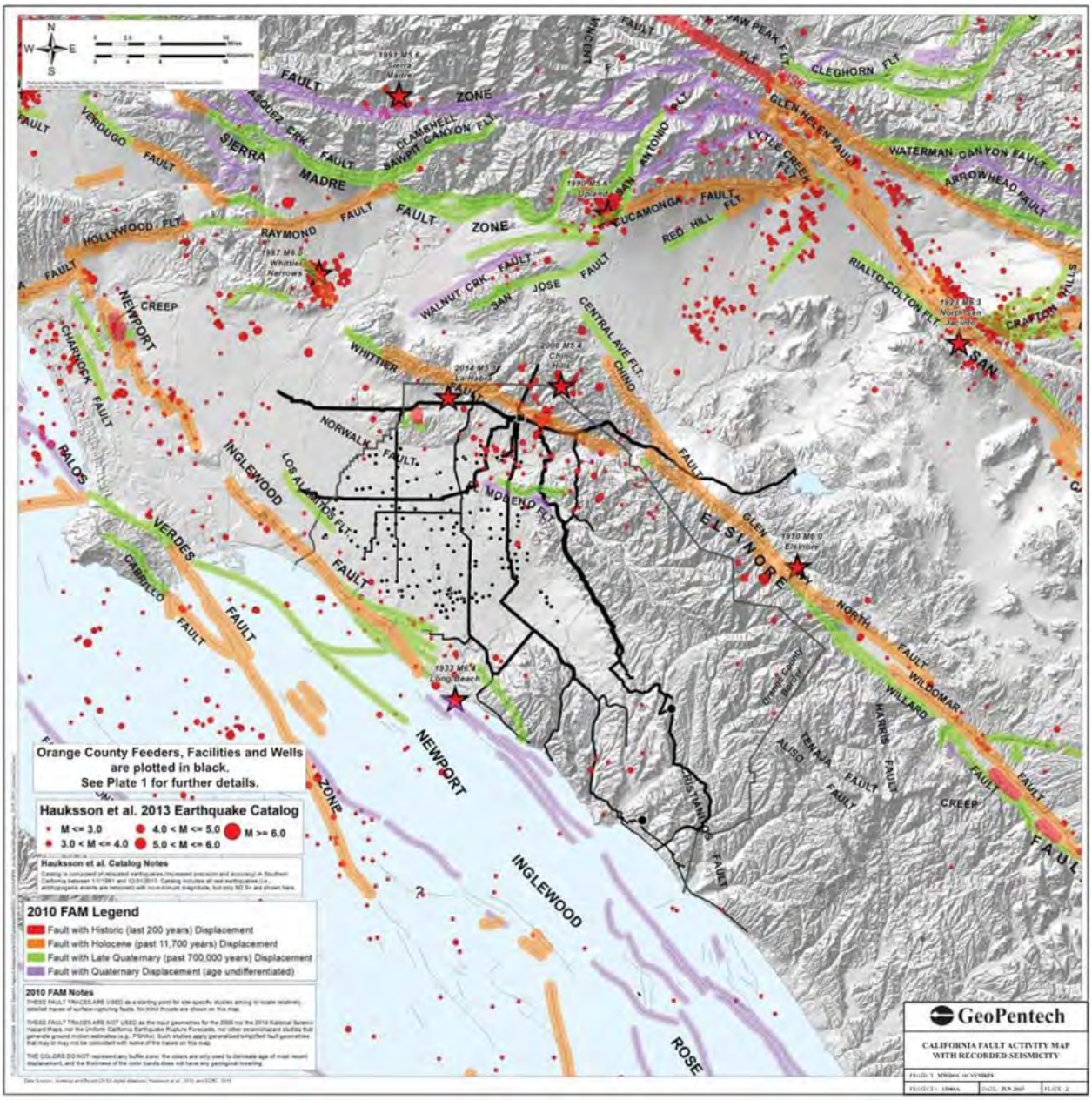
Exhibit 3-17. Characteristics of Important Geologic Faults in Orange County

Characteristic	Newport Inglewood Rose Canyon (onshore)	Peralta Hills	Puente Hills	San Joaquin Hills	Whittier
Fault Type	Strike-slip	Thrust	Blind thrust	Blind thrust	Strike-slip
Slip Rate (mm/yr)	1 +/-0.5	Unknown, Prob. <1	0.7 +/-0.4	0.5 +/-0.2	2.5 +/-1.0
Magnitude[1]	6.9	6.8	7.5	6.6	6.8
Recurrence Interval (years)	2,200-3,900	Unknown	2,750	1,600-3,100	1,100
Last Activity (years ago)	6.3 in 1933	Unknown	<3,000	200-300	1,600-2,000

1. The magnitude shown represents the fault's average behavior.
(Earth Consultants 2005)

Exhibit 3-18, prepared for the California Domestic Water Corp., a private wholesaler, shows the location of earthquake epicenters from 1941 to 2013 in and around Orange County, which is outlined in the center of the map.

Exhibit 3-18. Location of Earthquake Faults Bounding the California Domestic Water Corp. Service Area and Orange County

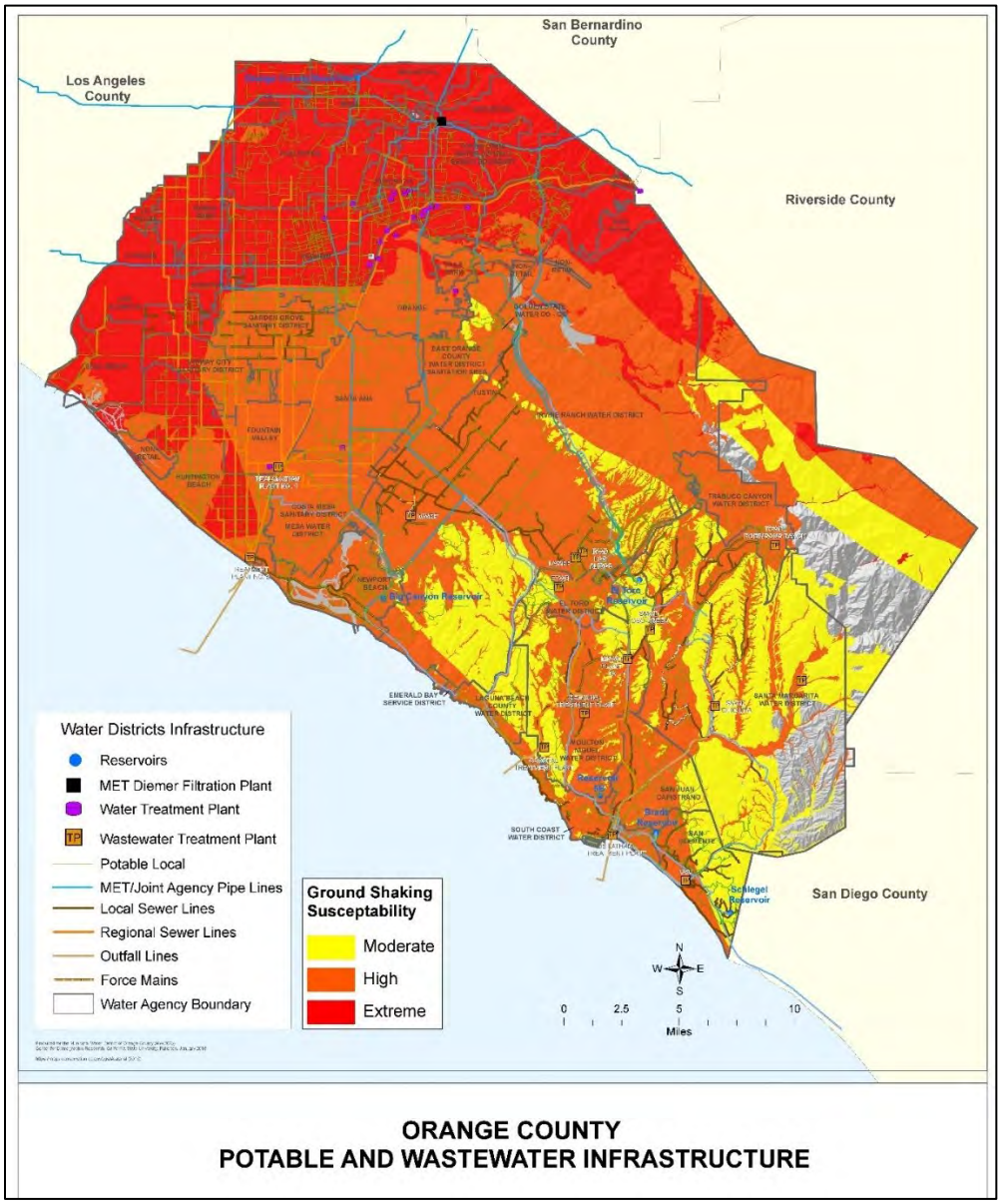


Earthquakes that occur outside of Southern California and Orange County could also have a significant impact on drinking water supplies. Such scenarios include disruptions of the Colorado River Aqueduct, the State Water Project (especially at an area such as the Edmonston Pumping Station and Porter Tunnel bringing water over and through the Tehachapi), and in the Bay-Delta Region, where failure of levees and flooding of islands with saltwater from San Francisco Bay could disrupt water supplies for months or years. Orange County is 50% dependent on supplies from beyond its borders to meet the county's drinking water needs. This leaves it exposed to these occurrences from outside the region.

Seismic Shaking

Nearly all of Orange County is at risk of moderate to extreme ground shaking. **Exhibit 3-19** shows ground shaking severity zones for Orange County. The area's most susceptible to damage from earthquakes based on the shaking intensity hazard map include YLWD and the Cities of La Habra and Buena Park. These communities can be severely impacted by landslides, liquefaction, extensive infrastructure damage, fire, dam failure, and other secondary earthquake effects. A major earthquake could be catastrophic in its effect on the population and could exceed the response capability of the local communities and even the State. Although the above-noted water/wastewater utilities are most likely to experience "extreme" shaking, all of Orange County's water/wastewater utilities fall within a moderate to extreme shaking intensity zone and therefore should expect the potential of damage from an earthquake.

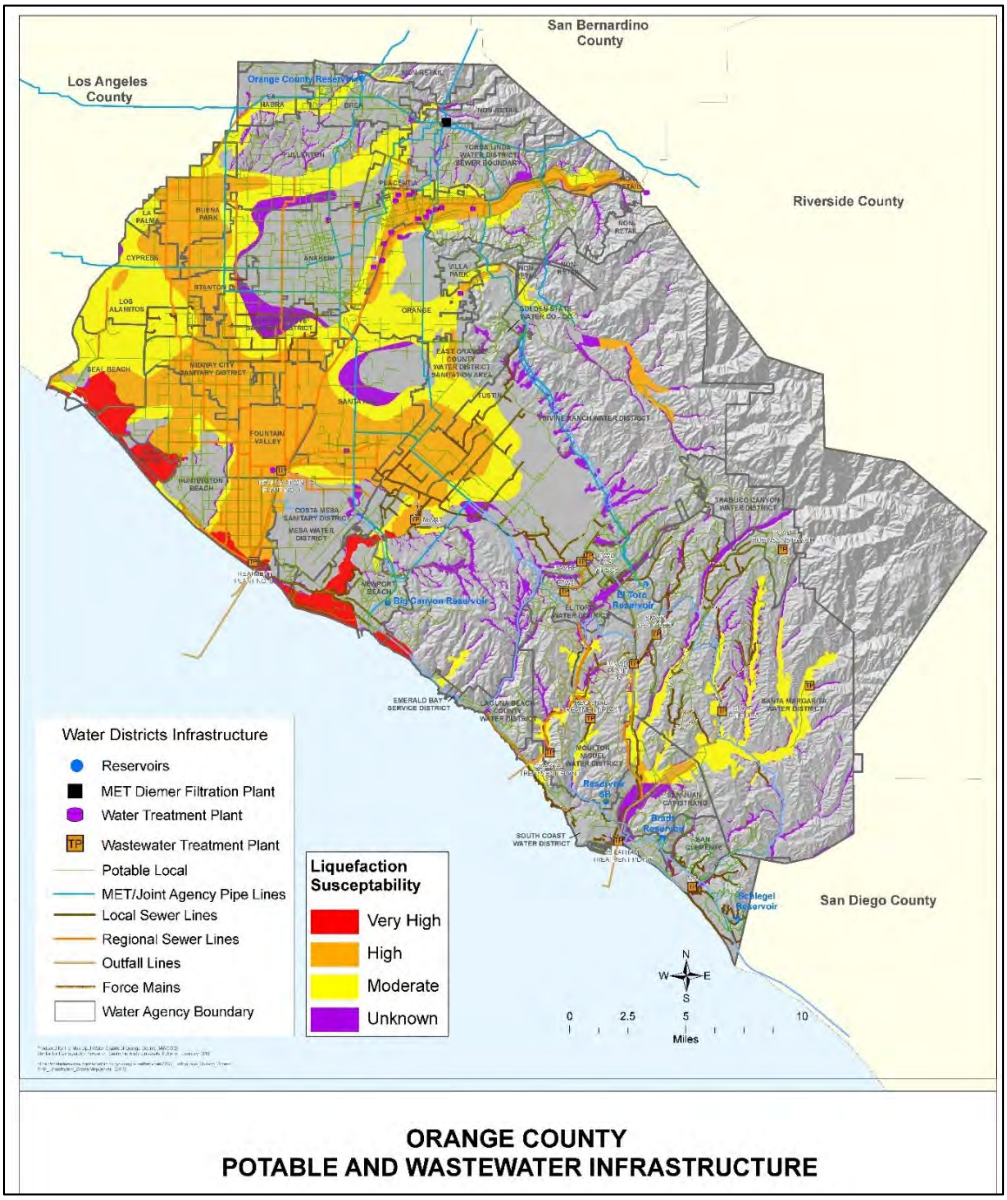
Exhibit 3-19. Ground Shaking Hazard



Liquefaction

The potential for liquefaction exists in areas susceptible to ground shaking with loose soils and/or shallow groundwater. Given the active faults in the region and the presence of geologically young, unconsolidated sediments and hydraulic fills, liquefaction is possible throughout much of Orange County. The California Geological Survey's Seismic Hazards Zonation Program identifies and maps areas prone to liquefaction. These zones for Orange County are shown in **Exhibit 3-20**. The most extensive liquefaction zones occur in coastal areas, including parts of Huntington Beach and Newport Beach, and along Upper Newport Bay. In addition, a 2016 Seismic Hazard Assessment conducted by GeoPentech, Inc., found that the highest liquefaction hazard areas are the flat, coastal portions of the planning area, and the risk decreases moving inland. The areas identified as being highly susceptible to liquefaction are the San Juan Creek/San Clemente Beach areas.

Exhibit 3-20. Liquefaction Susceptibility Zones



3.2.6.4 Magnitude/Severity

Fault Rupture

The planning area has multiple known faults that run through and near the planning area. A significant earthquake along either any of these major faults could cause substantial casualties, extensive damage, and other threats to life and property. The shaking of the ground can also damage or destroy underground utilities or pipelines, potentially leading to the release of hazardous materials and flooding if water lines are breached.

The planning area can expect varying degrees of damage depending on the magnitude and duration of an earthquake along one of these faults within the region. The topography in portions of the planning area means there are areas with critical infrastructure and facilities of concern constructed on or adjacent to slopes, which may be subject to earthquake-induced landslides (reference the landslide hazard profile for further discussion).

Seismic Shaking

Ground shaking is measured using either the moment magnitude scale (MMS, denoted as Mw or simply M) or the Modified Mercalli Intensity Scale. The MMS is a replacement for the Richter scale, which is still often referred to but is no longer actively used, as the Richter scale is not reliable when measuring large earthquakes (USGS 2014). The weakest earthquakes measured by the MMS start at 1.0, with the numbers increasing with the strength of the earthquake. The strongest recorded earthquake, which struck Chile in 1960, measured 9.5 on the MMS (MWDOC 2019). Like the Richter scale, the MMS is a logarithmic scale, meaning the difference in strength between two earthquakes is much larger than the difference in their measurements. For example, a 6.0 Mw earthquake is 1,000 times stronger than a 4.0 Mw earthquake and about 1.4 times as strong as a 5.9 Mw event.

The Modified Mercalli Intensity Scale is based on the damage caused by the earthquake and how it is perceived, rather than an actual measurement. When comparing multiple earthquakes, one event may have a higher Mercalli rating than another even if it released less energy, and thus was measured lower on the MMS. The Mercalli scale ranges from I (instrumental, rarely felt by people) to XII (catastrophic, total damage and lines of sight are distorted). **Exhibit 3-21**, **Comparison of MMS and Modified Mercalli Intensity Scale,** shows a general comparison between the MMS and the Modified Mercalli Intensity Scale. Note that there is some overlap toward the higher end of the Mercalli ratings, with certain intensities produced by multiple ranges of magnitude measurements.

Exhibit 3-21. Comparison of MMS and Modified Mercalli Intensity Scale

Magnitude (MMS)	Modified Mercalli Intensity Scale	
	Intensity	Description
1.0 to 3.0	I	Not felt except by very few persons under especially favorable conditions.
3.0 to 3.9	II	**Weak:** Felt only by a few persons at rest, especially on upper floors of buildings.
	III	**Weak:** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
4.0 to 4.9	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.

Magnitude (MMS)		Modified Mercalli Intensity Scale	
		Intensity	Description
		V	**Moderate:** Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 to 5.9		VI	**Strong:** Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
	6.0 to 6.9	VII	**Very Strong:** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
7.0 and greater		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.
		XI	**Extreme:** Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
		XII	**Extreme:** Damage total. Lines of sight and level are distorted. Objects thrown into the air.
(USGS 2017)			

Several faults in Orange County can produce severe to extreme earthquakes. The SCEC and the Working Group on California Earthquake Probabilities have determined the probable magnitude for an earthquake along these major faults:

- **Elsinore Fault Zone.** SCEC reports probable earthquake magnitudes for the main trace of the Elsinore Fault to be in the range of 6.5 to 7.5. The two northern segments, the Whittier Fault and the Chino Fault, have probable magnitudes of 6.0 to 7.2 and 6.0 to 7.0, respectively. The Whittier Fault location is extremely critical because it crosses the two main sources of untreated water being brought into Orange County (Yorba Linda Feeder and the Lower Feeder) and it passes very close to the Diemer Filtration Plant, which serves as the treatment facility for the bulk of Orange County. Metropolitan does not have a backup system to supply treated water to many parts of central and southern Orange County in the event of an outage of the Diemer Plant.
- **Newport-Inglewood Fault Zone.** SCEC reports probable earthquake magnitudes for the Newport-Inglewood Fault to be in the range of 6.0 to 7.4.
- **Puente Hills Thrust Fault.** Recent studies indicate that this fault has experienced four major earthquakes ranging in magnitude from 7.2 to 7.5 in the past 11,000 years, but that the recurrence interval for these large events is on the order of several thousand years.
- **Peralta Hills Fault.** The Earth Consultants International study for MWDOC indicates that this may be a back thrust fault to the Elsinore Fault and may be capable of a magnitude 6.8 (Earth Consultants 2005).

- **San Andreas Fault Zone.** Based on that evidence and other geophysical observations, the fault has estimated the probability of a rupture with a magnitude 7.8 in the next 30 years (1994 through 2024) to be about 50% (Field 2013). The range of probable magnitudes on the San Andreas Fault Zone during this period is reported to be 6.8 to 8.0.
- **San Joaquin Hills Fault.** Recent reports have determined that the blind thrust fault can generate an earthquake as large as 7.3. In addition, a minimum average recurrence interval of 1,650 to 3,100 years has been estimated for moderate-sized earthquakes on this fault.
- **San Jacinto Fault Zone.** SCEC reports probable earthquake magnitudes for the San Jacinto Fault Zone to be in the range of 6.5 to 7.5.

Although the San Andreas Fault Zone can produce an earthquake with a magnitude greater than 8.0, some of the smaller faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood Fault Zone would result in far more death and destruction than a larger earthquake on the San Andreas Fault Zone, due to the San Andreas' relatively remote location from the urban centers of Southern California.

3.2.6.5 Probability of Future Occurrences

Fault Rupture

Based on the amount of seismic activity that occurs within the region, there is no doubt that communities within the jurisdictional boundaries of MWDOC will continue to experience future earthquake events. It is reasonable to expect that a major event (5.0 magnitude or higher) and possibly even more severe will occur within a 30-year timeframe.

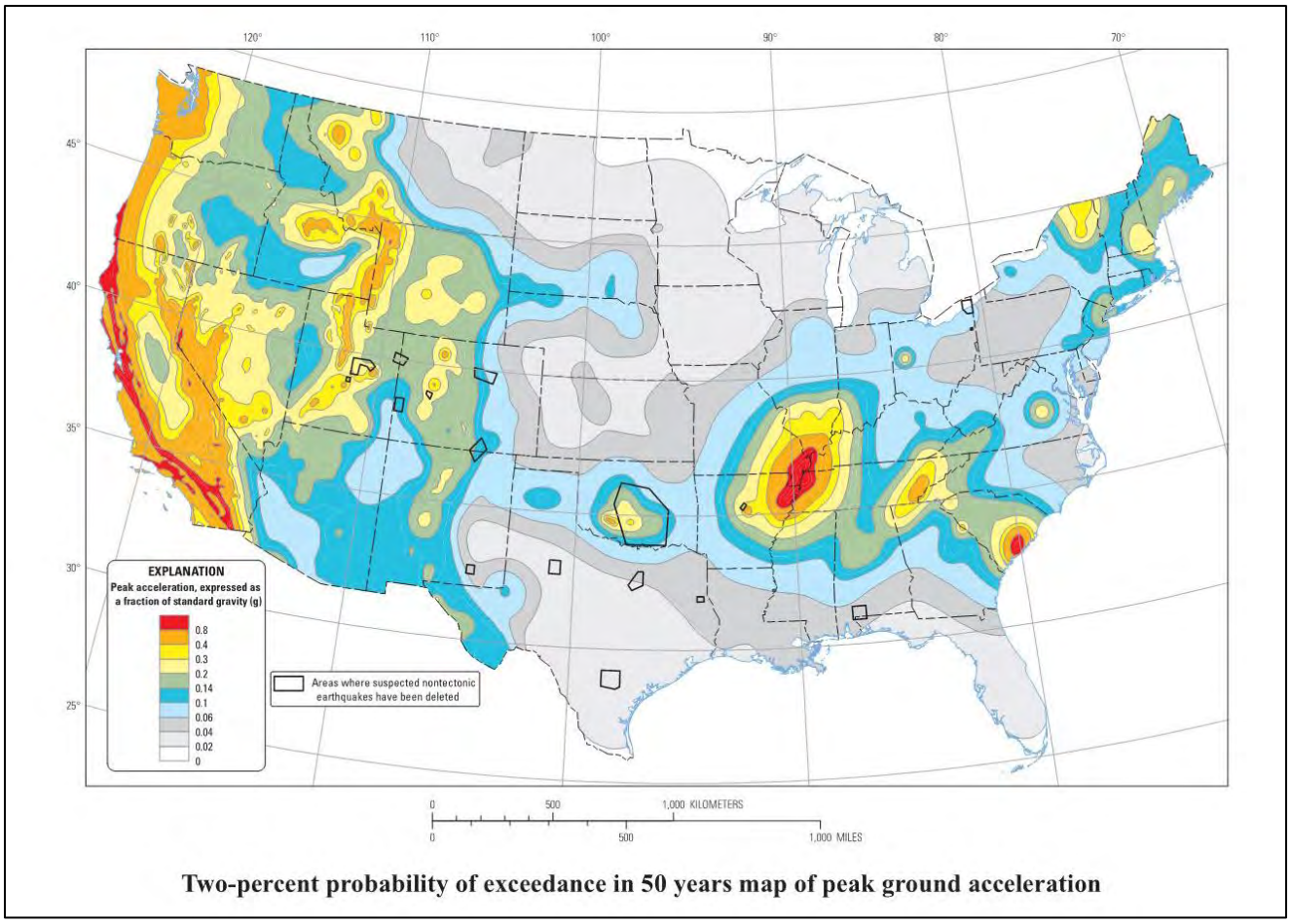
The Third Uniform California Earthquake Rupture Forecast (UCERF3), developed in 2014 by the Working Group on California Earthquake Probabilities and led by the USGS, provides estimates of the magnitude, location, and likelihood of fault rupture for more than 350 fault segments throughout the State. For Southern California, the study estimated the likelihood of a 6.0 magnitude earthquake at 100%, a 7.0 earthquake at 75%, and an 8.0 earthquake at 7% (USGS 2015).

Seismic Shaking

Predicted ground shaking patterns throughout Southern California for hypothetical scenario earthquakes are available from the USGS as part of their ongoing "ShakeMap" program. These maps are provided in terms of Instrumental Intensity, which is essentially Modified Mercalli Intensity estimated from instrumental ground motion recordings. ShakeMaps in graphical and GIS formats are available on the USGS website at: https://earthquake.usgs.gov/data/shakemap/.

In 2014, USGS released a simplified Peak Ground Acceleration (PGA) map to demonstrate the 2% probability of exceedance within a 50-year time period; refer to **Exhibit 3-22**. This analysis was done at the nationwide level. California, and many parts of Southern California, have a risk of high PGA at this probability level.

Exhibit 3-22. United States PGA with 2% Probability in 50 Years



(USGS 2014b)

Liquefaction

Soil liquefaction is a seismically induced form of ground failure, which has been a significant cause of earthquake damage in Southern California. During the 1971 San Fernando and 1994 Northridge earthquakes, significant damage to roads, utility pipelines, buildings, and other structures in the region was caused by liquefaction (a significant amount of this damage type was reported in Los Angeles County). Research and historical data indicate that loose, granular materials situated at depths of less than 50 feet with fine (silt and clay) contents of less than 30%, which are saturated by a relatively shallow groundwater table, are most susceptible to liquefaction. These geological and groundwater conditions exist in parts of Southern California and the planning area, typically in valley regions, stream and river watersheds, and alluvial floodplains.

For liquefaction to occur, three general conditions must be met. The first condition, strong ground shaking for a relatively long duration, can be expected to occur in the planning area because of an earthquake on any of the several active faults in the region. The second condition, loose or unconsolidated, recently deposited sediments consisting primarily of silt and sand, occurs in many valley floors and the larger canyon bottoms prevalent throughout Orange County and the region. The third condition is water-saturated sediments within about 50 feet of the surface. Liquefaction

could occur, but defining the precise likelihood is not possible. Refer to the seismic shaking magnitude/severity section for the probability of a major earthquake occurring in faults within the planning area.

3.2.6.6 Climate Change Considerations

Fault Rupture

Generally, there is no known direct connection between fault rupturing and climate change. Some evidence suggests that greater oceanic pressure on tectonic plates due to melting land ice could influence seismic events' behavior. Still, little indicates that this would play a major factor in any seismic event, including fault rupture.

Seismic Shaking

There is no direct link between climate change and seismic activity, so climate change is not expected to cause any changes to the frequency or intensity of seismic shaking. Some research indicates that climate change could result in “isostatic rebounds,” or a sudden upward movement of the crust because of reduced downward weight caused by glaciers. As glaciers are known to melt when global temperatures increase, climate change could indirectly lead to increased seismicity in Southern California. (Masih 2018)

Liquefaction

While climate change may not impact seismic shaking, it can directly impact liquefication. Climate change is anticipated to change the usual precipitation patterns in Southern California. Periods of both rain and drought are anticipated to become more intense and frequent. This means more precipitation will likely occur during rainy periods, and drought is expected to last even longer. As a result, the water table along the creeks and canyons in Orange County could rise during intense periods of precipitation. Alternatively, a longer-lasting drought may lead to more groundwater withdrawal and could lower the water table. Therefore, climate change could potentially increase during times of intense precipitation or decrease during times of prolonged drought.

3.2.7 Severe Weather (Drought, Extreme Heat, Windstorm [Santa Ana Winds])

3.2.7.1 Description (Nature) of the Hazard

Drought

Many governmental utilities, the NOAA and the California Department of Water Resources, as well as academic institutions, such as the University of Nebraska-Lincoln’s National Drought Mitigation Center, generally agree that there is no clear definition of drought. Drought is highly variable depending on one’s location.

Drought in its simplest definition is an extremely dry climatic period where the available water falls below a statistical average for a region. Drought is also defined by factors other than rainfall, including vegetation conditions, agricultural productivity, soil moisture, water levels in reservoirs, and stream flow.

In effect, there are essentially three forms of drought: meteorological or hydrological drought, agricultural drought, and regulatory drought.

- **A meteorological or hydrological drought** is typically defined when there is a prolonged period of less than average precipitation resulting in the water level in aquifers, lakes, or above-ground storage reservoirs falling below sustainable levels.
- **An agricultural drought** occurs when there is insufficient moisture for an average crop yield. Agricultural drought can be caused by the overuse of groundwater, poor management of cultivated fields, as well as lack of precipitation.
- **A regulatory drought** can occur when the availability of water is reduced due to imposition of regulatory restrictions on the diversion and export of water out of a watershed to another area. A significant percentage of water in Southern California is imported from other regions (Colorado River and Northern California) via aqueducts. Correspondingly, drought in California can be made worse by water availability conditions in the regions at which the water originates.

An example of regulatory drought occurred between 1999 and 2004. A six-year drought on the Colorado River Basin, a major water supply for Southern California, resulted in a draw-down of Colorado River water storage by more than 50%. More recently, beginning in 2008, regulatory restriction in exporting water via the State Water Project combined with unusually dry weather patterns resulted in two years of water rationing in Southern California. Additionally, a meteorological drought can lead to regulatory restrictions; for example, California experienced prolonged drought from 2013 to 2017, resulting in mandatory water restrictions for residents through November 25, 2017.

Even distant droughts may have consequences for the plan area and participating jurisdictions. The great drought of the 1930s, coined the "Dust Bowl," was geographically centered in the Great Plains yet ultimately affected water shortages in California. The drought conditions in the plains resulted in a large influx of people to the west coast. Approximately 350,000 people from Arkansas and Oklahoma immigrated mainly to the Great Valley of California. As more people moved into California, including Orange County, increases in intensive agriculture led to overuse of the Santa Ana River Watershed and groundwater resulting in regional water shortages.

Droughts cause public health and safety impacts, as well as economic and environmental impacts. Public health and safety impacts are primarily associated with catastrophic wildfire risks and drinking water shortage risks for small water systems in rural areas and private residential wells. Examples of other impacts include costs to homeowners due to loss of residential landscaping; degradation of urban environments due to loss of landscaping, agricultural land fallowing, and associated job loss; degradation of fishery habitat; and tree mortality with damage to forest ecosystems. Drought conditions can also result in damage to older infrastructure that is located within dry soils with potential to leak or break. Dead or dying vegetation poses a risk to falling and damaging water and wastewater infrastructure systems.

In Orange County, drought conditions typically result in implementation of large-scale conservation efforts, reducing water supplies to customers and altering the pricing system by implementing higher rates for water usage that exceeds certain levels (e.g., wasteful). Higher rates that may be imposed during a drought could have disproportionate impacts on lower-income households. Reduction in groundwater supplies during drought conditions can also result in the need for water agencies that have high reliance on local groundwater supplies to purchase larger amounts of imported water. Drought conditions have also resulted in drier brush and an increase in the size and severity of wildfires. Water and wastewater infrastructure systems located within areas susceptible to wildfires are at a greater risk of being impacted. Damage or failure to water

and wastewater infrastructure systems can significantly reduce or even interrupt service to customers. For more on wildfire hazards, see **Section 3.2.8, Wildland/Urban Fire.** In addition, climate change may lead to more frequent and persistent droughts in the future.

Several bills have been introduced into Congress to mitigate the effects of drought. In 1998, President Clinton signed into law the National Drought Policy Act, which called for the development of a national drought policy or framework that integrates actions and responsibilities among all levels of government. In addition, it established the National Drought Policy Commission to provide advice and recommendations on the creation of an integrated Federal policy. The most recent bill introduced into Congress was the National Drought Preparedness Act of 2003, which established a comprehensive national drought policy and statutorily authorized a lead Federal utility for drought assistance. Currently there exists only an ad-hoc response approach to drought unlike other disasters (e.g., hurricanes, floods, and tornadoes) which are under the purview of FEMA.

Extreme Heat

Extreme heat is a period when temperatures are abnormally high relative to a designated location's normal temperature range. There are generally three types of extreme heat events:

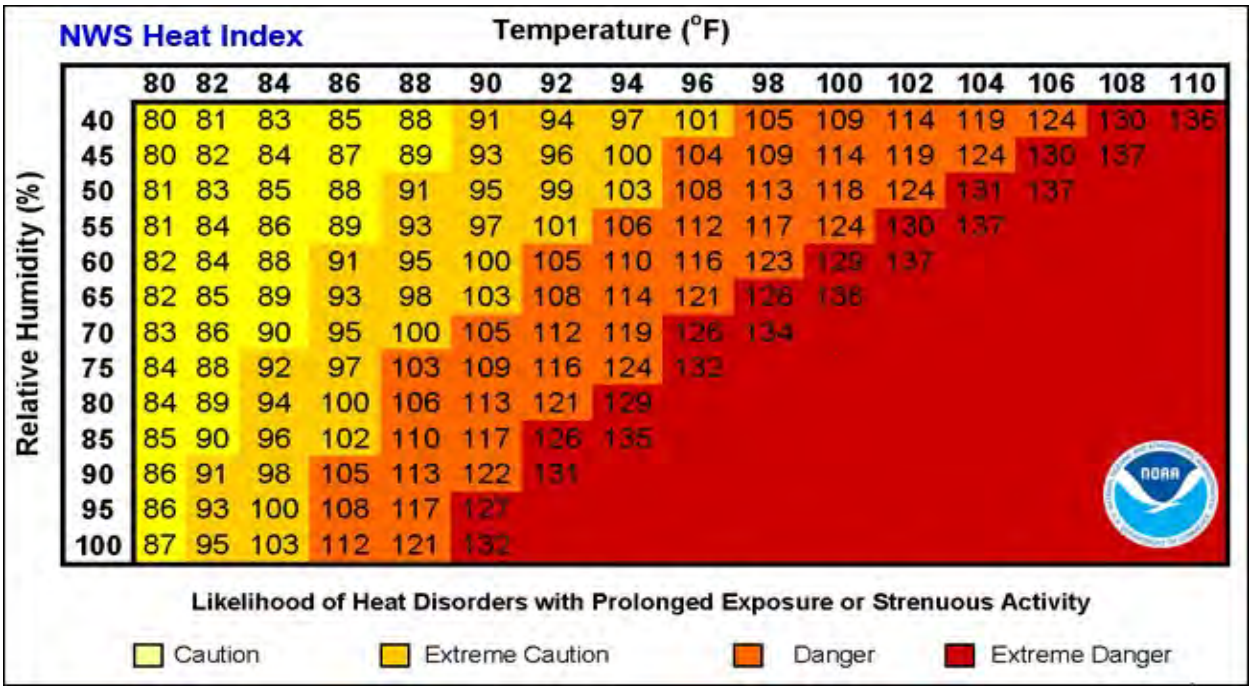
- **Extreme Heat Days:** A day during which the maximum temperature surpasses 98% of all historic high temperatures for the area, using the time between April and October from 1961 to 1990 as the baseline.
- **Warm Nights:** A day between April to October when the minimum temperature exceeds 98% of all historic minimum daytime temperatures observed between 1961 to 1990.
- **Extreme Heat Waves:** A successive series of extreme heat days and warm nights where extreme temperatures do not abate. Although no universally accepted minimum length of time for a heatwave event exists, Cal-Adapt considers four successive extreme heat days and warm nights to be the minimum threshold for an extreme heatwave.

Extreme heat events will have unique metrics from region to region since different areas have different historic high temperatures. For example, an extreme heat day on the coast will have lower temperatures than an extreme heat day in the High Desert.

Humidity plays a factor in people's perception of heat, as humid conditions will make a day feel hotter than a non-humid day even though the temperature may be the same on both days. The difference between the perceived and actual temperatures is known as the "heat index." To illustrate the effect of the heat index, a 90°F day with 50% humidity feels like 95°F, whereas a 90°F with 90% humidity feels like 122°F. **Exhibit 3-23** shows NOAA's National Weather Service Heat Index.

Extreme heat poses several dangers to public health. The human body is vulnerable to long periods of high temperatures and will eventually enter a state of heat exhaustion and dehydration if exposure to heat is extended. If exposure to high temperatures is particularly prolonged to the point that internal body temperature surpasses 105°F, heatstroke may occur, and organ failure and death may soon follow without intervention.

Exhibit 3-23. NOAA's National Weather Service Heat Index



Windstorm

High winds are defined as those that last longer than 1 hour at greater than 39 miles per hour (mph) or for any length of time at greater than 57 mph. High winds that affect Orange County, notably Santa Ana winds, are generally defined as warm, dry winds that blow from the east or northeast (offshore). Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon and forecasters at the National Weather Service in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots. The complex topography of Southern California combined with various atmospheric conditions creates numerous scenarios that may cause widespread or isolated Santa Ana events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra Mountains and west of the Rocky Mountains including most of Nevada and Utah). Clockwise circulation around the center of this high-pressure area forces air down slope from the high plateau. The air warms as it descends toward the California coast at the rate of 5°F per 1,000 feet due to compression of the air mass. The air is dry since it originated in the desert, and it dries out even more as it is compressed.

3.2.7.2 History/Past Occurrences

Drought

Based on years of recorded water trends in Southern California, it is quite apparent that droughts and water shortages can occur. Paleo records indicate that much more extreme events can occur than those since historical record-keeping began. A significant drought, reported by many of the ranchers in Southern California, occurred in 1860.

The National Drought Mitigation Center maintains a Drought Risk Atlas with historic data on drought classifications throughout the United States. Based on the Palmer Drought Severity Index

(PDSI), there have been eight occasions since records began in 1920 when the monitoring station in the City of Santa Ana recorded "severe" or "extreme" drought conditions for a period of at least 12 months. These periods, based on a "self-calibrating" PDSI, which uses data adjusted to be more sensitive to the local climate, are listed in **Exhibit 3-24**, Severe and Extreme SC-PDSI Drought Periods 1920-2023 Lasting 12 Months or Longer (Santa Ana, California) (NDMC 2024).

Exhibit 3-24. Severe and Extreme SC-PDSI Drought Periods 1920-2023 Lasting 12 Months or Longer (Santa Ana, California)

Drought Start	Drought End	Duration (Months)
February 1961	September 1963	31
March 1971	January 1978	82
May 1984	December 1992	103
January 1994	January 1995	12
December 1999	October 2004	58
January 2006	October 2010	57
December 2011	March 2017	64
January 2020	December 2022	36

Governor Jerry Brown proclaimed a State of Emergency in January 2014; the declaration was not lifted until April 2017. In Orange County, precipitation totals were well below average for five 12-month periods in a row. From July 2013 to June 2014, the weather station in Santa Ana recorded just 4.4 inches or rain, about one-third of the normal annual amount (OC Public Works n.d.). Governor Gavin Newsom issued a series of emergency proclamations beginning in April 2021, initially in only parts of California, but by October of 2021 the drought state of emergency proclamation was extended statewide. Newsom also issued Executive Order N-10-21 in July of 2021, which called for Californians to voluntarily reduce their water use by 15% from their 2020 levels, which was followed by additional water restrictions and regulations. The California Department of Water Resources stated that the State Water Project would not provide water to California farmers unless drought conditions improved in 2022, while many of California's water suppliers were forced to implement water shortage contingency plans to combat low water supplies (Romey et al. 2021).

Extreme Heat

According to NASA's Global Climate Change website, the mean global temperature has increased 1.8°F since 1880, and 17 of the 18 warmest years on record have occurred since 2001 (NASA 2024). The scientific consensus is that these changes are the result of human activity increasing the levels of carbon dioxide and other greenhouse gases in the atmosphere, and that they will intensify. The Intergovernmental Panel on Climate Change forecasts temperatures to rise an additional 2.5 to 10 degrees over the next century. Such drastic changes to the Earth's climate will have significant consequences around the globe. Long-term effects include rising sea levels due to melting ice, changes in precipitation patterns, heat waves, and more frequent and intense storms.

Based on local data from NOAA , Orange County can expect to see its daily maximum temperature increase from a current annual average of 73°F to 78°F by 2100 under a low-emission scenario and 82°F under a high-emission scenario (MWDOC 2019). The county currently experiences an average of 4.5 days a year where temperatures reach 95°F; that is projected to increase to as many as 31 days a year by the end of the century.

Windstorm

Most high wind incidents in the planning area are the result of Santa Ana wind conditions. While high impact wind incidents are not frequent in the area, significant Santa Ana wind events have impacted Orange County. The NOAA Storm Events Database identified 250 events reported within Orange County between January 1, 1950, and June 30, 2024. **Exhibit 3-25**, Major High Wind Events, identifies and describes some of the major events occurring within Orange County.

Exhibit 3-25. Major High Wind Events

Date	Location	Magnitude (kts)	Property Damage (dollars)	Description
12/9/1998	Northeast Orange County	81	50,000	Severely disrupted transportation, power, and daily activities. Broken trees and power poles were common throughout the area and power was knocked out to 180,000 customers. Downed power lines also started several wild fires, damaging one house.
12/3/1999	Santa Ana Mountains and Foothills	104	20,000	Most of the major highways in the Inland Empire and through the Santa Ana Mountains were closed, partially due to two semi-tractor trailers that overturned, partially from blowing dust reducing visibility, and partially from road signs and other debris being blown onto the roads.
3/20 – 3/21/2000	Santa Ana Mountains and Foothills	51	25,000	Damage ranged from downed power poles, trees falling on cars and houses, fruit being knocked off of trees, and blowing sand and dust lowering visibility to zero.
1/5 – 1/7/2003	Santa Ana Mountains and Foothills			Numerous trees and power poles were blown down. At least 60 communities were affected. A commuter train was delayed for several hours in Orange County when power poles were blown down onto the track. A brush fire whipped by the winds, damaged 5 houses and burned 150 acres. Sparks from downed power lines started numerous small brush fires, but these were quickly contained. Many houses and at least 300 parked automobiles were damaged by falling trees.
11/23/03	Santa Ana Mountains and Foothills	50	50,000	Trees, power lines, and signs were knocked down.
12/16/04	Northeast Orange	68	20,000	
2/3/05	Santa Ana Mountains and Foothills	53	5,000	
3/31/05	Northeast Orange	54	5,000	Strong Santa Ana winds caused power outages, blew over big rigs, and knocked down trees.
1/22/06	Santa Ana Mountains and Foothills	62	15,000	Surface high pressure over the Great Basin resulted in gusty Santa Ana winds from the San Bernardino mountains, through the Inland

Date	Location	Magnitude (kts)	Property Damage (dollars)	Description
				Empire, and into Orange County. Wind gusts over 60 mph toppled trees and power poles. Downed power lines caused sporadic power outages. Most of the property damage that occurred came as a direct result of falling trees.
10/21-22/2007	Santa Ana Mountains and Foothills/Orange County Coastal Areas	74	100,000	Santa Ana winds toppled trees, brought down power lines, and knocked out power to thousands in many parts of Orange County. The strongest winds were felt along the foothills of the Santa Ana mountains and near the Chino Hills area.
12/16/11	Santa Ana Mountains and Foothills	56	15,000	This system set off intense showers and isolated thunderstorms with pea-sized hail (accumulations in Rancho Cucamonga and Mission Viejo), as well as several funnel clouds spotted east of John Wayne Airport. Most of the rain with this system was confined to Orange County, the Inland Empire, and the northern mountains. Heavy rain was observed in Orange County and the Inland Empire on December 15 and 16, with locations there recording between one-quarter and one-half inch. Strong winds were also observed with this storm, especially on December 16, which was a more widespread wind event than early December, impacting all counties, including San Diego County, with warning-level winds. Several wind gusts of 45-65 mph were reported in the Santa Ana Mountains, the Inland Empire and San Diego County Mountains. Several trees and power poles were downed, leaving many without power. Power poles were reported down in Yorba Linda and around 240 customers were reported without power in Tustin.
1/14/14	Santa Ana Mountains and Foothills	67	2,000	The highest wind gusts occurred in the San Diego County foothills and inland Orange County, including the Santa Ana Mountains. Winds downed fiber optic lines near Santiago Canyon in Orange County.
2/12/16	Orange County Inland	52	20,000	Strong northeasterly winds downed numerous trees near Irvine, Santa Ana, and Orange. Approximately 85 customers lost power in the City of Santa Ana.
2/17/17	Orange County Coastal	52	75,000	A strong trough and associated Pacific cold front swept into Southern California from the west, bringing strong winds, heavy snow, and rain. The storm was noteworthy for the strong prefrontal southerly winds that produced significant tree damage over the coast and valleys. In the

Date	Location	Magnitude (kts)	Property Damage (dollars)	Description
				mountains the ski resorts received 1-2 feet of snow, while elevations as low as 5,000 feet saw a few inches of accumulation. Rainfall ranged from 2-6 inches along the coastal slopes to 1-2 inches at the coast. At the beaches surf heights reached 8 to 12 feet. An isolated peak gust of 60 mph occurred at San Clemente Pier. Numerous trees were downed over the coastal areas.
12/4/17	Orange County Inland	52	15,000	Report of a large tree downed by strong winds in Orange. Tree damage, minor roof damage, and an exploding transformer were also reported in Santa Ana.
10/15/18	Orange County Inland	71	Unknown	A deep low pressure axis extending across Southern California produced strong region-wide Santa Ana winds. The strongest gust reached 82 mph in Fremont Canyon, with widespread gusts above 40-50 mph reported in valley locations. In Orange County, more than 200 trees were downed, and one person was killed when a tree fell onto their vehicle.
10/26/20	Santa Ana Mountains and Foothills	61	Unknown	A strong offshore wind, a “cool” Santa Ana, produced many gusts exceeding 70 mph and a top gust of 88 mph at Fremont Canyon. The winds toppled big-rig trucks and downed mature trees in the northern Inland Empire. The dry winds also contributed to spreading two fires, the Blue Ridge and Silverado fires in eastern Orange County.

Notes: kts = knots. One knot is equal to 1.151 mph.
(NOAA 2024a)

3.2.7.3 Location/Geographic Extent

Drought

Droughts occur over large regions and thus can affect the entire planning area.

Extreme Heat

Extreme heat can occur anywhere in the planning area; however, areas farther from the coast are expected to experience hotter temperatures than coastal communities. For many coastal communities, warmer temperatures are expected to have greater impacts on residents living in homes without air conditioning. Extreme heat events occurring throughout the planning area could also impact utilities and infrastructure if power loss occurs either due to grid reliability or the use of a public safety power shutoff.

Windstorm

Santa Ana winds blow westward through the canyons toward the coastal areas of Southern California. Orange County commonly experiences Santa Ana winds between October and March.

The winds are not location specific, but rather impact the entire planning area in different ways based on location, topography, and the nature of the wind event itself.

3.2.7.4 Magnitude/Severity

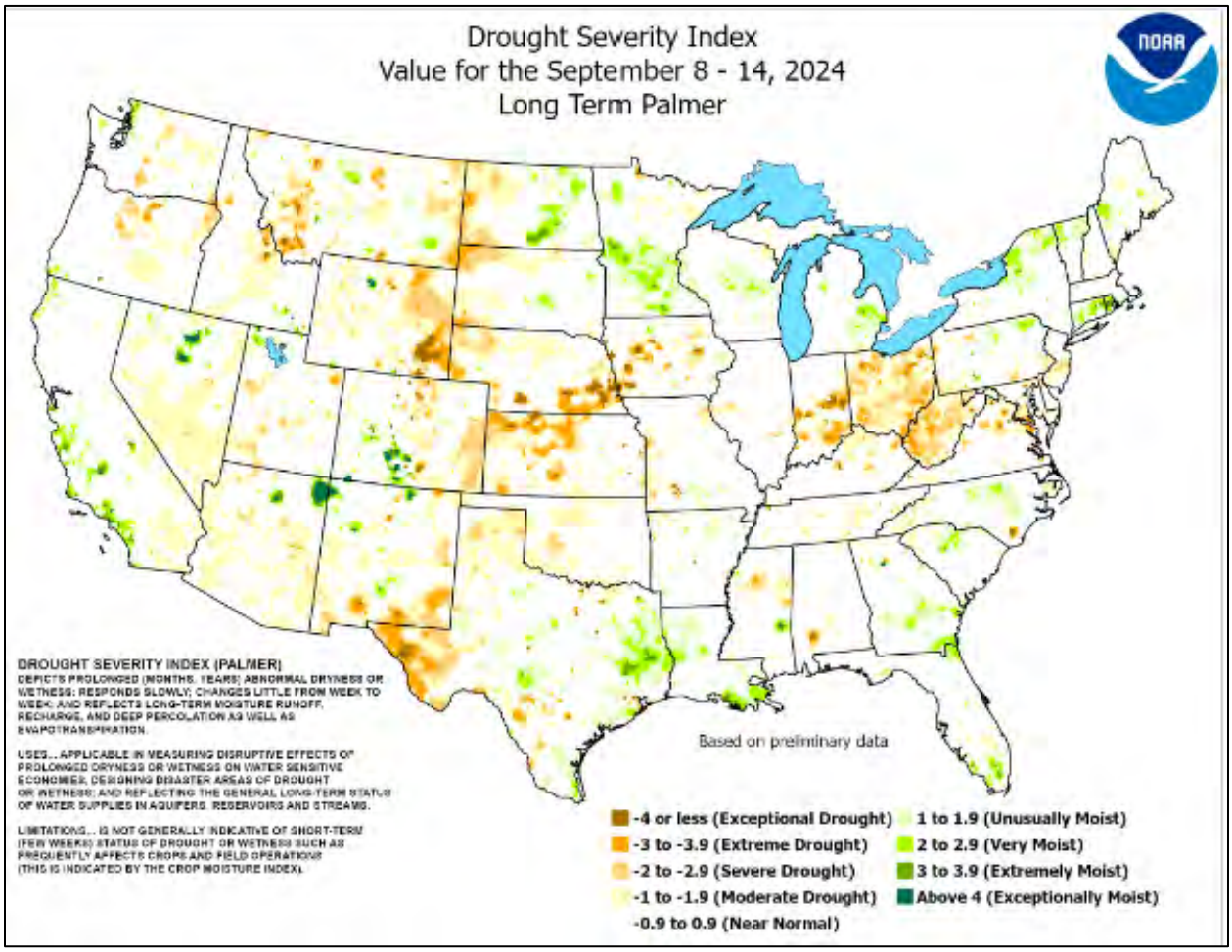
Drought

Of the many varied indexes used to measure drought, the Palmer Drought Severity Index (PDSI) is the most commonly used in the United States. Developed by meteorologist Wayne Palmer, the PDSI is used to measure dryness based on recent temperature compared to the amount of precipitation. It utilizes a number range, where 0 indicates normal conditions, negative numbers indicate drought, and positive numbers indicate wet spells; refer to **Exhibits 3-26 and 3-27.**

Exhibit 3-26. Palmer Drought Severity Index

Drought	Wet Spells
-4.0 or less (Extreme Drought)	+2.0 or +2.9 (Unusual Moist Spell)
-3.0 or -3.9 (Severe Drought)	+3.0 or +3.9 (Very Moist Spell)
-2.0 or -2.9 (Moderate Drought)	+4.0 or above (Extremely Moist)
-1.9 to +1.9 (Near Normal)	

Exhibit 3-27. September 8, 2024 PDSI



Extreme Heat

The minimum threshold for an extreme heat day in the planning area is 93.4°F. The minimum threshold for a warm night in the planning area is 65.1°F. These values are displayed below in **Exhibit 3-28** and **Exhibit 3-29**.

Exhibit 3-28. Average Number of Extreme Heat Days

Scenario	Historic (1961 1990)	Projected (2020 2050)	Projected (2050 2070)	Projected (2070 2099)
RCP 4.5	3	8	11	16
RCP 8.5	3	9	18	31

Exhibit 3-29. Average Number of Warm Nights

Scenario	Historic (1961 1990)	Projected (2020 2050)	Projected (2050 2070)	Projected (2070 2099)
RCP 4.5	5	22	32	42
RCP 8.5	5	25	54	88

Cal-Adapt uses an emissions scenario when determining the data in its projections. An emissions scenario is a representation of future greenhouse gas emissions and resulting atmospheric concentrations through time. An emissions scenario illustrates a plausible future so that climate projections for that emissions scenario can be generated, used to inform analysis and decision-making, and compared to other scenarios. The data for these scenarios uses what are called representative concentration pathways (RCPs), which are different scenarios for the future severity of climate change, and comes from California's Fourth Climate Change Assessment, which uses two RCPs from the Fifth Intergovernmental Panel on Climate Change (IPCC) Assessment Report on Climate Change (Cal-Adapt 2024).

- **RCP 4.5 (medium emissions scenario):** A mitigation scenario where greenhouse gas (GHG) emissions peak by 2040 and decline. In California, annual average temperatures under this scenario are projected to increase 2°C to 4°C (35.6°F to 39.2°F) by the end of this century, depending on the location.
- **RCP 8.5 (high emissions scenario):** A no-mitigation scenario where global GHG emissions continue to rise throughout the 21st century. In California, annual average temperatures under this scenario are projected to increase 4°C to 7°C (39.2°F to 44.6°F) by the end of this century.

Based on these scenarios, extreme heat days throughout the planning area could increase from three days to 31 days by the end of the century. In addition, the average number of warm nights could increase from five nights to 88 nights during that same period.

Windstorm

Wind speeds are typically 35 knots through and below passes and canyons with gusts to 50 knots. Stronger Santa Ana winds can have gusts greater than 60 knots over widespread areas with gusts greater than 100 knots in some areas. Frequently, the strongest winds in the Orange County Groundwater Basin occur during the night and morning hours due to the absence of a sea breeze. The sea breeze, which typically blows onshore daily, can moderate the Santa Ana winds during the late morning and afternoon hours. Santa Ana winds are an important forecast challenge because of

the high fire danger associated with them. Santa Ana winds can adversely affect power utilities that have transformers and power lines, in turn affecting the ability of some water and wastewater utilities to operate when backup generation is unavailable. The magnitude and severity of Santa Ana winds are similar throughout the planning area.

3.2.7.5 Probability of Future Occurrences

Drought

The University of Nebraska-Lincoln has published PDSI maps analyzing trends over the past 100 years (NDMC 2024). In coastal Southern California, from 1895 to 1995, severe droughts occurred 10% to 15% of the time. From 1990 to 1995, severe droughts occurred 10% to 20% of the time.

Based on the droughts listed in **Exhibit 3-24**, Orange County has been in severe or extreme drought for a total of 443 months, or approximately 35.5% of the time since 1920 and approximately 57.7% of the time since 1960.

Extreme Heat

Given past occurrences of extreme heat events in the planning area, it is expected that these types of events will occur in the future. What is expected in the future is that extreme heat events will increase in both frequency and duration. With the projected increases in extreme heat days and warm nights, the probability of future occurrence is highly likely.

Windstorm

High winds, including Santa Ana winds, will continue to occur annually in Orange County. The probability of future occurrence throughout the planning area is high.

3.2.7.6 Climate Change Considerations

Drought

Climate change is anticipated to abate drought in certain situations; however, projections suggest that future drought events could become more frequent and intense. In some cases, climate change-intensified weather patterns, like El Niño Southern Oscillation (ENSO), may bring more rain to California and the planning area, reducing drought conditions. In other years, climate change may also prolong the La Niña phase of ENSO, which could lead to longer periods with no precipitation in California.

Climate change is also expected to increase the average temperature and cause more frequent and prolonged heatwaves in the region. During these events, water supplies may be affected within the planning area. Hotter temperatures may also lead to increased surface water evaporation, which could lead to greater water consumption. If a drought occurs coupled with heatwave events, additional strain could be placed on water and wastewater infrastructure.

From a regional perspective, warmer overall temperatures in California are anticipated to reduce statewide water supplies. Much of California's water comes from melted snow in the High Sierra. As the average temperature grows warmer with climate change, the precipitation that falls as snow is expected to shift towards rain. As less snow falls, the amount of melted water from the snowpack in the Sierra Nevada will decrease, reducing the water that will flow into the reservoirs and aqueducts that supply Southern California. Reductions in water availability could strain

supplies, impacting the quality and availability of water within the Orange County Groundwater Basin.

Extreme Heat

The primary effect of climate change is warmer average temperatures. The warmest decade on record is 2011-2020, and the warmest three years on record occurred in 2023, 2016, and 2020. As climate change accelerates in the 21st century, it is anticipated that extreme heat events will become more frequent and intense in California. In the planning area specifically, the projected average number of extreme heat days per year could increase from three to 16 (in 2100), assuming global greenhouse gas emissions peak around 2040, then decline. If global greenhouse gas emissions continue to rise until 2100, the number of extreme heat days could increase to as many as 31 days per year. The number of warm nights could increase from five to 42 (in 2100), assuming an emissions peak and decline in 2040 but could increase to as many as 88 if emissions continue to rise until 2100 (Cal-Adapt 2024).

Windstorm

It is anticipated that the atmospheric rivers that deliver storms to Southern California may intensify because of climate change. While the average number of storms in Southern California will remain the same, storms are expected to increase in intensity between 10% and 20% (Oskin 2014). This increase in storm intensity may also bring more intense winds to the Southern California region, including the planning area.

Studies indicate that Santa Ana wind events may be affected in varying ways by climate change, but it is unknown whether this will affect the frequency and intensity of these events. According to one study that examined two global climate models, there is a projected increase in future Santa Ana events. However, other studies have found that the number of Santa Ana events may decrease by about 20% in the future (Hall et al. 2018). Given the anticipated increases in temperatures throughout the region, future events are anticipated to become more severe in some cases, even if the number of events decreases.

3.2.8 Wildland/Urban Fire

3.2.8.1 Description (Nature) of the Hazard

Wildland Fire

A variety of fire protection challenges exist within Orange County, including structure fires, urban fires, wildland fires, and fires at the wildland/urban interface. This hazard analysis focuses on wildland fires, but also addresses issues specifically related to the wildland/urban interface. There are three categories of interface fires:

- The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas;
- The mixed wildland/urban interface is characterized by isolated homes, subdivisions and small communities situated predominantly in wildland settings; and
- The occluded wildland/urban interface existing where islands of wildland vegetation occur inside a largely urbanized area.

Certain conditions must be present for significant interface fires to occur. The most common conditions include hot, dry, and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). The three primary factors that lead to severe wildfires in Orange County are drought, insect infestation causing tree decimation (bark beetles), and wildfire suppression. Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought, and development.

A key challenge Orange County faces regarding the wildfire hazard is the increasing number of houses being built in the wildland/urban interface. Every year the growing population has expanded further and further into the hills and mountains, including forest lands. The increased "interface" between urban/suburban areas and open space areas has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability.

Urban Fire

An urban fire is a fire that causes damage to buildings or infrastructure in an urbanized area. In some minor situations, the fire prompts the evacuation of the building's occupants, and the fire is contained within a short amount of time by firefighting teams or the building's fire suppression systems. In severe cases, the fire leads to the complete destruction of the building and can spread to other surrounding properties. Common causes of urban fires include stoves that are accidentally left on, short-circuited electrical equipment, or mishandling of household tools. Larger urban fires may be caused by breaches in gas pipelines, large transportation accidents, or downed electrical transmission wires. Fires may also be intentionally started by arsonists.

3.2.8.2 History/Past Occurrences

Wildland Fire

Although no federally declared wildfire disasters have occurred in Orange County, significant wildfires have impacted Orange County and surrounding areas. Since 1950, the NOAA reports 28 wildfire events occurring in Orange County. **Exhibit 3-30**, Major Wildfires, identifies significant fires that have occurred since 1950.

Exhibit 3-30. Major Wildfires

Date	Location	Description
8/22/2000	San Clemente	Hot temperatures and dry conditions allowed a brush fire to quickly race uphill and ignite the underside of two roofs. Fifteen families were evacuated as more than 40 firefighters worked for several hours to control the blaze.
9/11/2000	San Clemente	A wild fire was fanned by east winds and burned 500 acres before being contained.
8/7/2001	Laguna Beach	A wild fire in a steep canyon near the main toll plaza on the San Joaquin Hills Toll Road (Highway 73).
9/9/2001	El Toro	A brush fire burned 30 acres before it was brought under control.
1/23/2002	Trabuco	Santa Ana winds gusted between 60 to 70 mph for several days across Southwest California.
5/13/2002	Mission Viejo	Extremely dry conditions, above normal temperatures, and gusty winds helped a brush fire, started by an arsonist, to quickly consume 1,100 acres before being controlled. Two trucks and one structure were destroyed. Many

Date	Location	Description
		residential homes suffered smoke damage and residents were evacuated. Traffic was halted on Highway 241. No injuries occurred.
2/6-12/2006		Santa Ana winds and Red Flag conditions resulted in the rapid spread of a wildfire in the Santa Ana mountains. Named the Sierra Fire, this fire burned 10,854 acres from Sierra Peak to the 241 Toll Road. While evacuations were ordered, no structures were burned. Eight minor injuries were reported.
3/11-14/2007	Santa Ana Mountains and Foothills	The Windy Ridge Fire was intentionally set during the early stages of a red flag event at the mouth of Fremont Canyon. Humidity values less than 10% and wind gusts in excess of 40 mph caused the fire to spread quite rapidly across the rain starved hillsides. At the time of the fire, the Santa Ana Fire Station had only measured 1.81 inches of rain on the season, nearly 9 inches below the average rainfall for that date. Mandatory evacuations were posted for 1,200 homes in Anaheim Hills and Orange as the wind-driven fire spread westward. The fire burned 2,036 acres, damaged one home, and destroyed two out-structures before it was extinguished.
10/21/2007	Santa Ana Mountains and Foothills	The Santiago Fire was intentionally set and burned 28,400 acres in Modjeska and Santiago Canyons. The fire destroyed 15 homes and nine outbuildings. An additional 20 structures were damaged. Sixteen firefighters were injured during the blaze.
9/23/2010	Santa Ana Mountains and Foothills	The Long Canyon Fire started in the Cleveland National Forest in eastern Orange County, west of the Ortega Highway near the Riverside County line. Some structures were threatened, but the fire generally burned away from the populated areas, 40 acres total. Three firefighters and one police officer suffered non-life-threatening heat-related and smoke inhalation injuries. One of the Cleveland National Forest's fire engines was destroyed by fire, cause unknown, no injuries.
8/5/2013	Santa Ana Mountains and Foothills	The Falls Fire started off Ortega Highway near Decker Canyon, in Riverside. Due to the fire burning on the Trabuco Ranger District, the San Mateo Wilderness, El Cariso Campground, Blue Jay Campground, the Firefighter Memorial Picnic Area and Wildomar Off-Highway Vehicle area were closed. Road closures included Ortega Hwy 74 from Lake Elsinore west to San Antonio Parkway. Evacuations were ordered for Lakeland Village, Rancho Capistrano and Decker Canyon residents. Evacuation perimeter was between Grand/Ortega and Grand/Corydon. No structures were threatened and no injuries. Minor guardrail damage occurred because of a rock fall along Ortega Highway. The fire burned 1,416 acres before being fully contained.
9/12-13/2014	Santa Ana Mountains and Foothills	The Silverado Fire began along Silverado Canyon Road in the Cleveland National Forest of the Santa Ana Mountains. The fire burned at a critical rate of spread, threatening power lines and forcing evacuations and road closures. Mandatory Evacuations were ordered from 30331 Silverado Canyon east to the end of the road (fire gate) and included 50 residences affecting approximately 220 people. The American Red Cross opened an evacuation center at 3:30 p.m. at El Modena High School at 3920 East Spring Street. The 12kV line servicing Silverado residents was down. One pole and the downed lines required replacement. There were 71 customers without power in Silverado Canyon. After burning a total of 1,600 acres, the Silverado Fire was completely contained.
9/25/2017	Santa Ana Mountains and Foothills	The Canyon Fire began near Highway 91 in Orange County. The fire spread rapidly due to dry fuel conditions and very low humidity, and firefighting efforts were hindered by a transition from light Santa Ana winds to onshore

Date	Location	Description
		flow. This initially pushed the fire into the foothills before sending it back eastward toward Corona. The fire was estimated at 1,700+ acres and was threatening residences. Winds calmed over the ensuing days and the fire was quickly contained at 2,662 acres. The cause of the wildfire was determined to be a roadside flare.
10/9/2017	Orange County Inland	The Canyon Fire began near the 91 Freeway and Gypsum Canyon Road in Anaheim Hills. The fire spread rapidly, threatening numerous structures. In the first 24 hours the fire consumed more than 7,000 acres. In total, 25 structures were destroyed, 55 were damaged, and 9,217 acres burned. Four injuries were also reported. The cause of the fire was reported to be embers from the Canyon Fire which began September 25 and was contained October 4, 2017.
08/06/2018	Cleveland National Forest	The Holy Fire was a wildfire that burned in the Cleveland National Forest in Orange and Riverside Counties, California. The wildfire started on August 6, 2018, at around 1:15 p.m. PDT, in the vicinity of Trabuco Canyon. It burned approximately 23,136 acres, destroyed 18 structures, and caused more than $25 million in damages. Three firefighters were injured battling the fire, no fatalities were reported.
10/26/2020	Santa Ana Mountains and Foothills	The Silverado Fire started near Orange County Route S-18 (Santiago Canyon Road) and Silverado Canyon Road, fueled by strong Santa Ana winds gusting up to 80 mph (130 km/h) and low humidity. The fire burned in a path similar to that taken by the 2007 Santiago Fire, mostly through terrain that had not seen significant burning in the 13 years since that fire. The fire consumed over 13,390 acres, destroyed one structure, two minor structures and damaged five others. Two firefighters were seriously burned battling this fire, both men survived. Over 90,000 people were forced to be evacuated as a result.
10/26/2020	Orange County Inland	A second brush fire ignited in Southern California amid dangerous high winds, which prompted evacuation orders for Yorba Linda. The blaze was initially dubbed the Green Fire but was later renamed the Blue Ridge Fire. This brush fire started in the Chino Hills area of Corona, west of the Santa Ana River. Spreading west toward Brea. The fire burned some 13,694 acres destroying one structure and damaging 10 others, as a result over 30,000 people were evacuated.
12/2/2020	Santiago Canyon	The Bond Fire was a wildfire that burned 6,686 acres in the Santiago Canyon area of Orange County, California in December 2020. The fire caused evacuations of 25,000 residents and injured two firefighters. The fire was very close to the burn scar of the Silverado Fire, which took place in October 2020. The fire destroyed 31 structures.
05/11/2022	Laguna Niguel	The Coastal Fire was a brushfire which started in the wilderness area near a Laguna Niguel neighborhood, burned approximately 200 acres and destroyed 20 homes in the neighborhood. One injury to a fire fighter was reported.
09/09/2024	Santa Ana Mountains, Trabuco Canyon	The Airport Fire was unintentionally ignited by an Orange County public works crew using heavy equipment in Trabuco Canyon. The fire burned over 23,000 acres in the Cleveland National Forest, destroying 160 structures and damaging another 34. Although this incident started in Orange County a majority of the affected areas are located in Riverside County on the eastern slopes of the Santa Ana Mountains.

(NOAA 2024a)

At 9:01 a.m. on November 15, 2008, the Corona Fire Department responded to calls reporting a brush fire in Riverside County. Upon arrival it became apparent to first responders the fire would be significant and of a highly destructive nature. At the time of the alarm a Red Flag Warning had been in effect due to low humidity levels, high temperatures, and strong Santa Ana winds. These conditions along with the terrain of the areas burned facilitated the rapid growth and spread of the fire and significantly affected first responder's efforts of containment and in the protection of property and lives. Initial calls reported the fire's location as west of the Green River Exit off the 91 Freeway in Riverside County. From there the fire quickly advanced in a Northwesterly direction towards Orange County where the fire split into two separate branches shortly after crossing over the county line; the first branch of the fire followed the Santa Ana River Basin southwest into Anaheim hills, and the second continued northwest into Yorba Linda. Both branches of the fire became of concern to the water utilities of Orange County as the fire threatened infrastructure or moved into the service areas of Anaheim, Brea, the YLWD, and Metropolitan's Diemer Filtration Plant facility. Eventually, the fire burned through approximately 30,305 acres and damaged or destroyed over 300 structures in Riverside, San Bernardino, Los Angeles, and Orange counties.

A brush fire erupted along State Route 241 near Santiago Canyon Road in Irvine on the morning of July 13, 2015. Campgrounds near Irvine Lake were evacuated, and three abandoned structures caught fire. The blaze encompassed a total of approximately 214 acres. Around one year later, a fire occurred in the Laguna Coast Wilderness Park near Bommer Ridge Trail on June 26, 2017. The fire burned approximately 47 acres and was reported as contained on June 27, 2017. On August 31, 2016, the Holy Fire started in the early morning just east of Trabuco Canyon in the Cleveland National Forest. The blaze did not threaten any homes; however, it was in an area around Holy Jim Canyon that was difficult for firefighters to reach. The fire burned through approximately 150 acres.

Most recently on September 9, 2024, the Airport Fire erupted in the Cleveland National Forest (in the vicinity of Trabuco and Rose Canyons) burning over 23,000 acres in both Orange and Riverside Counties. Impacts associated with the fire included nearly 200 damaged and destroyed structures and 22 injuries. No loss of life was reported as a result of this incident.

Urban Fire

A majority of the water/wastewater infrastructure locations throughout the planning area are located in developed areas. Many of these sites are surrounded by existing developments and run a low risk of ignition due to the use of non-combustible materials, and limited vegetation. Even with these typical site conditions on most utility locations, there is still the potential for fires to occur. To date, no significant fire events within the more developed portions of the planning area have occurred affecting water/wastewater infrastructure.

The Coastal Fire (05/11/2022) took place in a wildland/urban interface area within Aliso and Wood Canyons causing damage to the SOCWA Coastal Treatment Plant and affecting wastewater treatment plant operations.

3.2.8.3 Location/Geographic Extent

Wildland Fire

California Department of Forestry and Fire Protection (Cal Fire) prepares fire hazard severity maps including mapping areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies, and influence how people construct buildings and

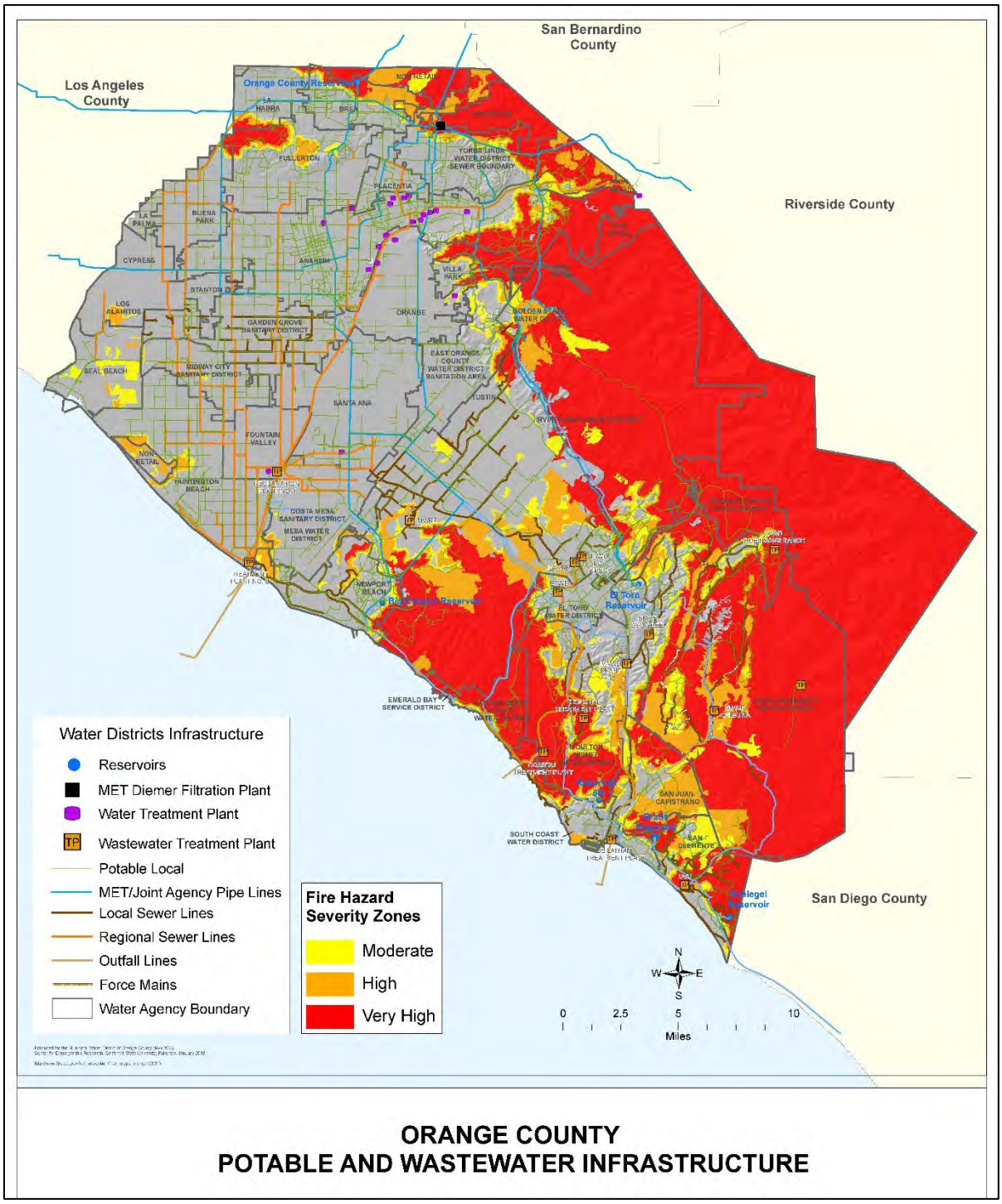
protect property to reduce risk associated with wildland fires. According to **Exhibit 3-31**, the southern and eastern portions of Orange County are located within High and Very High Fire Severity Zones.

Urban Fire

Most buildings in the planning area consist of wooden-frame construction, which is vulnerable to catching fire. Structures that do not have wooden frames, such as large wastewater and processing facilities, pumping stations, and other infrastructure are also potentially at risk of urban fires. These locations contain furniture, papers, chemicals, plant material, textiles, and other objects that can be ignited. Given that a very large portion of the planned area is developed, urban fires can occur at any location.

Fires are also likely to occur where there are other types of major infrastructure, such as gas pipelines, power lines, or highways. For example, Southern California Edison owns and operates above-ground, high-voltage transmission lines strung from towers on rights-of-way throughout the planning area. The planning area is also crisscrossed by multiple freeways (State routes) and interstates. These freeways/interstates facilitate the transportation of people and goods, which lead to an immense amount of traffic every day. If a major transportation accident were to occur on any of these freeways or roads, it could potentially cause a fire and spread to nearby facilities, buildings, and infrastructure within the planning area.

Exhibit 3-31. Fire Hazard Severity Zones



3.2.8.4 Magnitude/Severity

Wildland Fire

California experiences large, destructive wildland fires almost every year, and Orange County is no exception. Wildland fires have occurred within Orange County, particularly in the fall, ranging from small, localized fires to disastrous fires covering thousands of acres. The most severe fire protection problem is wildland fire during Santa Ana wind conditions. These conditions have been further exacerbated by more recent drought conditions. Drought causes fuels (both live and dead vegetation) to dry out and become more flammable, increasing the probability of ignition along with the rate of fire spread. If drought continues for an extended period, the number of days with elevated probability of ignition and fire spread increases, raising the risk of widespread burning. The combination of drought conditions, need to maintain water fire flow and the potential for power failure due to Santa Ana wind conditions can impact the magnitude and severity of fires within the planning area.

The magnitude/severity of a wildfire would be dependent upon the location and conditions (e.g., Santa Ana winds) in place at the time. The Fire Hazard Severity Zone maps prepared by Cal Fire (refer to **Exhibit 3-31**) identify the extent and severity of the fire hazard zones within Orange County. Although a fire could start and/or extend beyond these areas, they identify the areas of severity so that measures can be identified to mitigate the rate of spread and reduce the potential intensity of uncontrolled fires that threaten to destroy resources, life, or property.

Urban Fire

A fire can only ignite if three elements are present: heat, fuel, and oxygen. If any one of these elements is removed, the fire will extinguish itself. Throughout the planning area, hundreds of thousands of structures have the ability to provide fuel to an urban fire. The National Institute of Standards and Technology, Fire Research Division has developed a scale that measures the increase in temperature and the kind of fire response that develops. **Exhibit 3-32** shows the progression of temperature relative to fire response.

Exhibit 3-32. Fire Susceptibility Based On Temperature Increase

Temperature (F)	Response
98.6 °F	Average normal human oral/body temperature.
101 °F	Typical body core temperature for a working firefighter.
109 °F	Human body core temperature that may cause death.
111 °F	Human skin temperature when pain is felt.
118 °F	Human skin temperature causing a first-degree burn injury.
130 °F	Hot water causes a scald burn injury with 30 seconds of exposure.
131 °F	Human skin temperature with blistering and second degree burn injury.
140 °F	Temperature when burned human tissue becomes numb.
162 °F	Human skin temperature at which tissue is instantly destroyed.
212 °F	Temperature when water boils and produces steam.
482 °F	Temperature when charring of natural cotton begins.
>572 °F	Modern synthetic protective clothing fabrics begin to char.
≥752 °F	Temperature of gases at the beginning of room flashover.
≈1832 °F	Temperature inside a room undergoing flashover.

Once a fire has been ignited, it could conceivably grow to an indefinite size if abundant fuel and oxygen are available. For example, a fire that ignites in one structure could hypothetically continue to expand and even spread to other adjacent structures if there was enough fuel to link the structures together. Fires in confined spaces may occasionally burn so intensely that they consume all the oxygen available and burn out before they can expand. The magnitude and severity of urban fires would be dependent upon the location and the conditions in place at the time. A fire in or near a small structure in an isolated area would not be as severe as a fire in or near a large facility or piece of infrastructure when considering the monetary cost or replacement. However, that same small structure could be a key piece of infrastructure required to maintain the function of services in the planning area and could be considered a greater concern for the people who rely on it for their daily needs.

3.2.8.5 Probability of Future Occurrences

Wildland Fire

Wildfires are a regular feature of many of California's ecosystems and will continue to be in the future. Since the northern, eastern, and southern portion of Orange County are considered wildland/urban interface areas, the county has a higher probability of wildfire risks in those communities and surrounding areas. The specific chance of wildfire in Orange County's wildland/urban interface is not known, but the general vulnerability of the area to fires means that there is a reasonable possibility such an event will occur. According to the Planning Team and based on conditions experienced within the last several years, the probability of Orange County experiencing wildfires is highly likely—near 100% probability in the next year or happens every year.

Urban Fire

If the conditions for an urban fire exist in the planning area, the planning area will forever be at risk of experiencing an urban fire event. It is impossible to predict the precise likelihood and location of an urban fire emerging in the planning area, given how each fire event has unique origins. However, some areas are at an increased risk, including facilities, buildings, and infrastructure located along or adjacent to natural gas transmission pipelines, powerlines, and the many freeways and roads that run through the planning area. Given the vast amount of activity and fuel and chemicals that pass through the region, the likelihood of an urban fire outbreak in the planning area is probable.

3.2.8.6 Climate Change Considerations

Wildland Fire

Climate change is expected to cause an increase in temperatures and more frequent and intense drought conditions. This increase will likely increase the amount of dry plant matter available for fuel, increasing wildfire risk statewide. Climate change is expected to increase the number of acres burned annually in the foothills and mountainous areas of Orange County, which are already highly prone to wildfires. However, increases in fuel supplies could cause wildfires to move faster or spread into more developed areas, increasing the future threat for the planning area.

Urban Fire

While climate change has been linked to a potential increase in wildfire events, it is not clear exactly how climate change could influence the ignition or behavior of urban fires in the planning area.

3.3 Vulnerability Assessment

Vulnerability describes how exposed or susceptible to damage an asset is, and depends on an asset's construction, condition, contents, and the economic value of its functions. A vulnerability analysis predicts the extent of injury and damage on the existing and future built environment that may result from a hazard event of a given intensity in a given area. Due to the interrelatedness of water and wastewater infrastructure and the role each has in public health and safety, vulnerabilities in one community are often related to vulnerabilities in another. Indirect effects can be much more widespread and damaging than direct effects. For example, damage to a major water utility line could result in significant inconveniences and business disruption that would far exceed the cost of repairing the utility line.

The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to hazards and estimates potential losses. This section focuses on the risks to the planning area; data for each of the MAs was also evaluated and is included here and in the Jurisdictional Annexes.

3.3.1 Asset Inventory

Hazards that occur in Orange County can impact critical facilities located throughout the county. For this 2024 MJHMP, a critical facility is defined as public infrastructure used to provide potable water to the public and maintain wastewater services, necessary to maintain public health and safety. Critical facilities associated with potable water services located within the planning area include: wells, water storage tanks, reservoirs with dams, water treatment plants, pump stations, pressure reducing stations, emergency interties, service connections, pipelines, and administrative buildings and utility yards; refer to **Exhibit 3-34, Summary Assets,** at the end of this section. Critical facilities associated with wastewater services located within the planning area include wastewater treatment plants, lift stations, pipelines, and administrative buildings and utility yards (**Exhibit 3-35**).

3.3.2 Estimating Potential Exposure and Losses

Orange County covers 948 square miles with several different climate patterns and types of terrain, from the coast to the mountains, which allows for several hazards to affect various parts of Orange County, as described above. Due to the vast area, a hazard event could impact a single jurisdiction or multiple jurisdictions.

To assess the changing conditions within the planning area, an updated analysis of new water and wastewater infrastructure constructed since the last update was developed to inform the 2024 MJHMP update. As part of this update, the infrastructure mapping for new assets was overlaid with hazards having a physical geographic location to estimate exposure to water and wastewater infrastructure. Hazard areas and infrastructure overlays were conducted for wildfires, flooding, fault rupture, earthquakes, liquefaction, landslides, and tsunamis; refer also to the Jurisdictional Annexes. Hazards and infrastructure overlays were not conducted for the remaining hazards because data for these hazards was either not available or is not geographically distinct. Many of these hazards, such as drought, power outage, and high winds/Santa Ana winds affect the entire planning area; therefore, all water and wastewater infrastructure could be potentially susceptible to damage from them. For these hazards, quantitative analyses were not performed. Vulnerability assessments associated with these hazards are based on historic incidents and the knowledge

that water and wastewater experts have of their critical facilities and the susceptibility of those facilities to these hazards.

For water and wastewater infrastructure pipelines, the length of exposure/impact is given in miles. Other critical facilities are identified by facility/structure type. Exposure characterizes the value of facilities/structures within the hazard zone and is shown as estimated exposure based on the overlay of the hazard on the critical facilities which are assigned a cost of replacement for each type of facility/structure exposed. These replacement costs for the critical facilities were identified by each MA. The loss or exposure value is then determined with the assumption that the given facility/structure is destroyed (worst-case scenario), which is not always the case in hazard events. This assumption was valuable in the planning process, so that the total potential damage value was identified when determining capabilities and mitigation measures for each MA.

Exhibit 3-33, Unit Replacement Costs of Facilities, provides average replacement costs used for critical facilities and infrastructure listed in all subsequent exposure/loss tables.

Exhibit 3-33. Unit Replacement Costs of Facilities

Abbreviation	Name	Replacement Cost
WST	Water Storage Tank	$20,000,000
RES	Reservoir (with a dam)	$50,000,000
WTP	Water Treatment Plant (Diemer Filtration Plant)	$350,000,000
WTP	Water Treatment Plant by retail agency	$10,000,000
PS	Pump Station (South County Pump Station)	$35,000,000
PS	Retail Water Agency Pump Station	$8,000,000
PRS	Pressure Reducing Station (Metropolitan facility)	$52,000,000
PRS	Pressure Reducing Station for retail agency	$2,000,000
EIT	Emergency Interties	$2,000,000
SC	Service Connector	$3,000,000
ADM	Administration (large administration building)	$8,000,000
LS	Wastewater Pump Station/Lift Station by OC San/SOCWA	$4,000,000
LS	Wastewater Pump Station/Lift Station by retail agency	$5,000,000
WWTP	Wastewater Water Treatment Plant	$30,000,000
WELL	Well	$5,000,000
PP	Power Plant (Metropolitan Yorba Linda Power Plant)	$12,000,000

(1) Based on the highest cost for typical facility from among the MAs' facility values submitted. These results are conservatively high replacement costs for some retail agencies.

Exhibit 3-34 provides the total inventory for the critical facilities and infrastructure by jurisdiction. Estimated exposure for critical infrastructure by MA is provided in the Jurisdiction Annexes. **Exhibit 3-35, Planning Area Critical Facilities and Infrastructure Exposure Costs by Hazard,** provides a summary of exposure for the planning area by hazard. The costs identified reflect cost of replacement in a worst-case scenario (defined as the highest cost submitted from among all the MAs in the study process, excluding the regional facilities, as this would overstate the local costs). For example, Garden Grove may have identified a cost of $3 million to replace a well and Buena Park may identify a cost of $3.5 million to replace a well; however, $3.5 million would be used as the replacement cost for all wells within the planning area. This methodology was used for consistency across the planning area and selection of the highest cost helps ensure that appropriate costs are considered when requesting grants. For any detailed proposals submitted to FEMA, actual costs for mitigation and detailed estimates of the benefits of the mitigation measure

will be prepared and submitted. The costs included herein provide a relative measure of the impacts of the various hazards.

For additional detail on the exposure of facilities by MA, refer to the Jurisdictional Annexes. The Jurisdiction Annexes include a discussion of hazards and vulnerabilities specific to each MA, a discussion of their capabilities to address these losses, and identifies the actions to help mitigate damage to their infrastructure against hazards identified in the risk assessment.

3.3.3 Land Use and Development Trends/Changes in Development

The MAs provide water and wastewater services to majority of Orange County, which has a population of almost 3.2 million people. Depending upon the hazard and its magnitude and duration, a considerable number of people and businesses could be impacted. Of primary concern would be a hazard that results in the loss of water supply and wastewater services to the planning area. As discussed previously, a hazard could result in direct physical damage to water/wastewater infrastructure, as well as indirect damage resulting from business disruption.

Although Orange County is urbanized and predominately built out, the Southern California Association of Governments (SCAG) projects continued population, employment, and housing growth into 2040. The County of Orange and its incorporated cities maintain General Plans, which identify the planned growth and development for their respective jurisdictions. The planning area includes a wide variety of residential and non-residential land uses. Water and wastewater service providers will continue to work with the communities they serve to identify service needs, including the construction, expansion, or modification of water and wastewater infrastructure. The construction of new facilities or infrastructure will be completed in coordination with these communities to ensure compliance with appropriate codes and regulations, including consideration of potential hazards.

Population growth and development in Orange County has increased since 2012. According to the Department of Finance, the population for the county is expected to rise by approximately 0.31% in 2024 from the previous year. For a total population of approximately 3,150.835 people living within Orange County. Along with population growth has come an increase in development, increasing demands on water and wastewater infrastructure. Many Orange County cities have seen shifts in development toward higher-density residential and mixed-use development projects in response to the demand for housing.

Due to the highly developed nature of Orange County along with the presence of natural hazards throughout the area such as earthquakes, liquefaction, flood risk, and wildfires, development and population growth has continued to occur within areas of risk. Recent drought conditions have placed greater emphasis on the ability for new development to be served by water supplies and planning for prolonged drought conditions. Water and wastewater agencies continue to coordinate with Orange County, cities, and each other to meet the demands of the respective communities they serve while also strengthening regional and local infrastructure and overall reliability in the event of a hazard. MWDOC and many of the MAs have modified their infrastructure to include EOCs and water infrastructure, to mitigate potential threats.

3.3.4 Vulnerable Populations

Water supplies for safe drinking, sanitation, and hygiene are relied upon by the entire population. However, there are populations within the MA service areas that would be considered more vulnerable in the event of a hazard that affects water and wastewater infrastructure. These

populations include those that are reliant on others for their wellbeing, such as young children, individuals with disabilities, individuals' dependent on medical equipment, and individuals with impaired mobility, as well as people with low socioeconomic levels. Vulnerable populations are more significantly impacted in the event of a hazard.

3.4 Summary of Vulnerability

Due to the nature of water and wastewater infrastructure and its location throughout Orange County, there is some form of infrastructure that intersects with a hazard area. **Exhibit 3-34** identifies the infrastructure that intersects with hazards that have a specific geographic area (e.g., fire hazard, liquefaction); however, the entire MA service area also intersects with hazards that are not geographically specific (e.g., drought, power outage). The variety of hazards and the varying magnitude and probability of occurrence make it challenging to assess the hazards that pose the greatest risk to the MAs. The potential losses vary greatly depending upon the hazard and resulting impact to infrastructure. The challenge is further magnified by the potential health and economic impacts that could occur in the event water supplies are disrupted.

Exhibit 3-34. Summary Assets

Member Agency	Facility/Infrastructure																											
	Existing																	Future										
	Wells	Dams/Reservoirs	Water Treatment Plant	Potable Water System Pipeline (mile)	Water Storage Tank	Pump Stations	Pressure Reducing Station	Imported Water Connections	Emergency Intertie	Hydrants	Potable Service Connections	Administrative/ Office/Lab/ Maintenance Facilities	Wastewater System Pipeline (mile)	Wastewater/Water Reclamation Plant	WW Service Connections	Sewer Lift Stations	Heli Pad/Heli Hydrant	Wells	Dams/Reservoirs	Potable Water System Pipeline (mile)	Water Treatment Plant	Administrative/Office/ Maintenance Facilities	Water Storage Tank	Pump Stations	Pressure Reducing Station	Wastewater System Pipeline (mile)	Lab	Sewar Lift Station
Metropolitan Water District of Orange County	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orange County Water District	901	27	0	15	5	9	0	2	0	0	4	12	40	2	0	0	0	6	0	0	0	0	0	0	1	0	0	0
Orange County Sanitation District	0	0	0	0	0	0	0	0	0	0	0	1	380	2	0	16	0	0	0	0	0	0	0	0	0	0	1	0
South Orange County Wastewater Authority	0	0	0	0	0	0	0	0	0	0	0	6	25	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
El Toro Water District	0	2	0	168	5	9	19	4	12	1,964	9,871	2	114	1	8,950	11	0	0	0	0	0	0	0	0	0	0	0	0	0
Laguna Beach County Water District	0	0	3	135	21*	14	19	3	14	952	8,800	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Mesa Water District	9	0	1	317	3	2	0	3	15	3,404	25,300	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Moulton Niguel Water District	0	0	0	655	28	25	16	12	19	7,168	53,620	2	501	2	50,682	17	0	0	0	2	0	1	0	0	1	10	1	0
Santa Margarita Water District	0	3	0	626	34	21	25	22	4	4,250	54,254	1	630	3	57,537	19	0	0	0	2	3	0	0	22	21	25	20	0	0
Serrano Water District	2	1	1	43	2	5	0	1	0	370	2,385	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
South Coast Water District	1	0	2	169	14	9	25	4	18	1,694	17,240	9	140	1	14,764	13	0	1	0	0	0	0	1	0	0	0	0	1
Trabuco Canyon Water District	2	2	2*	65	9	12	11	2	6	600	4,150	2	47	1	3,670	8	0	1	0	2	0	0	2	2	5	2	0	0
Yorba Linda Water District	10	0	1	354	14	12	45	4	9	4,045	25,471	2	269	0	24,291	1	4	1	0	4	0	0	0	0	2	1	0	0
Irvine Ranch Water District	30	5	4	2,034	49	58	363	21	36	18,929	125,404	8	1,496	3	113,945	11	0	2	0	0	0	0	1	2	1	0	0	0
Costa Mesa Sanitary District	0	0	0	0	0	0	0	0	0	0	0	2	224	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0

(1) Regional water systems identified here are co-owned and managed by multiple utilities.

Exhibit 3-35. Planning Area Critical Facilities and Infrastructure Exposure Costs by Hazard

Hazard		Infrastructure Type														Replacement Costs
		Administration Buildings	Interties (#)	Pump Stations (#)	Treatment Plants (#)	Lift Stations (#)	Pressure Control Stations (#)	Reservoirs (#)	Water Storage Tanks (#)	Wells (#)	Effluent Pipeline (miles)	Potable Pipeline (miles)	Wastewater Pipeline (miles)	Manholes	Heli Pad/ Heli Hydrant	
Fire Hazard Zone	Moderate	0	14	13	0	7	0	13	0	0	0.5	45.02	37.78	0	0	$148,340,000
	High	0	5	6	1	0	0	13	0	1	1.0	59.03	66.8	0	0	$172,964,000
	Very High	0	24	48	2	10	1	72	1	5	1.6	151.14	101.75	0	0	$609,812,000
FEMA Flood Zone	100-Year	0	4	2	2	7	0	15	0	9	0.5	38.73	137.84	70	0	$183,256,000
	500-Year	0	18	7	2	11	4	8	0	38	2.1	106.05	308.36	535	0	$297,288,000
Alquist-Priolo Fault Zone		0	0	0	0	0	2	0	0	0	0	4.29	1.81	0	0	$440,000
Ground Shaking	Moderate	0	22	40	0	2	1	50	1	0	0	86.18	53.59	0	0	$391,736,000
	High	4	97	110	11	21	78	55	11	67	5.2	370.53	727.72	5,708	1	$1,387,396,357
	Extreme	1	24	25	1	10	1	43	0	26	0	169.53	391.85	48	2	$561,504,000
Liquefaction	Moderate	0	13	13	3	3	1	14	8	41	0	85.53	484.64	76	0	$321,936,000
	High	3	25	16	6	2	20	17	1	42	0	91.48	198.47	1,075	0	$553,840,000
	Very High	0	0	0	1	0	2	0	0	0	0	10.39	16.74	0	0	$23,104,000
	Unknown	0	13	7	1	1	0	1	0	7	0	54.45	100.4	0	0	$142,080,000
Landslide Zone		0	5	24	0	7	8	28	7	0	2.8	40.83	46.64	17	0	$227,676,000
Tsunami Zone		3	0	58	4	9	77	1	11	10	0.6	6.75	7.42	5,653	4	$299,752,357

(1) Based on the highest cost for typical facility from among the MAs' facility values submitted. These results are conservatively high replacement costs for some retail agencies.

SECTION 4: MITIGATION STRATEGY

Planning is the cornerstone to successful hazard mitigation efforts. Citizens, local government, and private interests with proactive policies can reduce damages and impacts associated with natural and human-caused hazards. Benefits realized by implementing hazard mitigation measures include:

- Saving lives by removing people from hazard prone situations.
- Limiting property damage by regulating development in hazard areas.
- Reducing economic impacts by minimizing outages of essential services during and after these events.
- Saving money for taxpayers by reducing the need for services during a disaster.
- Speeding disaster recovery and post-disaster relief funds.
- Demonstrating a strong commitment to the health and safety of the community.

Relocating people, institutions, and businesses from hazard-prone areas saves property and lives. Removal or protection of the structures within hazard-prone areas means that there is less to pay for disaster recovery or for service outages during an event. Having alternative service plans for essential services, such as water and sewer operations, protects structures from fire and allows residents and businesses to continue functioning or to restore normal functions quicker following a disaster. Post-event, recovery crews will have less to do because there will be less damage. Implementation of these measures speeds the overall recovery process.

4.1 Hazard Mitigation Overview

The mitigation strategy and actions were developed by the Planning Team based on an in-depth review of the vulnerabilities and capabilities described in the plan. The mitigation actions described in the Jurisdictional Annexes represent each MA's risk-based approach for reducing and/or eliminating the potential losses as identified in **Section 3, Risk Assessment**.

As part of the update process, the hazard mitigation goals were reviewed and refined. It was determined that the overarching mitigation goals were the same for all MAs. Therefore, one set of goals were identified for the MJHMP, as discussed below. If additional, jurisdiction-specific goals were identified by an MA, they are included in the Jurisdictional Annex.

MAs provided a comprehensive review of their mitigation actions to assess their ability to reduce risk and vulnerability to the jurisdiction from identified hazards. Upon review of each mitigation action, an assessment was made as to whether the mitigation action should be carried forward into the 2024 MJHMP and/or be revised/modified or removed to reflect changing conditions or priorities. Mitigation actions that were deemed complete during the current plan period were identified and removed (refer to the Jurisdictional Annexes). New mitigation measures were also identified.

4.1.1 FEMA's National Flood Insurance Program

In 1968, the U.S. Congress created the National Flood Insurance Program (NFIP) to provide affordable insurance to property owners while also encouraging communities to adopt and enforce floodplain management regulations. Community participation is voluntary; however, it is required to receive certain grants and funding from FEMA. The Orange County Flood Division (OC Flood) is a participant in the program and administers the floodplains within the unincorporated areas of Orange County. Within the incorporated areas, Orange County cities administer their floodplains.

Since the creation of NFIP, OC Flood has worked cooperatively with cities in Orange County to reduce the floodplain area by constructing flood control facilities that provide 100-year flood protection. Such facilities typically traverse through the cities and ultimately outlet into the Pacific Ocean. All cities within Orange County are participants in the program. As participants in this HMP update, both water and wastewater districts do not participate in the NFIP nor do they monitor properties within their jurisdictional boundaries as this responsibility falls on the county or cities they support.

Repetitive Loss Properties

According to the NFIP, a repetitive loss structure is an insured building that has had two or more losses of at least $1,000 each being paid under the NFIP within any 10-year period since 1978. MWDOC and MAs are not participants in the NFIP. Based on this status they do not regulate flood management for other property owners and solely focus on flood management of their owner properties/facilities.

4.2 Hazard Mitigation Goals

Mitigation goals are defined as general guidelines explaining what each jurisdiction wants to achieve in terms of hazard risk reduction and loss prevention. Goal statements are typically long-range, policy-oriented statements representing jurisdiction-wide visions. The goals identified in the previous plan were reviewed by the Planning Team. Through the update process, it was determined that these previous goals were adequate and relevant to MWDOC and the MAs. Based on discussions with the Planning Team only minor revisions to two goals were recommended to better align with current priorities. The following hazard mitigation goals have been identified for this 2024 MJHMP:

- **Goal 1:** Minimize vulnerabilities of critical facilities and infrastructure to minimize damages, loss of life, and injury to human life caused by hazards.
- **Goal 2:** Minimize security risks to water and wastewater infrastructure.
- **Goal 3:** Minimize interruption to water and wastewater utilities.
- **Goal 4:** Improve public outreach, awareness, education, and preparedness for hazards in order to increase the community resilience.
- **Goal 5:** Eliminate or minimize wastewater/recycled water spills and overflows (wastewater agencies).
- **Goal 6:** Protect water quality and supply, critical aquatic resources, and habitat to ensure a safe water supply.
- **Goal 7:** Strengthen emergency response services, workforce training, and education enhancement to ensure preparedness, response, and recovery during any major or multi-hazard event.

The MJHMP goals guide the direction of future activities aimed at reducing risk and preventing loss from natural and human-caused hazards. The goals also serve as checkpoints as the MAs begin implementing mitigation action items. Mitigation goals do not account for implementation cost, schedule, funding sources, etc. Goals represent what each MA wants to achieve, whereas the mitigation actions provide the actions needed to achieve the goals.

4.3 Identify and Prioritize Mitigation Actions

Mitigation actions were identified, evaluated, and prioritized by the MAs. They provide a list of activities that the MAs will use to reduce their risk of potential hazards. Some of these actions may be eligible for funding through Federal and State grant programs and other funding sources as made available by the MAs or other agencies/organizations. The mitigation actions are intended to address the comprehensive range of identified hazards for each MA, while some actions may address risk reduction from multiple hazards.

A detailed list of mitigation actions for each MA is provided in their respective Jurisdictional Annexes. The process used by the Planning Team to identify hazard mitigation actions for this MJHMP included the following:

- Review of the risk assessment presented in **Section 3**;
- Review of the capabilities assessment presented for each MA in the Jurisdictional Annexes; and
- Team discussion of new concerns/issues that need to be addressed to reduce hazards to critical water/wastewater infrastructure.

The mitigation actions identify the hazard, proposed mitigation action, location/facility, local planning mechanism, risk, cost, timeframe, possible funding sources, status, and status rationale, as applicable.

MAs conducted a capabilities assessment (provided in the Jurisdictional Annexes), to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP . To identify the capabilities, the Planning Team collaborated to identify current local capabilities and mechanisms available for reducing damage from future hazard events. The capabilities and resources were reviewed while developing the 2024 MJHMP, and opportunities to enhance mitigation were identified where applicable. After completion of the capabilities assessment, each jurisdiction evaluated and prioritized their proposed mitigation strategies and actions.

FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criteria was used to identify, evaluate, and prioritize mitigation actions based on existing local conditions. Using this method each MA considered the STAPLEE criteria regarding the feasibility and implementation of a mitigation action; refer to **Exhibit 4-1, STAPLEE Review and Selection Criteria.** This process was used to help ensure that the most equitable and feasible actions would be undertaken based on each MA's unique capabilities.

Exhibit 4-1. STAPLEE Review and Selection Criteria

STAPLEE Review	Selection Criteria
Social	Is the proposed action socially acceptable to the jurisdiction and surrounding community? Any equity issues involved that would mean that one segment of the jurisdiction and/or community is treated unfairly? Will the action cause social disruption?
Technical	Will the proposed action work? Will it create more problems than it solves?

STAPLEE Review	Selection Criteria
	Does it solve a problem or only a symptom? Is it the most useful action in light of other jurisdiction goals?
Administrative	Can the jurisdiction implement the action? Is there someone to coordinate and lead the effort? Is there sufficient funding, staff, and technical support available? Are there ongoing administrative requirements that need to be met?
Political	Is the action politically acceptable? Is there public support both to implement and to maintain the project?
Legal	Is the jurisdiction authorized to implement the proposed action? Are there legal side effects? Could the activity be construed as a taking? Will the jurisdiction be liable for action or lack of action? Will the activity be challenged?
Economic	What are the costs and benefits of this action? Do the benefits exceed the costs? Are initial, maintenance, and administrative costs taken into account? Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)? How will this action affect the fiscal capability of the jurisdiction? What burden will this action place on the tax base or local economy? What are the budget and revenue effects of this activity? Does the action contribute to other jurisdiction goals? What benefits will the action provide?
Environmental	How will the action affect the environment? Will the action need environmental regulatory approvals? Will it meet local and state regulatory requirements? Are endangered or threatened species likely to be affected?

In some instances, MAs revised the priorities of mitigation actions or removed mitigation actions all together. If the mitigation action was completed and no further action would be needed, the action was removed. However, in some instances it was determined that a mitigation action was no longer relevant due to technical changes or advances, a change in service conditions, or the cost associated with a mitigation that would not result in the benefits needed. To document these instances an additional table was included in the Jurisdictional Annex that highlights actions removed due to completion or if it was deemed unnecessary or infeasible. Some actions that may have been considered lower in priority during the last plan update were elevated due to conditions that either allowed for the action to be prioritized, such as the potential for funding or completion of other mitigation actions that preceded them. Mitigation actions were also prioritized based on more recent experiences associated with drought conditions and wildfires. These hazards and the impact they have had throughout Orange County and the State have resulted in new requirements in how these hazards are addressed in water supply and water and wastewater infrastructure systems.

4.3.1 Hazard Mitigation Benefit-Cost Review

FEMA requires local governments/agencies to analyze the benefits and costs of a range of mitigation actions that can reduce the effects of each hazard within their communities. Benefit-cost analysis is used in hazard mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit-cost analysis for a mitigation activity can assist communities in determining whether a project is worth

undertaking now to avoid disaster-related damages later. The analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

An HMP must demonstrate that a process was employed that emphasized a review of benefits and costs when prioritizing the mitigation actions. The benefit-cost review must be comprehensive to the extent that it can evaluate the monetary as well as the nonmonetary benefits and costs associated with each action. The benefit-cost review should at least consider the following questions:

- How many people will benefit from the action?
- How large an area is impacted?
- How critical are the facilities that benefit from the action (e.g., which is more beneficial to protect, the fire station or the administrative building)?
- Environmentally, does it make sense to do this project for the overall community?

These questions were used to help determine the appropriateness of mitigation actions. Benefits and costs are a primary motivation for implementing mitigation projects at water and wastewater utilities. Past disasters have shown the benefit-cost of mitigating water utilities against identifiable hazards. For example, a cold weather system that impacted most of the United States resulted in pipeline breaks across the State of California. Those ruptures primarily occurred on a specific type of pipeline that has been gradually phased out of use in California. The replacement of this type of pipeline prior to the cold front could have not only prevented the cost of pipeline breaks, but also costs related to flooding, landslides, loss of water supply, other secondary effects of the broken pipelines.

The final prioritization completed by each MA depended on the direct loss estimations for water/wastewater critical infrastructure along with the secondary costs associated with business loss and recovery. Much of this effort was completed with informal cost-benefit analysis based on the knowledge and expertise of the participants (many of them certified operators, water quality experts, or engineers), previous planning documents, and the concepts identified above. Those actions that did not have adequate benefits were excluded from the list of mitigation actions.

4.4 Regional Considerations

It is envisioned that the mitigation actions for the most part will be implemented on a district-by-district basis. MWDOC will provide facilitation, as appropriate, of this process to help reduce duplication of efforts between jurisdictions and to spearhead coordination of initiatives and action items that could be accomplished more efficiently on a regional level. In its role as a regional planning agency, MWDOC will act as lead on water-related hazard mitigation projects that are regional in nature, such as projects that cross several jurisdictional boundaries and work planned on behalf of Metropolitan. OC San, CMSD, and SOCWA will take the lead on wastewater related hazard mitigation projects that are regional in nature and within their individual service areas.

Section 3: Risk Assessment and Jurisdictional Annexes indicate that each MA is susceptible to a variety of potentially serious hazards in the region. The approach to emergency planning in California has been comprehensive in its planning for and preparedness to respond to all hazards utilizing the SEMS and a coordinated Incident Command System. A program managed by MWDOC, the Water Emergency Response Organization of Orange County (WEROC), acts as a coordination point (Area Command) to support an effective emergency response to major disasters by the Orange County water and wastewater utilities. WEROC provides services that promote planning

and preparedness activities for both the utilities, as well as its own EOC staff. WEROC also helps maintain a turn-key EOC as well as other preparedness and response resources throughout Orange County. WEROC receives guidance from a steering committee, which includes representatives from Orange County water utilities, Metropolitan, the County of Orange and the California Department of Health Service's Office of Drinking Water. WEROC and its steering committee help ensure water and wastewater utilities remain current with Federal and State emergency response procedures and plans for potential disasters.

The Disaster Mitigation Act of 2000 requires that in addition to having emergency response and emergency preparedness documents, regions should develop and maintain a document outlining measures that can be implemented before a hazard event occurs that would help minimize the damage to life and property. MWDOC has accepted the role of coordinating the development the HMP as a multi-jurisdictional plan. All-hazard mitigation planning efforts within the region are the responsibility of the jurisdictions. As noted, the capabilities of the jurisdictions to perform hazard mitigation planning are detailed in the Jurisdictional Annexes.

4.4.1 Regional Fiscal Resources

One of MWDOC's primary roles in coordinating the development of the MJHMP is to identify and obtain grant funding for preparing and implementing certain aspects of the plan. This is consistent with WEROC's role, as a program managed by MWDOC, for hazard mitigation and preparedness. WEROC has received grants to improve the EOCs and to secure water trailers for distribution of drinking water during disasters and will continue to provide guidance to the MAs with hazard mitigation project grant applications and their implementation. Additional fiscal capabilities of the jurisdictions when implementing a hazard mitigation project are detailed in their individual capabilities assessments.

Potential Funding Sources

The following are potential funding sources that may be used to implement mitigation strategies. These funding sources include the following Federal and State sources:

- **Building Resilient Infrastructure and Communities (BRIC):** A competitive FEMA grant program to support states, local communities, tribes, and territories.
- **Hazard Mitigation Grant Program (HMGP):** Provides funding to local, State, tribal, and territorial governments to rebuild in a way that reduces or mitigates future disaster losses in their communities. This grant funding is available after a presidentially declared disaster.
- **Emergency Management Performance Grant (EMPG) Program:** The Federal Government, through the EMPG Program, provides necessary direction, coordination, and guidance and provides necessary assistance, as authorized in this title, to support a comprehensive all-hazards emergency preparedness system.
- **Other Grants:** Other grants may include State of California grants associated with climate change, water infrastructure, homeland security, transportation, or other funding sources that periodically become available. The list below provides some common sources:

    1. Climate Adaptation Planning Sustainable Transportation Planning Grant Program – Department of Transportation
    2. Sustainable Communities Competitive – Department of Transportation

3. CAL FIRE Wildfire Prevention Grants Program – Department of Forestry and Fire Protection
4. Integrated Climate Adaptation and Resiliency Program's Climate Adaptation Planning Grant – Office of Planning and Research
5. Small Community Drought Relief Program – Department of Water Resources
6. Addressing Climate Impacts – Department of Fish and Wildlife
7. Cleanup Loans and Environmental Assistance to Neighborhoods (CLEAN) Program – Department of Toxic Substances Control
8. Clean Water State Revolving Fund (CWSRF) Program Construction – State Water Resources Control Board
9. Drinking Water State Revolving Fund (DWSRF) Construction – State Water Resources Control Board
10. Water Recycling Funding Program (WRFP) Construction Grant – State Water Resources Control Board
11. Equitable Community Revitalization Grants (ECRGs) – Department of Toxic Substances Control
12. Water Recycling Funding Program (WRFP) Planning Grant – State Water Resources Control Board
13. Infrastructure State Revolving Fund (ISRF) Program – Infrastructure and Economic Development Bank

SECTION 5: PLAN MAINTENANCE

This section of the MJHMP describes the formal process that will ensure this plan remains an active and relevant document. The maintenance process includes a schedule for monitoring and evaluating the MJHMP annually and producing a plan revision every five years. This section describes how the MAs will integrate public participation throughout the plan maintenance process. It also describes how the MAs intend to implement the MJHMP and incorporate its mitigation actions into existing planning mechanisms and programs. The MJHMP format, organized with Jurisdictional Annexes, allows the MAs to readily update sections when new data becomes available, ensuring the plan remains current and relevant.

5.1 Monitoring, Evaluating, and Updating the Plan

5.1.1 Plan Maintenance

MWDOC will be responsible for initiating plan reviews and coordinating with the MAs. The internal planning teams for each jurisdiction will meet bi-annually to review progress on plan implementation. MWDOC and the MAs will meet annually, or following a hazard event as described below, to monitor the plan's progress and implementation. This will also allow the opportunity for updates to hazards, jurisdictional goals, and mitigation action items, as necessary. If needed, the MAs will coordinate with MWDOC to integrate updates into the plan.

5.1.2 Plan Evaluation

The plan will be evaluated by the MAs at least annually to determine the effectiveness of the plan, and to reflect changes in land development or programs that may affect mitigation priorities. MWDOC and the Planning Team leads (or their jurisdictional representative) will also review the goals and action items to determine their relevance to changing situations in Orange County, as well as changes in State or Federal regulations and policy. MWDOC and MA representatives will also review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data or incidents. The MAs will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised. Any updates or changes necessary will be forwarded to MWDOC for inclusion in further updates to the plan.

MWDOC, with input from the Planning Team, will use the progress report template provided in **Appendix C** to report on annual progress. This will help to ensure consistent and accurate tracking of the plan implementation by each of the MAs. Each MA will coordinate with their responsible departments/agencies identified for each mitigation action. These responsible departments/agencies will help to monitor and evaluate the progress made on the implementation of mitigation actions and report to the MA's Planning Team representative on a semi-annual basis. These responsible departments/agencies will be asked to assess the effectiveness of the mitigation actions and modify the mitigations actions as appropriate. The MJHMP Mitigation Action Progress Report worksheet will assist Planning Team representatives in reporting the status and assessing the effectiveness of the mitigation actions.

The following questions will be considered in evaluating the plan's effectiveness:

- Has the nature or magnitude of hazards affecting the planning area/jurisdiction changed?
- Are there new hazards that have the potential to impact the planning area/jurisdiction?
- Do the identified goals and actions address current and expected conditions?

- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the HMP?
- Should additional local resources be committed to address identified hazards?

Future updates to the MJHMP will account for any new hazard vulnerabilities, unusual circumstances, or additional information that becomes available. Issues that arise during monitoring and evaluating the MJHMP, which require changes to the risk assessment, mitigation strategy, and other components of the plan, will be incorporated into the next update of the MJHMP, described below.

5.1.3 Plan Updates

Title 44 CFR § 201.6(d)(3) requires that local hazard mitigation plans be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for mitigation project grant funding. Monitoring the progress of the mitigation actions, as described above, will be ongoing throughout the five-year period between the adoption of the HMP and the next update effort. The five-year cycle may be accelerated to less than five years based on the following triggers:

- A presidential disaster declaration that impacts one or more of the MAs.
- A hazard event that causes loss of life.

Should a significant hazard occur within the planning area, the MJHMP Planning Team will reconvene within 60 days of the disaster to review and update the HMP, as required.

MWDOC, working in conjunction with the MAs, will serve as the primary responsible agency for updates to the plan. All MAs will be responsible to provide MWDOC with jurisdictional-level updates to the plan when/if necessary, as described above. Every five years the updated plan will be submitted to Cal OES and FEMA for review.

The intent of the update process will be to add new planning process methods, MA profile data, hazard data and events, vulnerability analyses, mitigation actions, and goals to the adopted plan so that the MJHMP will always be current and up to date. Based on the needs identified by the Planning Team, the update will, at a minimum, include the elements below:

- The update process will be convened by MWDOC and a Planning Team comprised of at least one representative from each MA.
- The hazard risk assessment will be reviewed and updated using best available information and technologies on an annual basis.
- The evaluation of critical infrastructure and mapping will be updated and improved as funding becomes available.
- The mitigation actions will be reviewed and revised to account for any actions completed, deferred, or changed to account for changes in the risk assessment or new policies identified under other planning mechanisms, as appropriate.
- The draft update will be made available to appropriate agencies for comment.
- The public will be given an opportunity to comment prior to adoption.
- The governing bodies for each MA will adopt the updated MJHMP.

5.1.4 Adoption

Each jurisdiction is responsible for adopting the MJHMP. This formal adoption should take place every five years. Once the plan had been adopted, MWDOC will be responsible for final submission to Cal OES. Cal OES will then submit the plan to FEMA for final review and approval.

5.1.5 Implementation Through Existing Programs

The effectiveness of the nonregulatory MJHMP depends on the implementation of the plan and incorporation of the outlined mitigation action items into existing plans, policies, and programs. The plan includes a range of action items that, if implemented, would reduce loss from hazard events in the planning area. Together, the mitigation action items in the MJHMP provide the framework for activities that the MAs may choose to implement over the next five years. The MAs have identified the plan's goals and prioritized jurisdiction-specific actions that will be implemented (resources permitting) through existing plans, policies, and programs.

Implementation of the plan will be the responsibility of each MA. Successful implementation is more likely if the plan recommendations are integrated into other plans and mechanisms, such as water and wastewater master plans, urban water management plans, administrative codes, strategic plans, CIPs, and budgets for each of the participating jurisdictions. Upon adoption of the 2024 MJHMP, the MAs can use the MJHMP as a baseline of information on the hazards that impact their jurisdictions. The MJHMP can also build on related planning/design efforts and mitigation programs that are already occurring within the planning area. This will also facilitate applying for funding opportunities as they become available. Progress on implementing mitigation actions through other planning programs and mechanisms should be monitored and integrated into future updates.

By adopting a resolution approving this MJHMP , each MA agrees to reference and incorporate the document into their future local planning documents, codes, decisions, processes, and regulations. The MJHMP will be reviewed and considered by each MA, as applicable plans are created or updated in the future. Upon creating or updating new plans or policies, each MA will review this MJHMP and consider the following:

- What hazard and/or vulnerability information should be considered and/or integrated into this plan?
- Are there opportunities for this plan to support and/or implement mitigation actions?
- What mitigation actions can and should be integrated into this plan?
- Are there other community mechanisms that mitigation can be integrated?
- Is there information from this plan or policy that can be integrated into the next MJHMP update?

Further, the WEROC program manager will establish as an annual agenda item to review and discuss incorporation of the MJHMP into local planning efforts and processes.

Some of the ways each MA will integrate information from this MJHMP into their planning mechanisms are described below.

The timing of updates to plans, programs, and regulatory documents vary depending upon the document and statutory requirements. The information provided in the hazards profiles, vulnerability assessment, and the mitigation actions will be integrated directly or incorporated by reference to support and enhance goals/policies and specific actions for each MA. This will be done as the documents are updated by each MA.

For water and wastewater service providers the most common plans, programs, and regulatory documents expected to integrate information from the MJHMP include water and wastewater master plans, urban water management plans, risk and resilience assessments, and capital improvement programs.

Water and Wastewater Plans will integrate more current hazard and vulnerability information and establish or update their framework for implementing actions identified in the MJHMP. Upon creating or updating any plans, water and wastewater agencies will review this MJHMP to consider the various hazards of concern as part of system design and programming and ensure integration of the mitigation actions into the respective plans. As staff assesses the information and analysis in the current plan it is anticipated that updated hazard information and mitigation actions would allow the MA to modify assumptions on their proposed systems that could increase resilience from potential hazard events.

The Urban Water Management and Planning Act was passed in 2010 and requires water suppliers to estimate water demands and available water supplies. Each water district has an Urban Water Management Plan (UWMP). UWMPs are required to evaluate the adequacy of water supplies including projections of 5, 10, and 20 years. These plans are also required to include water shortage contingency planning for dealing with water shortages, including a catastrophic supply interruption.

UWMPs are intended to be integrated with other urban planning requirements and management plans. Some of these plans include city and county General Plans, Water Master Plans, Recycled Water Master Plans, Integrated Resource Plans, Integrated Regional Water Management Plans, Groundwater Management Plans, Emergency Response Plans, and others. Each water district will review the MJHMP in coordination with preparation of UWMP updates to ensure the most current hazard information is provided and that the appropriate mitigation actions are incorporated.

Additionally, all water utilities are required to conduct RRAs and corresponding ERPs every five years in accordance with the AWIA. The RRAs include a risk assessment process that focuses on potential physical and cyber components of operations and business continuity. AWIA requires water utilities to assess their facilities for all-hazard risks, but specifically calls attention to malevolent acts, physical security, natural hazard risks, cyber security, and fiscal processes security. The corresponding ERP typically addresses protocols for potential emergency events. Both the RRA and the ERP are documents that are considered Protected Critical Infrastructure Information (PCII) due to information within the documents related to the water infrastructure. However, MAs will integrate pertinent information from this mitigation plan into their updated RRAs and ERPs, as well as utilize those documents to continue to update and enhance the MJHMP.

Wastewater agencies are also required to maintain current Sewer Master Plans; Sanitary Overflow Response Plans; and Fats, Oils, and Grease Ordinances. These plans can help to support hazard mitigation efforts, as well as shape future policy to reduce the impacts of sewer system failures.

Each MA has its own budget process, including CIPs that identify capital projects and equipment purchases. These systems provide a link between an MAs general and/or strategic plan and annual budget. As part of the annual review and update of the CIP, the mitigation actions identified in this HMP will be reviewed to determine which actions should be included within the CIP.

This HMP will be added or incorporated by reference into each MA’s emergency plans (e.g., Emergency Operations Plans, ERPs, and Emergency Evacuation Plans) as they are updated. The

hazard profiles, risk assessment, and mitigation actions will be reviewed during updates to these plans. Further, mitigation actions not currently provided in the HMP will be identified for consideration as part of the MJHMP update.

Other opportunities for integration of this MJHMP include education programs and continued coordination between MWDOC, the MAs, and other agencies. Each MA maintains a website and utilizes social media to provide updated information to its community and service area. Hazard information and opportunities for the community to reduce individual exposure to hazards will be provided. Some MAs will also provide in-person educational events and activities to further inform the community.

5.1.6 Continued Public Involvement

MWDOC is dedicated to involving the public directly in review and updates of the plan. MWDOC and a representative from each participating jurisdiction will be responsible for monitoring, evaluating, and updating the plan as described above. During all phases of plan maintenance, the public will have the opportunity to provide feedback.

The most current copy of the plan will be publicized and permanently available for review on MWDOC's website at https://www.mwdoc.com/your-water/emergency-management/emergency-management-resources/. The site will contain contact information to which people can direct their comments and concerns. All public feedback will be forwarded to the appropriate jurisdiction for review and consideration for incorporation (if deemed appropriate) into the next plan update. This information will also be forwarded to MWDOC, responsible for keeping track of public comments on the plan. In addition, copies of the plan will be catalogued and kept at all the appropriate agencies in the county. The existence and location of these copies will also be posted on the MWDOC website. This will provide the public an outlet for which they can express their concerns, opinions, or ideas about any updates/changes that are proposed to the plan.

Point of Contact

The primary point of contact for the HMP is MWDOC Emergency Manager Vicki Osborn. Ms. Osborn (or their designee) provides oversight and support maintenance and implementation efforts as well as future updates. To contact Ms. Osborn and other MWDOC staff, please use weroc@mwdoc.com or 714.963.3058.

SECTION 6: REFERENCES

Barnard, P., Short, A., Harley, M. *et al.* Coastal vulnerability across the Pacific dominated by El Niño/Southern Oscillation. *Nature Geosci* **8**, 801–807 (2015).

Bender, E. E.;2000. Late Quaternary uplift and earthquake potential of the San Joaquin Hills, southern Los Angeles basin, California: Comment and Reply: COMMENT. *Geology* ; 28 (4): 383.

Cal-Adapt. 2024. "Extreme Heat Days & Warm Nights" page. Cal-Adapt website. https://cal-adapt.org/tools/extreme-heat/.

Cal Fire (California Department of Forestry and Fire Protection, Fire and Resource Assessment). 2023. Fire Hazard Severity Zones. September 2023. https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/fire-hazard-severity-zones-maps-2022.

Cal Fire. 2024. Fire Incident Results. Accessed October 2024. https://www.fire.ca.gov/incidents.

Cal OES (California Governor's Office of Emergency Services). n.d. Spill Release Reporting. Accessed October 1, 2024. https://www.caloes.ca.gov/office-of-the-director/operations/response-operations/fire-rescue/hazardous-materials/spill-release-reporting/

CDC. n.d. Centers for Disease Control and Prevention. Drinking Water FAQ. Accessed January 10, 2018. https://www.cdc.gov/drinking-water/.

CGS (California Geological Survey), n.d.A "Alquist-Priolo Earthquake Fault Zones". Accessed October 1, 2024. https://www.conservation.ca.gov/cgs/alquist-priolo

CGS (California Geological Survey), n.d.B "Earthquakes". Accessed October 1, 2024. https://www.conservation.ca.gov/cgs/earthquakes

CGS (California Geological Survey), n.d.C "Seismic Hazard Zones". Accessed October 1, 2024. https://www.conservation.ca.gov/cgs/sh/seismic-hazard-zones

Climate Central. n.d. "Huntington Beach, California, USA." Surging Seas Risk Finder. https://riskfinder.climatecentral.org/place/huntington-beach.ca.us?comparisonType=place&forecastName=Single-year&forecastType=NOAA2017_int_p50&level=3&unit=ft. Accessed March 2018.

Cocca, Christina. 2013. "Power Back on After Massive Blackout Hits South Orange County, San Diego" page. NBC website. July 19, 2013. https://www.nbclosangeles.com/news/local/Massive-Blackout-Hits-South-orange-county-San-Diego-216115731.html.

Connelly, Laylan. 2016. "Our Eroding Coastline: Recent storms are reshaping beaches, and some are getting tougher to visit." *Orange County Register*. February 9, 2016. Accessed August 2017. https://www.ocregister.com/2016/02/09/our-eroding-coastline-recent-storms-are-reshaping-beaches-and-some-are-getting-tougher-to-visit/.

County of Orange. 2015. General Plan, Chapter IX: Safety Element. https://ocds.ocpublicworks.com/service-areas/oc-development-services/planning-development/codes-and-regulations/general-plan

Day, Robert W. 1994. Performance of Slab-on-Grade Foundations on Expansive Soil. Journal of Performance of Constructed Facilities. P 129-138

DoD (Department of Defense). 2015. National Security Implications of Climate-Related Risks and a Changing Climate. http://archive.defense.gov/pubs/150724- congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery.

Earth Consultants. 2005. Five Earthquake Scenarios Ground Motion Maps for Northern Orange County. Prepared for MWDOC by Earth Consultants International. July 22, 2005.

EPA (Environmental Protection Agency). n.d. "National Primary Drinking Water Regulations" page. EPA website. Accessed on October 14, 2024. https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

EPA. n.d. "Orange County North Basin, Orange County, CA, Cleanup Activities" on Superfund Site page. EPA website. https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0900251.

EPA. 2017. "EPA Prioritizes Cleanup of Orange County North Basin Groundwater" article on News Releases page. EPA website. December 8, 2017. Accessed January 10, 2018. https://www.epa.gov/newsreleases/epa-prioritizes-cleanup-orange-county-north-basin-groundwater.

Everest. 2013. Orange County Coastal Regional Sediment Management Plan. June 2013. Everest International Consultants, Inc., in association with Science Applications International Corporation Dr. Philip King. Prepared for the U.S. Army Corps of Engineers. https://danapointboaters.org/documents/government%20affairs/OCCRSMP_Report_Final.pdf.

Faunt, Claudia C., Sneed, Michelle. 2015. Water Availability and Subsidence in California's Central Valley. San Francisco Estuary and Watershed Science. Volume 13, Issue 3 | Article 4

Fausto, Alma. 2019. "Stretch of Pacific Coast Highway." *Orange County Register*. January 16, 2019. https://www.ocregister.com/2019/01/16/stretch-of-pacific-coast-highway-in-huntington-beach-closed-because-of-rain-flooding/.

FEMA (Federal Emergency Management Agency). 2019. Flood Insurance Study, Orange County, California and Incorporated Areas. March 21, 2019. https://ocpl.org/sites/ocpl/files/2021-07/flood_insurance_study_06059cv001c.pdf

FEMA. 2016. Flood Risk Report, Orange County, CA Open Pacific Coast Flood Insurance Study. Report Number 01. October 4, 2016.

FEMA. 2022. Local Mitigation Planning Policy Guide. FP 206-21-0002 (OMB Collection #1660-0062). https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf.

Field, E.H., Biasi, G.P., Bird, P., Dawson, T.E., Felzer, K.R., Jackson, D.D., Johnson, K.M., Jordan, T.H., Madden, C., Michael, A.J., Milner, K.R., Page, M.T., Parsons, T., Powers, P.M., Shaw, B.E., Thatcher, W.R., Weldon, R.J., II, and Zeng, Y., 2013, Uniform California earthquake rupture forecast, version 3 (UCERF3)—The time-independent model: U.S. Geological Survey Open-File Report 2013–1165, 97 p., California Geological Survey Special Report 228, and Southern California Earthquake Center Publication 1792, http://pubs.usgs.gov/of/2013/1165/.

Hall, Alex, Neil Berg, and Katherine Reich. 2018. Los Angeles Summary Report: California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007. University of California, Los Angeles.

Hapke, C.J., D. Reid, B. M. Richmond, P. Ruggiero, and J. List. 2006. National assessment of shoreline change: Part 3: Historical shoreline changes and associated coastal land loss along the sandy shorelines of the California coast: U.S. Geological Survey Open-file Report 2006-1219. https://pubs.usgs.gov/of/2006/1219/.

Hernandez, Salvador. 2013. "Cleveland National Forest fire 78% contained." *Orange County Register*. August 7, 2013.https://www.ocregister.com/2013/08/07/cleveland-national-forest-fire-78-contained/.

Penn, Ivan. 2016. "AECOM, Energy Solutions win bid to decommission San Onofre nuclear plant." *Los Angles Times*. December 20, 2016. http://www.latimes.com/business/la-fi-san-onofre-decommission-20161220-story.html.

Krohn, J. P., and J. E. Slosson. 1980. "Assessment of expansive soils in the United States," Proc., 4th Int. Conf. on Expansive Soils, 596–608. New York: ASCE.

Lee, Greg, ABC 7. 2015. "Brush fire erupts on State Route 241 near Irvine Lake; campgrounds evacuated." ABC 7 webpage. July 13, 2015. http://abc7.com/news/brush-fire-erupts-on-state-route-241-near-irvine-lake/848365/.

Masih, A. January 2018. "An Enhanced Seismic Activity Observed Due to Climate Change: Preliminary Results from Alaska." IOP Conference Series: Earth and Environmental Science. doi :10.1088/1755-1315/167/1/012018. https://iopscience.iop.org/article/10.1088/1755-1315/167/1/012018/pdf

Mateski, M., C. Trevino, C. Veitch, J. Michalski, J. Harris, S. Maruoka, and J. Frye. 2012. "Cyber Threat Metrics." Sandia National Laboratories. https://fas.org/irp/eprint/metrics.pdf.

Meinzer, Oscar Edward; Compressibility and elasticity of artesian aquifers. Economic Geology 1928;; 23 (3): 263–291.

MWDOC (Municipal Water District of Orange County). 2015. 2015 Urban Water Management Plan. May 2016. https://www.mwdoc.com/wp-content/uploads/2017/06/FINAL-MWDOC-UWMP-May-2016.pdf.

National Climate Assessment. 2014. Coastal Zone Development and Ecosystems. http://nca2014.globalchange.gov/report/regions/coasts.

National Geophysical Data Center (NGDC) / World Data Service: NCEI/WDS Global Historical Tsunami Database. NOAA National Centers for Environmental Information. doi:10.7289/V5PN93H7. Accessed August 17, 2024.

NASA. 2024. Global Climate Change Vital Signs of the Planet website. Accessed October 14, 2024. https://climate.nasa.gov/.

NDMC (National Drought Mitigation Center). 2024. Drought Risk Atlas website. https://droughtatlas.unl.edu/Data.aspx.

NOAA (National Oceanic and Atmospheric Administration). n.d. “Tides and Currents” page. NOAA website. Accessed October 2024. https://tidesandcurrents.noaa.gov/

NOAA. n.d. United States Climate Resilience Toolkit, The Climate Explorer. Managed by NOAA's Climate Program Office and hosted by the National Environmental Modeling and Analysis Center (NEMAC) at the University of North Carolina Asheville. https://toolkit.climate.gov/climate-explorer2/.

NOAA. 2015. “Drought Monitoring” page. National Weather Service Climate Prediction Center site. January 13, 2015. Accessed March 2018. http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml.

NOAA. 2024a. Storm Events Database. National Centers for Environmental Information website. June 2024. https://www.ncdc.noaa.gov/stormevents/.

NOAA. 2024b. Sea Level Rise Trends, Los Angeles, CA. https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=9410660

NYU. 2024. Index of Cybersecurity. Accessed October 1, 2024. https://wp.nyu.edu/awm1/

OC Public Works. n.d. “Rain & Stream Data.” OC Environmental Resources page. OC Public Works website. Accessed on October 14, 2024. https://ocerws.ocpublicworks.com/service-areas/oc-environmental-resources/oc-watersheds/rain-stream-data.

OC San (Orange County Sanitation District). 2023. Annual Report 2022-2023.

OC San. 2023. Five Year Strategic Plan. https://www.ocsan.gov/home/showpublisheddocument/34283/638357197431730000.

OCWD (Orange County Water District). 2015. Groundwater Management Plan 2015 Update. https://www.ocwd.com/wp-content/uploads/groundwatermanagementplan2015update_20150624.pdf.

OCWD. “Orange County North Basin Superfund Site” page. OCWD website. Accessed October 15, 2024. https://www.ocwd.com/what-we-do/water-quality/groundwater-cleanup/north-basin/.

Orange County Sheriff’s Department. JTTF. Accessed August 24, 2017. http://www.ocsd.org/divisions/fieldops/security/terrorism/jttf.

Orange County Sheriff’s Department. Orange County Intelligence Assessment Center. Accessed August 23, 2017. http://www.ocsd.org/divisions/fieldops/security/iac.

Oskin, B. 2014. “No Evidence of Megatsunamis Slamming California Coast.” *Live Science*. May 19, 2014. http://www.livescience.com/45864-california-ancient-tsunamis-evidence.html.

Orange County’s Homeland Security. Accessed August 23, 2017. https://media.ocgov.com/gov/bos/5/info/issues/homeland.asp.

OCOF (Our Coast, Our Future). 2024. Interactive Map. Accessed October 2024. https://ourcoastourfuture.org/hazard-map/

Polade, S.D., Gershunov, A., Cayan, D.R., Dettinger, M.D., & Pierce, D.W. 2017. Precipitation in a warming world: Assessing projected hydro-climate changes in California and other Mediterranean climate regions. Scientific Reports. https://www.nature.com/articles/s41598-017-11285-y.

Poland, J.F., Lofgren, R.L., and Pugh, R.G., 1972. Land Subsidence in the San Joaquin Valley, California, as of 1972.

Rocha, Veronica. 2016."Where is the Holy fire burning?" *LA Times*. September 27, 2016. http://www.latimes.com/local/california/la-me-updates-wildfire-season-where-is-the-holy-fire-1472674601-htmlstory.html#nt=card.

Romey, Michael G., Cody M. Kermanian, and Lucas I. Quass. 2021. "A Dry 2021 in California Prompts Water Conservation Response." Environment, Land & Resources website. Latham & Watkins LLP. December 13, 2021. https://www.globalelr.com/2021/12/a-dry-2021-in-california-prompts-water-conservation-response/.

Salazar, Denisse. 2013. "Silverado fire battle continues overnight." *Orange County Register*. October 7, 2013. https://www.ocregister.com/2013/10/07/silverado-fire-battle-continues-overnight/.

Nikolewski, Rob. 2018. "Court Settlement looks to move nuclear waste from San Onofre." *San Diego Union-Tribune*. Accessed January 10, 2018.http://www.sandiegouniontribune.com/business/energy-green/sd-fi-songs-agreement-20170828-story.html.

Schwartz, P., and D. Randall. 2003. An Abrupt Climate Change Scenario and Its Implications for United States National Security. http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA469325.

SCAG (Southern California Association of Governments). 2012. Regional Transportation Plan 2012-2035 Sustainable Communities Strategy, Growth Forecasts. https://scag.ca.gov/post/2012-2035-regional-transportation-plansustainable-communities-strategy-executive-summary.

State of California. 2024. Department of Conservation website. http://www.conservation.ca.gov/.

Sudock, Joshua. 2016. "Laguna Wilderness Park fire nearing containment; roads open." Orange County Register. June 27, 2016. https://www.ocregister.com/2016/06/27/laguna-wilderness-park-fire-nearing-containment-roads-open/.

Swegles, Fred. 2017. "Flooding, mudslides, power outages follow torrential rainstorm." *Orange County Register*. January 23, 2017. https://www. ocregister.com/2017/01/23/flooding-mudslides-power-outages-follow-torrential-rainstorm/.

Union of Concerned Scientists. n.d. When Rising Seas Hit Home website. https://ucsusa.maps.arcgis.com/apps/MapSeries/index.html?appid=64b2cbd03a3d4b87aaddaf65f6b33332.

USDA (United States Department of Agriculture). 2015. "Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis." November 2015. https://www.fs.usda.gov/sites/default/files/GTR-WO-93a.pdf .

USGS (United States Geological Survey). 2014a. ''Moment Magnitude, Richter Scale.'' https://www.usgs.gov/faqs/moment-magnitude-richter-scale-what-are-different-magnitude-scales-and-why-are-there-so-many.

USGS (Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H.), 2014b, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., http://dx.doi.org/10.3 33/ofr20141091.

USGS. 2015. UCERF3: A New Earthquake Forecast for California's Complex Fault System. Fact Sheet 2015-3009. ISSN 2327-6916. March 2015. http://dx.doi.org/10.3133/fs20153009.

USGS. 2017a. "Disappearing Beaches: Modeling Shoreline Change in Southern California." USGS website. May 31, 2017. https://www.usgs.gov/programs/cmhrp/news/disappearing-beaches-modeling-shoreline-change-southern-california.

USGS. 2017b. Severe West Coast Erosion During 2015-16 El Nino. February 14, 2017. https://www.usgs.gov/news/ severe-west-coast-erosion-during-2015-16-el-ni-o.

USGS. 2000. Landslide Hazards (Fact Sheet 0071-40, Version 1.0). May 2000. https://pubs.usgs.gov/fs/fs-0071-00/fs-0071-00.pdf.

USGS. N.D. Coastal Storm Modeling System: CoSMoS. Accessed October 2024. https://www.usgs.gov/centers/pcmsc/science/coastal-storm-modeling-system-cosmos.

USGS. 2024. Land Subsidence. Accessed October 1, 2024. https://www.usgs.gov/special-topics/water-science-school/science/land-subsidence

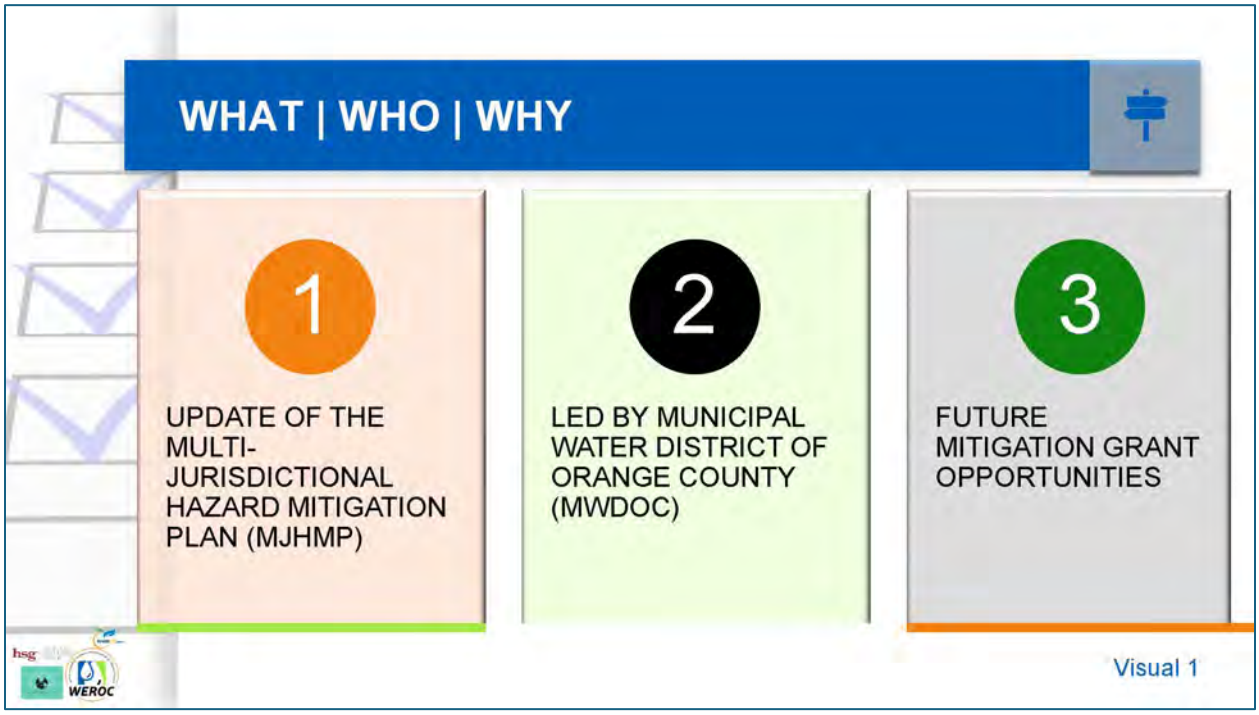
University of California San Diego. 2016. Santa Ana Winds of Southern California: Historical Variability and Future Climate Projections. June 1, 2016. Accessed October 2024. https://escholarship.org/content/qt6hm499nj/qt6hm499nj_noSplash_2bb235bdd62bbb3fa12f96fcd60de8ab.pdf.

Weather.gov. 2024. A History of Significant Weather Events in Southern California: Organized by Weather Type. March 2024. https://www.weather.gov/media/sgx/documents/weatherhistory.pdf.

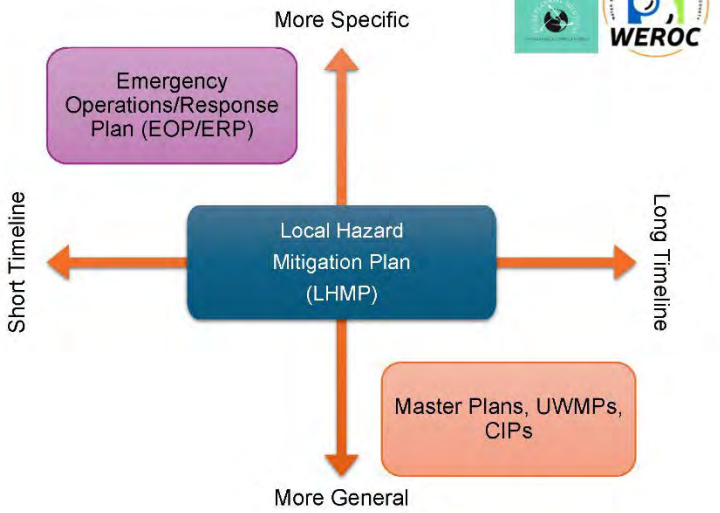
Williams, Lauren. 2017. "Orange County Beach Cities Bracing for 7-foot King Tides; Flooding Possible." *Orange County Recorder*. January 10, 2017. https://www.ocregister.com/2017/01/10/orange-county-beach-cities-bracing-for-7-foot-king-tides-flooding-possible/.

Appendix A: Outreach Materials

Water Board Meeting Presentations



Fitting the Pieces Together



Visual 2

What is Hazard Mitigation?

- Sustained actions taken to reduce or eliminate long-term risk to life and property from hazards
- Actions that make the community less vulnerable to natural hazards before disasters strike
- Communities reduce their vulnerability through the development of a Hazard Mitigation Plan (HMP)

Visual 3

WHAT DOES A LOCAL HAZARD MITIGATION PLAN DO?

Discuss Community hazards

Analyzes hazard risks

Identifies Policies / Projects to Reduce Risk

Provides direction to implement and monitor

Visual 4

Who is Participating in the MJHMP Planning Process?

- Municipal Water District of Orange County
- Costa Mesa Sanitary District
- El Toro Water District
- Irvine Ranch Water District
- Laguna Beach County Water District
- Mesa Water District
- Moulton Niguel Water District
- Orange County Sanitation District
- Orange County Water District
- Santa Margarita Water District
- Serrano Water District
- South Coast Water District
- South Orange County Wastewater Authority
- Trabuco Canyon Water District
- Yorba Linda Water District

Visual 5

Why Prepare an LHMP?

Reduces injury, loss of life, property damage, and loss of services from natural disasters.

Eligibility for FEMA Grants:

- Building Resilient Infrastructure and Communities (BRIC) replaces Pre-Disaster Mitigation Grant Program
- Flood Mitigation Assistance (FMA)
- Hazard Mitigation Grant Program (HMGP)

Visual 6

MJHMP Goals

Goal 1:	Minimize vulnerabilities of critical facilities and infrastructure to minimize damages and loss of life and injury to human life caused by hazards.
Goal 2:	Minimize security risks to water and wastewater infrastructure.
Goal 3:	Minimize interruption to water and wastewater utilities.
Goal 4:	Improve public outreach, awareness, education, and preparedness for hazards in order to increase the community resilience.
Goal 5:	Eliminate or minimize wastewater/ recycled water spills and overflows (Wastewater agencies).
Goal 6:	Protect water quality and supply, critical aquatic resources and habitat to ensure a safe water supply.
Goal 7:	Strengthen emergency response services, workforce training, and education enhancement to ensure preparedness, response, and recovery during any major or multi-hazard event.

Visual 7

What Hazards are in the LHMP?

List of Hazards		
Coastal Hazards		
Coastal Erosion	Yes	
Coastal Storm	Yes	
Sea Level Rise	Yes	
Tsunami	Yes	
Dam/ Reservoir Failure	Yes	
Flood	Yes	
Geological Hazards		
Expansive Soils	Yes	
Land Subsidence	Yes	
Landslide and Mudflow	Yes	
Human-Caused Hazards	Yes	
Contamination/ Saltwater Intrusion	Yes	
Hazardous Materials	Yes	
Power Outage	Yes	
Terrorism (Cyberthreat)	Yes	
Terrorism (Mass-Casualty Incident)	Yes	
Seismic Hazards		
Fault Rupture	Yes	
Liquefaction	Yes	
Seismic Shaking	Yes	
Severe Weather	Includes discussion of weather related hazards (Hurricane, Tornado, Lightning, Winter Storms, etc...)	
Drought	Yes	
Extreme Heat	Yes	
Windstorm (Santa Ana Winds)	Yes	
Urban Fire	Yes	Providing adequate pressure for fire suppression as a key issue
Wildfire	Yes	
Climate Change	Yes	Covered in all hazards

* Climate Change addressed under each relevant hazard

Visual 8

9

Countywide Hazards Ranking

Section 1						
Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration
		Affected Area	Primary Impact	Secondary Impact		
Human-Caused Hazards - Power Outage	4	3	4	4	57.6	High
Wildfire	4	3	3	4	52.0	High
Human-Caused Hazards - Terrorism (Cyberthreat)	4	3	3	2	44.0	High
Seismic Hazards - Seismic Shaking	3	3	4	4	43.2	High
Seismic Hazards - Liquefaction	3	3	4	4	43.2	High
Severe Weather - Windstorm	4	4	2	1	40.8	Medium
Severe Weather - Extreme Heat	3	3	3	3	36	Medium
Severe Weather - Drought	4	4	1	1	35.2	Medium
Dam/Reservoir Failure	2	3	4	4	28.8	Medium
Flood	3	3	2	1	25.8	Medium
Coastal Hazards - Coastal Storm	3	2	2	2	24.0	Medium
Coastal Hazards - Coastal Erosion	3	1	2	2	19.2	Medium
Seismic Hazards - Fault Rupture	2	1	4	2	18.4	Medium
Geological Hazards - Landslide and Mudflow	2	2	2	3	18	Medium
Coastal Hazards - Sea Level Rise	3	1	2	1	16.2	Medium
Human-Caused Hazards - Contamination/ Saltwater Intrusion	1	2	3	4	11.4	Low
Human-Caused Hazards - Terrorism (MCI)	1	1	3	3	8.8	Low
Human-Caused Hazards - Hazardous Materials	1	1	2	3	7.4	Low
Urban Fire	1	1	2	1	5.4	Low
Geological Hazards - Land Subsidence	1	1	1	2	5	Low
Geological Hazards - Expansive Soils	1	1	1	2	5	Low
Coastal Hazards - Tsunami	1	1	1	1	4	Low

Scores are based on a scale from 1 to 4, where 4 is the highest score and 1 is the lowest. Refer to Table 3-3 for additional information. The total score is based on an equation that weights categories by importance. Refer to Table 3-3 for additional information.

Visual 9

How is the Plan being developed?

- Plan Development
  July 2024 – October 2024
- Public Review/
  Stakeholder Coordination
  July – November 2024
- Plan Review (Cal OES/ FEMA)
  December 2024
- Plan Adoption
  Spring 2025

Visual 10

Public Participation

Online Engagement

- Online Survey
- Online Promotion
  - Local Hazard Mitigation Plan Webpages
  - Social Media Postings
  - Newsletters,
  - Blogs,
  - Bill Inserts
  - Other Materials

In Person Engagement

- Engagement Kick Off (Information Sharing)
- Public Review Period (Draft Plan)
- Final Adoption

Visual 11


Questions?
WEROC
Vicki Osborn
Director of Emergency Management
Water Emergency Response Organization of Orange County
Municipal Water District of Orange County
vosborn@mwdoc.com
714-593-5010
hsg
HERNDON
SOLUTIONS
GROUP
Visual 12

Municipal Water District of Orange County 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

MWDOC *eCurrents* Newsletter

OCTOBER 2024

5 THINGS TO KNOW!

About the MJHMP Update

Gabby Landeros, WEROC Specialist
Municipal Water District of Orange County

The Municipal Water District of Orange County (MWDOC) and participating agencies are updating our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) to enhance community safety and resilience. This five-year plan identifies vulnerabilities to disasters and outlines proactive measures to mitigate these threats. Developed by agency staff, with support from elected officials, key stakeholders, public safety, and technical consultants, the plan also incorporates feedback from community members.

DID YOU KNOW? Updating the MJHMP is a collaborative and inclusive process. Participation is crucial, with stakeholder meetings and public hearings held at various times to raise awareness of hazards and gather input on mitigation actions. Community feedback is essential for the planning process, ensuring the plan reflects the needs and concerns of all stakeholders.

An updated MJHMP is necessary to maintain eligibility for Federal Emergency Management Agency (FEMA) grants under the Federal Robert T. Stafford Act and the Disaster Mitigation Act of 2000. This plan must be updated every five (5) years to ensure continued access to these critical funds, which support additional hazard mitigation efforts and help break the cycle of disaster damage and reconstruction.

The following are key factors of the planning process:

MWDOC.COM/WEROCMJHMP

1 BE INVOLVED.

Your feedback matters. Complete our survey at: https://forms.gle/RmJDAJddw4CfnrXC7. Visit with our participating agencies for future engagement opportunities. Follow MWDOC on social media throughout the process. For further questions, please email: weroc@mwdoc.com or call (714) 593-5010.

2 ASSESS RISKS, DEVELOP STRATEGY.

Once we understand the hazards and risks within our community, we can develop long-term strategies to minimize or avoid the effects of disasters. The plan will outline specific policy recommendations to implement over the next five (5) years.

3 THE PUBLIC PLAN RELEASE.

The DRAFT PLAN will be released around December 2024. This is the time to read and comment on the plan at community engagement opportunities or in writing. This plan will help our community learn about and prepare for emergencies, building a safer future for everyone.

4 ADOPT AND IMPLEMENT.

The developed plan will be adopted by MWDOC and participating agencies' governing bodies and approved by FEMA in spring 2025. The plan is then implemented through various means, including changes to day-to-day operations and specific mitigation actions.

5 CONDUCT PERIODIC UPDATES AND MAINTENANCE.

The MJHMP is a living document, subject to updates to reflect changing risks and priorities. An active hazard mitigation plan offers several benefits, including eligibility for federal funding, comprehensive risk assessment, and tangible action steps to manage and mitigate risk. This helps reduce the loss of life and property and supports pre-disaster mitigation and recovery efforts.

Costa Mesa Sanitary District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Local Hazard Mitigation Plan

Costa Mesa Sanitary District (CMSD) and its partner agencies in Orange County are preparing to update their Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community by analyzing threats from natural and human-caused hazards and recommending specific actions to proactively decrease these threats before disasters occur.

Why is the MJHMP important residents?

An MJHMP will help CMSD better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. The plan will allow us to better prepare in advance for these disasters so that less damage occurs, and recovery is easier. Our community can use the plan's strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach can save you money! Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. Having a plan will also make CMSD eligible for grants from the Federal Emergency Management Agency (FEMA) and the State of California that can be used toward projects that increase the reliability and redundancy of our infrastructure, rather than using ratepayer funds for these types of projects.

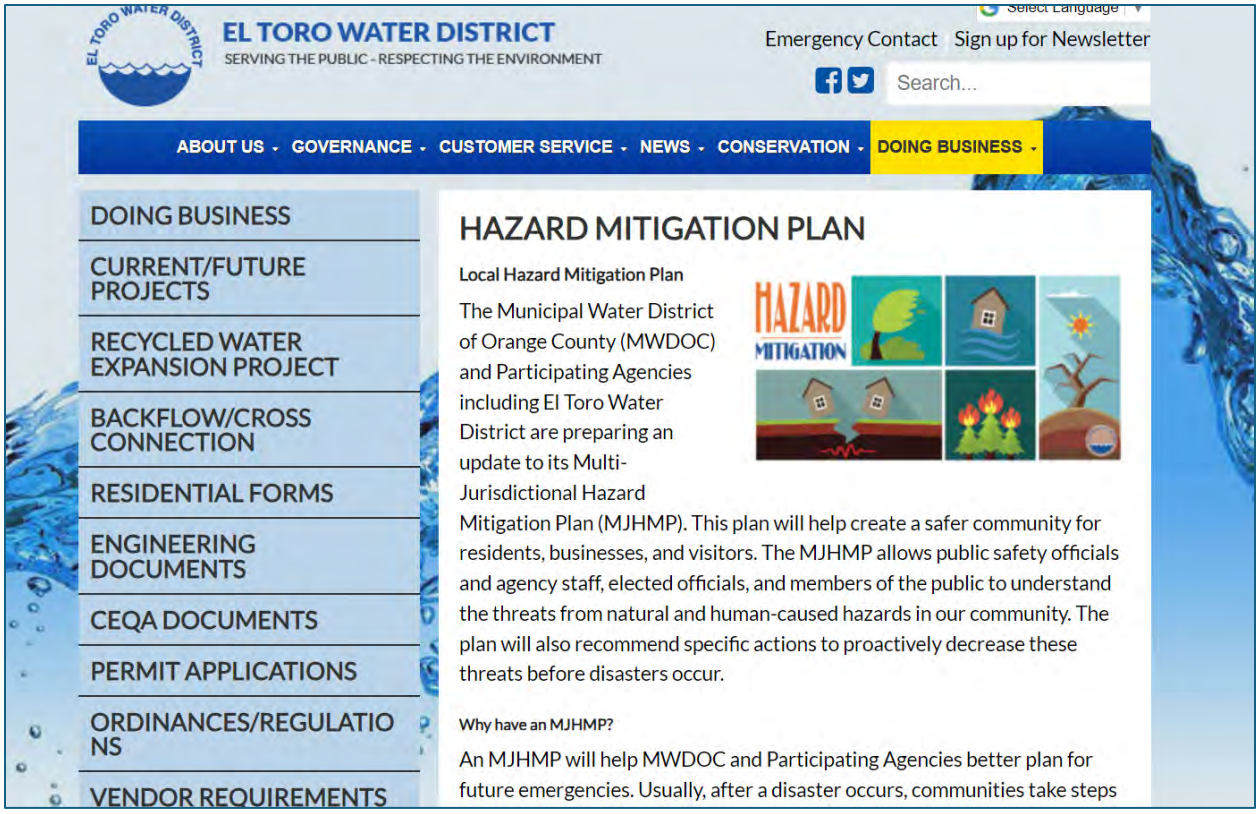
How can I get involved?

You can get involved in preparing our MJHMP in the following ways:

- Please take our online survey https://forms.gle/RmJDAJddw4CfnrXC7, which is available through October 2024. Share this link with your family and friends.
- CMSD will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Fill out the contact form at the bottom of this webpage with your questions, comments, or feedback.
- Attend and/or provide public comments during the public meetings listed below.

Meeting Information	Public Engagement Opportunities
Board of Directors Meeting August 26, 2024 at 4:30 p.m. Location: CMSD Headquarters 290 Paularino Ave, Costa Mesa, CA 92626 (or join by Zoom using Meeting ID 850 1825 3471)	• Receive presentation about the MJHMP planning process • Provide public comments
Citizens Advisory Committee Meeting November 13, 2024 at 6:00 p.m. Location: CMSD Headquarters 290 Paularino Ave, Costa Mesa, CA 92626 (or join by Zoom using Meeting ID 885 8027 5211)	• Receive presentation about the MJHMP planning process • Provide public comments

EL Toro Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website



How can I get involved?

You can get involved in preparing our MJHMP in different ways.

- The Agency will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.
- **Please take our online survey** https://forms.gle/RmJDAJddw4CfnrXC7 **, which is available through August 2024. Please share this link with your family and friends.**
- The Agency will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Encourage members of the Agency's Board of Directors to adopt the plan and begin implementing it.
- Reach out to district@etwd.com for more ways to stay involved.

Irvine Ranch Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

MJHMP: Help us build a safer community!

Take this regional survey to help identify potential disaster concerns

Irvine Ranch Water District is working with the Municipal Water District of Orange County and participating agencies on updates to a Multi-jurisdictional Hazard Mitigation Plan to help assess our community's vulnerabilities to disaster, and identify appropriate action to guard against it.

You can help!

Let your voice be heard as we plan for a safer future! Take this quick and anonymous survey on hazards and emergency preparations. Your responses will help in the preparation of the plan.

A draft of the completed MJHMP plan will be made available in the fall.

Why have an MJHMP?

An MJHMP will help IRWD, MWDOC, and Participating Agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for IRWD to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach can save money. Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. An MJHMP can also help strengthen the mission of public safety officers, such as police and fire department staff, providing them with clear roles and responsibilities to build a safer community.

Besides helping protect our assets and properties within the planning area, our MJHMP will make IRWD eligible for grants from the Federal Emergency Management Agency (FEMA) that can be used to further improve safety and preparedness in the community. Having an adopted MJHMP can also provide eligibility to receive more financial assistance from the State when disasters occur.

What is in our MJHMP?

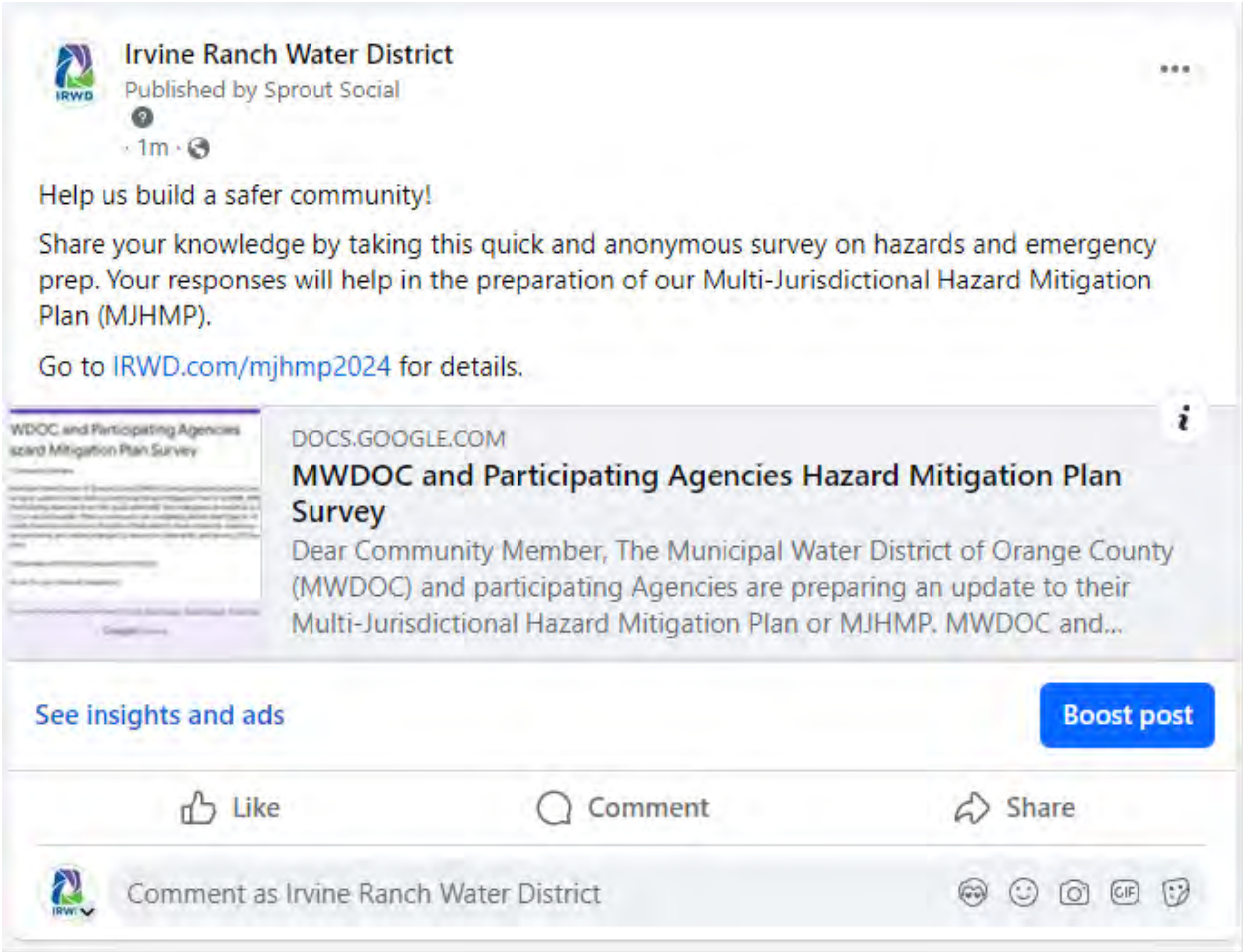
The MJHMP includes four main sections:

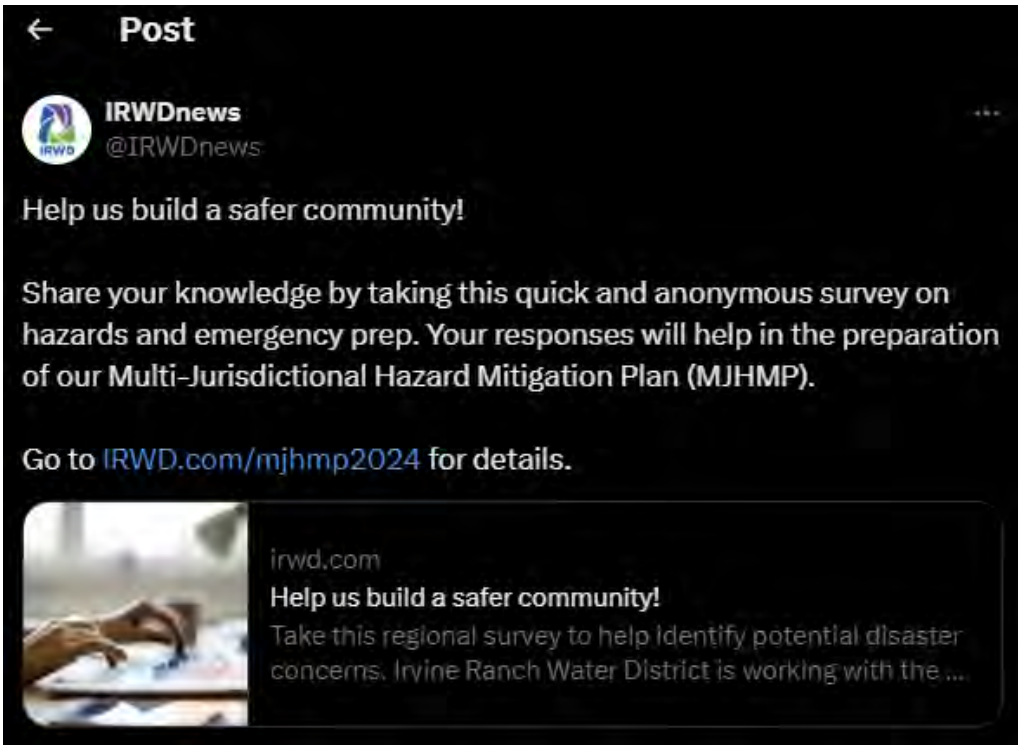
- A summary of the natural and human-caused hazards that pose a risk to our community.
- An assessment of the threat to IRWD, MWDOC and Participating Agencies, which will describe how our community is vulnerable to future disasters.
- A hazard mitigation strategy, which will lay out specific policy recommendations to carry out over the next five years.
- A section on maintaining the plan, which will help ensure that our MJHMP is kept up-to-date.

What hazards will our MJHMP help protect against?

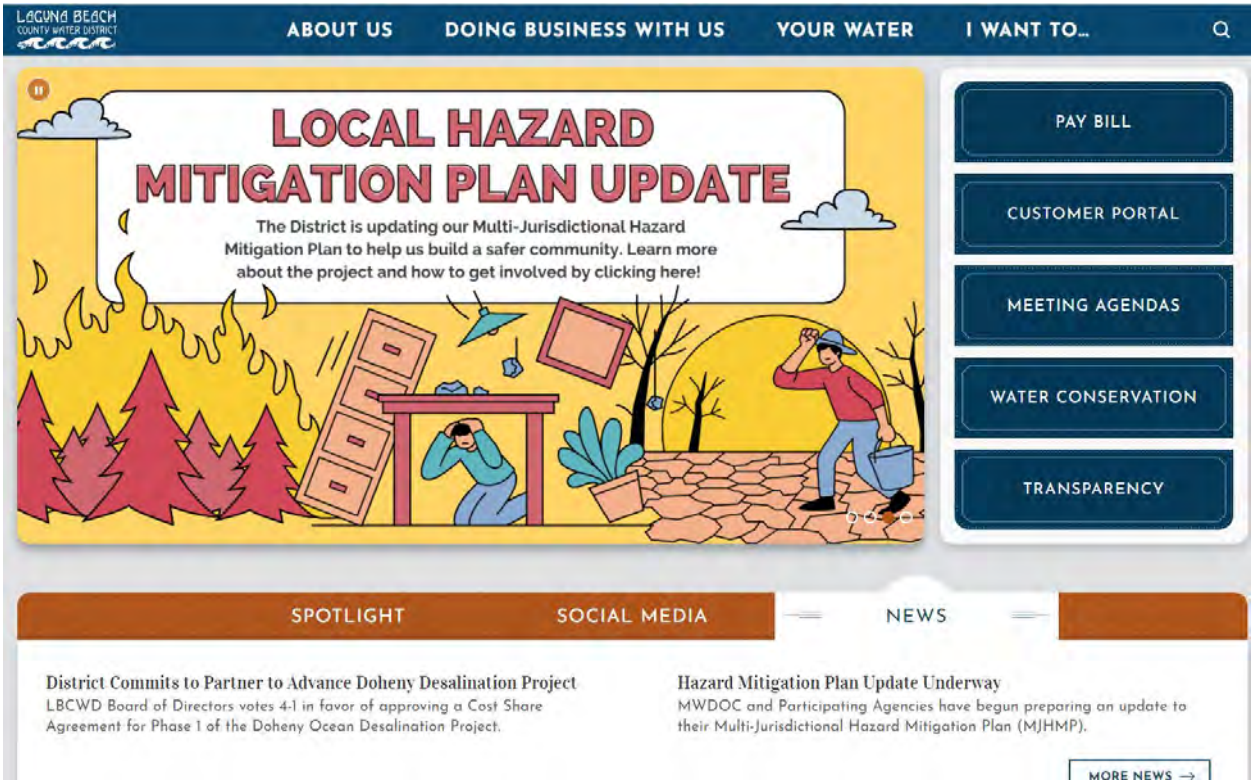
The MJHMP plans to include the following natural and human-cause hazards:

- Power Outage
- Wildfire
- Seismic Hazards – Ground Shaking
- Seismic Hazards – Liquefaction
- High Winds/Santa Ana Winds
- Drought
- Dam/Reservoir Failure
- Flood
- Earthquake Fault Rupture
- Landslide/Mudflow
- Contamination


Irvine Ranch Water District
Published by Sprout Social
· 1m ·
Help us build a safer community!
Share your knowledge by taking this quick and anonymous survey on hazards and emergency prep. Your responses will help in the preparation of our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP).
Go to IRWD.com/mjhmp2024 for details.
DOCS.GOOGLE.COM
MWDOC and Participating Agencies Hazard Mitigation Plan Survey
Dear Community Member, The Municipal Water District of Orange County (MWDOC) and participating Agencies are preparing an update to their Multi-Jurisdictional Hazard Mitigation Plan or MJHMP. MWDOC and...
See insights and ads
Boost post
Like
Comment
Share
Comment as Irvine Ranch Water District


Post
IRWDnews
@IRWDnews
Help us build a safer community!
Share your knowledge by taking this quick and anonymous survey on hazards and emergency prep. Your responses will help in the preparation of our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP).
Go to IRWD.com/mjhmp2024 for details.
irwd.com
Help us build a safer community!
Take this regional survey to help identify potential disaster concerns. Irvine Ranch Water District is working with the ...

Laguna Beach Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website



Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Font Size: Share & Bookmark Feedback Print

Local Hazard Mitigation Plan

Floods, wildfires, earthquakes, and drought—we have all heard about these disasters, and many of us have lived through them, often several times. It's easy to think that we can do nothing about these events, but while we often can't stop them from happening, we can reduce the damage to our community.

The District in partnership with the Municipal Water District of Orange County (MWDOC) and other Participating Agencies in the region are preparing an update to the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The MJHMP allows public safety officials and agency staff, elected officials, and members of the public to understand the threats from natural and human-caused hazards in our community. The plan will also recommend specific actions to proactively decrease these threats before disasters occur.

Why have an MJHMP?

An MJHMP will help MWDOC and Participating Agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for the District to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach can save money. Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. An MJHMP can also help strengthen the mission of public safety officers, such as police and fire department staff, providing them with clear roles and responsibilities to build a safer community.

Besides helping protect our assets and properties within the planning area, our MJHMP will make the District eligible for grants from the Federal Emergency Management Agency (FEMA) that can be used to further improve safety and preparedness in the community. Having an adopted MJHMP can also provide eligibility to receive more financial assistance from the State when disasters occur.

What is in our MJHMP?

The MWDOC and Participating Agencies MJHMP includes four main sections:

- A summary of the natural and human-caused hazards that pose a risk to our community.
- An assessment of the threat to MWDOC and Participating Agencies, which will describe how our community is vulnerable to future disasters.
- A hazard mitigation strategy, which will lay out specific policy recommendations to carry out over the next five years.
- A section on maintaining the plan, which will help ensure that our MJHMP is kept up-to-date.

What hazards will our MJHMP help protect against?

The MWDOC MJHMP plans to include the following natural and human-cause hazards:

- Power Outage
- Wildfire
- Seismic Hazards – Ground Shaking
- Seismic Hazards – Liquefaction
- High Winds/Santa Ana Winds
- Drought
- Dam/Reservoir Failure
- Flood
- Earthquake Fault Rupture
- Landslide/Mudflow
- Contamination
- Human-Cause Hazards – Terrorism
- Human-Caused Hazards – Hazardous Materials
- Urban Fire
- Geologic Hazards – Land Subsidence
- Geologic Hazards – Expansive Soils
- Tsunami
- Climate Change
- Coastal Storms/Erosion

While many of these hazards may affect our District, for those that are not relevant, the plan will provide an explanation regarding its exclusion.

The District will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.

How is our MJHMP being prepared?

MWDOC and Participating Agencies have assembled a Hazard Mitigation Planning Committee (HMPC), which includes representatives from Agency Departments and is supported by key stakeholders and technical consultants. Together, these participants form the project team responsible for guiding the overall development of our MJHMP.

When will our MJHMP be done?

The project team plans to release a Public Review Draft MJHMP in Fall 2024. After members of the public provide comments and feedback, the plan will be revised and sent to the California Office of Emergency Services and FEMA for review and approval. Once approved by these agencies, the decision making body of our District will adopt the final MJHMP.

How can I get involved?

You can get involved in preparing our MJHMP in different ways.

- The District will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.
- The District will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Encourage members of the District's Board of Directors to adopt the plan and begin implementing it.
- Reach out to the District for more ways to stay involved.

What can I do now to be better prepared for disasters?

- Know the hazards that may affect you at home, work, or school. You can find out more at **http://myhazards.caloes.ca.gov/**.
- Assemble an emergency kit for your home. In a disaster, you may have to rely on supplies in your emergency kit for at least three days. Be sure to include supplies for any pets and anyone in your home with special needs. Learn more at **https://www.ready.gov/kit**.
- Have a disaster plan for your household, including how people should contact each other if a disaster occurs and where you should meet.
- Learn about your neighbors and how to help them. In a disaster, emergency responders may not be able to reach your neighborhood for a while. Know if your neighbors have any special needs, and check on them as soon as possible.
- Make sure your homeowner's or renter's insurance covers you from disasters such as earthquakes and floods. If these disasters occur, having good insurance coverage will help you recover more easily.
- Volunteer with an emergency response or community service organization that does work on disaster education and preparation.
- Speak to your employer about creating a disaster recovery, workforce communication, and/or business continuity plan. If they already have one or more of these plans in place, make sure you and your co-workers know it.
- ***Check out MWDOC's Emergency Management webpage for information about WEROC and other projects underway by this organization: https://www.mwdoc.com/your-water/emergency-management/***

Mesa Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Mesa Water District (Mesa Water®) and 18 water and wastewater utilities throughout Orange County have initiated an update to the 2019 Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The MJHMP provides a framework for water and wastewater utilities in Orange County to reduce their vulnerability to the impacts of natural and man-made hazard events such as earthquakes, flooding, and hazardous materials spills.

What is a Hazard Mitigation Plan?

A Hazard Mitigation Plan is a framework that guides our communities in making decisions and developing policies to reduce or eliminate risk to life and property. The plan identifies the types of hazards that threaten our communities, evaluates our vulnerability to those threats, and outlines a strategy to reduce or eliminate the risk posed by future threats.

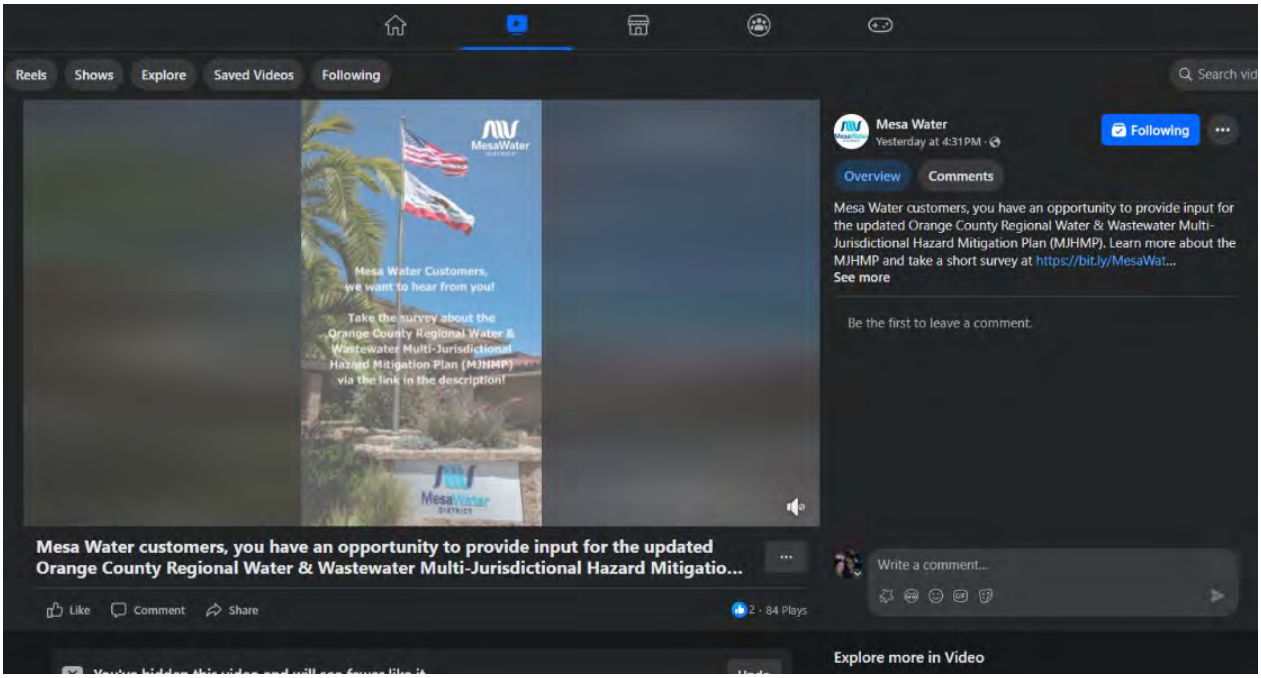
How can the public become involved in the Hazard Mitigation planning process?

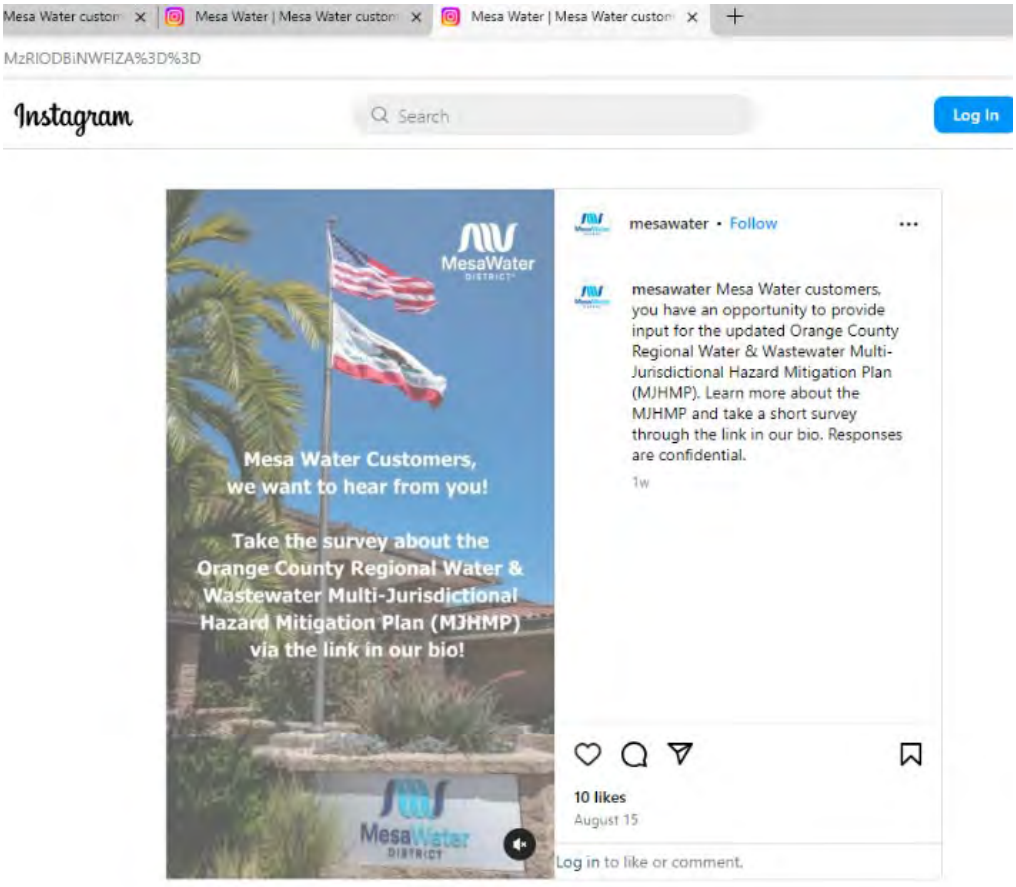
Public participation in the process is important because it helps raise awareness of the hazards we face in Orange County and the actions needed to mitigate those hazards. By participating in the process, you will be taking time to consider the hazards in our communities, the impact of those hazards on life and property, actions that need to be taken to reduce that impact, and the priority those actions should take. Mesa Water will consider all input from the public and integrate it into the plan where appropriate. Your comments, questions, ideas, and concerns will have a significant role in the plan's finalization.

- **Take the survey** Let your voice be heard as we plan for a safer future! Mesa Water is looking for engaged community members to take a quick survey on hazards and emergency preparations. Your responses will help in the preparation of our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). All survey responses are entirely anonymous. Click here to take the survey and learn more about the MJHMP: **https://bit.ly/MesaWaterHazardMitigation**.
- **Contact Us.** Comments and questions may be submitted to Carrie Fesili by calling 949.207.5464 or through email.

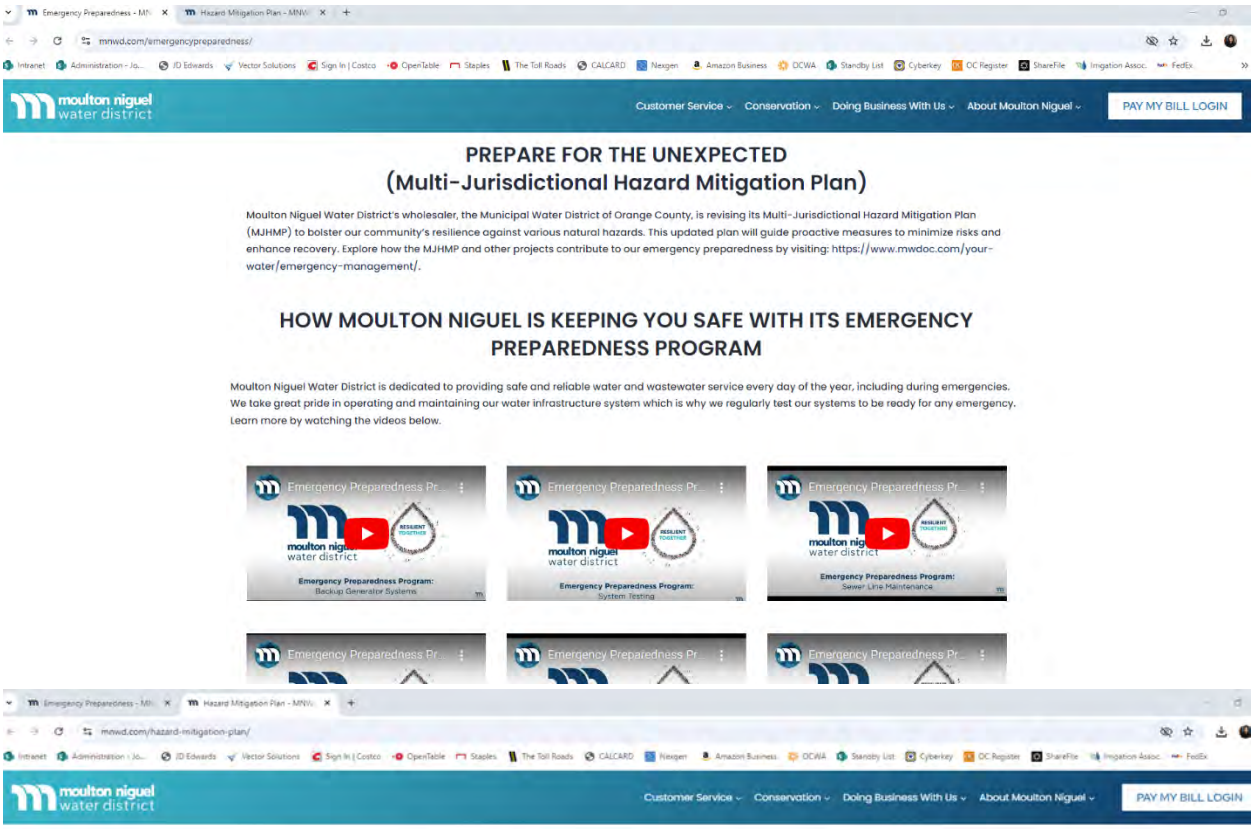
2019 Orange County Regional Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

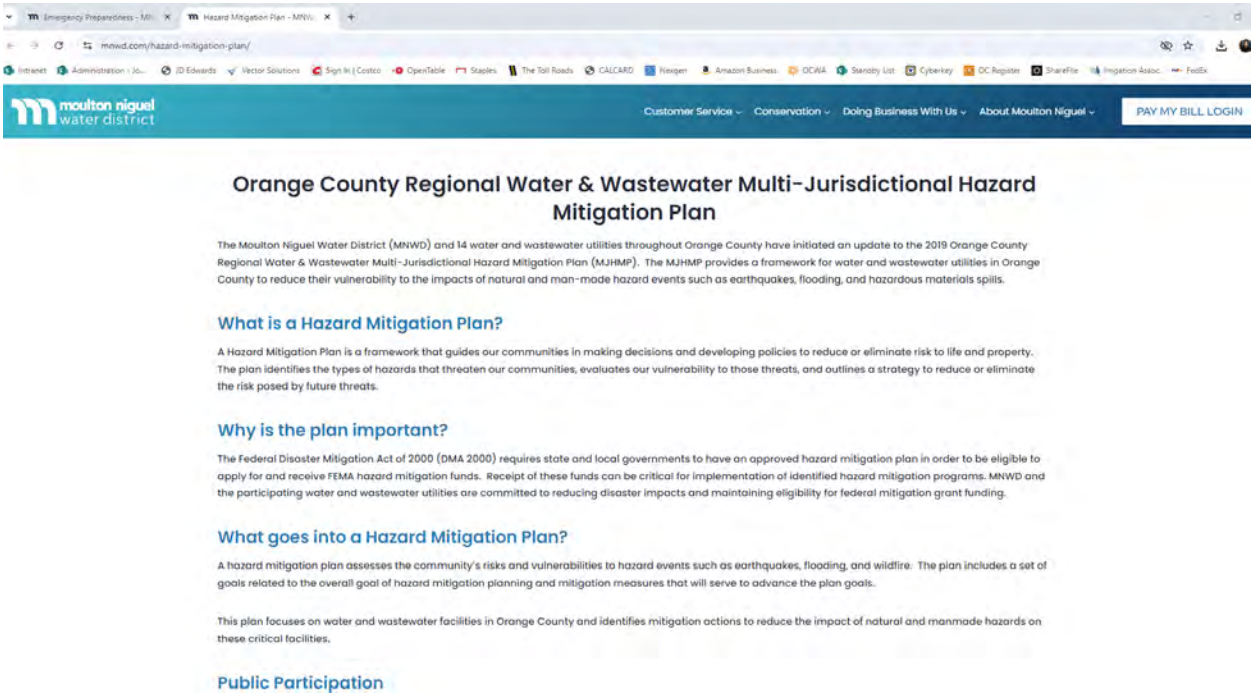
The current hazard mitigation plan can be downloaded here.


Reels
Shows
Explore
Saved Videos
Following
Mesa Water
Yesterday at 4:31 PM
Following
Overview
Comments
Mesa Water customers, you have an opportunity to provide input for the updated Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). Learn more about the MJHMP and take a short survey at https://bit.ly/MesaWat...
See more
Be the first to leave a comment.
Mesa Water Customers, we want to hear from you!
Take the survey about the Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) via the link in the description!
Mesa Water customers, you have an opportunity to provide input for the updated Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigatio...
Like
Comment
Share
2 · 84 Plays
Write a comment...
Explore more in Video

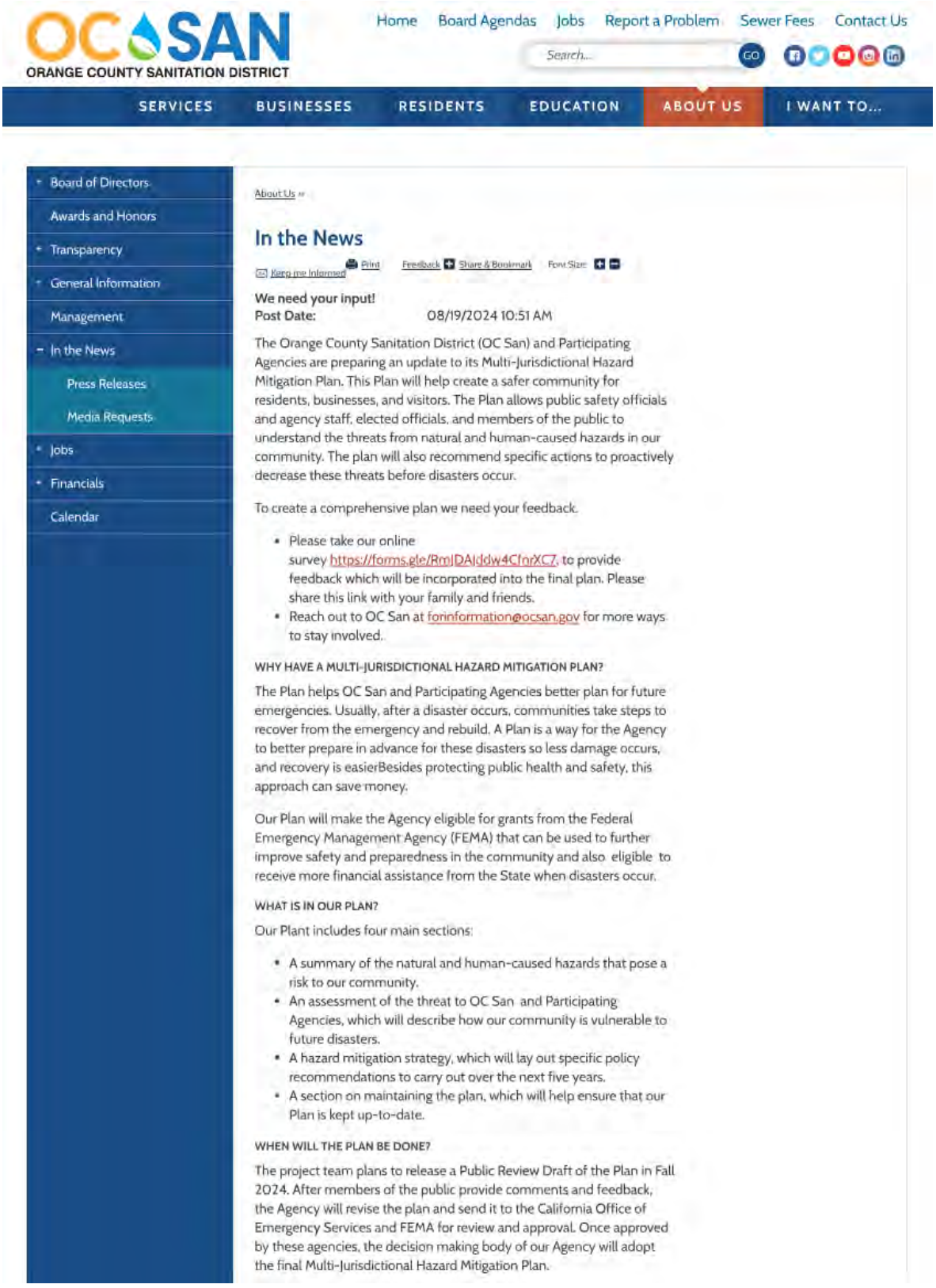

Mesa Water | Mesa Water
Mesa Water | Mesa Water
MzRIODBiNWFlZA%3D%3D
Instagram
Search
Log In
Mesa Water Customers, we want to hear from you!
Take the survey about the Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) via the link in our bio!
mesawater • Follow
mesawater Mesa Water customers, you have an opportunity to provide input for the updated Orange County Regional Water & Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). Learn more about the MJHMP and take a short survey through the link in our bio. Responses are confidential.
1w
10 likes
August 15
Log in to like or comment.

Moulton Niguel Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

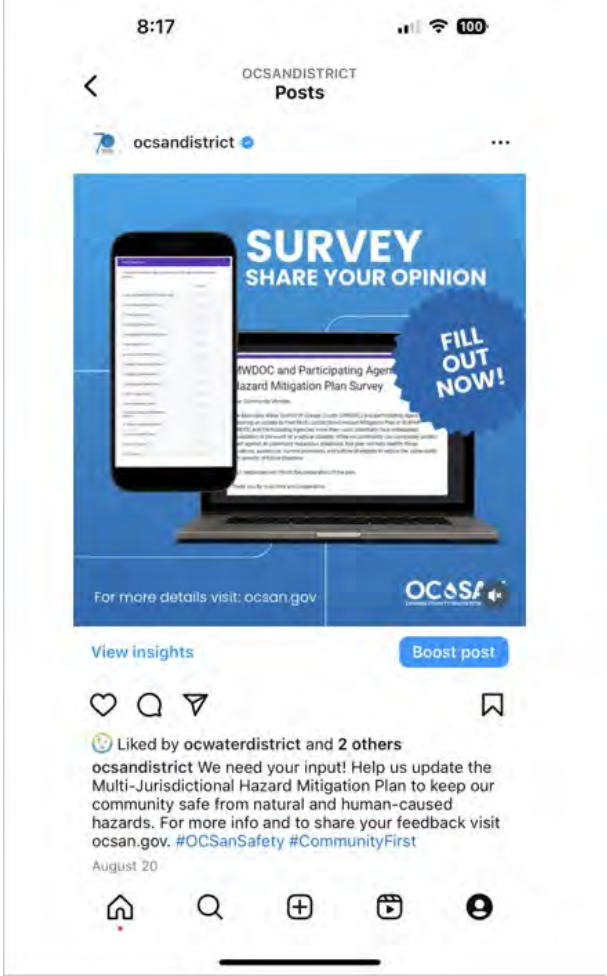




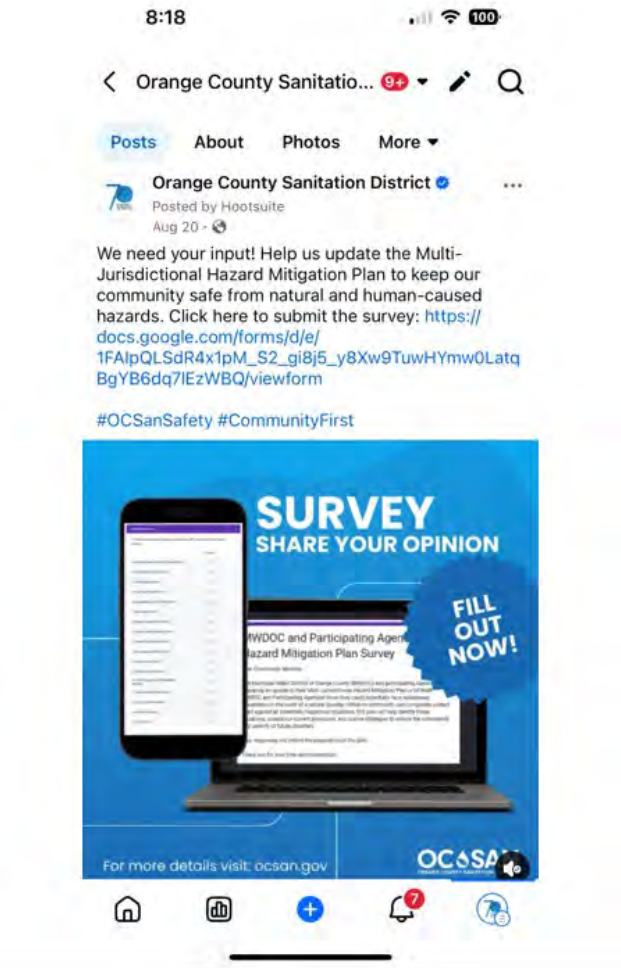
Orange County Sanitation District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

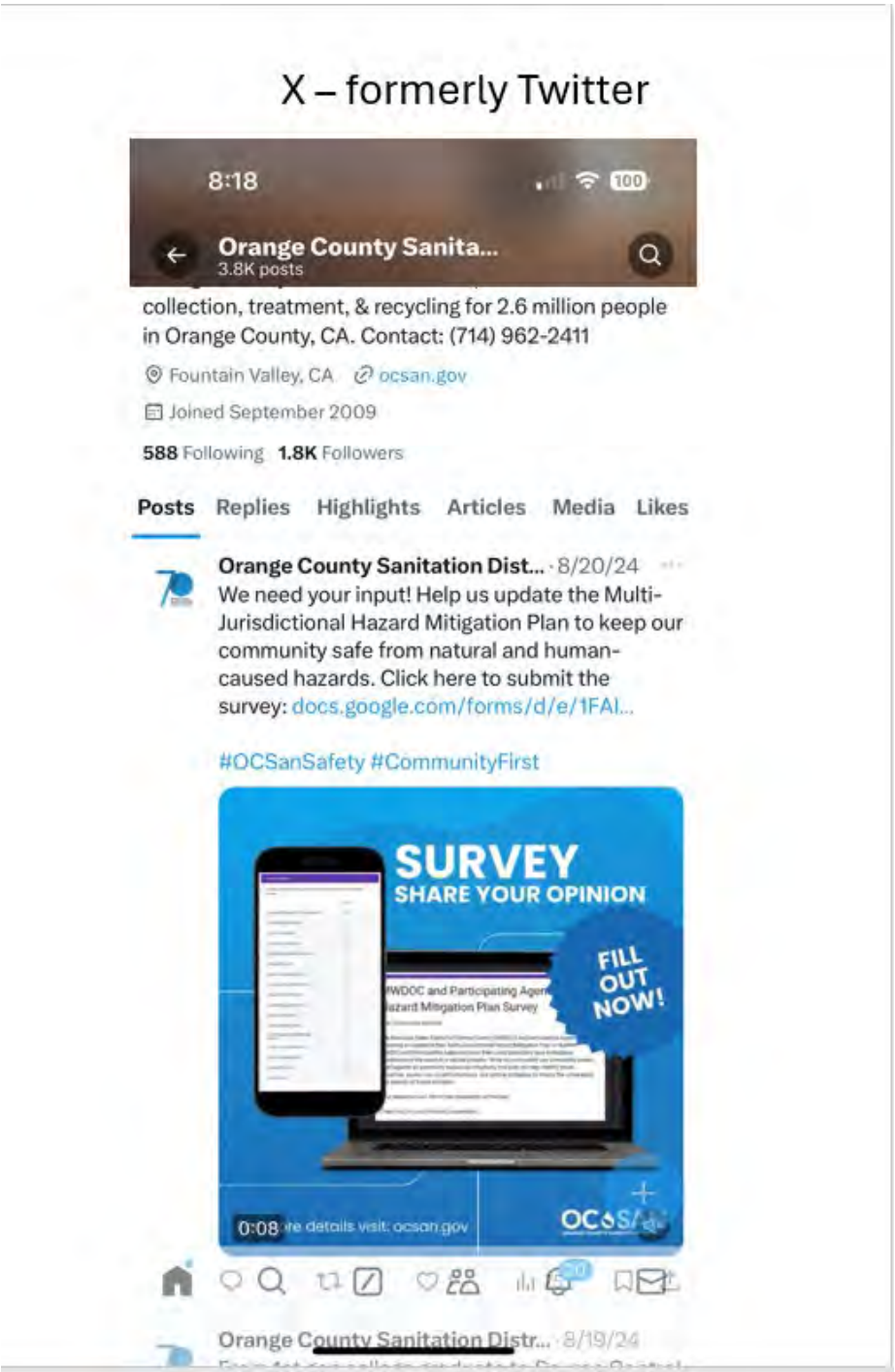


Instagram



Facebook




X – formerly Twitter
8:18
100
Orange County Sanita...
3.8K posts
collection, treatment, & recycling for 2.6 million people in Orange County, CA. Contact: (714) 962-2411
Fountain Valley, CA
ocsan.gov
Joined September 2009
588 Following 1.8K Followers
Posts Replies Highlights Articles Media Likes
Orange County Sanitation Dist... · 8/20/24
We need your input! Help us update the Multi-Jurisdictional Hazard Mitigation Plan to keep our community safe from natural and human-caused hazards. Click here to submit the survey: docs.google.com/forms/d/e/1FAI...
#OCSanSafety #CommunityFirst
SURVEY
SHARE YOUR OPINION
FILL OUT NOW!
0:08
Orange County Sanitation Distr... · 8/19/24

Orange County Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

efficiency in meeting the county's water needs.

In response to this recommendation, OCWD has formally requested the Local Agency Formation Committee of Orange County (LAFCO) to study the feasibility of such a consolidation. The study will explore how merging the two agencies could be accomplished while maintaining high standards of service and operations. As this process unfolds, OCWD remains committed to transparency and ensuring that any future changes are made in the best interests of the communities it serves.

Local Agencies to Update Hazard Mitigation Plan

OCWD, in partnership with local agencies, is set to update its Multi-Jurisdictional Hazard Mitigation Plan. This five-year strategic plan is crucial in helping our community assess potential future disasters, enhance our preparedness, and secure additional federal funding. Orange County residents are invited to take an anonymous survey on hazards and emergency preparations. Your input is vital to ensuring the plan reflects the community's opinions, concerns and goals.

Click here to take the survey

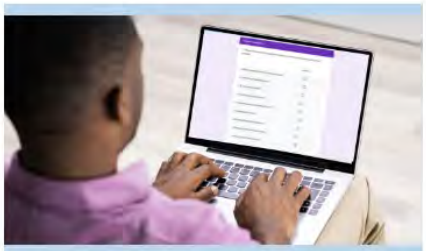
Leading the Way in Water Industry Innovation and Expertise

District board members and staff are frequently invited to speak at conferences, workshops, and industry events, where we share best practices, innovative solutions, and how we successfully maintain a reliable water supply. Through these speaking engagements, we are proud to influence and inspire others, reinforcing our role as a trusted leader in water management. Check out a few highlights below!

August Webinar Recording Now Available

Missed OCWD's latest webinar "Squeezing the Last Drop: Using Enhanced-Recovery Reverse Osmosis to Improve Water Production"? A recording is now available. During this one-hour webinar, you'll learn how OCWD and the city of Santa Monica are exploring cutting edge solutions to enhance water production.

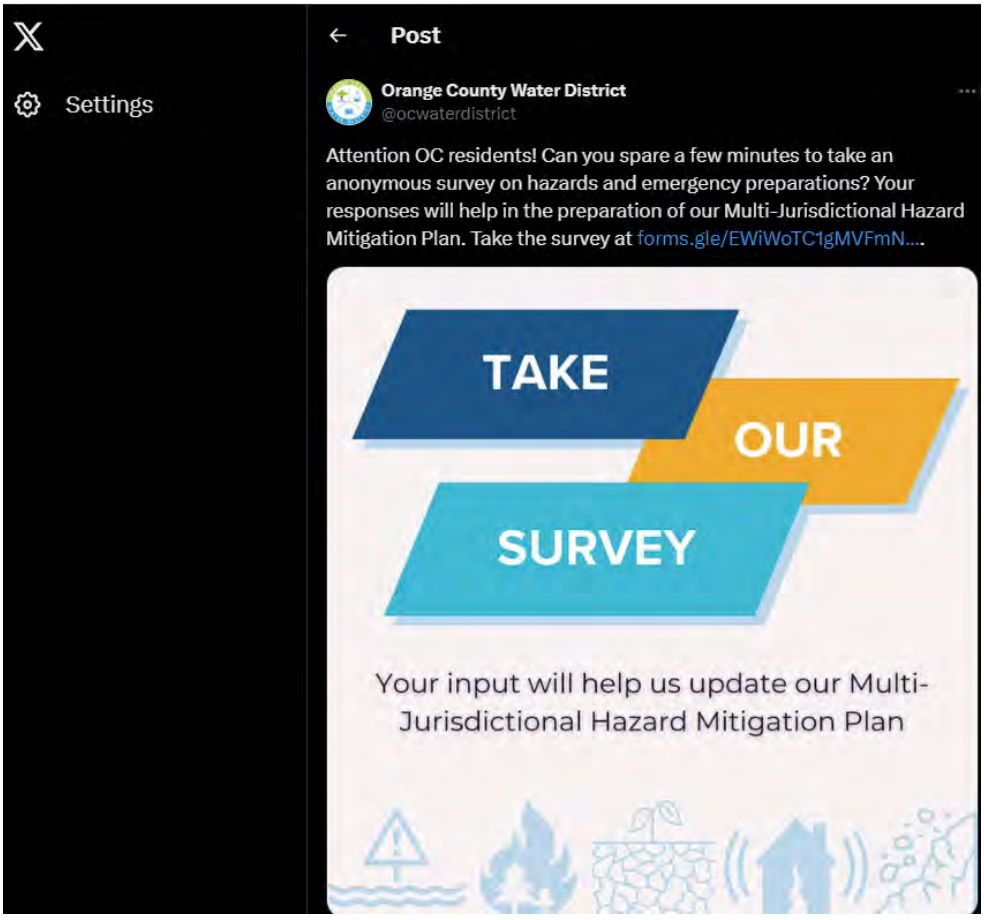
WATCH THE WEBINAR RECORDING



Take Our Emergency Preparedness Survey

Can you spare a few minutes to take a survey on hazards and emergency preparations? Your responses will help in the preparation of our Multi-Jurisdictional Hazard Mitigation Plan. Community participation is key to ensuring that residents' concerns are heard and addressed. All survey responses are anonymous.

TAKE THE SURVEY



Santa Margarita Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Hazard Mitigation

The Municipal Water District of Orange County (MWDOC) and Participating Agencies are preparing an update to its Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The MJHMP allows public safety officials and agency staff, elected officials, and members of the public to understand the threats from natural and human-caused hazards in our community. The plan will also recommend specific actions to proactively decrease these threats before disasters occur.

How can I get involved?

To create a comprehensive plan we need your feedback!

- Please take our online survey https://forms.gle/RmJDAJddw4CfnrXC7, which is available through August 2024. Please share this link with your family and friends.
- YLWD will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Reach out to Chris Lopez, Safety Officer, by phone 949-459-6531or email chrisl@smwd.com for information or ways to stay involved.

Why have a MJHMP?

An MJHMP will help MWDOC and Participating Agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for the Agency to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injur from disasters. Besides protecting public health and safety, this approach can save money. Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. An MJHMP can also help strengthen the mission of public safety officers, such as police and fire department staff, providing them with clear roles and responsibilities to build a safer community.

Besides helping protect our assets and properties within the planning area, our MJHMP will make the Agency eligible for grants from the Federal Emergency Management Agency (FEMA) that can be used to further improve safety and preparedness in the community. Having an adopted MJHMP can also provide eligibility to receive more financial assistance from the State when disasters occur.

What is in our MJHMP?

he MWDOC and Participating Agencies MJHMP includes four main sections:

- A summary of the natural and human-caused hazards that pose a risk to our community.
- An assessment of the threat to MWDOC and Participating Agencies, which will describe how our community is vulnerable to future disasters.
- A hazard mitigation strategy, which will lay out specific policy recommendations to carry out over the next five years.
- A section on maintaining the plan, which will help ensure that our MJHMP is kept up-to-date.

What hazards will our MJHMP help protect against?

The MWDOC MJHMP plans to include the following natural and human-cause hazards:

- Power Outage
- Wildfire
- Seismic Hazards – Ground Shaking
- Seismic Hazards – Liquefaction

- High Winds/Santa Ana Winds
- Drought
- Dam/Reservoir Failure
- Flood
- Earthquake Fault Rupture
- Landslide/Mudflow
- Contamination
- Human-Cause Hazards – Terrorism
- Human-Caused Hazards – Hazardous Materials
- Urban Fire
- Geologic Hazards – Land Subsidence
- Geologic Hazards – Expansive Soils
- Tsunami
- Climate Change
- Coastal Storms/Erosion

While many of these hazards may affect our specific agency, for those that are not relevant, the plan will provide an explanation regarding its exclusion.

How is our MJHMP being prepared?

MWDOC and Participating Agencies have assembled a Hazard Mitigation Planning Committee (HMPC), which includes representatives from Agency Departments and is supported by key stakeholders and technical consultants. Together, these participants form the projec responsible for guiding the overall development of our MJHMP.

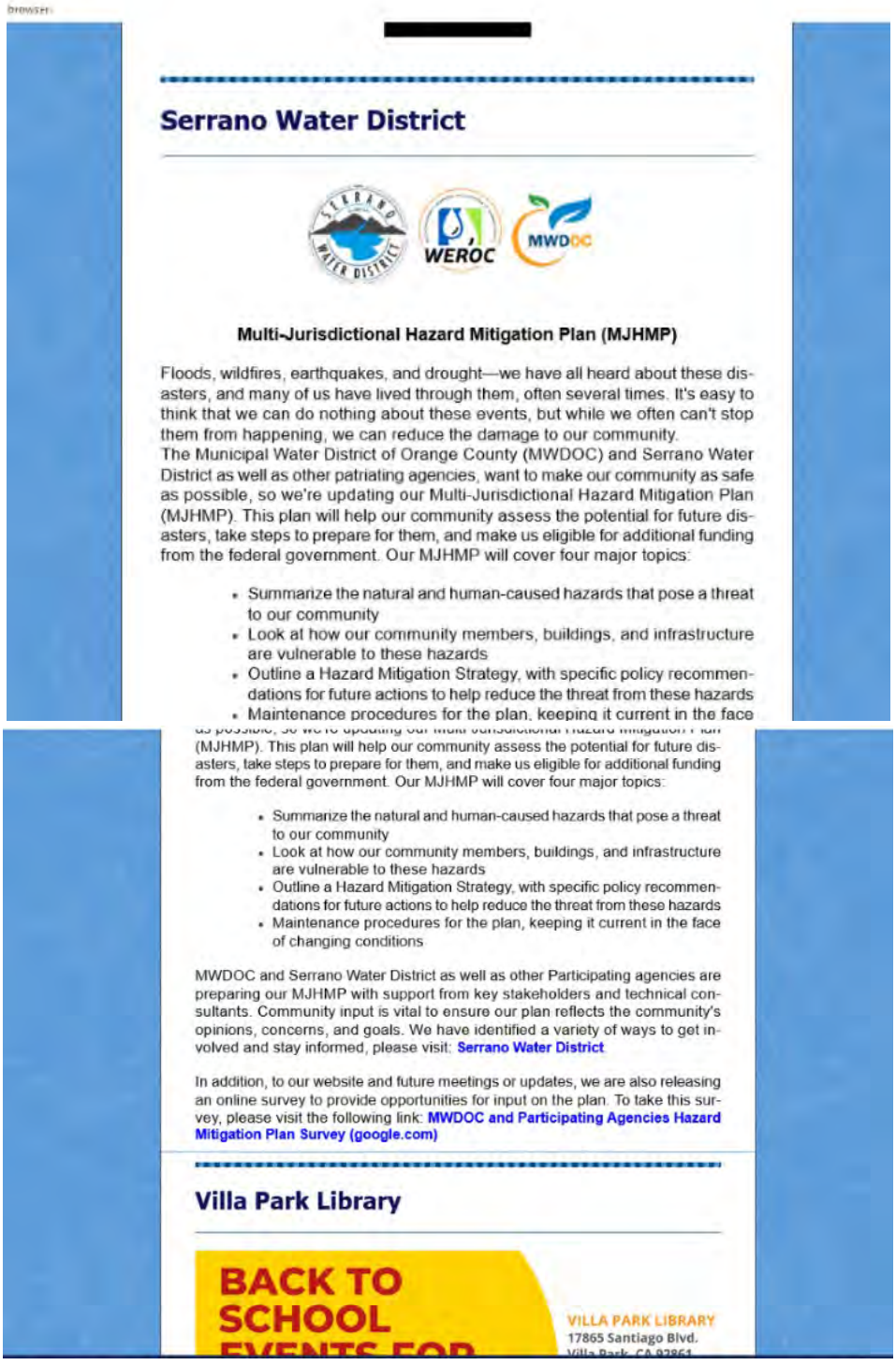
When will our MJHMP be done?

The project team plans to release a Public Review Draft MJHMP in Fall 2024. After members of the public provide comments and feedback, the Agency will revise the plan and send it to the California Office of Emergency Services and FEMA for review and approval. Once approved by these agencies, the decision making body of our Agency will adopt the final MJHMP.

What can I do now to be better prepared for disasters?

- Know the hazards that may affect you at home, work, or school. You can find out more at http://myhazards.caloes.ca.gov/.
- Assemble an emergency kit for your home. In a disaster, you may have to rely on supplies in your emergency kit for at least three days. Be sure to include supplies for any pets and anyone in your home with special needs. Learn more at https://www.ready.gov/kit.
- Have a disaster plan for your household, including how people should contact each other if a disaster occurs and where you should meet.
- Learn about your neighbors and how to help them. In a disaster, emergency responders may not be able to reach your neighborhood for a while. Know if your neighbors have any special needs, and check on them as soon as possible.
- Make sure your homeowner's or renter's insurance covers you from disasters such as earthquakes and floods. If these disasters occur, having good insurance coverage will help you recover more easily.
- Volunteer with an emergency response or community service organization that does work on disaster education and preparation.
- Speak to your employer about creating a disaster recovery, workforce communication, and/or business continuity plan. If they already have one or more of these plans in place, make sure you and your co-workers know it.
- ***Check out MWDOC's Emergency Management webpage for information about WEROC and other projects underway by this organization: https://www.mwdoc.com/your-water/emergency-management/***

Serrano Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website



Serrano Water District

Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)

Floods, wildfires, earthquakes, and drought—we have all heard about these disasters, and many of us have lived through them, often several times. It's easy to think that we can do nothing about these events, but while we often can't stop them from happening, we can reduce the damage to our community.
The Municipal Water District of Orange County (MWDOC) and Serrano Water District as well as other patriating agencies, want to make our community as safe as possible, so we're updating our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help our community assess the potential for future disasters, take steps to prepare for them, and make us eligible for additional funding from the federal government. Our MJHMP will cover four major topics:

- Summarize the natural and human-caused hazards that pose a threat to our community
- Look at how our community members, buildings, and infrastructure are vulnerable to these hazards
- Outline a Hazard Mitigation Strategy, with specific policy recommendations for future actions to help reduce the threat from these hazards
- Maintenance procedures for the plan, keeping it current in the face

(MJHMP). This plan will help our community assess the potential for future disasters, take steps to prepare for them, and make us eligible for additional funding from the federal government. Our MJHMP will cover four major topics:

- Summarize the natural and human-caused hazards that pose a threat to our community
- Look at how our community members, buildings, and infrastructure are vulnerable to these hazards
- Outline a Hazard Mitigation Strategy, with specific policy recommendations for future actions to help reduce the threat from these hazards
- Maintenance procedures for the plan, keeping it current in the face of changing conditions

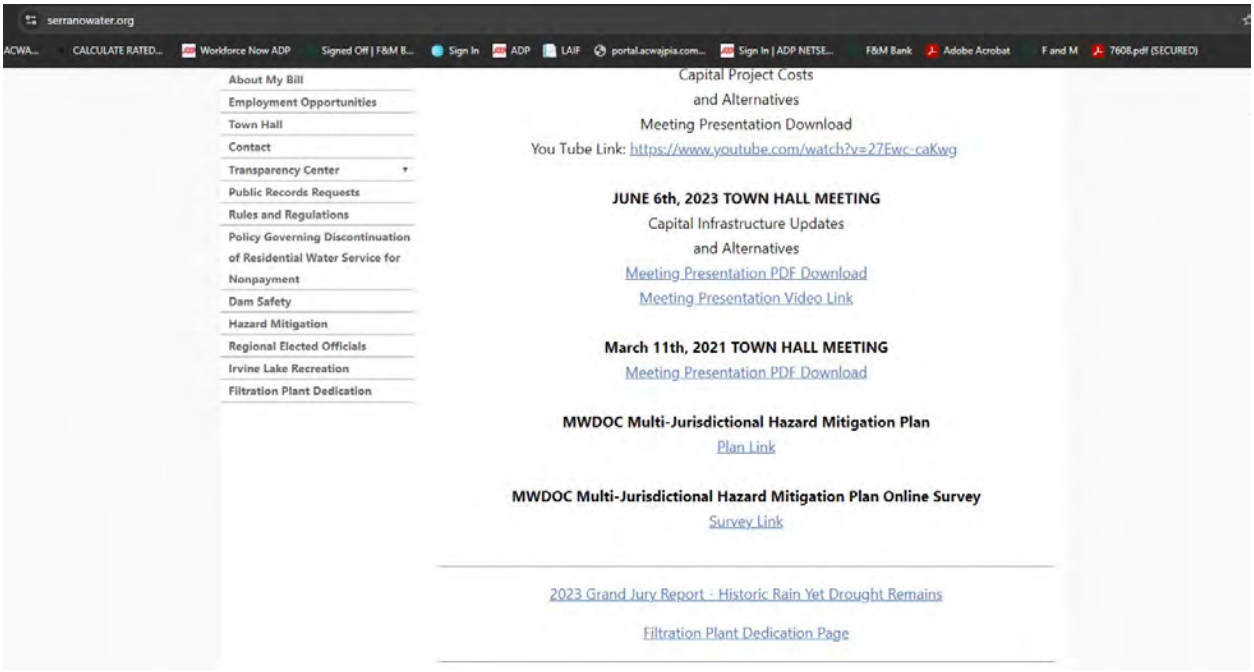
MWDOC and Serrano Water District as well as other Participating agencies are preparing our MJHMP with support from key stakeholders and technical consultants. Community input is vital to ensure our plan reflects the community's opinions, concerns, and goals. We have identified a variety of ways to get involved and stay informed, please visit: **Serrano Water District**

In addition, to our website and future meetings or updates, we are also releasing an online survey to provide opportunities for input on the plan. To take this survey, please visit the following link: **MWDOC and Participating Agencies Hazard Mitigation Plan Survey (google.com)**

Villa Park Library

BACK TO SCHOOL

VILLA PARK LIBRARY
17865 Santiago Blvd.


serranowater.org
About My Bill
Employment Opportunities
Town Hall
Contact
Transparency Center
Public Records Requests
Rules and Regulations
Policy Governing Discontinuation of Residential Water Service for Nonpayment
Dam Safety
Hazard Mitigation
Regional Elected Officials
Irvine Lake Recreation
Filtration Plant Dedication
Capital Project Costs
and Alternatives
Meeting Presentation Download
You Tube Link: https://www.youtube.com/watch?v=27Ewc-caKwg
JUNE 6th, 2023 TOWN HALL MEETING
Capital Infrastructure Updates
and Alternatives
Meeting Presentation PDF Download
Meeting Presentation Video Link
March 11th, 2021 TOWN HALL MEETING
Meeting Presentation PDF Download
MWDOC Multi-Jurisdictional Hazard Mitigation Plan
Plan Link
MWDOC Multi-Jurisdictional Hazard Mitigation Plan Online Survey
Survey Link
2023 Grand Jury Report - Historic Rain Yet Drought Remains
Filtration Plant Dedication Page

South Coast Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Home › Customers › Emergency Preparedness › Local Hazard Mitigation Plan

Local Hazard Mitigation Plan

Local Hazard Mitigation Plan

The Municipal Water District of Orange County (MWDOC) and SCWD and other participating agencies are preparing an update to its Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The MJHMP allows public safety officials and agency staff, elected officials, and members of the public to understand the threats from natural and human-caused hazards in our community. The plan will also recommend specific actions to proactively decrease these threats before disasters occur.

Why have an MJHMP?

An MJHMP will help SCWD, MWDOC, and other participating agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for SCWD to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach

When will our MJHMP be done?

The project team plans to release a Public Review Draft MJHMP in Fall 2024. After members of the public provide comments and feedback, SCWD will revise the plan and send it to the California Office of Emergency Services and FEMA for review and approval. Once approved by these agencies, the SCWD Board will adopt the final MJHMP.

How can I get involved?

You can get involved in preparing our MJHMP in different ways.

- SCWD will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.
- Please take our online survey https://forms.gle/RmJDAJddw4CfnrXC7, which is available through October 2024. Please share this link with your family and friends.
- SCWD will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Encourage members of our Board to adopt the plan and begin implementing it.
- Reach out to Blaise (Health & Safety Manager) or Sheena (Public Information Officer) for more ways to stay involved.

South Orange County Water Authority 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Local Hazard Mitigation Plan

The South Orange County Wastewater Authority (SOCWA) and Participating Agencies are preparing an update to its Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The MJHMP allows public safety officials and agency staff, elected officials, and members of the public to understand the threats from natural and human-caused hazards in our community. The plan will also recommend specific actions to proactively decrease these threats before disasters occur.

Why have an MJHMP?

An MJHMP will help SOCWA and Participating Agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for the Agency to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach can save money. Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. An MJHMP can also help strengthen the mission of public safety officers, such as police and fire department staff, providing them with clear roles and responsibilities to build a safer community. Besides helping protect our assets and properties within the planning area, our MJHMP will make the Agency eligible for grants from the Federal Emergency Management Agency (FEMA) that can be used to further improve safety and preparedness in the community. Having an adopted MJHMP can also provide eligibility to receive more financial assistance from the State when disasters occur.

What is in our MJHMP?

SOCWA and Participating Agencies MJHMP includes four main sections:

- A summary of the natural and human-caused hazards that pose a risk to our community.
- An assessment of the threat to MWDOC and Participating Agencies, which will describe how our community is vulnerable to future disasters.
- A hazard mitigation strategy, which will lay out specific policy recommendations to carry out over the next five years.
- A section on maintaining the plan, which will help ensure that our MJHMP is kept up-to-date.

What hazards will our MJHMP help protect against?

The MWDOC MJHMP plans to include the following natural and human-cause hazards:

- Power Outage
- Wildfire

- Seismic Hazards – Ground Shaking
- Seismic Hazards – Liquefaction
- High Winds/Santa Ana Winds
- Drought
- Dam/Reservoir Failure
- Flood
- Earthquake Fault Rupture
- Landslide/Mudflow
- Contamination

- Human-Cause Hazards – Terrorism
- Human-Caused Hazards – Hazardous Materials
- Urban Fire
- Geologic Hazards – Land Subsidence
- Geologic Hazards – Expansive Soils
- Tsunami
- Climate Change
- Coastal Storms/Erosion

While many of these hazards may affect our specific agency, for those that are not relevant, the plan will provide an explanation regarding its exclusion.

How is our MJHMP being prepared?

MWDOC and Participating Agencies have assembled a Hazard Mitigation Planning Committee (HMPC), which includes representatives from Agency Departments and is supported by key stakeholders and technical consultants. Together, these participants form the project team

responsible for guiding the overall development of our MJHMP.

When will our MJHMP be done?

The project team plans to release a Public Review Draft MJHMP in Fall 2024. After members of the public provide comments and feedback, the Agency will revise the plan and send it to the California Office of Emergency Services and FEMA for review and approval. Once approved by these agencies, the decision making body of our Agency will adopt the final MJHMP.

How can I get involved?

You can get involved in preparing our MJHMP in different ways.

- The Agency will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.
- Please take our online survey https://forms.gle/RmJDAJddw4CfnrXC7, which is available through October 2024. Please share this link with your family and friends.
- The Agency will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Encourage members of the Agency's Board of Directors to adopt the plan and begin implementing it.
- Reach out to Sean Peacher at speacher@socwa.com or (949) 234-5443 for more ways to stay involved.

What can I do now to be better prepared for disasters?

- Know the hazards that may affect you at home, work, or school. You can find out more at http://myhazards.caloes.ca.gov/.
- Assemble an emergency kit for your home. In a disaster, you may have to rely on supplies in your emergency kit for at least three days. Be sure to include supplies for any pets and anyone in your home with special needs. Learn more at https://www.ready.gov/kit.
- Have a disaster plan for your household, including how people should contact each other if a disaster occurs and where you should meet.

- Learn about your neighbors and how to help them. In a disaster, emergency responders may not be able to reach your neighborhood for a while. Know if your neighbors have any special needs, and check on them as soon as possible.
- Make sure your homeowner's or renter's insurance covers you from disasters such as earthquakes and floods. If these disasters occur, having good insurance coverage will help you recover more easily.
- Volunteer with an emergency response or community service organization that does work on disaster education and preparation.
- Speak to your employer about creating a disaster recovery, workforce communication, and/or business continuity plan. If they already have one or more of these plans in place, make sure you and your co-workers know it.

Trabuco Canyon Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website

Orange County Regional Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

LOCAL HAZARD MITIGATION PLAN

TCWD, with the assistance of Municipal Water District of Orange County (MWDOC) and participating agencies, is preparing an update to its Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The MJHMP allows public safety officials and agency staff, elected officials, and members of the public to understand the threats from natural and human-caused hazards in our community. The plan will also recommend specific actions to proactively decrease these threats before disasters occur.

Why have an MJHMP?

An MJHMP will help MWDOC and Participating Agencies better plan for future emergencies. Usually, after a disaster occurs, communities take steps to recover from the emergency and rebuild. An MJHMP is a way for the Agency to better prepare in advance for these disasters so less damage occurs, and recovery is easier. Our community can use MJHMP strategies to reduce instances of property damage, injury, and loss of life from disasters. Besides protecting public health and safety, this approach can save money. Studies estimate that every dollar spent on mitigation saves an average of four dollars on response and recovery costs. An MJHMP can also help strengthen the mission of public safety officers, such as police and fire department staff, providing them with clear roles and responsibilities to build a safer community.

Besides helping protect our assets and properties within the planning area, our MJHMP will make TCWD eligible for grants from the

Besides helping protect our assets and properties within the planning area, our MJHMP will make TCWD eligible for grants from the Federal Emergency Management Agency (FEMA) that can be used to further improve safety and preparedness in the community. Having an adopted MJHMP can also provide eligibility to receive more financial assistance from the State when disasters occur.

What is in our MJHMP?
The MJHMP includes four main sections:

- A summary of the natural and human-caused hazards that pose a risk to our community.
- An assessment of the threat to MWDOC and Participating Agencies, which will describe how our community is vulnerable to future disasters.
- A hazard mitigation strategy, which will lay out specific policy recommendations to carry out over the next five years.
- A section on maintaining the plan, which will help ensure that our MJHMP is kept up-to-date.

What hazards will our MJHMP help protect against?
The MJHMP plans to include the following natural and human-cause hazards:

- Power Outage
- Wildfire
- Seismic Hazards – Ground Shaking
- Seismic Hazards – Liquefaction
- High Winds/Santa Ana Winds
- Drought
- Dam/Reservoir Failure
- Flood
- Earthquake Fault Rupture
- Landslide/Mudflow
- Contamination
- Human-Cause Hazards – Terrorism
- Human-Caused Hazards – Hazardous Materials

- Human-Cause Hazards – Terrorism
- Human-Caused Hazards – Hazardous Materials
- Urban Fire
- Geologic Hazards – Land Subsidence
- Geologic Hazards – Expansive Soils
- Tsunami
- Climate Change
- Coastal Storms/Erosion

While many of these hazards may affect our specific agency, for those that are not relevant, the plan will provide an explanation regarding its exclusion.

How is our MJHMP being prepared?
MWDOC and Participating Agencies, including TCWD, have assembled a Hazard Mitigation Planning Committee (HMPC), which includes representatives from Agency Departments and is supported by key stakeholders and technical consultants. Together, these participants form the project team responsible for guiding the overall development of our MJHMP.

When will our MJHMP be done?
The project team plans to release a Public Review Draft MJHMP in Fall 2024. After members of the public provide comments and feedback, TCWD will revise the plan and send it to the California Office of Emergency Services and FEMA for review and approval. Once approved by these agencies, TCWD's Boad of Directors will adopt the final MJHMP.

How can I get involved?
You can get involved in preparing our MJHMP in different ways.

- TCWD will have public engagement opportunities to share information about our MJHMP and obtain community feedback. Stay tuned for these opportunities.
- Please take our online survey **https://forms.gle/RmJDAJddw4CfnrXC7**, which is available through August 2024. Please share this link with your family and friends.
- TCWD will release a draft of the completed MJHMP for public review. Please review and provide comments on this document, either at community engagement opportunities or in writing.
- Encourage members of the TCWD's Board of Directors to adopt the plan and begin implementing it.
- Reach out to insert contact information for more ways to stay involved.

What can I do now to be better prepared for disasters?

- Know the hazards that may affect you at home, work, or school. You can find out more at **http://myhazards.caloes.ca.gov/**.
- Assemble an emergency kit for your home. In a disaster, you may have to rely on supplies in your emergency kit for at least three days. Be sure to include supplies for any pets and anyone in your home with special needs. Learn more at **https://www.ready.gov/kit**.
- Have a disaster plan for your household, including how people should contact each other if a disaster occurs and where you should meet.
- Learn about your neighbors and how to help them. In a disaster, emergency responders may not be able to reach your neighborhood for a while. Know if your neighbors have any special needs, and check on them as soon as possible.
- Make sure your homeowner's or renter's insurance covers you from disasters such as earthquakes and floods. If these disasters occur, having good insurance coverage will help you recover more easily.
- Volunteer with an emergency response or community service organization that does work on disaster education and preparation.
- Speak to your employer about creating a disaster recovery, workforce communication, and/or business continuity plan. If they already have one or more of these plans in place, make sure you and your co-workers know it.

Check out MWDOC's Emergency Management webpage for information about WEROC and other projects underway by this organization: **https://www.mwdoc.com/your-water/emergency-management/**

ON TAP NEWSLETTER

OCTOBER 2024

KEEPING OUR COMMUNITY SAFE

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

Over the years, TCWD's service area and its customers have been impacted by natural disasters, including floods, wildfires, earthquakes and drought. While we often can't stop these events from happening, we can reduce the damages. To make our community as safe as possible, we're updating our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The updated plan will help our community assess the potential for future disasters, take steps to prepare for them, and make us eligible for additional funding from the federal government. Our updated MJHMP will cover four major topics:

- Summarize the natural and human-caused hazards that pose a threat to our community
- Look at how our community members, buildings and infrastructure are vulnerable to these hazards
- Outline a Hazard Mitigation Strategy, with specific policy recommendations for future actions to help reduce the threat from these hazards
- Set maintenance procedures for the plan, keeping it current in the face of changing conditions

PROVIDE YOUR INPUT

TCWD is preparing the MJHMP update with the assistance of Municipal Water District of Orange County (MWDOC) and support from key stakeholders and technical consultants. Community input is vital to ensure our plan reflects local opinions, concerns, and goals. We have identified a variety of ways for customers to get involved and stay informed.

TAKE THE SURVEY

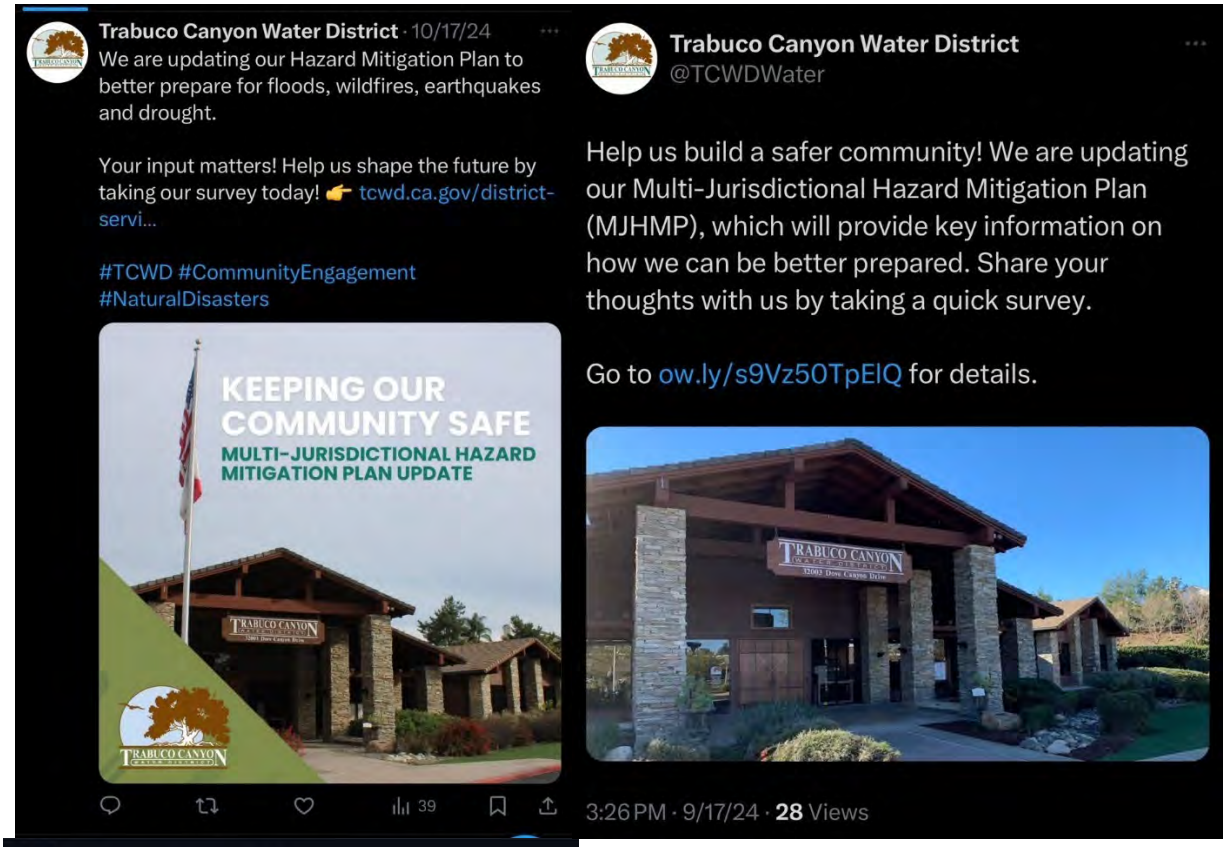
Learn more and take an online survey to share your thoughts about the plan

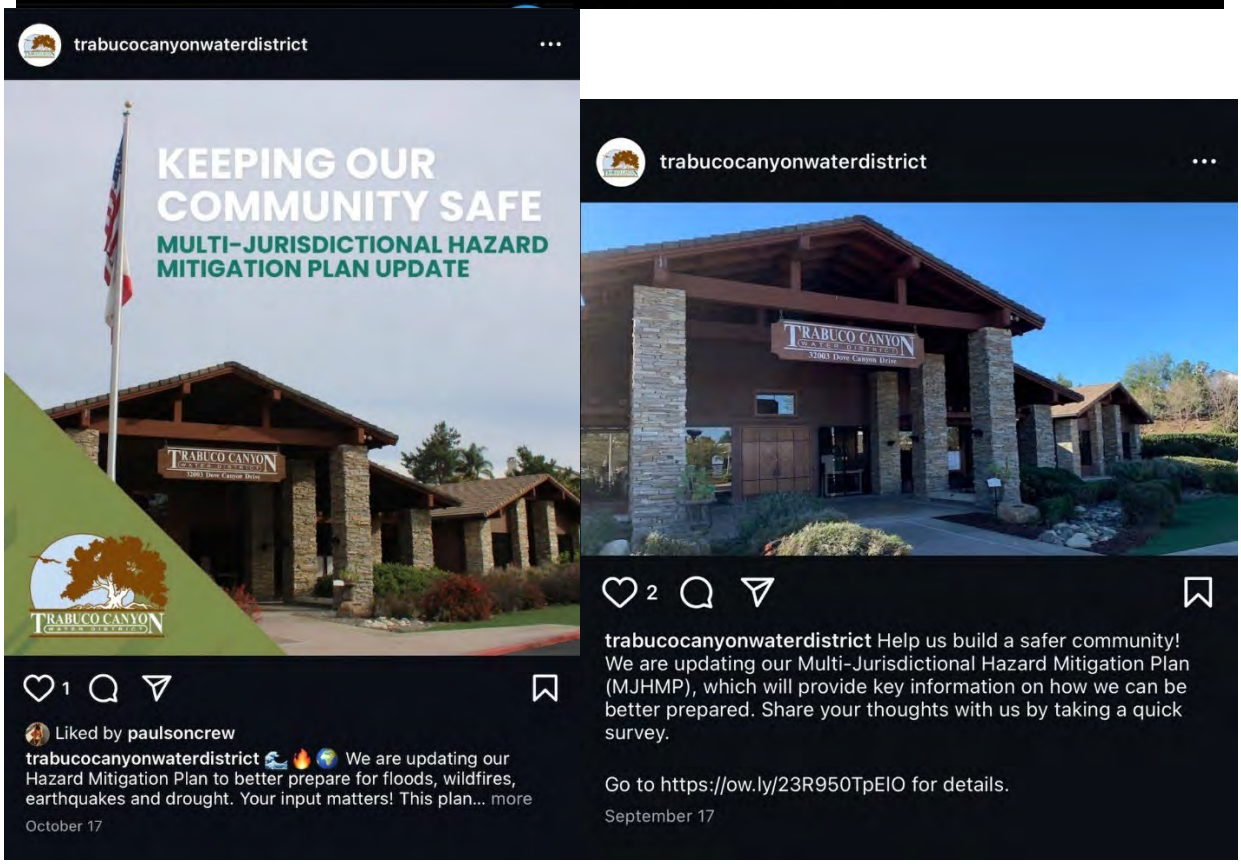
MAKE SURE FATS, OILS AND GREASE DON'T CLOG UP YOUR HOLIDAY PLANS

Keep fats, oils and grease (FOG) off the guest list so you don't get caught with a clog this holiday season. Pouring FOG down the drain or into the garbage disposal can result in blocked pipes, messy backups in your home and even sewage spills. Prevent these substances from entering your plumbing to protect your pipes and safeguard our environment. Always place the items below into the trash—not down the drain.

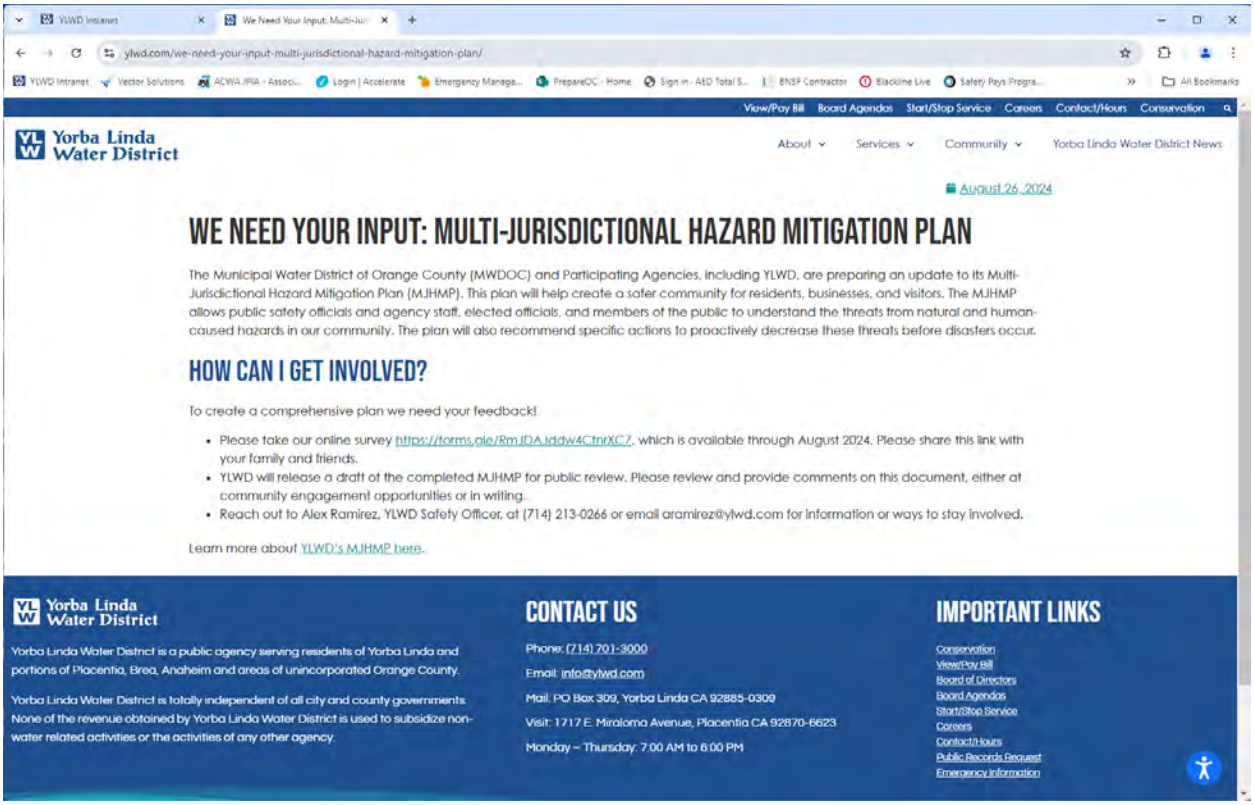
A fatberg caused by fats, oils and grease (FOG)

- Meat drippings
- Gravy
- Cooking oil
- con grease
- ur cream
- Salad dressing and mayonnaise
- Butter, margarine, shortening and lard


Trabuco Canyon Water District · 10/17/24
We are updating our Hazard Mitigation Plan to better prepare for floods, wildfires, earthquakes and drought.
Your input matters! Help us shape the future by taking our survey today! 👉 tcwd.ca.gov/district-servi...
#TCWD #CommunityEngagement #NaturalDisasters
KEEPING OUR COMMUNITY SAFE
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE
TRABUCO CANYON
39
Trabuco Canyon Water District
@TCWDWater
Help us build a safer community! We are updating our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), which will provide key information on how we can be better prepared. Share your thoughts with us by taking a quick survey.
Go to ow.ly/s9Vz50TpEIQ for details.
TRABUCO CANYON
3:26 PM · 9/17/24 · 28 Views


trabucocanyonwaterdistrict
KEEPING OUR COMMUNITY SAFE
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE
TRABUCO CANYON
1
Liked by paulsoncrew
trabucocanyonwaterdistrict 🌊🔥🌍 We are updating our Hazard Mitigation Plan to better prepare for floods, wildfires, earthquakes and drought. Your input matters! This plan... more
October 17
trabucocanyonwaterdistrict
TRABUCO CANYON
2
trabucocanyonwaterdistrict Help us build a safer community! We are updating our Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), which will provide key information on how we can be better prepared. Share your thoughts with us by taking a quick survey.
Go to https://ow.ly/23R950TpEIO for details.
September 17

Yorba Linda Water District 2024 Multi-Jurisdictional Hazard Mitigation Plan Project Website




4:21
Instagram
yorbalindawaterdistrict
Participate in an important Survey!
Multi-Jurisdictional Hazard Mitigation Plan
View insights
Boost post
yorbalindawaterdistrict 📲Participate in an important Feedback Survey:
⚠️ Multi-Jurisdictional Hazard Mitigation Plan ⚠️
The Municipal Water District of Orange County (@MWDOC) and Participating Agencies, including YLWD, are preparing an update to its Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). This plan will help create a safer community for residents, businesses, and visitors. The

Appendix B: Resolutions of Adoption

This appendix will be populated after FEMA approval

Appendix C: Progress Report Worksheet

MWDOC and MA Progress Report Worksheet

Agency Name	
Date	
Progress Update #	

The following worksheet is intended to support MWDOC and MAs during plan monitoring and implementation. The following instructions outline proper use of the worksheet.

When should we use this?

Use of the worksheet should occur under the following circumstances:

- Annual Implementation Check In
- Presidential disaster declaration that impacts one or more of the MAs;
- A hazard event that causes loss of life.

During the progress update

Key Questions for Annual Progress Check In

- Has the nature or magnitude of hazards affecting the planning area/jurisdiction changed?
- Are there new hazards that have the potential to impact the planning area/jurisdiction?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the HMP?
- Should additional local resources be committed to address identified hazards?

If your Agency is preparing/updating a new plan/program/project

- What hazard and/or vulnerability information should be considered and/or integrated into this plan?
- Are there opportunities for this plan to support and/or implement mitigation actions?
- What mitigation actions can and should be integrated into this plan?
- Are there other community mechanisms that mitigation can be integrated?
- Is there information from this plan or policy that can be integrated into the next HMP update?

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex A: Municipal Water District of Orange County

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY ANNEX

The Municipal Water District of Orange County (MWDOC) is a participant and the lead coordinator in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). MWDOC representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to MWDOC.

This annex details the hazard mitigation planning elements specific to MWDOC and describes how MWDOC's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by MWDOC. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to MWDOC with a focus on the risk assessment and mitigation strategies.

A.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit A-1** lead the MWDOC planning team, attended meetings on behalf of MWDOC, and coordinated the hazard mitigation planning efforts with MWDOC staff and the consultant team supporting the effort.

Exhibit A-1. Planning Team Leads

Primary Point of Contact	Alternate Point of Contact
Name: Vicki Osborn	Name: Janine Schunk
Title: Director of Emergency Management	Title: WEROC Specialist
Telephone: 714-746-4808	Telephone: 714-397-1111
Email: vosborn@mwdoc.org	Email: jschunk@mwdoc.org

MWDOC followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as MWDOC's internal hazard mitigation planning development team.

Exhibit A-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Sarina Sriboonlue	Principal Engineer
Gabriela Landeros	WEROC Specialist

Outreach to the public was performed across the planning area to ensure residents could access information on this planning effort. MWDOC published a webpage with information on the MJHMP process and a link to the MJHMP survey which was distributed by all MAs. The Director of Emergency Management spoke at various MA board meetings and assisted with outreach to MA service areas and at regional emergency management meetings.

A WEROC team member published an article in the MWDOC eCurrent newsletter to all member agencies and the public regarding the importance of hazard mitigation and update of current plan, along with social media posts highlighting how members of the public can get involved.

A.2 JURISDICTION PROFILE

Service Population: 2,312,708

MWDOC is a wholesale water supplier and resource planning agency which serves more than 2.3 million residents in a 600-square-mile service area. MWDOC's service area covers 28 retail water agencies throughout Orange County, except for the cities of Anaheim, Fullerton, and Santa Ana. MWDOC's principal goal is to provide broad-reaching services and programs to support its member agencies. In addition, MWDOC ensures sound planning and appropriate investments in water supply development, water use efficiency, public information, legislative advocacy, water education, and emergency preparedness that is mutually beneficial to all member agencies. MWDOC is governed by a seven-member Board of Directors. Each director is elected by the public to represent a specific portion of Orange County. MWDOC also appoints four representatives to advocate for the interests of Orange County on the Metropolitan Board. MWDOC served as the lead jurisdiction for this plan update.

The Water Emergency Response Organization of Orange County (WEROC), administered by the MWDOC, supports and manages countywide emergency preparedness, planning, response, and recovery efforts among 36 Orange County water and wastewater utilities.

To carry out its mission, WEROC provides essential resources, trainings, and exercises to member agencies and to coordinating partners throughout the county and State. The program takes an active role in engaging trained Emergency Operations Center (EOC) staff and maintaining two EOC's that are used to coordinate emergency response operations during large scale disasters.

A.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that MWDOC faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

MWDOC's service area covers most of Orange County, and its exposure to hazards reflects the same countywide scope presented in **Section 3**. Based on the risk assessment, the MWDOC development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect MWDOC and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit A-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit A-3. MWDOC Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to MWDOC
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Low
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	High
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Medium
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	Low
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Low
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Low
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	High
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	High
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Medium
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Medium
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Low

**The values within these columns are representative of the entire planning area of Orange County.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit A-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and MWDOC.

A.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit A-4. Fire Hazard and MWDOC Potable Water Infrastructure

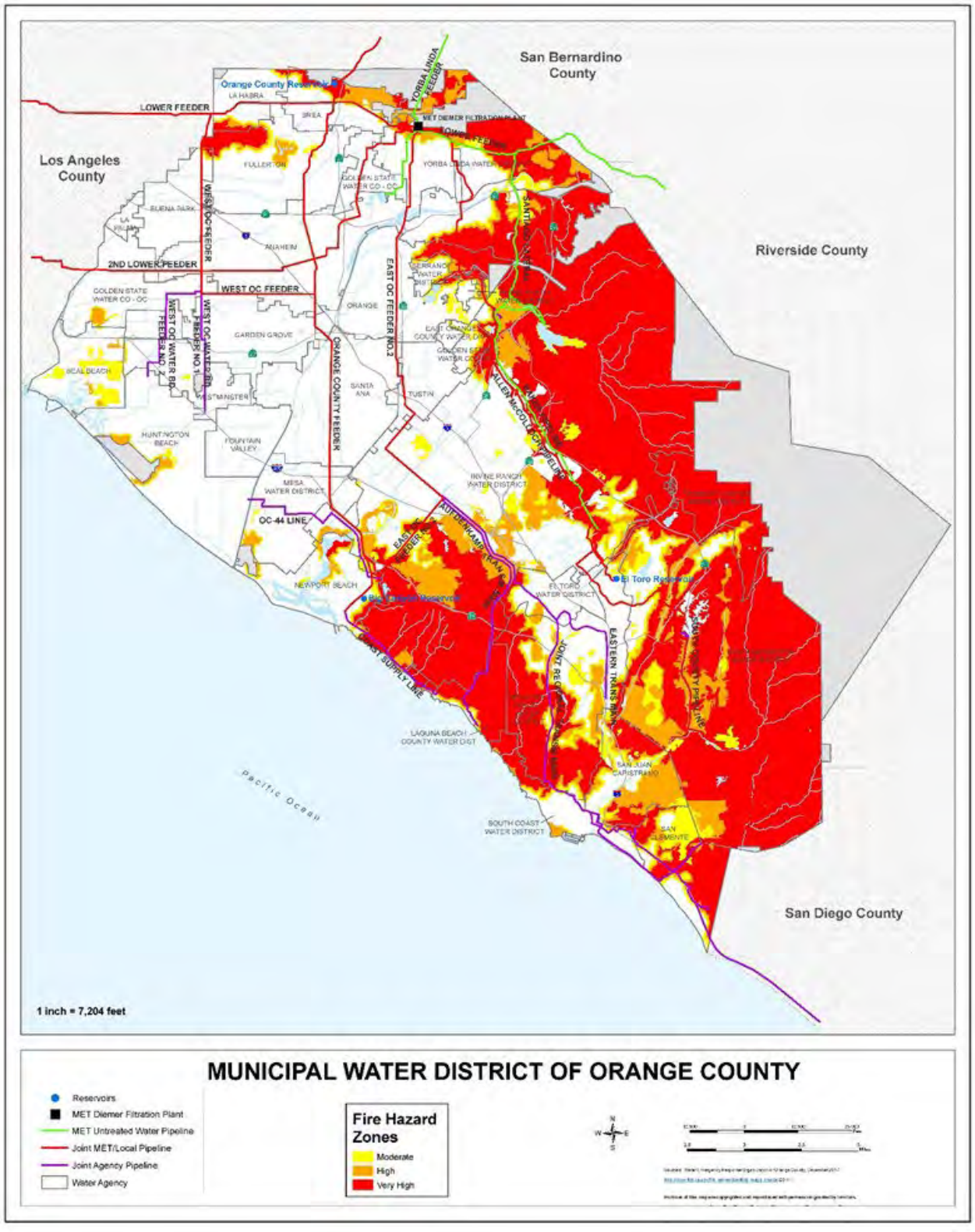


Exhibit A-5. Flood Hazard and MWDOC Potable Water Infrastructure

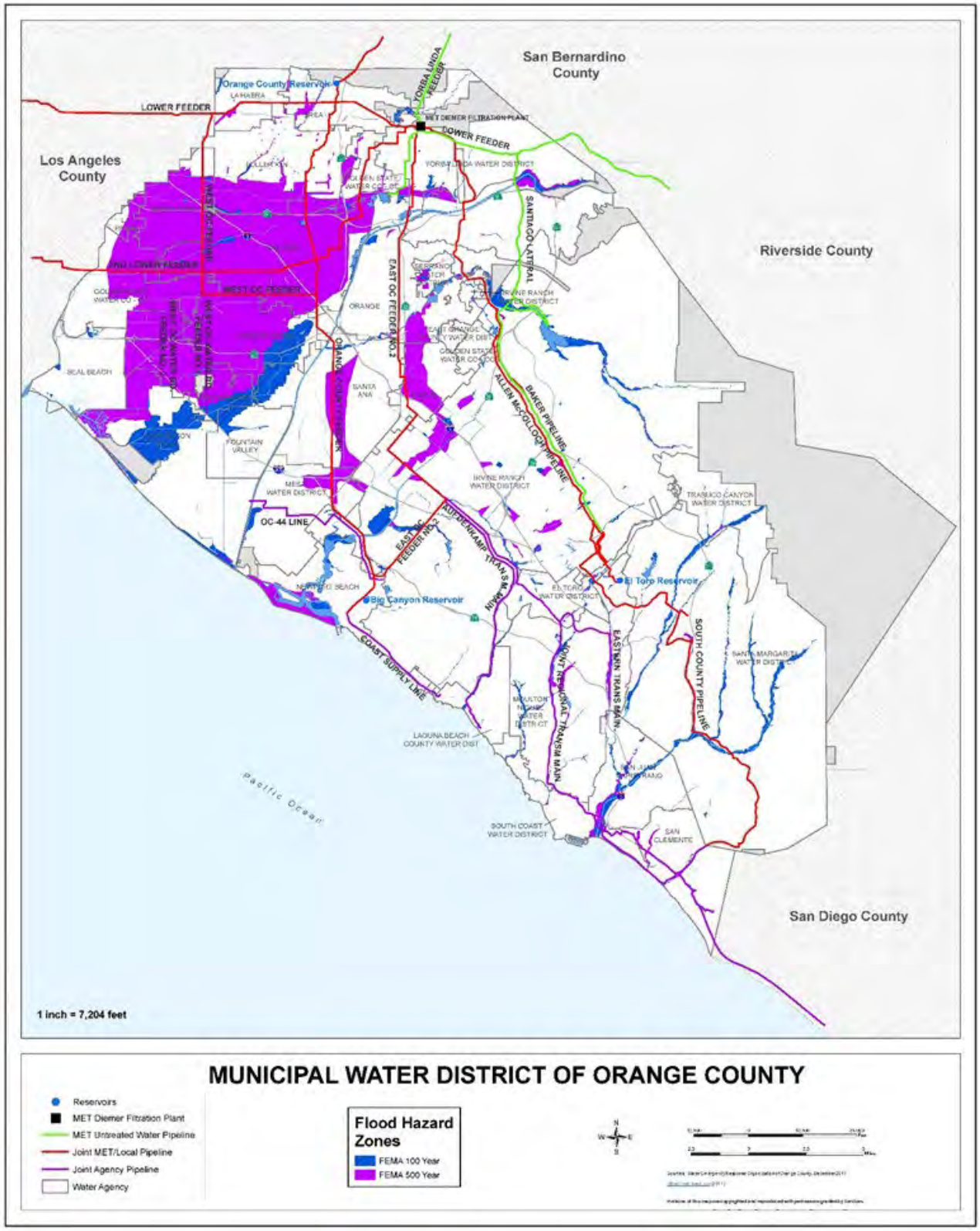


Exhibit A-6. Fault Rupture Hazard MWDOC Potable Water Infrastructure

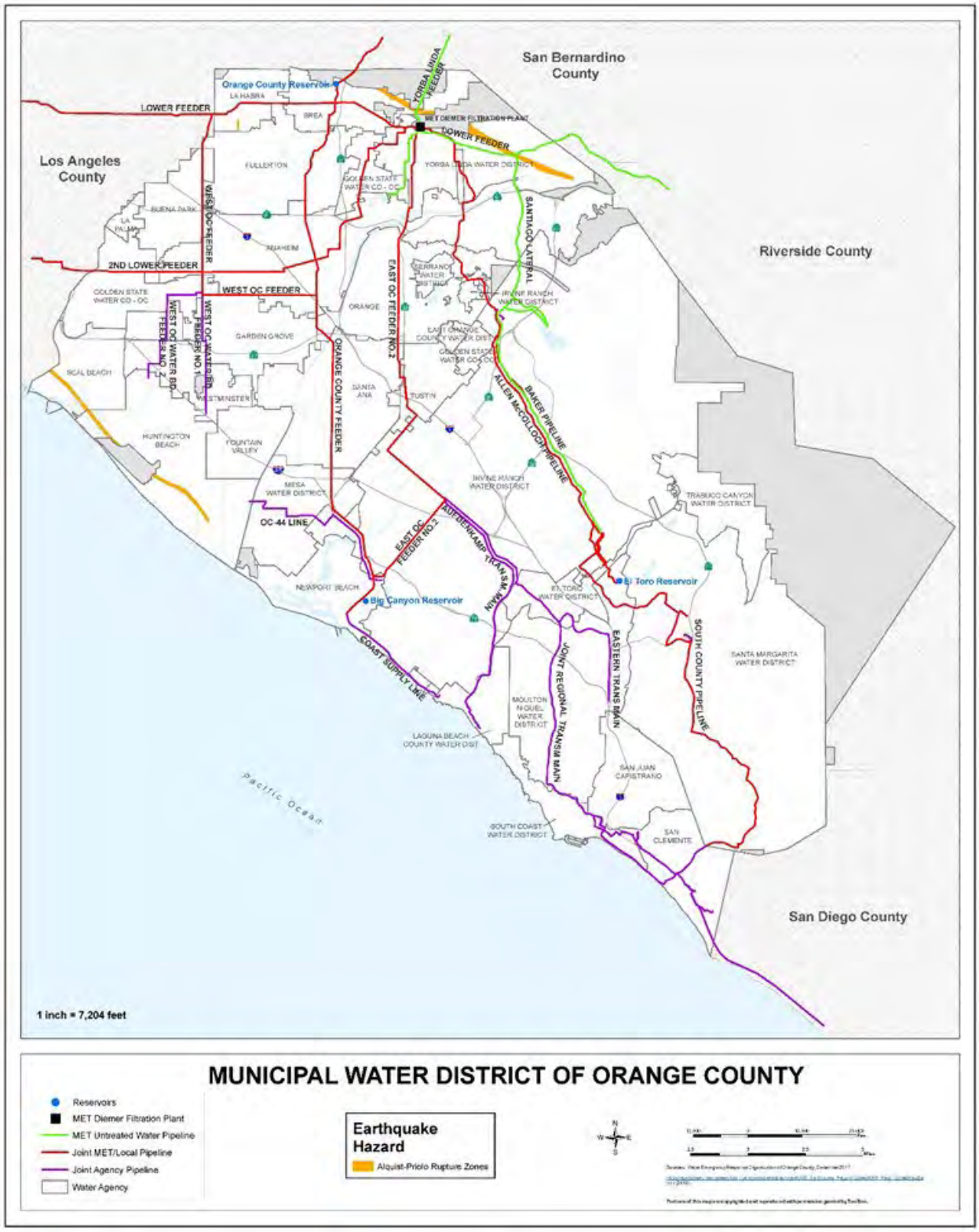


Exhibit A-7. Seismic Shaking Hazard and MWDOC Potable Water Infrastructure

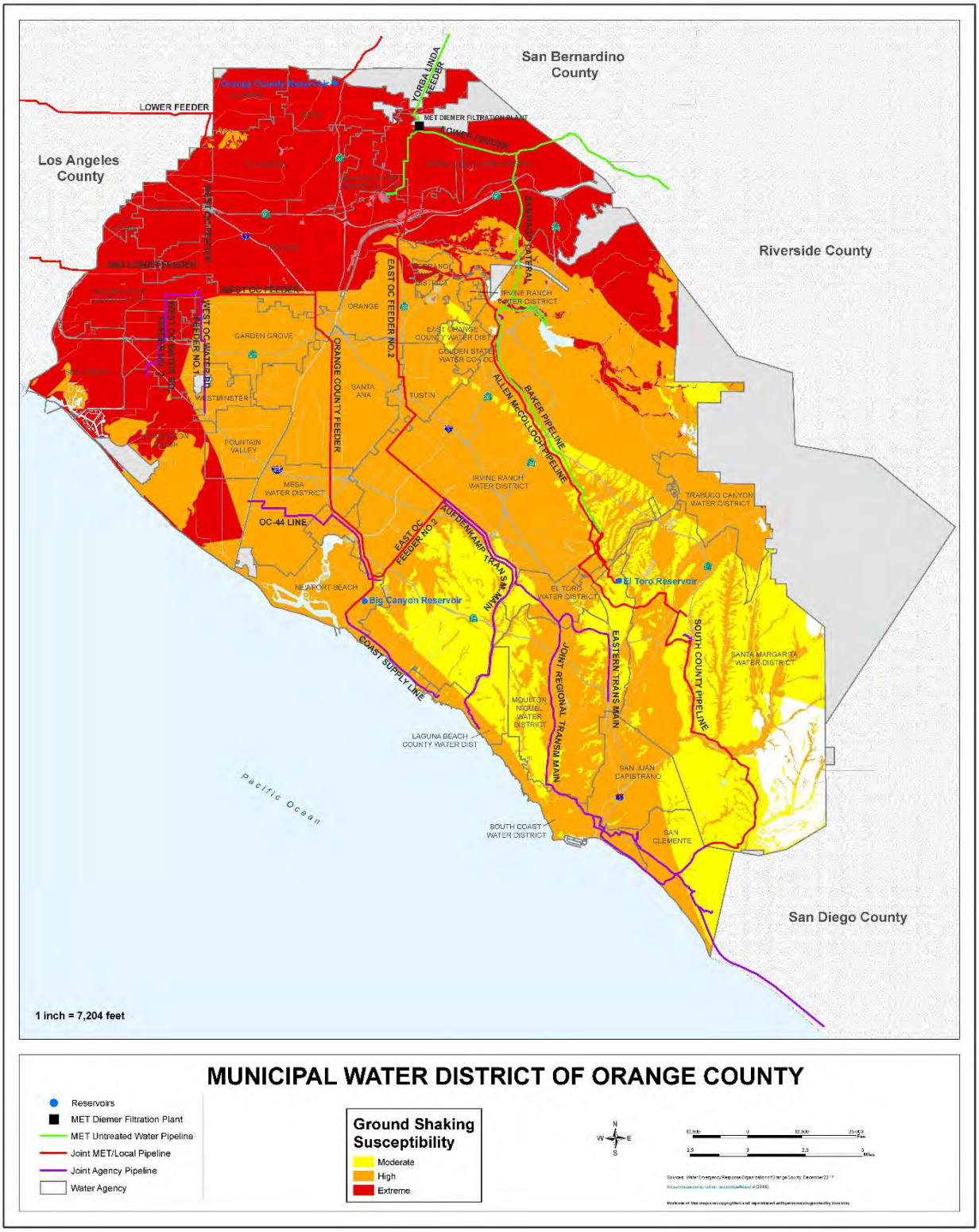


Exhibit A-8. Liquefaction Hazard and MWDOC Potable Water Infrastructure

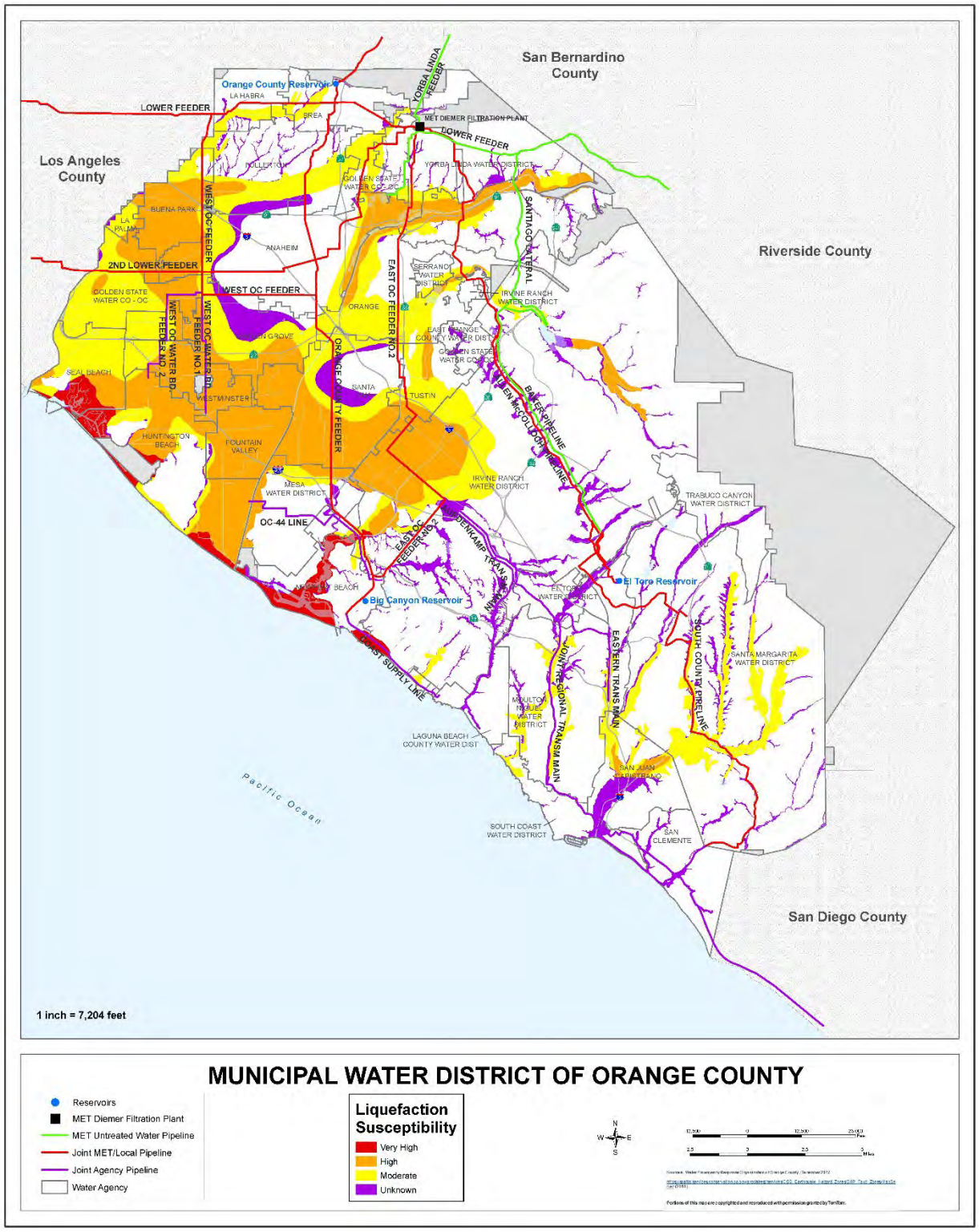


Exhibit A-9. Landslide Hazard and MWDOC Potable Water Infrastructure

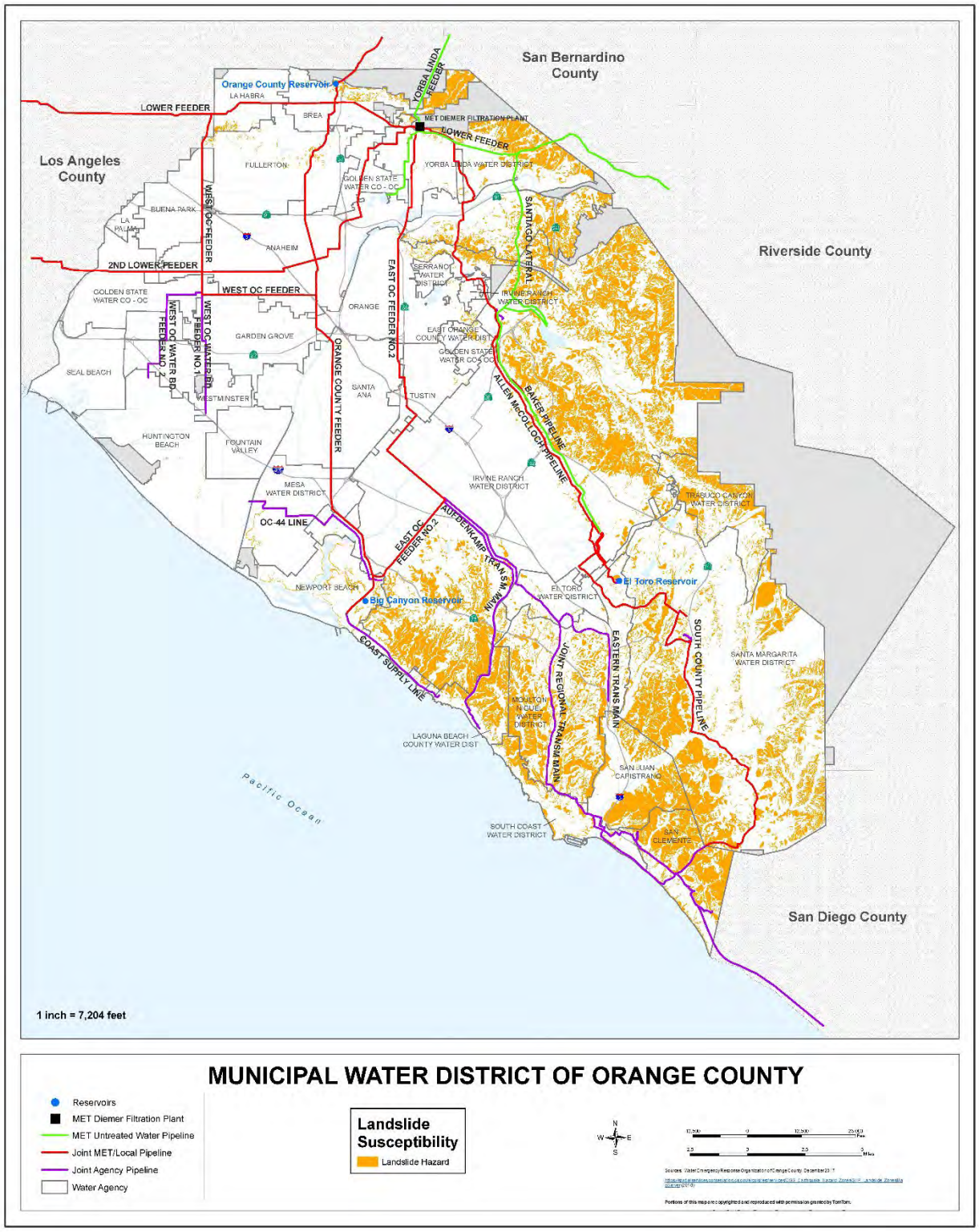
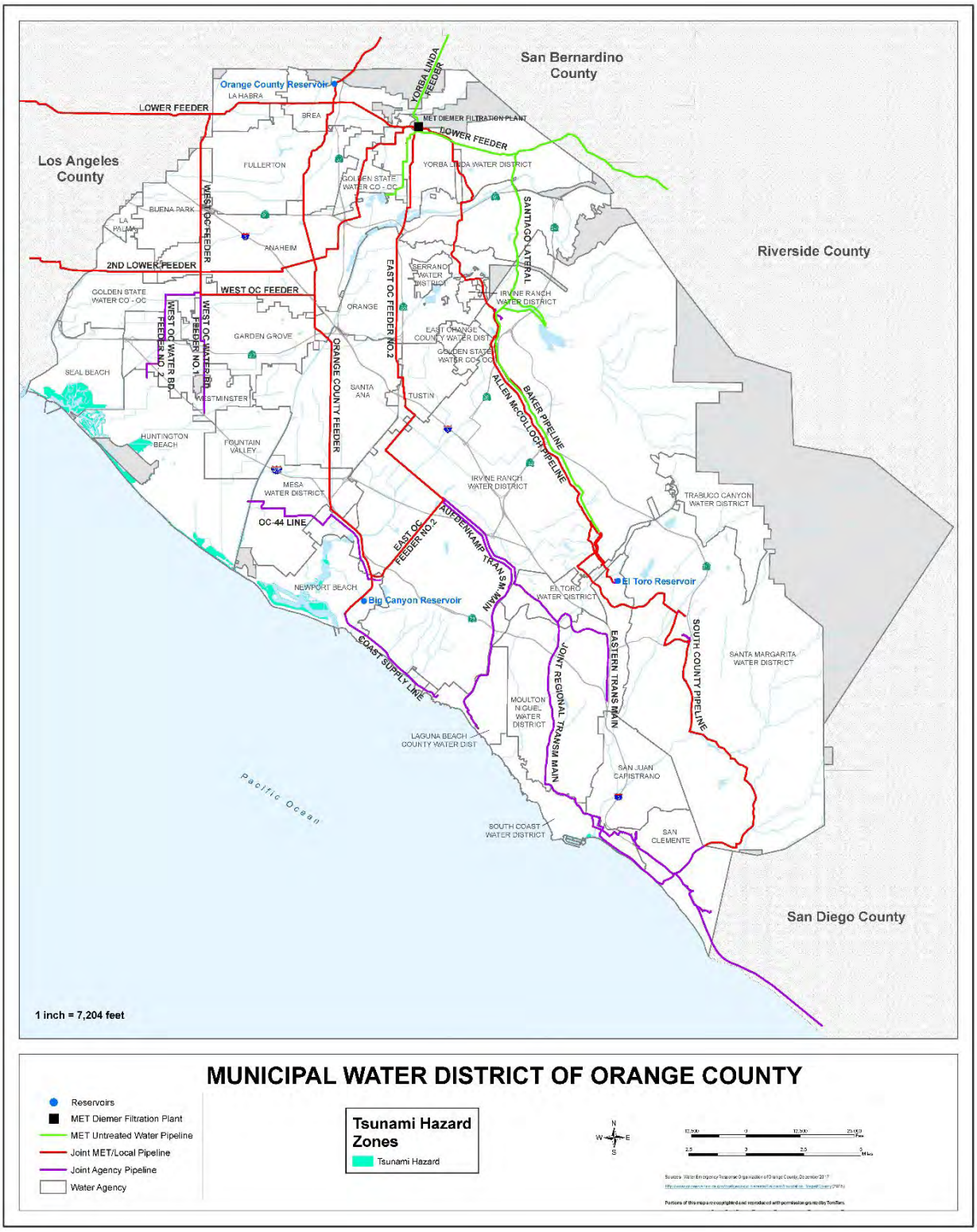


Exhibit A-10. Tsunami Hazard and MWDOC Potable Water Infrastructure



Note: Detailed tsunami maps are located within each agencies' annex who are affected by tsunamis.

A.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within MWDOC's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

In general, MWDOC does not have ownership of the water infrastructure that it uses in its role as a water wholesaler. The infrastructure MWDOC relies on are owned by Metropolitan Water District (MET) or are jointly owned by various MAs.

MWDOC's involvement in hazard mitigation as it relates to water and wastewater assets and infrastructure, is as a regional planner and facilitator. MWDOC and WEROC work with their member agencies to complete regional studies, facilitate regional projects, and to sometimes manage the design, construction and fiscal aspects of those projects. This has at times, and could in the future, include grant application and management of those projects.

Additionally, MWDOC does own, or lease, three facilities as a component of its business administration and EOC operations. MWDOC has authority to make physical improvements to all three facilities but is limited to only tenant improvements at the WEROC Staging and Logistics within the City of Orange, which is owned by MET. At the WEROC North EOC, MWDOC requests any needed structural, and/or land improvements for general maintenance, and repair and mitigation from MET, and is subject to MET's budgeting and staffing capabilities. At the MWDOC Administration Building in Fountain Valley MWDOC works with partner agencies (they are shared facilities) and has authority to complete general maintenance, repairs, and mitigation projects at each facility.

WEROC will ensure that Orange County facilities are operable following the hazards outlined in the MJHMP and ensure water and wastewater utilities have a central coordination point for resources in their quest to restore and/or maintain operational water and wastewater services. WEROC staff assist MAs in the Stafford Act and California Emergency Services Act process following such disasters, including providing support to pursue 406 Public Assistance Mitigation funding.

Changes in Land Use and Development

MWDOC's service area encompasses the entire Orange County, leading them to be impacted by any development and land use changes that occur across the county. The majority of land within the service area is used for single family residential buildings as the land in Orange County is predominantly built out for residential uses. Portions of the service area are also dedicated to commercial, industrial, and governmental use. Land use is not anticipated to change much in the northern portion of Orange County as it is predominantly built out with little development potential beyond redevelopment and infill projects. Southern Orange County has higher potential for development in the vacant areas transitioning into residential and commercial uses.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for MWDOC from climate change will mirror the impacts discussed in the Base Plan.
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the Base Plan.
Flood	Climate change is expected to cause some higher-level flood waters within MWDOC's service area due to the various creeks and rivers where the 100-year flooding event may expand into the 500-year flood zones on a more frequent basis.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within MWDOCs planning area. The vulnerability follows that described in the Base Plan.
Geological Hazards: Land Subsidence	MWDOC's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Human-Caused Hazards: Contamination/Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber-based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within MWDOC's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the MWDOC service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within MWDOC's service area as a result of climate change.
Hazards of Medium Concern	
Human-Caused Hazard: Power Outage	Climate change will likely increase MWDOC's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact facilities.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact MWDOC as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact MWDOC's service area as described in the base plan.

Hazard	Climate Change Vulnerabilities
Severe Weather: Windstorm	The challenges to MWDOC from climate change's impacts on windstorms are expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact on how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is expected to increase the risk of wildfires within MWDOC's service area.
Hazards of Low Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to MWDOC's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to MWDOC's service area from climate change will mirror the impacts discussed in the Base Plan.
Coastal Hazards: Tsunami	MWDOC's vulnerability to tsunamis is not expected to change due to climate change.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across MWDOC's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.

A.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. MWDOC's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to Member Agencies (MAs) for reducing damage from future hazard events. **Exhibits A-11a through A-11d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. MWDOC has the ability to expand on and improve existing emergency management policies and programs through its WEROC program and MWDOC Board of Directors to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit A-11a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City of Fountain Valley and County of Orange	MWDOC complies with applicable building codes and works with cities within their service area. **Expansion and Improvement:** As retrofits and replacement projects are identified MWDOC will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Zoning Ordinance	Cities of Fountain Valley and County of Orange	MWDOC complies with applicable zoning ordinances and works with cities within their service area.
Subdivision Ordinance or Regulations	Cities of Fountain Valley and County of Orange	MWDOC complies with applicable subdivision ordinances and regulations and works with cities within the service area.
Special Purpose Ordinance	Cities of Fountain Valley and County of Orange	MWDOC complies with applicable special purpose ordinances and regulations and works with cities within their service area.
Growth Management Ordinances	Cities of Fountain Valley and County of Orange	MWDOC complies with applicable growth management ordinances and works with cities within their service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, MWDOC can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	OCFA and Cities within MWDOC service area	MWDOC complies with applicable site plan review requirements and works with the OCFA and cities within their service area. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Urban Water Management Plans	Engineering	Prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Urban Water Management Plan; master plans of the MWDOC member agencies; MET Integrated Resources Plan. **Expansion and Improvement:** Integration of future projects from UWMPs into Local Hazard Mitigation Plans can ensure both plans are supporting the necessary improvements needed to ensure future water supplies and minimize risks to hazards and disasters.
Capital Improvements Plan	WEROC EOC and MWDOC Admin Building	Identifies capital projects and equipment purchases, provides a planning schedule and identifies options for financing the plan. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	WEROC	Emergency response procedures and EOC operations. Last updated 2021. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure MWDOC and other MAs are better prepared

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		for future incidents and can anticipate their communities' needs.
Post-Disaster Recovery Plan	WEROC	Outlines long term recovery operations after a disaster. WEROC is part of the Operational Area and County of Orange Recovery Plan and is identified as the Mutual Aid Coordinator for the 36 water and wastewater agencies in OC.
Title 17 & 22	State Water Resource Control Board	Water supply is regulated by a State or local health agency.
Air Quality	South Coast Air Quality Management District	Comply with South Coast Air Quality Management District.
Safety	Occupational Health and Safety Administration	Comply with OSHA regulations.
Comprehensive/ Master Plan		Preparation of a comprehensive infrastructure (water, wastewater, etc…) is an acceptable method of understanding overall system design capabilities and needs. **Expansion and Improvement:** Updates to these plans should incorporate much of the risk assessment data and analysis that highlights which assets are at risk from various hazards.
Continuity of Operations Plan		Preparation of a COOP allows MWDOC to understand operational needs during an outage or event that can impact agency functions. **Expansion and Improvement:** Development and update of this plan should focus on integration of the risk probabilities of event types and nature of potential impacts, to better inform the COOP planning and process.

How can these capabilities be expanded and improved to reduce risk?
▪ Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with MAs as a component of the Southern California Catastrophic Plan. ▪ Evaluate and support MA ability to contract with local fuel distributors and gas stations for emergency backup supply.

Exhibit A-11b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Engineering	2 Engineers; Attend EOC trainings, continuing education related to hazard mitigation.
Engineer(s) or Professional(s) Trained in Construction	Engineering	2 Engineers; Attend EOC trainings, continuing education related to hazard mitigation.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Practices Related to Buildings and/or Infrastructure		
Planners or Engineer(s) with an Understanding of Natural and/or Human – Caused Hazards	Engineering	2 Engineers; Attend EOC trainings, continuing education related to hazard mitigation.
Flood Plain Manager	County of Orange	The County of Orange has flood plain managers who can assist cities and special districts.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	WEROC/OCIAC	MWDOC staff have education and expertise to assess the community's vulnerability to hazards. WEROC can also work with OCIAC, DHS, DDW, DWR, EPA, and Cal OES.
Personnel Skilled in GIS and/or HAZUS	Center for Demographic Research	MWDOC will seek consulting services when GIS or HAZUS information is needed. In the past, WEROC has contracted with the Center for Demographic Research and others for these types of services. MWDOC/WEROC is using more GIS tools. Water leak detention, Initial Damage Estimates, and other layers are being crafted. One being implemented is DAG communities.
Scientists familiar with the hazards of the community	WEROC	WEROC staff is familiar with the hazards to the community. And has access to state and national tools.
Emergency Manager	WEROC	WEROC has 3 staff members that can fill 3 positions - an Emergency Manager, an EOC Directly, and an Emergency Coordinator on staff 24/7.
Grant Writers	WEROC	WEROC staff have the ability to write grants. When needed, MWDOC has an open contract for grant consultant services that can be used.
Mutual aid agreements	WEROC	Creating and expansion of mutual aid agreements can assist with increasing capabilities within the planning area. Many MAs have limited resources and the creation of WEROC was intended to support mutual aid and capabilities expansion. **Expansion and Improvement:** Increased coordination, exercises, and trainings can help support MAs needs and help further identify mutual aid opportunities and needs.

Exhibit A-11c. Financial Capabilities Summary

Fees for Water, Sewer, Gas, or Electric Service	Finance	MWDOC charges fees for water to its member agencies. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Incur Debt Through General Obligation Bonds	Finance	MWDOC has a system in place to do so, but it is not a part of the organization's routine duties.

How can these capabilities be expanded and improved to reduce risk?
▪ Enhance fiscal resilience through the revision of MWDOC Administration Code and contracts to be compliant with the Stafford Act and CA Emergency Services Act for Public Assistance Reimbursement.

Exhibit A-11d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Quarterly Meetings	WEROC	WEROC hosts quarterly member agency meetings to increase awareness and implement projects that decrease our vulnerability. Planning meetings, drills and exercises have been enhanced using the Federal Integrated Preparedness Plan in conjunction with all WEROC member agencies, and with the County of

Training Opportunities	WEROC	WEROC hosts various trainings and exercises throughout the year to increase our member agencies' understanding of potential hazards. **Expansion and Improvement:** New trainings focused on mitigation strategies and implementation can help.
Monthly Meetings with MWDOC Agencies	Multiple staff including WEROC	Monthly meetings are held where issues of common concern are identified and discussed, including emergency preparedness, response, and planning with MWDOC MA Managers. Additionally, WEROC attends monthly County Emergency Management meetings to ensure knowledge of and coordination between water and other jurisdictions within the county. **Expansion and Improvement:** Incorporate mitigation information and analysis into monthly meeting agendas to continue sharing information with MA managers and board members.
Organizations that represent/advocate for/interact with underserved and vulnerable communities	MWDOC: Water Use Efficiency	Premium High-Efficiency Toilet Rebate Program, Turf Replacement Rebate Programs, Drip Irrigation Rebate Programs, Smart Sprinklers, and Rain Barrel Program.

How can these capabilities be expanded and improved to reduce risk?
▪ Lead efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to our utility.

A.7 MITIGATION STRATEGY

A.7.1 Mitigation Goals

MWDOC adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

A.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit A-12,** MWDOC Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit A-12. MWDOC Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH							
Creation of water and wastewater EOC Position Taskbooks in compliance with the federal National Qualification System of all positions identified.	WEROC	All Hazards	$2,000	WEROC and Member Agencies	Short Term	WEROC	New
Create a list of fleet vehicles, personal vehicles, and generators within the county to include fuel type, fuel duration, and connection type. Include fuel storage and operational capabilities for each agency.	Orange County	Flood; Seismic Shaking; Severe Weather: Windstorm; Urban Fire; Wildfire	N/A	WEROC and MWDOC Water Resources	Long Term	General Fund	Existing, Modified
Lead strategic planning with MA who own Dams to ensure local coordination and standardized pre-event education materials and Alerts and Warning messaging.	Orange County	Dam/Reservoir Failure	N/A	WEROC and MWDOC Public Affairs	Immediate	WEROC and General Fund	Existing, Ongoing
Planning Study of Phase 2 Pump into the EOCF#2.	Planning Study	All Hazards	N/A	MWDOC Engineering	Long Term	Local, OCWD, MET	Existing, Modified
Provide Member Agencies with training opportunities that will assist them with DOC activations, Unknown Contaminant Response, AlertOC, and WebEOC.	Orange County	All Hazards	N/A	WEROC	Long Term	General Fund	Existing, Ongoing
Translate water quality notices into the nine most common languages in OC besides English.		All Hazards	$3,000	WEROC	Short Term	General Fund	Existing, Modified
Work with MET on storage of water for delivery during emergency situations.	MET	All Hazards	Unknown	MWDOC Water Resources	Long Term	MET	Existing, Ongoing
Work with MET, LADWP and DWR on resiliency & restoration efforts for the systems importing water to Southern California	Statewide	All Hazards	Unknown	MWDOC Water Resources	Long Term	MET, LADWP, DWR	Existing, Ongoing
Work with Orange County stakeholders to promote the California WaterFix.	Orange County	All Hazards	N/A	All MWDOC and WEROC staff	Short Term	General Fund	Existing, Ongoing
LOW							
Continue to work with DWR, MET, OCWD, and MA on water supply resiliency, as well as updates to Drought Response Plans to prepare for the next drought.	Statewide	Drought	N/A	MWDOC Water Resources and WUE	Long Term	General Fund	Existing, Ongoing

A.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Structural upgrades to Administrative Building
  - **Status:** Completed 2024.
- **Mitigation:** Investigate the possibility of having a lab in Southern California to test Emergency Water Quality Sample Kits and work with CA DDW to implement.
  - **Status:** Completed 2024. DWR/DDW has created a GIS platform showing all the labs in Southern California that can assist with testing as needed during an event. Use of wastewater members lab and services has been identified and implemented as another resource within the county.
- **Mitigation:** Expansion of the IRWD Interconnection to South Orange County.
  - **Status:** Removed 2024.
- **Mitigation:** Encourage Member Agencies to purchase Emergency Water Quality Sample Kits
  - **Status:** Removed 2024.
- **Mitigation:** Evaluate the current status of both EOC's. Conduct a seismic assessment, strengthen the buildings to improve life safety.
  - **Status:** Completed 2024. EOC assessment is complete.
- **Mitigation:** Encourage Member Agencies to create defensible space around critical facilities. To include the WEROC SEOC.
  - **Status:** Removed 2024.
- **Mitigation:** EOC structural and safety improvement at the MWDOC Fountain Valley location.
  - **Status:** Removed 2024. South EOC has been decommissioned.
- **Mitigation:** Purchase/create three Emergency Water Quality Sample Kits to use for training purposes. Use the lessons learned and suggestions to inform emergency response to an unknown contaminant.
  - **Status:** Completed 2019. Three Emergency Water Quality Sample Kits have been purchased.
- **Mitigation:** Purchase and locate nine 2,000-gallon water trailers around the county to provide drinking water during emergency events.
  - **Status:** Completed 2019. 15 trailers have been purchased and strategically distributed throughout the county.
- **Mitigation:** Create a list of generators within the county to include fuel type, fuel duration, and connection type. Include fuel storage and operational capabilities.

- **Status:** Completed 2019. A list of generators and fueling capabilities has been compiled. WEROC staff will work with MAs to continue to update and maintain this list. The list will be used for future planning, training, and grant proposals.

A.8 PLAN INTEGRATION

MWDOC's Strategic Plan, Annual Budget, South Orange County Reliability Study, Orange County Reliability Study (2016 and 2018 update), Continuity of Operations Plan, Urban Water Management Plan, WEROC Emergency Operations Plan, and the WEROC program are all used to implement mitigation initiatives identified in this Annex. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into these documents.

Since the previous plan update, MWDOC incorporated the MJHMP into the plans identified above, in addition to the following planning mechanisms:

- Continuing the development and training of Emergency Water Quality Sample Kits by working with local agencies to develop a local laboratory that can test water samples and continuing to build plans and agency templates to respond to a water quality threat.
- Using the risk assessment information to update the hazard analysis in MWDOC's Emergency Operations Plan.

MWDOC will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this plan.

2024

Orange County Water and Wastewater
Multi-Jurisdictional Hazard Mitigation Plan

Annex B: Orange County Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

ORANGE COUNTY WATER DISTRICT ANNEX

Orange County Water District (OCWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, OCWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to OCWD.

This annex details the hazard mitigation planning elements specific to OCWD and describes how OCWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the base MJHMP, including the planning process and other procedural requirements, apply to and were met by OCWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to OCWD with a focus on the risk assessment and mitigation strategies.

B.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit B-1** lead the OCWD planning team, attended meetings on behalf of OCWD, and coordinated the hazard mitigation planning efforts with OCWD staff and the consultant team supporting the effort.

Exhibit B-1. Planning Team Lead

Primary Point of Contact
Name: Paula Bouyounes
Title: Risk & Safety Manager
Telephone: 714-378-3310
Email: pbouyounes@ocwd.com

OCWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as OCWD's internal hazard mitigation planning development team.

Exhibit B-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Benjamin Smith	Director of Recharge and Wetlands Operations
Patel Mehul	Executive Director of Operations/Water Production
Chris Olsen	Executive Director of Engineering
Lenyss Bahena	Safety Assistant

Outreach to the public within OCWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, OCWD published a webpage with information on the MJHMP process. The MJHMP survey was posted to their social media platforms on Facebook and X (formerly known as Twitter) to increase engagement. OCWD's Public Affairs team included the MJHMP survey information and link in the District's August newsletter and hosted the survey link on the districts website homepage for a month.

B.2 JURISDICTION PROFILE

Service Population: 2,400,000

OCWD manages the large groundwater basin that provides reliable, high-quality groundwater to 19 cities and water utilities and their 2.4 million customers. OCWD was formed in 1933 by a special act of the California Legislature [Water Code App §40-1 et seq.], which authorized OCWD to represent water users and landowners in litigation (with upstream users) and empowered OCWD to protect the water supply and protect the groundwater basin. The mission of OCWD is to provide local water retailers with a reliable, adequate, high-quality water supply at the lowest reasonable cost in an environmentally responsible manner. With years of proper planning and investment, OCWD has more than doubled the output of the groundwater basin. Today, OCWD is managed by a ten-member Board of Directors, with three appointed from the cities of Anaheim, Fullerton and Santa Ana, and the remainder of the Board publicly elected from geographic divisions within the OCWD service area.

The groundwater basin, which underlies north and central Orange County, provides between 65 and 85 percent of the water needed in that area. Imported water meets the balance of the water demand. Groundwater is pumped by water utilities before being delivered to customers. Groundwater is a great value at approximately one-half the cost of imported water. OCWD purchases through MWDOC some imported water supplies for recharge operations and for operating and maintaining the seawater intrusion barrier.

OCWD is known internationally for its “tradition of innovation.” OCWD built the first advanced wastewater purification plant to provide water to prevent seawater intrusion into Orange County’s groundwater basin. Today, OCWD and OC San are partners in the world’s largest advanced wastewater purification project, called the Groundwater Replenishment System (GWRS) that is currently being expanded to provide 134,000 acre-feet per year (AF/yr) of water for seawater barrier and groundwater replenishment purposes.

One of OCWD’s core activities is refilling or replenishing the Basin to balance the removal of groundwater by pumping. Sources of recharged water include Santa Ana River baseflow and storm flow, Santiago Creek flows, imported supplies purchased from Metropolitan, supplemental supplies from the upper Santa Ana River Watershed, and purified wastewater from the GWRS plant. OCWD works closely with the U.S. Army Corps of Engineers, which operates Prado Dam on the Santa Ana River in Riverside County, to conserve storm water on lands behind the dam for use in OCWD’s recharge efforts. The Basin is not operated on an annual safe-yield basis, which means the water withdrawn may exceed replenishment in any given year; however, over the long term, the Basin must be maintained in an approximate balance to ensure long-term viability.

B.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that OCWD faces, distinct from that of the county-wide planning area. The hazard profiles in the base plan discuss overall impacts to the planning area and describe the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events, and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

OCWD’s service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought,

seismic shaking, and windstorms. Based on the risk assessment, the OCWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect OCWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit B-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit B-3. OCWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to OCWD
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	Medium
Wildfire	Highly Likely	Medium	Critical	High	High	Medium
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Medium
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	High
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	Low
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Low
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Low
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	High
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	High
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Medium
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	High
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	High
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Low

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to OCWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit B-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and OCWD.

B.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit B-4. Fire Hazard and OCWD District Potable Water Infrastructure

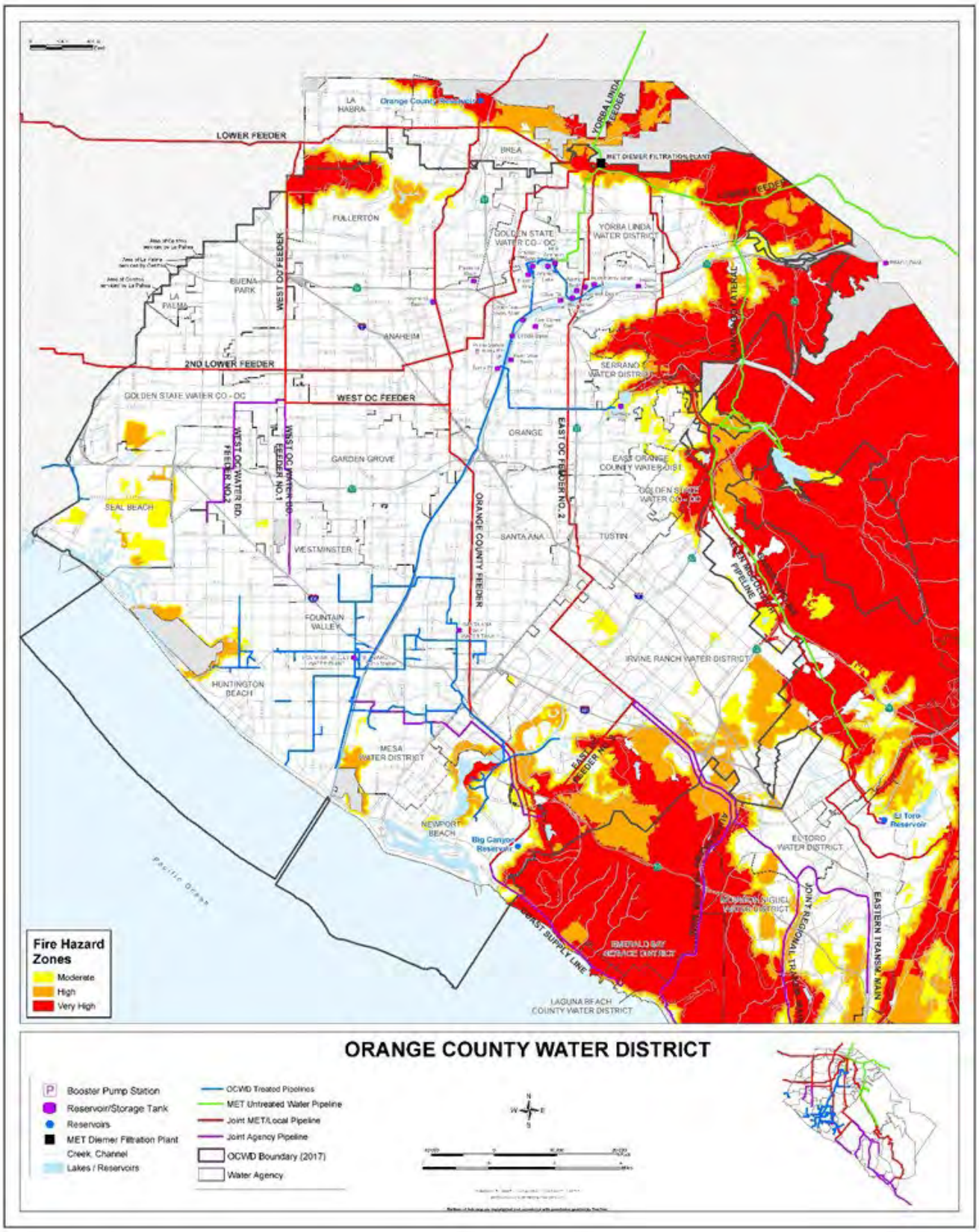


Exhibit B-5. Flood Hazard and OCWD Potable Water Infrastructure

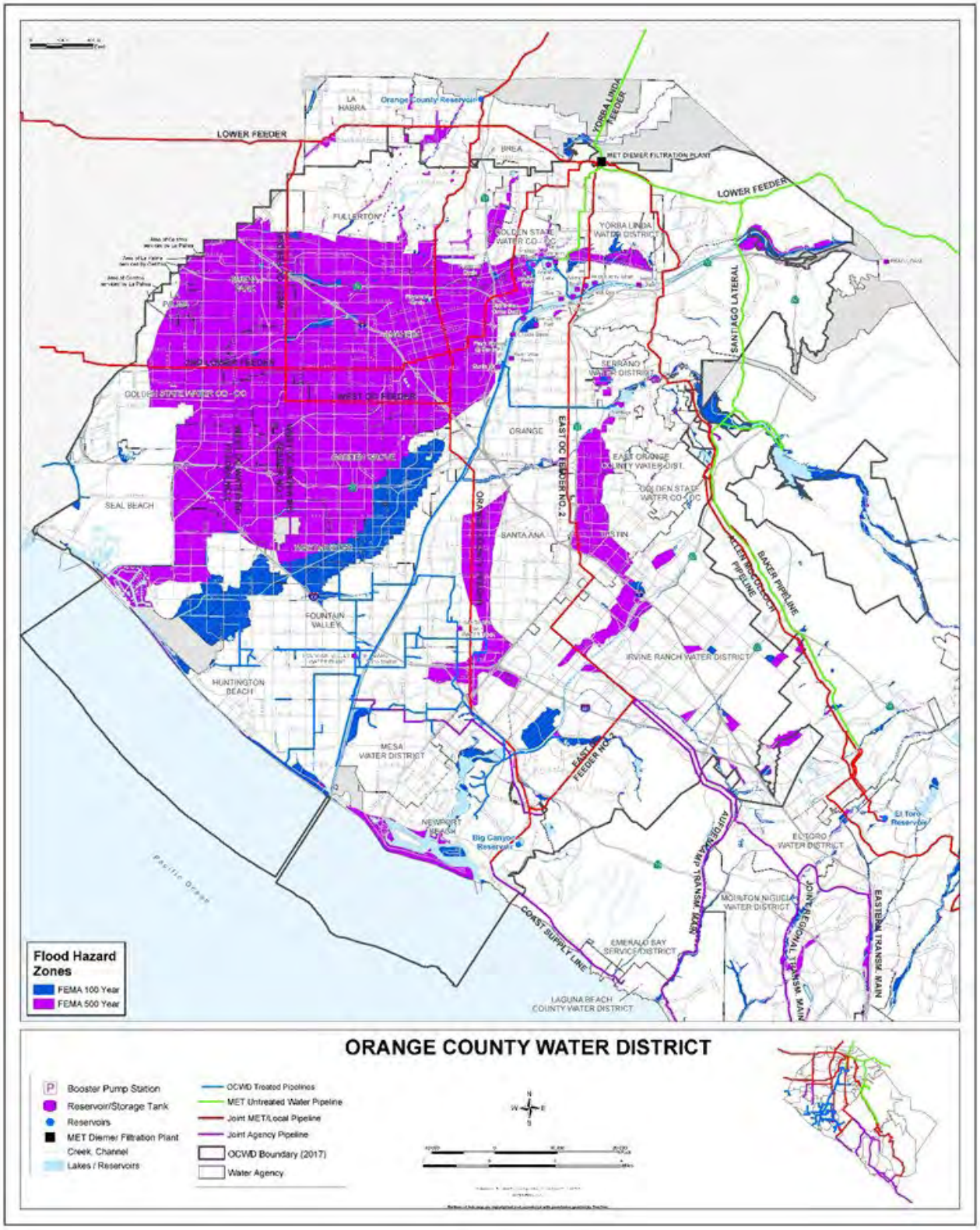


Exhibit B-6. Fault Rupture Hazard and OCWD Potable Water Infrastructure

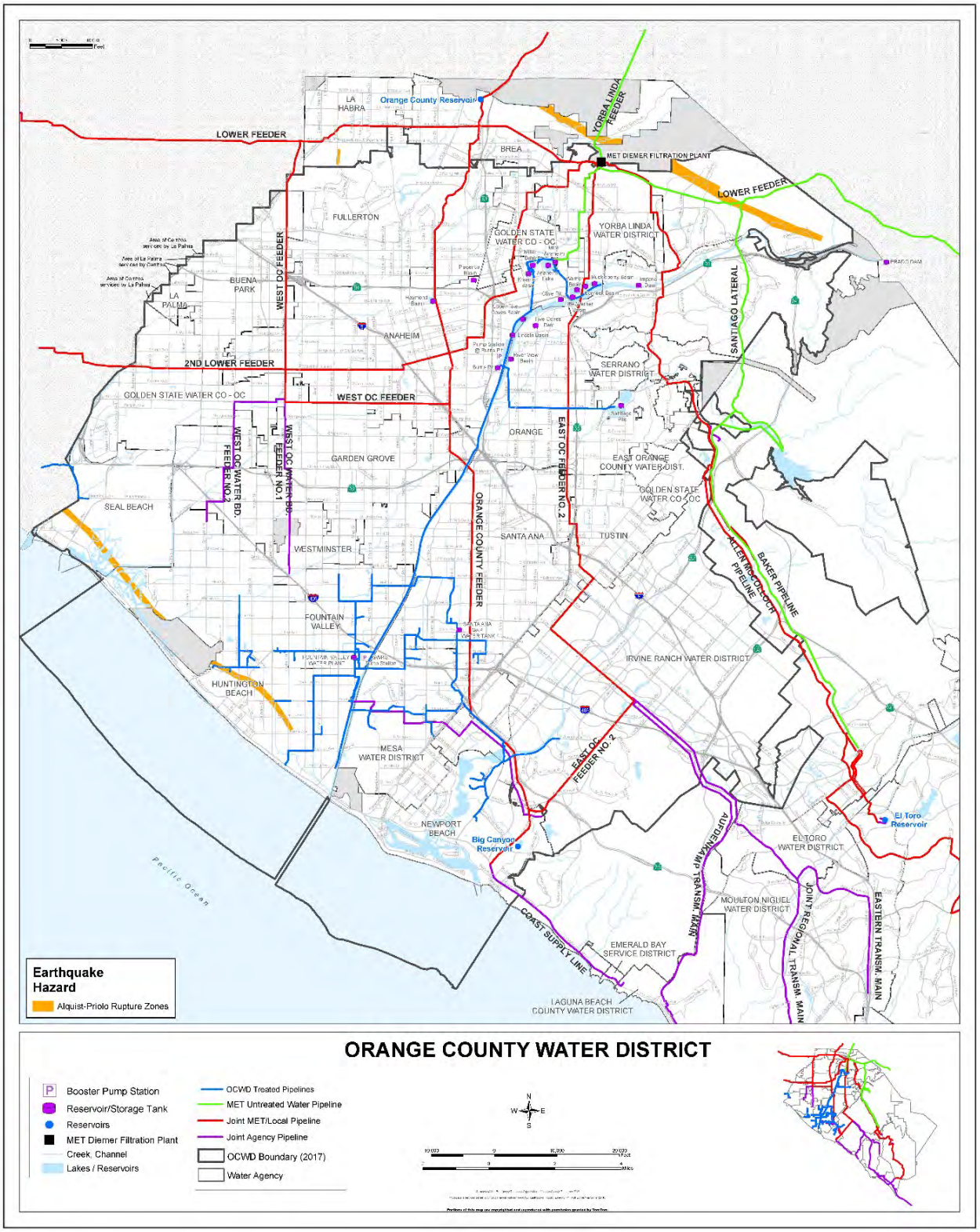


Exhibit B-7. Seismic Shaking Hazard and OCWD Potable Water Infrastructure

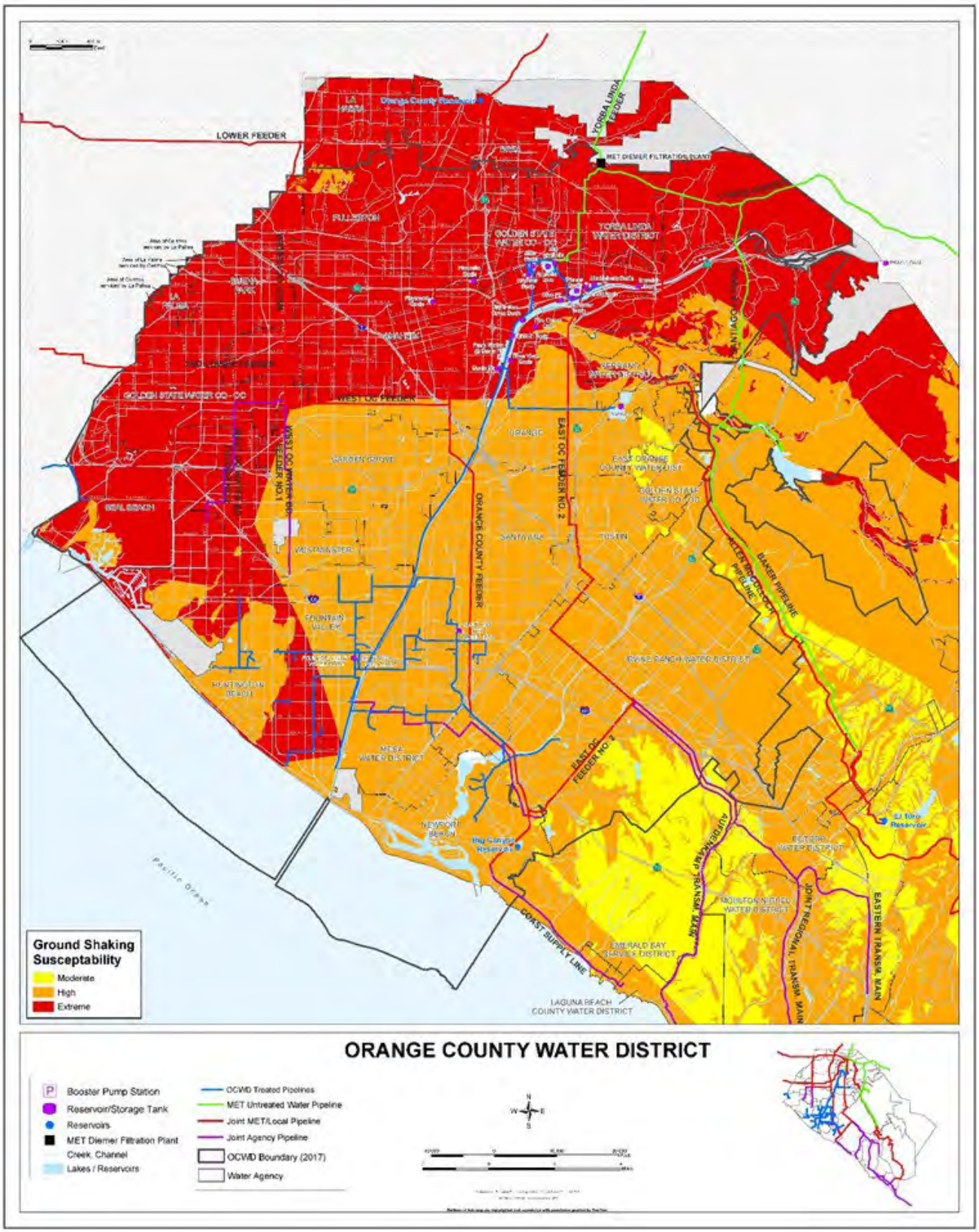


Exhibit B-8. Liquefaction Hazard and OCWD Potable Water Infrastructure

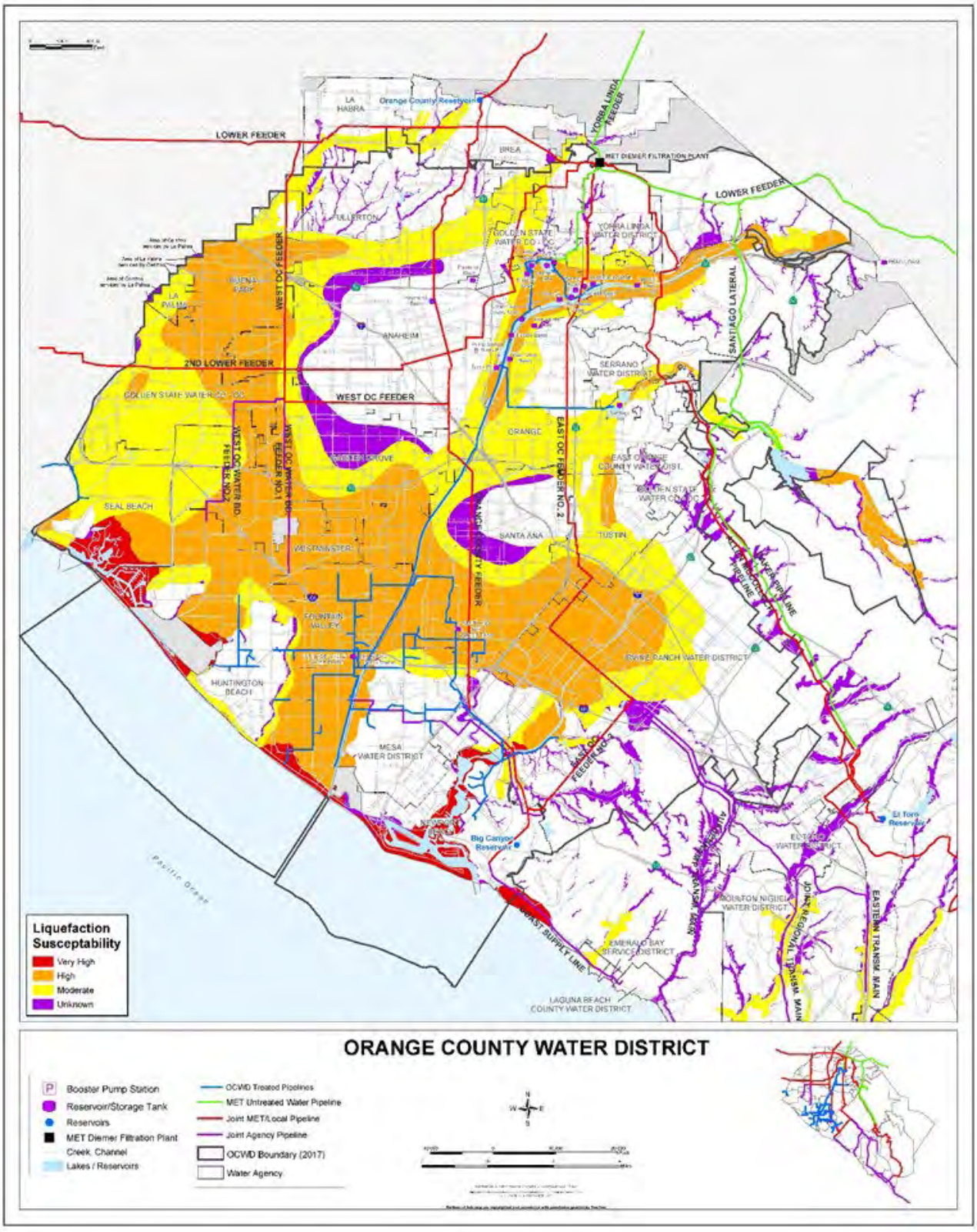


Exhibit B-9. Landslide Hazard and OCWD Potable Water Infrastructure

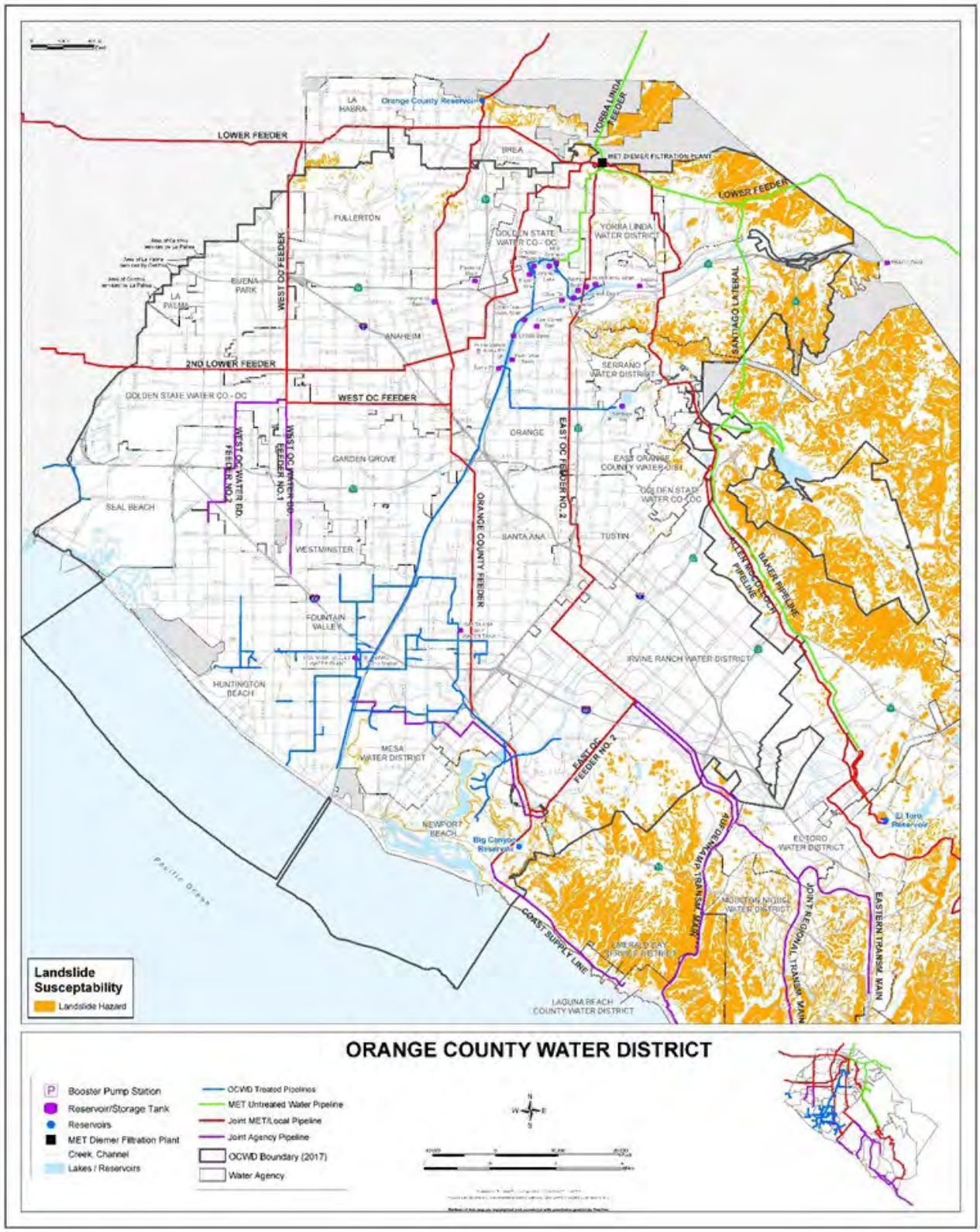
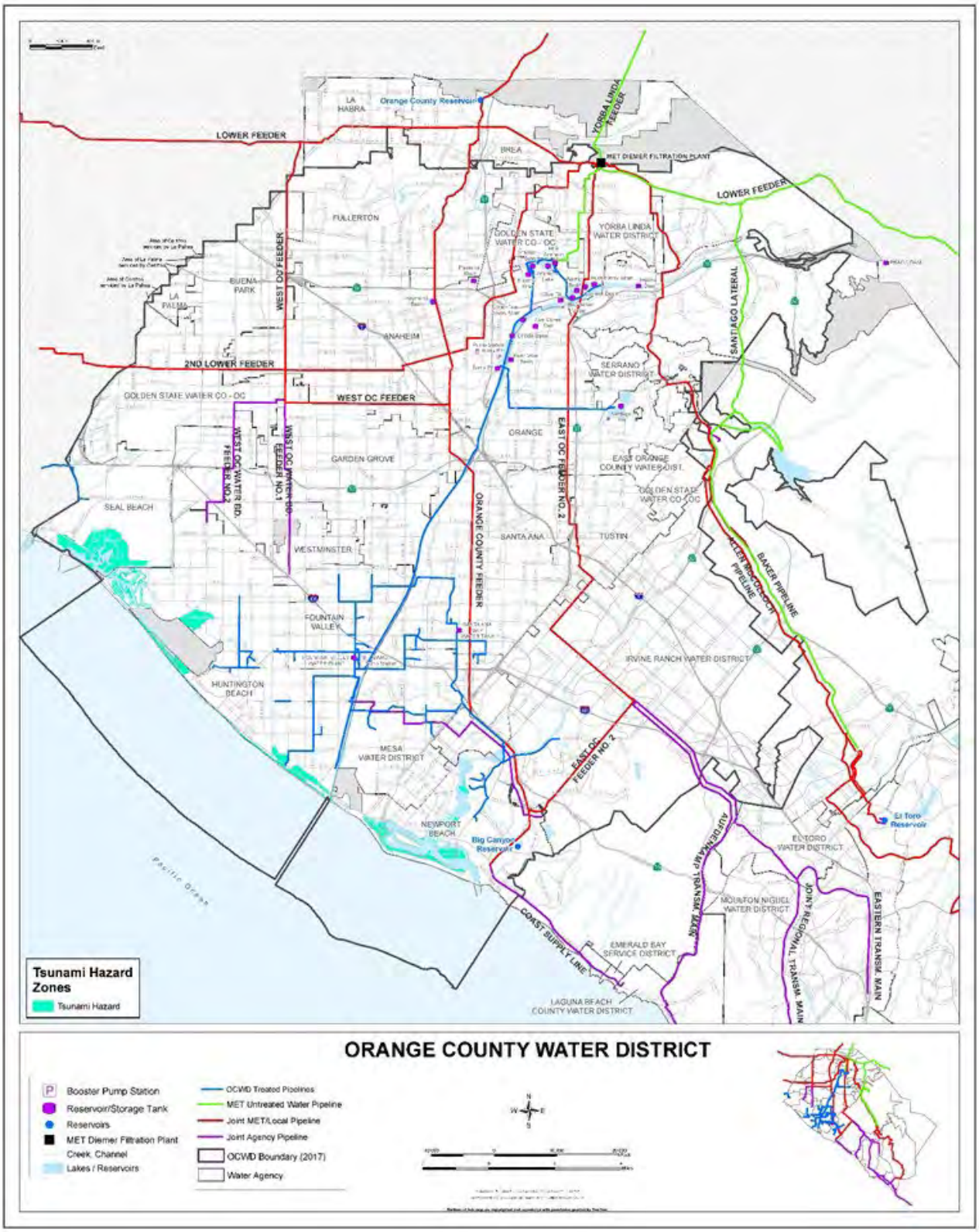


Exhibit B-10. Tsunami Hazard and OCWD Potable Water Infrastructure



B.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within OCWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

OCWD's infrastructure is outlined in **Exhibit B-11**, which lists the number of OCWD's infrastructure assets are located within the mapped hazard zones identified above.

Exhibit B-11. OCWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type						
		Administration Buildings (#)	Pump Stations (#)	Reservoirs (#)	Water Storage Tanks (#)	Wells (#)	Potable Pipelines (miles)	Wastewater Pipelines (miles)
Fire Hazard Zone	Moderate	0	0	1	0	0	0	0
	High	0	0	0	0	0	0	0
	Very High	0	0	0	0	0	0	0
FEMA Flood Zone	100-Year	0	0	15	0	0	11.6	0
	500-Year	0	0	0	0	0	0.4	0
Alquist-Priolo Rupture Zone		0	0	0	0	0	0	0
Seismic Shaking	Moderate	0	0	0	0	0	0	0
	High	1	1	1	1	1	12.1	0
	Extreme	1	1	17			5.7	0
Liquefaction	Moderate	0	0	2	0	0	3.8	0
	High	2	2	14	1	1	13.4	
	Very High	0	0	0	0	0	0	0.8
	Unknown	0	0	0	0	0	0.1	2.5
Landslide Zone		0	0	0	0	0	0	0
Tsunami Zone		0	0	0	0	0	0	0

Several miles of OCWD's potable pipeline system and reservoirs are in areas susceptible to flooding and within an area identified as having a high or extreme risk for seismic shaking and high risk of liquefaction during an earthquake.

Changes in Land Use and Development

Orange County is a highly developed county with expanding cities and growing population numbers. OCWD supplies groundwater to Orange County, meaning their service is impacted by land use changes and development that occurs across the 19 cities they serve. Some major developments that have happened includes the construction of Orange Heights' 1,066 single family homes and 114 multifamily units. One major development project performed by OCWD in partnership with OC San was the expansion of the Groundwater Replenishment System.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for OCWD from climate change will mirror the impacts discussed in the base plan. Since managing the groundwater basin is a major priority for OCWD, impacts associated with sea level rise affecting groundwater resources will be closely monitored.
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Flood	Climate change is expected to cause some higher-level flood waters within OCWD, and the 100-year flooding event may expand into the 500-year flood zones on a more frequent basis.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within OCWD's service area. The vulnerability follows that described in the base plan.
Geological Hazards: Land Subsidence	OCWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Human-Caused Hazards: Contamination/Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within OCWD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the OCWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within OCWD's service area as a result of climate change.
Hazards of Medium Concern	
Human-Caused Hazard: Power Outage	Climate change will likely increase OCWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact OCWD facilities.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact OCWD as described in the base plan.

Hazard	Climate Change Vulnerabilities
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact OCWD's service area as described in the base plan.
Severe Weather: Windstorm	The challenges to OCWD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is expected to increase the risk wildfires within OCWD's service area especially in the northeastern rural hill areas of OCWD.
Hazards of Low Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to OCWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to OCWD's service area climate change will mirror the impacts discussed in the Base Plan.
Coastal Hazards: Tsunami	OCWD's vulnerability to tsunamis is not expected to change due to climate change.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides around the eastern and southern portions of OCWD as increased precipitation and storm intensities may cause more moisture-induced landslides.

B.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. OCWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits B-12a through B-12d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. OCWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit B-12a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Engineering Department, OCWD	OCWD complies with applicable building codes and works with the cities within the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified, OCWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Zoning Ordinance	City/County	OCWD complies with applicable zoning ordinances and works with the cities within the service area.
Subdivision Ordinance or Regulations	City/County	OCWD complies with applicable subdivision ordinance or regulations and works with the cities within the service area.
Special Purpose Ordinance	City/County	OCWD complies with applicable special purpose ordinances and works with the cities within the service area.
Growth Management Ordinances	City/County	OCWD complies with applicable growth management ordinances and works with the cities within the service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, OCWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	City/County	OCWD complies with applicable site plan review requirements and works with the cities within the service area. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Urban Water Management Plan	City/County	Prepared by California's urban water suppliers to support their long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. **Expansion and Improvement:** Integration of future projects from UWMPs into Local Hazard Mitigation Plans can ensure both plans are supporting the necessary improvements needed to ensure future water supplies and minimize risks to hazards and disasters.
Capital Improvements Plan	Engineering, Hydrogeology, Field Headquarters	Construction Projects, Well Construction, Infrastructure Improvement Projects. Annual Board approval. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	Risk & Safety, OCWD	Maintains Emergency Response Plan. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure OCWD is better prepared for future incidents and can anticipate their communities' needs.
Post-Disaster Recovery Plan	Risk & Safety, OCWD	Business Continuity Plan; Partial recovery information in the Emergency Response Plan.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Water Discharge Requirements	Regional Water Quality Control Board (RWQCB); Regulatory Affairs; Water Quality & Technical Resources, Water Production	Permits related to GWRS and Green Acres Operations; RWQCB.

How can these capabilities be expanded and improved to reduce risk?

- Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements.
- Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan.
- Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.
- OCWD will update their Business Continuity Plan
- OCWD will participate in a Forecast Informed Reservoir Operations study to improve weather projections and the operations of Prado Dam to capture water supplies and prevent flooding in Orange County.
- OCWD will include a "Production Limitation" on annual groundwater pumping by its member agencies to ensure unexpected large amounts of groundwater are not pumped, keeping more water for storage in critical periods.

Exhibit B-12b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Planning & Natural Resources and Property Management, OCWD	Environmental Planners with expertise in land development practices. Collaborate with Engineering and cities to comply with all requirements.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering Department; OCWD	Licensed Civil Engineers and certified building evaluators (Safety Assessment Program certified by Cal OES). Evaluators certification through 2019.
Planners or Engineer(s) with an Understanding of Natural and/or Human-Caused Hazards	Engineering, Planning & Natural Resources, and Risk & Safety	Regional General Plan (RGP).
Surveyors	Engineering; OCWD	GPS Surveying Capabilities.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Risk & Safety; OCWD, WEROC	Cal ARP Tank Assessment.
Personnel Skilled in GIS and/or HAZUS	Hydrogeology	Dedicated GIS staff.
Emergency Manager	Risk & Safety; OCWD	Prepare, implement and provide emergency training to staff. Trained personnel in the following: Emergency Response Team; Confined Space Rescue Team; HAZMAT.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Grant Writers	Engineering Department; OCWD, Planning Department	Prepared, submitted, and received several grants for various projects. Includes but not limited to Proposition 1, Proposition 84, Measure M.
Water Quality Lab	Water Quality	Collects and analyzes water samples from ground water wells on routine basis. Samples include ground water, surface water, and treatment plant.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (CalOES) Safety Assessment Program (SAP) training for building inspections. ▪ OCWD will enter into the Santa Ana River Conservation and Conjunctive Use program with four other watershed agencies to store excess water supplies in the groundwater basin for drought periods. ▪ OCWD will purchase and train staff to operate drones which can be used to assess damage from natural disasters.

Exhibit B-12c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Engineering and Finance Departments, OCWD	Prepared, submitted, and received funding for various construction projects. Includes but not limited to State Revolving Fund Loan. **Expansion and Improvement:** During annual budgeting OCWD can highlight MJHMP strategies that support funding needs for the CIP.
Fees for Water, Sewer, Gas, or Electric Service	Finance Department, OCWD	Charge producers for recycled and ground water. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects
Incur Debt Through Special Tax and Revenue Bonds	Finance Department, OCWD	Use revenue refunding bonds to refinance existing debts.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Funding will be increased and annually included in the water reserve fund to give OCWD additional options to increase amounts of reported water purchased and stored in the groundwater basin for critical periods. ▪ OCWD will increase its rate to generate additional annual funding for necessary capital projects.

Exhibit B-12d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Agency Website and Social Media	Administration Staff and Public Affairs; OCWD	The district informs residents of special events, emergency information, and news.

Resource/ Programs	Agency or Department	Description/Comments
		Expansion and Improvement: Increase use of social media resources for hazard mitigation related content and information.
Great ShakeOut	Risk & Safety and Public Affairs Department; OCWD	Participation in the annual drill, training and social media.
WEROC	Risk & Safety and Public Affairs Department; OCWD	Participation in WEROC.
Public Agency Safety Management Association (PASMA) and Red Cross Disaster Program/Conference	Risk & Safety Department; OCWD	PASMA and Red Cross emergency training and Conferences.
Workplace Violence Program	Risk & Safety Department; OCWD	Education and training provided to OCWD staff.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to OCWD. ▪ OCWD will stress the importance of water infrastructure at the annual Orange County Water Summit. ▪ Tours of the OCWD facilities will include information on the critical nature of the water treatment facilities ▪ Implement employee emergency alert system via Alert OC & WEROC

B.7 MITIGATION STRATEGY

B.7.1 Mitigation Goals

OCWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

B.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit B-13,** OCWD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit B-13. OCWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Stream bank erosion threatening Villa Park Road in Santiago reservoirs' Smith pit.	Smith pit in Orange/Villa Park.	Dam/Reservoir Failure	$4 M	Engineering/ Operations	Short Term	General Fund	In Progress
Upgrade pipeline along Ellis to seismic standards.	Fountain Valley	Seismic Hazard-Seismic Shaking	$6 M	Engineering	Long Term	General Fund	Ongoing
Sunset Seawater Barrier		Coastal Hazards – Coastal Storms and Sea Level Rise				General Fund	New
PFAS Treatment Project		Human-Caused Hazards – Contamination/Saltwater Intrusion				General Fund	New
MEDIUM PRIORITY							
Seismic structure assessment for Administration Building.	Administration building in Fountain Valley.	Seismic Hazard-Seismic Shaking	$40,000	Engineering	Short Term	General Fund	Ongoing
Seismic structure assessment for Field Headquarters (FHQ) Building.	FHQ building in Anaheim.	Seismic Hazard-Seismic Shaking	$20,000	Engineering	Short Term	General Fund	Ongoing
Construct fencing on all sites. Ensure regular maintenance.	All Locations	Human-Caused Hazards – Terrorism (MCI)	$25,000	Engineering/ Operations	Immediate	General Fund	In Progress
Update SCADA System to ensure anomalies in the water system are detected.	All Locations	Human-Caused Hazards – Terrorism (Cyber Threat)	$50,000	Engineering/ Operations	Short Term	General Fund	In Progress

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Enforce sea water barrier	All locations	Coastal Hazards – Coastal Storms and Sea Level Rise	$5 M	Engineering	Long Term	General Fund	In Progress
Monitor Prado Dam run off. Ensure maintenance is completed after each rainstorm.	Prado Dam	Dam/Reservoir Failure	$10,000	Engineering/ Operations	Short Term	General Fund	In Progress
Investigate installing back-up power supplies at the Burris Pump Station and the Forebay Headquarters	Burris Pump Station and Forebay Headquarters	Human-Caused Hazards: Power Outage		Engineering	Short Term	General Fund	Ongoing

B.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Completion of the Santiago saddle repair following the 2010 storms..
  - **Status:** Complete.
- **Mitigation:** Reconstruction/maintenance of levees & diversion structure in Prado Wetlands.
  - **Status:** Completed in 2019.
- **Mitigation:** Acquire mobile emergency power generator system.
  - **Status:** Removed in 2019. OCWD no longer needed this action due to back-up power supply.

B.8 PLAN INTEGRATION

OCWD's Capital Improvement Program is used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into this document.

- The OCWD Capital Improvement Program (CIP) Projects have the following progression of stages:
  - A project is budgeted and included in the fiscal year CIP budget.
  - A feasibility study is prepared which describes the project with potential alternatives, a cost estimate and schedule.
  - Once approved by our Board of Directors, an Engineer's Report and the environmental documentation is prepared.
  - Upon approval, a design services request for proposals is advertised, an agreement awarded for design services, and project plans and specifications prepared.
  - The construction project is publicly advertised, awarded and the construction activities performed to completion.

Since the previous Plan Update, OCWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- Orange County Reliability Study (2016 and 2018 update) identifies threats to local water supplies and new planning scenarios to potentially address those threats.
- The risk assessment information was used to update the hazard analysis in OCWD's Emergency Response Plan.

OCWD will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this Plan.

2024

OC SAN
ORANGE COUNTY SANITATION DISTRICT

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex C: Orange County Sanitation District

WEROC

Contents

Exhibits

ORANGE COUNTY SANITATION DISTRICT ANNEX

Orange County Sanitation District (OC San) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, OC San representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The primary plan, including the MJHMP procedural requirements and planning process apply to OC San.

This annex details the hazard mitigation planning elements specific to OC San and describes how OC San's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the primary plan. All sections of the primary MJHMP, including the planning process and other procedural requirements, apply to and were met by OC San. The primary plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to OC San with a focus on the risk assessment and mitigation strategies.

C.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit C-1** lead the OC San planning team and attended meetings on behalf of OC San and coordinated the hazard mitigation planning efforts with OC San staff and the consultant team supporting the effort.

Exhibit C-1. Planning Team Lead

Primary Point of Contact
Name: John Frattali
Title: Safety and Health Manager
Telephone: 714-593-7162
Email: jfrattali@ocsan.gov

OC San followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as OC San's internal hazard mitigation planning development team.

Exhibit C-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Krystal Aleman	Security and Emergency Planning Specialist

Outreach to the public within OC San's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, OC San published a news release on their website and posted the MJHMP survey to their social media platforms.

C.2 JURISDICTION PROFILE

Service Population: 2.6 million

OC San is responsible for safely collecting, treating, and disposing wastewater (sewage) and industrial waste in central and northwest Orange County. Owning 396 miles of wastewater pipeline, OC San serves 2.6 million residents in 20 cities, four special districts and the

unincorporated areas within north and central Orange County. OC San is governed by a board of 25 individuals; 24 board members are elected officials appointed by the cities and special districts served, and one is a representative from the Orange County Board of Supervisors.

OC San treats approximately 185 million gallons of wastewater each day at either Plant No. 1 in Fountain Valley or Plant No. 2 in Huntington Beach and releases it into the ocean five miles from shore and approximately 200 feet below the surface. The one-mile-long diffuser section on the five-mile ocean outfall contains 503 portholes through which treated wastewater are slowly released. Up to 70 million gallons of treated wastewater is reclaimed each day for use by the OCWD to supplement the recharge of the groundwater basin, landscape irrigation, and injection into the sweater intrusion barrier along the coast.

In addition to its primary role of managing wastewater for north and central Orange County, OC San is also concerned about ocean water quality and protecting the coastline from urban runoff contamination. Therefore, OC San's charter was modified to allow OC San to accept dry weather urban runoff contaminated with bacteria in the sewer system. The dry weather urban runoff is then treated with the raw sewerage entering the plants and disinfected before it is released to the ocean outfall system. Currently, OC San recycles all biosolids produced for beneficial use by the agricultural industry and runs an award-winning ocean monitoring program that evaluates water quality, sediment quality and sea life.

C.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that OC San faces, distinct from that of the county-wide planning area. The hazard profiles in the primary MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

OC San's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the OC San development team discussed which hazards should or should not be profiled in the primary plan. This discussion resulted in the identification of the following hazards that affect OC San and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit C-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the primary plan.

Exhibit C-3. OC San Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to OC San
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	Low
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Low
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Low
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Low
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	N/A
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	Medium
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Medium
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Low
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Medium
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	High
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Medium
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Medium
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	High

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to OC San's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit C-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and OC San.

C.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit C-4. Fire Hazard and OC San Wastewater Infrastructure

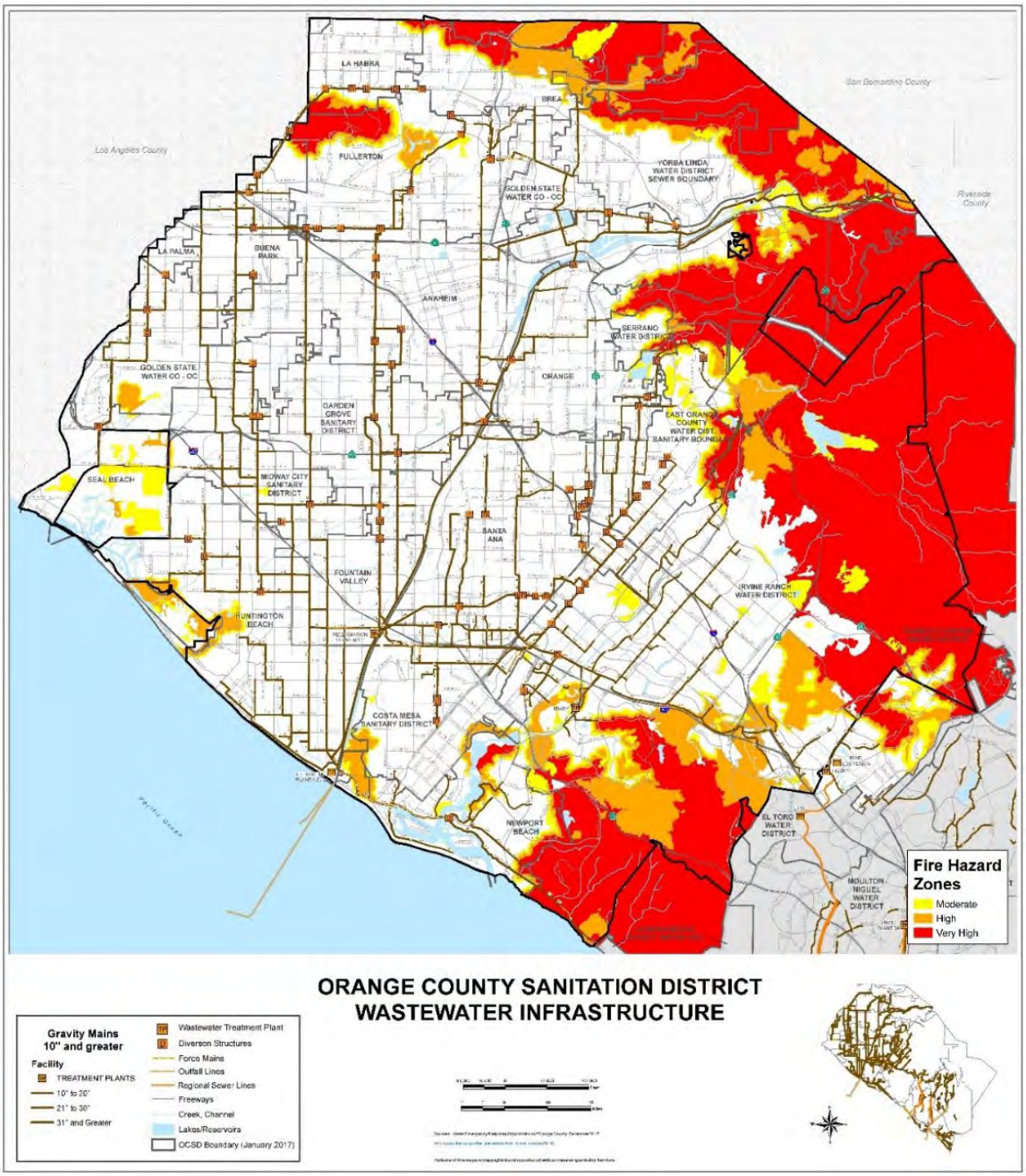


Exhibit C-5. Flood Hazard and OC San Wastewater Infrastructure

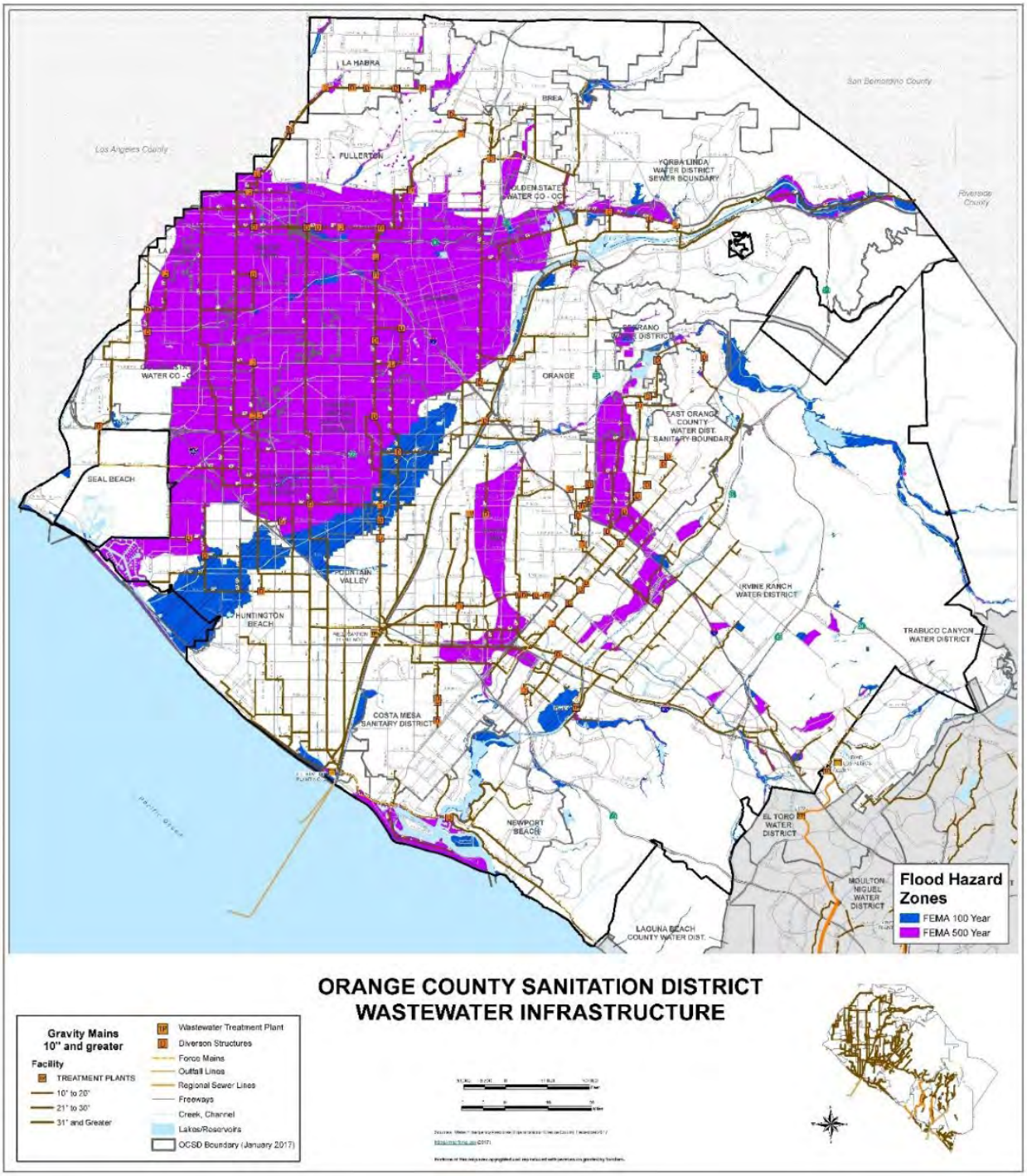


Exhibit C-6. Fault Rupture Hazard and OC San Wastewater Infrastructure

Exhibit C-7. Seismic Shaking Hazard and OC San Wastewater Infrastructure

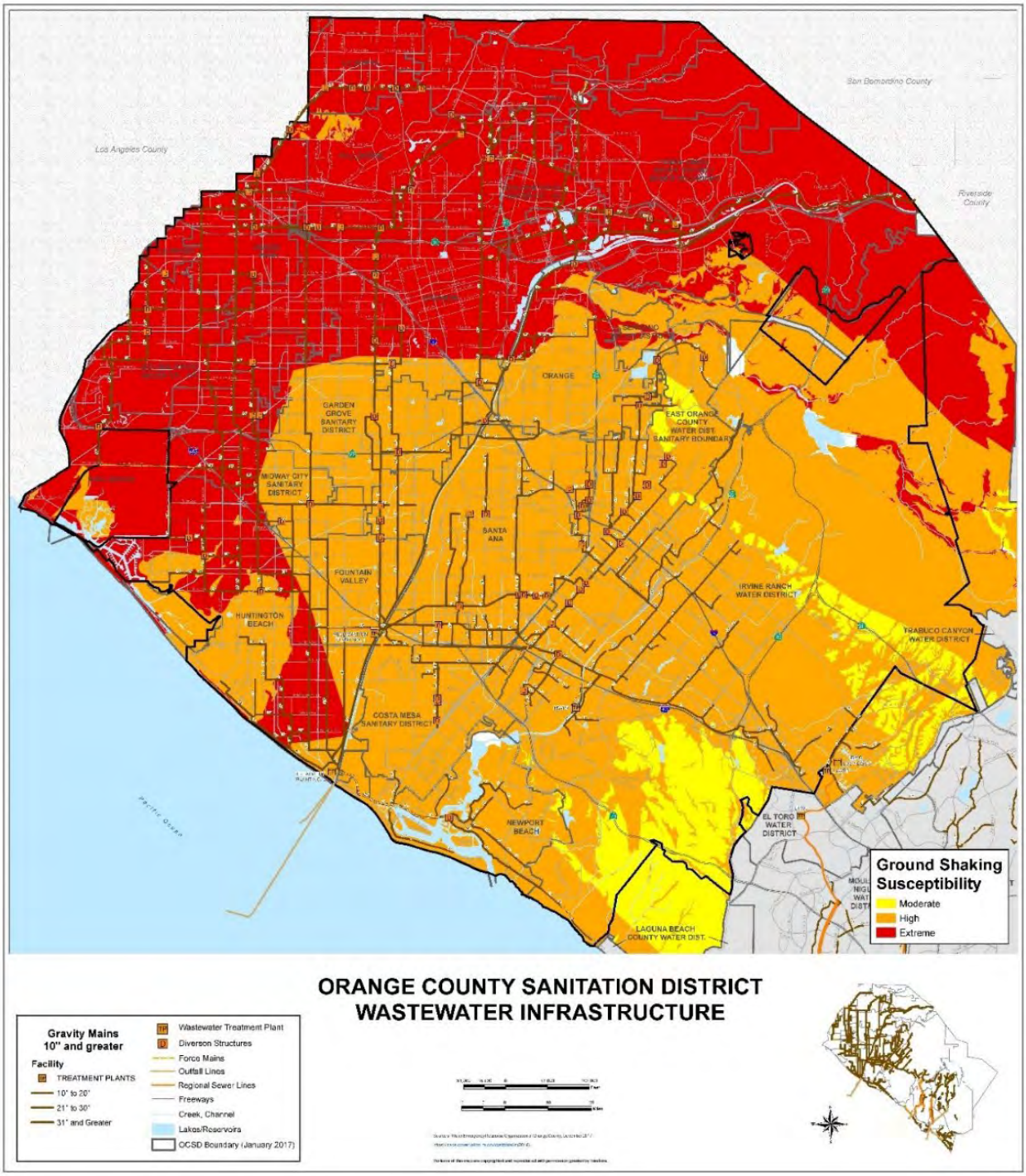


Exhibit C-8. Liquefaction Hazard and OC San Wastewater Infrastructure

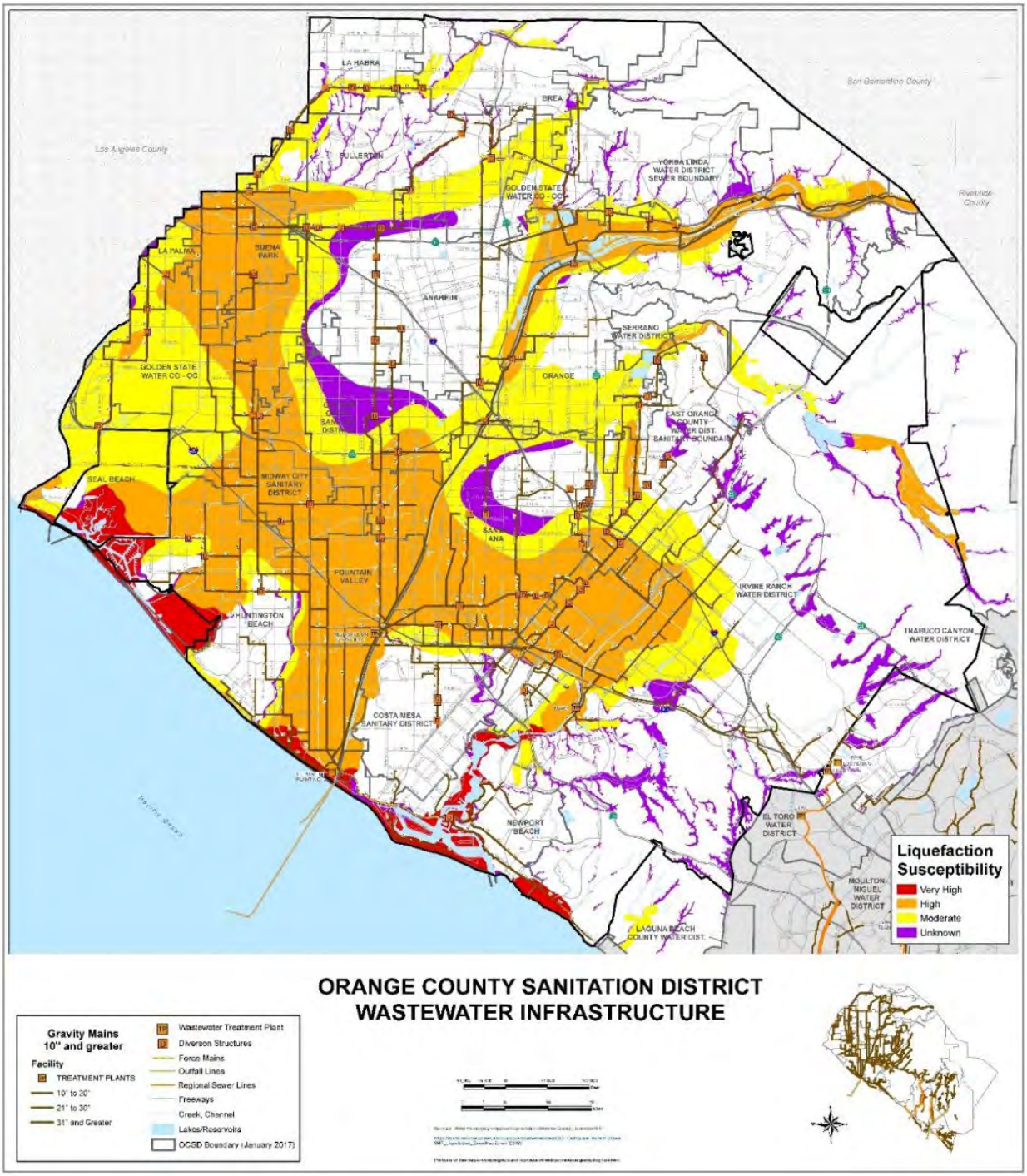


Exhibit C-9. Landslide Hazard and OC San Wastewater Infrastructure

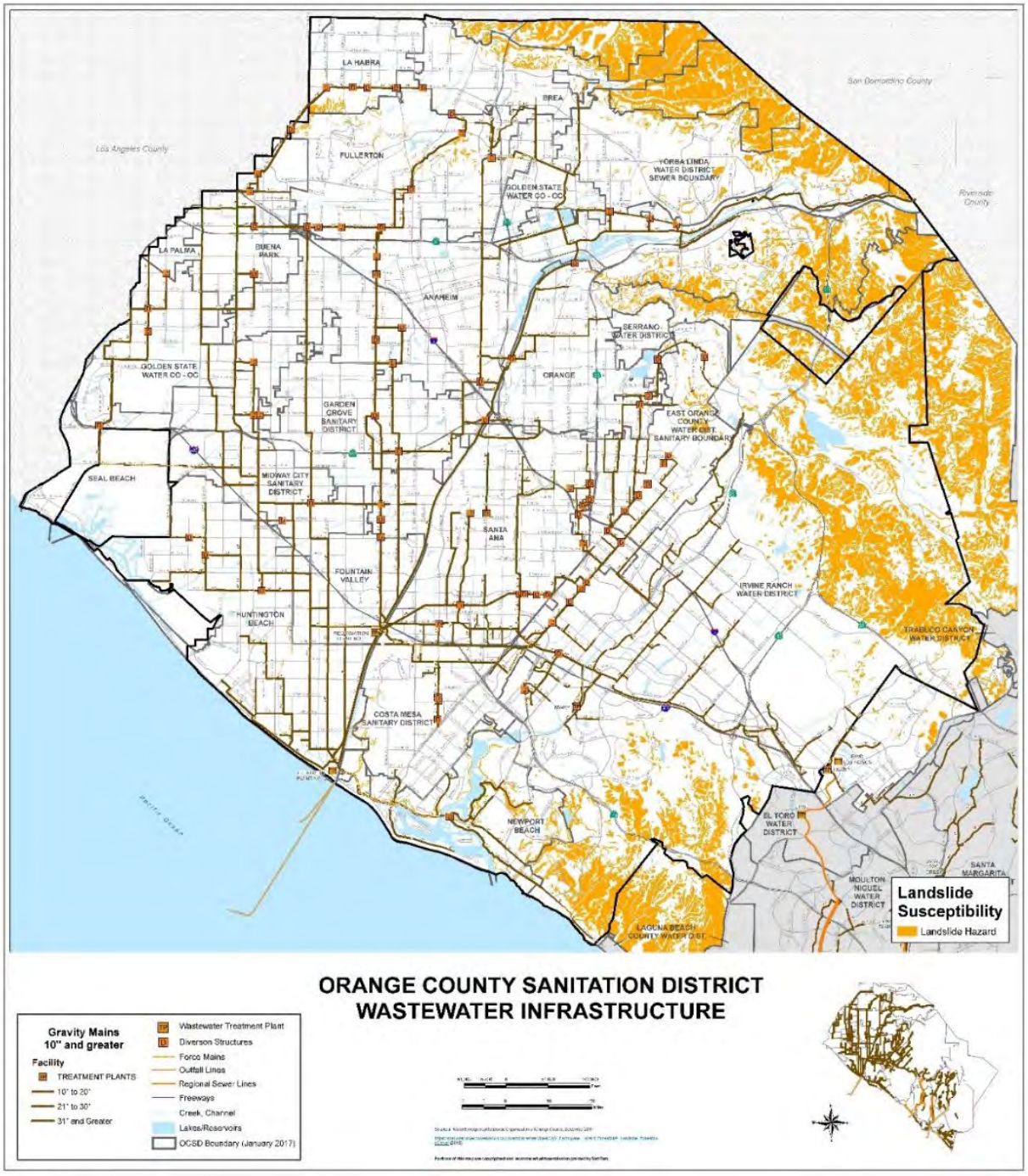
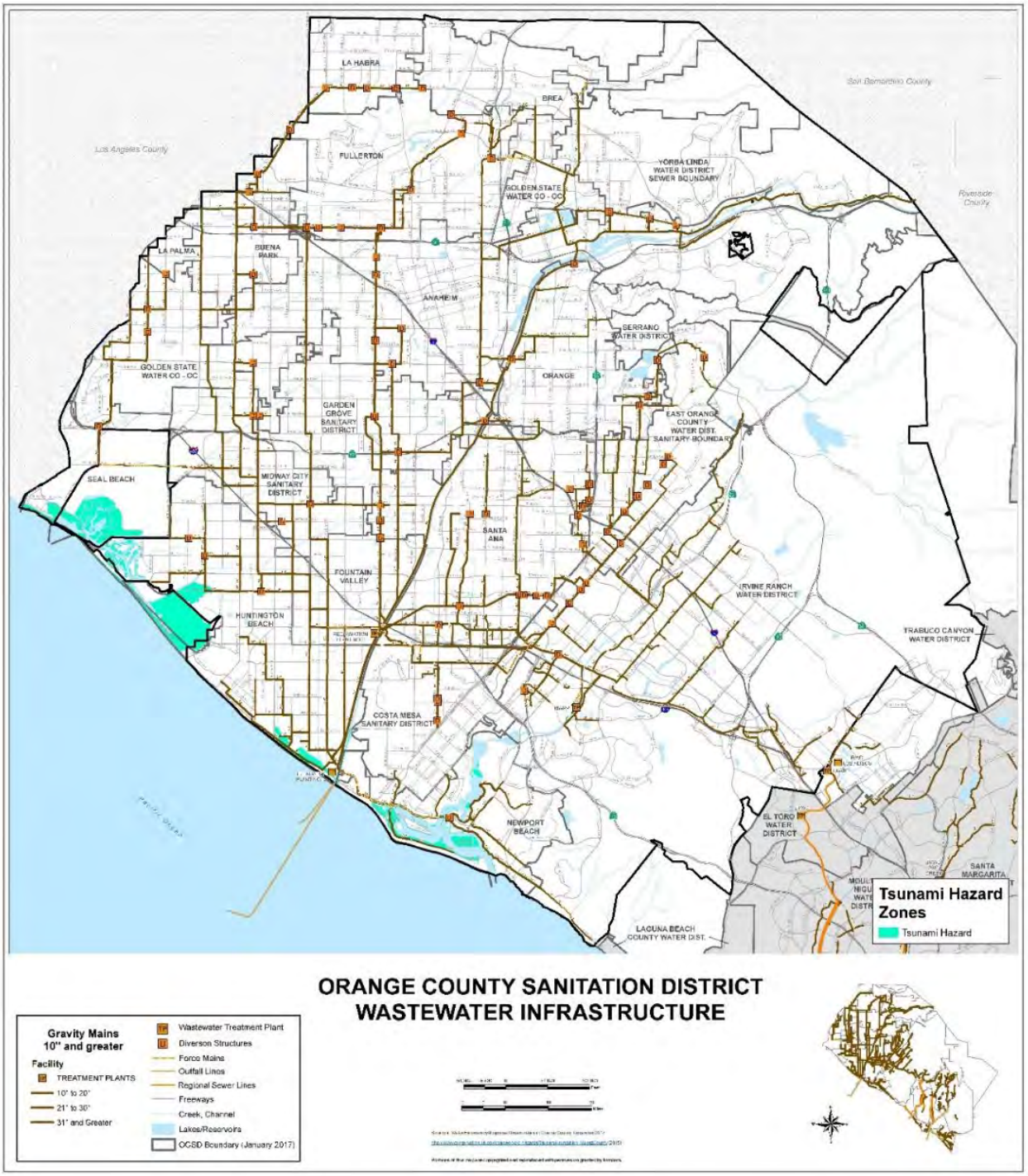


Exhibit C-10. Tsunami Hazard and OC San Wastewater Infrastructure



C.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within OC San's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

OC San's infrastructure is outlined in **Exhibit C-11**, which lists the number of OC San's infrastructure assets are located within the mapped hazard zones identified above.

Exhibit C-11. OC San Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Admin Buildings (#)	Manholes (#)	Lift Stations (#)	Treatment Plants (#)	Diversion Structures (#)	Wastewater Pipeline (miles)
Fire Hazard Zone	Moderate	0	0	4	0	2	8.7
	High	0	0	0	0	0	11.0
	Very High	0	0	3	0	0	6.3
FEMA Flood Zone	100-Year	0	9	1	2	39	96.8
	500-Year	0	33	9	0	6	266.1
Alquist-Priolo Rupture Zone		0	0	0	0	0	1.8
Seismic Shaking	Moderate	0	0	0	0	0	0.61
	High	1	55	11	4	45	444.9
	Extreme	0	48	8	0	29	355.5
Liquefaction	Moderate	0	76	0	0	22	395.7
	High	1	0	0	2	31	186.2
	Very High	0	0	0	1	1	15.9
	Unknown	0	0	0	0	4	29.6
Landslide Zone		0	0	2	0	5	5.3
Tsunami Zone		1	0	3	1	0	5.0

Several miles of OC San's pipeline system along with two treatment plants are located within areas identified as susceptible to flooding. Lift stations are also located within areas mapped as very fire hazard zone. Similarly, several miles and facilities, including lift stations, diversion structures and treatment plants are located within areas identified as having a high or extreme risk of ground shaking and a moderate, high, and very high risk of liquefaction during an earthquake. In addition, a pipeline in Huntington Beach crosses a mapped fault zone three times and lift stations and a treatment plant are located within a tsunami zone.

Changes in Land Use and Development

OC San provides wastewater services across the central and northwestern portion of Orange County. With a large service demand, OC San's service area has experience various land use changes and development over the past five years. Past development projects performed by OC San include the expansion of the Groundwater Replenishment System in partnership with Orange

County Water District. To meet growing demand, OC San is in the process of developing multiple facilities including large projects at the Fountain Valley Reclamation Plant and a treatment plant in Huntington Beach, as well as having recently completed a project at their Headquarters.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Coastal Hazards: Tsunami	OC San's vulnerability to tsunamis is not expected to change due to climate change.
Flood	Climate change is expected to cause some higher-level flood waters within OC San service area along the Santa Ana River, Black Star Canyon and other creeks and rivers throughout the county. The 100-year flooding event may expand into the 500-year flood zones on a more frequent basis.
Human-Caused Hazard: Power Outage	Climate change will likely increase OC San's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact OC San facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within OC San's service area as a result of climate change.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within OC San's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within OC San, especially within the north, west, and central portions of the service area, as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Hazards of Medium Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to OC San's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to OC San's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for OC San from climate change will mirror the impacts discussed in the base plan.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within OC San's service area. The vulnerability follows that described in the base plan.
Geological Hazards: Land Subsidence	OC San's vulnerability to land subsidence is not expected to change due to climate change.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Vulnerability changes in contamination and saltwater intrusion within OC San due to climate change are expected to follow the changes outlined in the base plan.

Hazard	Climate Change Vulnerabilities
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Hazards of Low Concern	
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within OC San as increased precipitation and storm intensities may cause more moisture-induced landslides.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact OC San as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact OC San's service area as described in the base plan.
Severe Weather: Windstorm	The challenges to OC San from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is expected to cause an increase in wildfires within the northeastern portion of the OC San service area around the large national forests and nature preserves.

C.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. OC San's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits C-12a through C-12d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. OC San has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit C-12a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City/County; Engineering Department	OC San complies with applicable building codes and works with the cities within OC San's service area. **Expansion and Improvements:** As retrofits and replacement projects are identified, OC San will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Zoning Ordinance	City/County	OC San complies with applicable zoning ordinances and works with cities within OC San's service area.
Subdivision Ordinance or Regulations	City/County	OC San complies with applicable subdivision ordinances or regulations and works with cities within OC San's service area.
Special Purpose Ordinance	City/County	OC San complies with applicable special purposes ordinances and works with cities within OC San's service area.
Growth Management Ordinances	City/County	OC San complies with applicable growth management ordinances and works with cities within OC San's service area. **Expansion and Improvements:** Growth management ordinances need to take into account wastewater needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, OC San can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	City/County	OC San complies with applicable site plan review requirements and works with cities within OC San's service area. **Expansion and Improvements:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plans	City/County	OC San complies with applicable General Plan requirements and works with cities within OC San's service area.
Capital Improvements Plan (CIP)	Engineering Department	OC San maintains a capital improvement plan. **Expansion and Improvements:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Economic Development Plan	City/County	OC San complies with applicable economic development plans and works with cities within OC San's service area.
Integrated Emergency Response Plan (IERP)	Risk Management Division	The IERP is designed to address organized response to emergency situations associated with natural or manmade incidents. **Expansion and Improvements:** Continued improvement and enhancement of emergency response plans can help ensure OC San is better prepared for future incidents and can anticipate their communities' needs.
Continuity of Operations Plan (COOP)		Preparation of a COOP allows OC San to understand operational needs during an outage or event that can impact agency functions.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		Expansion and Improvement: Development and update of this plan should focus on integration of the risk probabilities of event types and nature of potential impacts, to better inform the COOP planning and process.
Post-Disaster Recovery Plan	Risk Management Division	This is a component of the IERP.
Emergency Public Notification	Public Affairs Division	OC San has identified personnel who carry out responsibilities of public information.
Emergency Communications	Risk Management Division	OC San has the capability to communicate with WEROC and the Orange County Operational Area.
Emergency Operations Center (EOC)	OC San	OC San has a 24-hour operational capability of the EOC staffing, feeding, and fuel for generators.
Damage Assessment Teams (DAT)	Engineering Department	The DAT will conduct preliminary damage assessments to structures, critical facilities, and infrastructure.
Human Resources	Human Resources Division	HR supports OC Sanin a variety of administrative functions including employee training and identification of new staff positions. Hazard mitigation activities are the responsibility of this department.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate and update OC San's IERP and Continuity of Operations Plan (COOP) annually to ensure alignment with best industry practices and needs of the organization. Identify aspects of the MJHMP that are to be included in the IERP/COOP. ▪ Identify external sources that can provide damage assessment and/or expand damage assessment training internally. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ Train employees annually on OC San's IERP/COOP.

Exhibit C-12b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Engineering Department	OC San staff utilizes an outside consultant with input from engineering staff.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering Department	Licensed Civil Engineers and certified building evaluators (Safety Assessment Program certified by Cal OES).
Planners	Engineering Department	Regional General Plan (RGP).
Floodplain manager	County of Orange Floodplain Manager	Adhere to county standards.

Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Risk Management Division, WEROC, County of Orange, OCIAC	OC San has an emergency coordinator that coordinates with WEROC and the County to assess vulnerabilities.
Scientists Familiar with the Hazards of the Community	Risk Management Division, WEROC, County of Orange	OC San has an emergency coordinator that coordinates with WEROC, the County, and the cities in our service area to identify hazards.
Grant Writers	Risk Management Division; Public Affairs Division	OC San has employees within the Risk Management and Public Affairs Divisions that can write grants.

How can these capabilities be expanded and improved to reduce risk?
▪ Provide initial and refresher training to OC San's registered engineers and other qualified individuals regarding ATC-20, ATC-45, and FEMA P-154 for building inspections. ▪ Provide gran management training to individuals in Risk Management and Public Affairs.

Exhibit C-12c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Community Development Block Grants (CDBG)	Public Affairs Division	Prepared, submitted, and received funding for various construction projects. Includes but not limited to State Revolving Fund Loan. **Expansion and Improvements:**
Capital Improvements Project Funding	Public Affairs Division	OC San contributes funds to the capital improvement project fund on a yearly basis. **Expansion and Improvements:** During annual budgeting OC San can highlight HMP strategies that support funding needs for the CIP.
Fees for Water, Sewer, Gas, or Electric Service	Finance Division	Charge producers for sewer fees. **Expansion and Improvements:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Incur Debt Through General Obligation Bonds	Finance Division	Use revenue refunding bonds to refinance existing debt.
Grants	Public Affairs Division	OC San actively applies for federal and state grants. **Expansion and Improvements:** OC San can coordinate with MWDOC to better understand how grant support could be conducted that benefits the agency and the entire planning area as a whole.
Incur Debt Through Revenue Bonds		OC San has the ability to incur debt through revenue bonds.

How can these capabilities be expanded and improved to reduce risk?
▪ Provide grant management training to individuals who develop grants.

Exhibit C-12d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Agency website	Public Affairs	OC San informs residents of special events, emergency information, and news.
Social media	Public Affairs	OC San informs residents of special events, emergency information, and news. **Expansion and Improvements:** Increase the use of social media resources for hazard mitigation related content and information.
Memorandums	Public Affairs	OC San informs residents of special events, emergency information, and news. **Expansion and Improvements:** Incorporate mitigation information and analysis into memorandums to continue sharing information.

How can these capabilities be expanded and improved to reduce risk?
▪ Develop standardized messaging for known or potential disaster response efforts. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to our utility. ▪ Continue to identify opportunities to communicate hazard mitigation and emergency planning information to the public and partner agencies.

C.7 MITIGATION STRATEGY

C.7.1 Mitigation Goals

OC San adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

C.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit C-13,** OC San Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit C-13. OC San Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH							
Perform a seismic study analysis for all structures and facilities	District Wide	Seismic Hazards – Seismic Shaking	$1 Million per structure	Engineering	Immediate	Budget	Ongoing
P1-137 Support Building Seismic Improvements at Plant No.1	Plant No. 1	Seismic Hazards – Seismic Shaking	$27.6 Million	Engineering	Immediate	Budget	In Progress
PS23-06 Seismic Resilience Study at Plant No.2	Plant No. 2	Seismic Hazards – Seismic Shaking	$964,000	Engineering	Immediate	Budget	In Progress
P1-105: Headworks Rehabilitation at Plant 1: Refurbish, rehab, and build new structures at Plant 1 Headworks so that it can operate with no major issues for the next 20 years providing redundancy and resiliency to the process area.	Plant No. 1	All Hazards	$340 Million	Engineering /Operations	Long Term	Budget	In Progress
P1-126 Primary Sedimentation Basins 3-5 Replacement at Plant No. 1: The replacing circular clarifiers and odor control systems with new, as well as replacing gravity systems from headworks to AS-1.	Plant No. 1		$183 Million	Engineering /Operations	Long Term	Budget	In Progress
P2-98A A-Side Primary Clarifiers Replacement at Plant No. 2: The project is replacing circular clarifiers and odor control systems with new clarifiers.	Plant No. 2		$166 Million	Engineering /Operations	Long Term	Budget	In Progress
Identify locations and install sensors/alarms for harmful contaminants entering the treatment system.	District Wide	Human-Caused Hazards – Contamination/ Saltwater Intrusion		Operations	Short Term	Budget	Ongoing
MEDIUM							
Conduct routine site inspections of structures and facilities and follow-up on any reported structural deficiencies or mitigation measures.	District Wide	All Hazards	$500,000 per Year	Operations	Long Term	Budget	Modified
Follow the Asset Management Plan for replacement and refurbishment of facilities	District Wide	All Hazards	$200 Million	Engineering	Long Term	Budget	Ongoing
PSA2022-001 Coating Inspection Services to provide ongoing assessments of coatings and makes recommendations for repairs.	District Wide		$500,000 per Year	Operations	Long Term	Budget	Ongoing
MP2-004 Digester K Dome Structural Analysis at Plant No. 2 to perform a structural analysis of Digester K and making recommendations for repairs.	Plant No. 2	Seismic Hazards – Seismic Shaking	$500,000	Operations	Long Term	Budget	Ongoing

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Protect and reinforce facilities within flood plain areas, rivers, and creeks, or relocate facilities out of harm's way.	District Wide. South Perimeter Wall and Plant No. 2	Flood		Engineering /Operations	Long Term	Budget	In Progress
Improve security at key facilities and install surveillance equipment. MP1-008 EJB Security Lighting Improvements at Plant 1 to install motion detection lights at an offsite structure.	Plant 1	Human-Caused Hazards – Terrorism (MCI)	$100,000	Operations and Security	Short Term	Budget	In Progress
Improve security at key facilities and install surveillance equipment. SCE23-02 EJB Security Fence Replacement: Upcoming project to replace chain link fence with 8-foot-tall wrought iron fence.	Plant 1	Human-Caused Hazards – Terrorism (MCI)	$100,000	Operations and Security	Short Term	Budget	In Progress
J-120A Process Control Systems Upgrades: This project is upgrading the existing SCADA systems for the treatment plants and pump stations based on vendor system selected as part of SP-196 study. The project will replace existing obsolete HMI, databases, and software programs.	District Wide	Human-Caused Hazards – Terrorism (Cyber Threat)	$37 Million	Operations /Contractor	Short Term	Budget	In Progress
Standardized and upgrade older lift station electrical and instrumentation systems.	Yorba Linda Pumping Station, Bitter Point Pumping Station, Rocky Point Pumping Station, Crystal Cove Pumping Station, MacArthur Pumping Station, and Edinger Pumping Station	All Hazards	$160 Million	Operations	Long Term	Budget	Ongoing
3-67 Seal Beach Pump Station: The project is replacing the existing pump station with a new pump station as well as making modifications to the existing gravity sewers and force mains.	Seal Beach Pumping Station	All Hazards	$134 Million	Operations	Long Term	Budget	In Progress
5-67 Bay Bridge Pump Station: The project is replacing the existing pump station with a new pump station as well as making modifications to the existing gravity sewers and force mains.	Bay Bridge Pump Station	All Hazards	$145 Million	Operations	Long Term	Budget	In Progress
LOW							
Exterior Lighting Study at Plant Nos. 1 and 2	Plant Nos. 1 and 2	Human Caused Hazards – Terrorism (MCI)	$345,000	Engineering /Operations	Long-Term	Budget	Modified and In-Progress

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
J-117B/P2-107 Ocean Outfall Booster Pump Station and Supervisory Upgrades: The project will construct improvements to implement a power monitoring and control system. The project is replacing existing fiber network with a series of looped networks and network switches, creating an ICS to be used to improve reliability and allow automatic load shedding. The project installs two new server rooms.	Plant No. 2	Human-Caused Hazards: Power Outage; Human-Caused Hazards: Terrorism (Cyber Threat)	$140 Million	Operations	Long-Term	Budget	Modified and Ongoing

C.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Wastehauler Station Safety & Security Improvements
  - **Status:** Completed 2024. The project installed access control systems at our wastehauler station to prohibit illegal dumping
- **Mitigation:** Follow the Asset Management Plan for replacement and refurbishment of facilities.
  - **Status:** Complete 2023. Updates to OC San's Asset Management Plan was made and approved by the Board of Directors in 2023. OC San knows the condition of assets owned and has a plan to operate and maintain the assets to deliver the required level of service, at the lowest life cycle cost, with an acceptable level of risk.
- **Mitigation:** South Perimeter Security and Utility Improvements at Plant No. 1
  - **Status:** Completed 2023. Project replaced the perimeter chain link fence at Plant No. 1 along Ward Street from Garfield Avenue to Falcon Avenue with a security wall with an 8-feet tall split-face concrete masonry unit (CMU) wall with landscaping inside and outside the CMU wall. A permanent Guardhouse at Garfield Avenue Gate, interior perimeter lighting, video surveillance, and electronic security systems along Ward Avenue and Garfield Avenue were installed.
- **Mitigation:** Pump Station Portable Generator Connectors.
  - **Status:** Completed. The project installed connectors at the pump stations for backup power supply connections.
- **Mitigation:** Seismic Evaluation of Structures at Plant 1 and 2.
  - **Status:** Complete 2020. Evaluated seismic resiliency of structures at Plants 1 and 2 that were constructed prior to the 2001 California Building Code. Quantified the seismic vulnerability of these structures. Developed mitigation measures and costs that would address vulnerabilities and improve reliability. Prioritized seismic projects (ranked list of structures) and made recommendations.
- **Mitigation:** 2-41 SARI Realignment.
  - **Status:** Completed in 2019. A four-mile vulnerable segment of the SARI line between the Green River Golf course and SAVI Ranch that was in the flood plain of the Sanat Ana River was relocated in 2015, outside of the flood plain and protected with launched rip rap against major flood events and lateral erosion from high releases from the U.S. Army Corps of Engineers' Prado Dam. The SARI pipeline crossings have been lowered within encased siphons to withstand major riverbed degradation. Overall, this segment of the SARI line is protected and does not need additional relocation or protection.
- **Mitigation:** Install joint less pipelines in all creek crossings and slope easements.
  - **Status:** Removed, deemed cost prohibitive.

- **Mitigation:** Strictly enforce standard separation between water and wastewater infrastructure.
  - **Status:** Removed, not applicable.
- **Mitigation:** Survey and improve site fencing and other forms of hardening deterrence to facilities including the use of camera and wireless communications.
  - **Status:** Removed, repeat mitigation action.
- **Mitigation:** Examine opportunities for online water quality sensing relative to potential human induced contamination and implement if feasible.
  - **Status:** Removed, deemed not applicable.

C.8 PLAN INTEGRATION

OC San's capital budget, Wastewater Master Plan, and the Integrated Emergency Response Plan are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, OC San will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, OCWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- Incorporation of mitigation initiatives into the Water Master Plan.

The risk assessment information was used to update the hazard analysis in OC San's Emergency Response Plan.

OC San will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this Plan.

2024

SOCWA
South Orange County Wastewater Authority

Orange County Water and Wastewater
Multi-Jurisdictional Hazard Mitigation Plan

Annex D: South Orange County Water Authority

WEROC
WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY

Contents

Exhibits

SOUTH ORANGE COUNTY WATER AUTHORITY ANNEX

South Orange County Water Authority (SOCWA) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, SOCWA representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to SOCWA.

This annex details the hazard mitigation planning elements specific to SOCWA and describes how SOCWA's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the primary MJHMP, including the planning process and other procedural requirements, apply to and were met by SOCWA. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to SOCWA with a focus on the risk assessment and mitigation strategies.

D.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit D-1** lead the SOCWA planning team, attended meetings, and coordinated the hazard mitigation planning efforts with SOCWA staff and the consultant team supporting the effort.

Exhibit D-1. Planning Team Lead

Primary Point of Contact
Name: Sean Peacher
Title: Environmental Compliance Safety, Risk Manager
Telephone: 949-234-5443
Email: speacher@socwa.com

SOCWA followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as SOCWA's internal hazard mitigation planning development team.

Exhibit D-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Ernie Leal	Chief Plant Operator
Jim Burror	Director of Operations
Amber Baylor	Acting General Manager

Outreach to the public within SOCWA's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, SOCWA published a memorandum regarding the MJHMP process. This memorandum outlined the planning process and how the public could get involved, including a link to the MJHMP survey.

D.2 JURISDICTION PROFILE

Service Population: 500,000

SOCWA provides wastewater treatment, effluent and biosolids disposal, and water recycling at regional facilities in the southern part of Orange County. SOCWA was created July 1, 2001, as a Joint Powers Authority and formed under and pursuant to Government Code Section 6500 and is the legal successor to the Aliso Water Management Utility, the Southeast Regional Reclamation Authority, and the South Orange County Reclamation Authority. SOCWA is comprised of 7-member utilities including the City of Laguna Beach, City of San Clemente, Emerald Bay Service District, Moulton Niguel Water District, Santa Margarita Water District, South Coast Water District and Trabuco Canyon Water District.

SOCWA is governed by a Board of Directors. As members of SOCWA's Board of Directors (one Director from each Member Agency) they each balance the interests of their own respective district or city while continuing the purpose and mission of SOCWA's Project Committees.

SOCWA operates three wastewater treatment plants: Regional Treatment Plant, JB Latham Treatment Plant, and Coastal Treatment Plant, as well as the Effluent Transmission Main (ETM) and the Aliso Creek and San Juan Creek Ocean Outfalls. The City of Laguna Beach operates the North Coast Interceptor on a contract basis on behalf of SOCWA. Moulton Niguel Water District operates the Alicia Parkway Pump Station on behalf of SOCWA, and the City of San Clemente operates the San Clemente Land Outfall.

SOCWA provides, at a minimum, full secondary treatment at all its regional wastewater facilities, and has active water recycling, industrial waste (pretreatment), biosolids management and ocean/shoreline monitoring programs. Programs related to Hazard Mitigation Planning include acquiring, constructing, maintaining, repairing, managing, operating and controlling facilities for the collection, transmission, treatment and disposal of wastewater and biosolids, the reclamation and reuse of wastewater for beneficial purposes, and the production, transmission, storage and distribution of non-domestic water.

D.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that SOCWA faces, distinct from that of the county-wide planning area. The hazard profiles in the base plan discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

SOCWA's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the SOCWA development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect SOCWA and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit D-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit D-3. SOCWA Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to SOCWA
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards – Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards –Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather – Windstorm	Highly Likely	Large	Limited	Negligible	Medium	High
Severe Weather – Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather – Drought	Highly Likely	Large	Negligible	Negligible	Medium	Medium
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Low
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards – Coastal Storms	Likely	Small	Limited	Limited	Medium	Medium
Coastal Hazards – Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Medium
Seismic Hazards – Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	Medium
Geological Hazards –Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	High
Coastal Hazards – Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Medium
Human-Caused Hazards – Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Low
Human-Caused Hazards – Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	High
Human-Caused Hazards – Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards – Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards – Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards – Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Medium

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to SOCWA's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit D-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and SOCWA.

D.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit D-4. Fire Hazard and SOCWA Wastewater Infrastructure

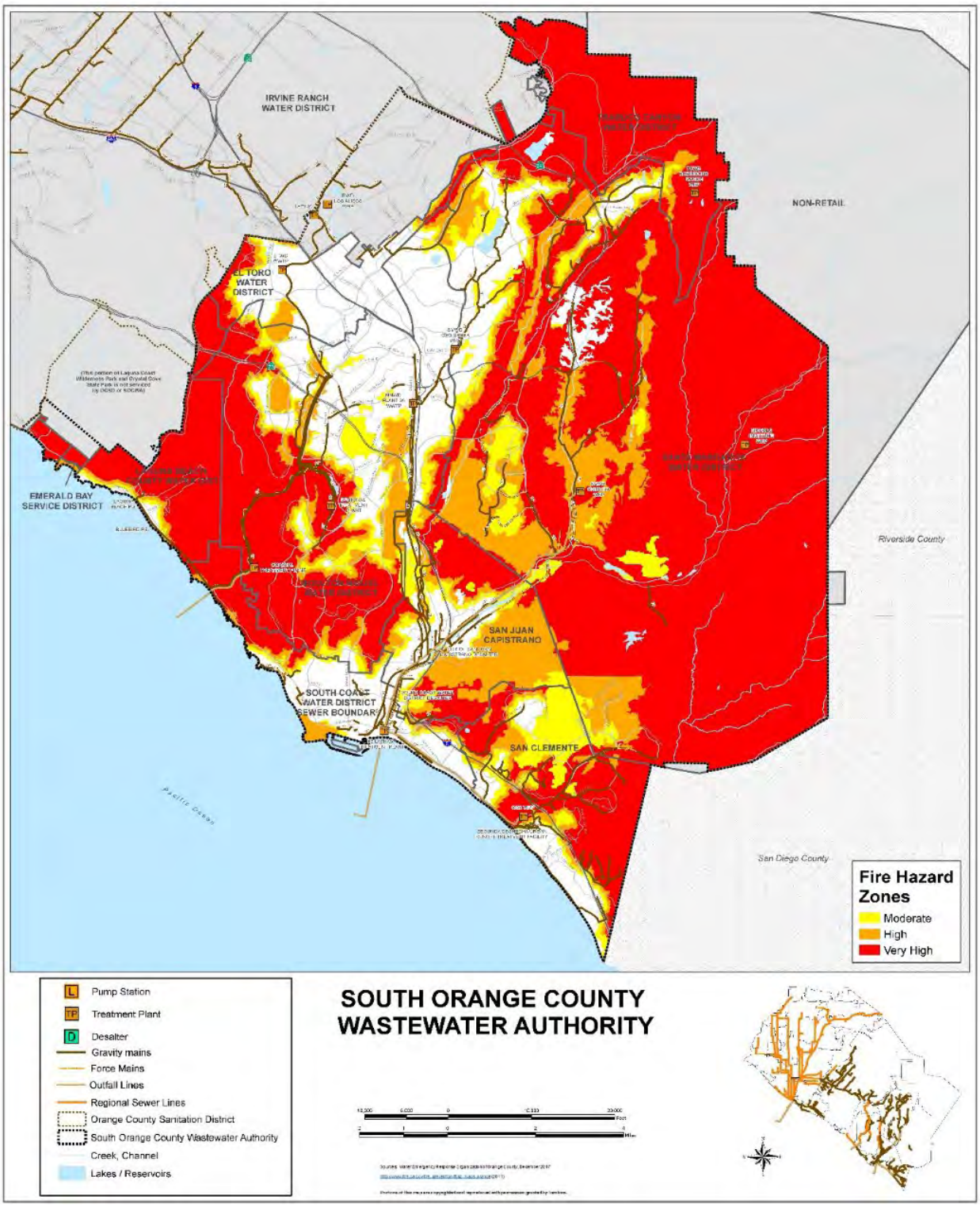


Exhibit D-5. Flood Hazard and SOCWA Wastewater Infrastructure

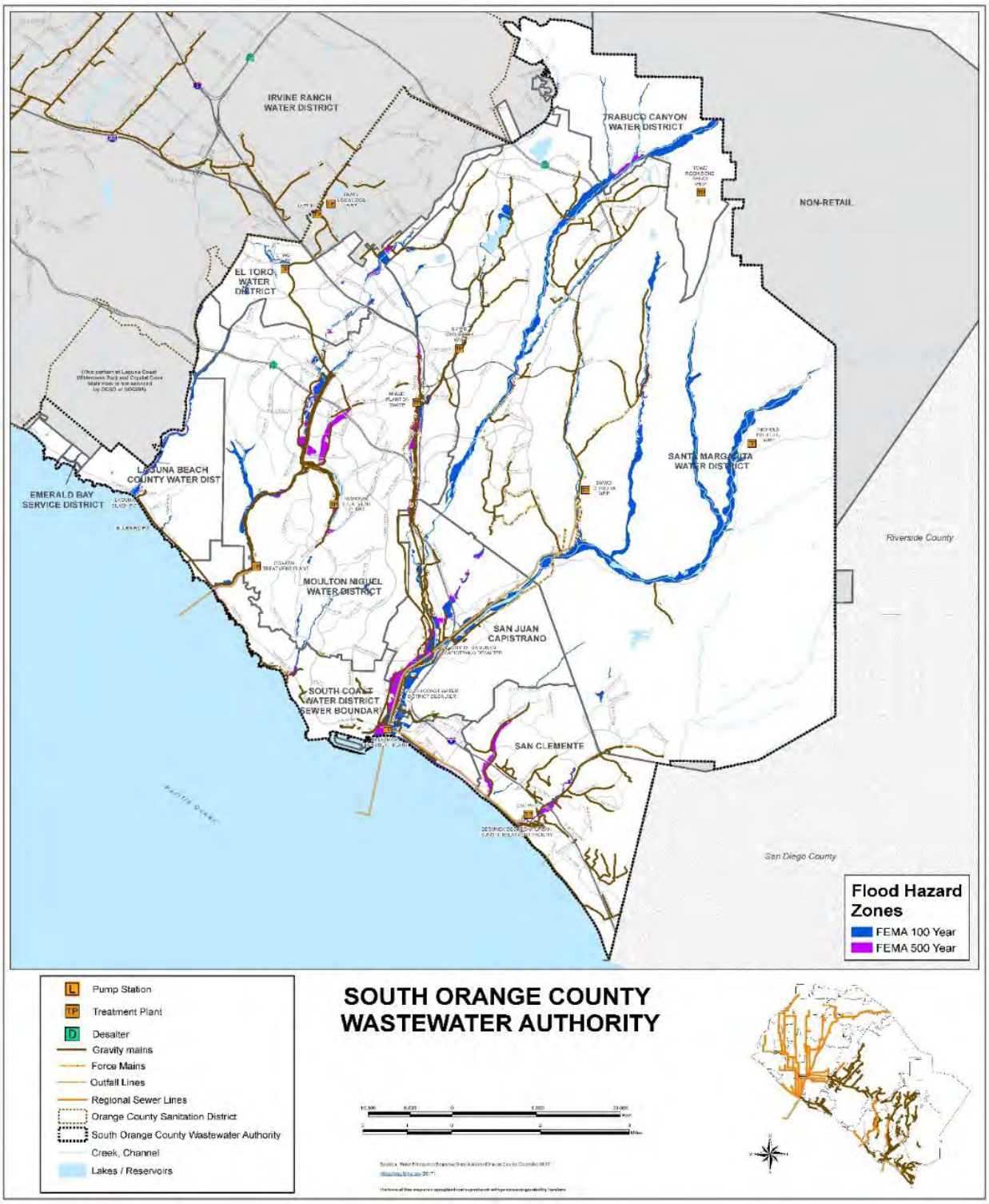


Exhibit D-6. Seismic Shaking Hazard and SOCWA Wastewater Infrastructure

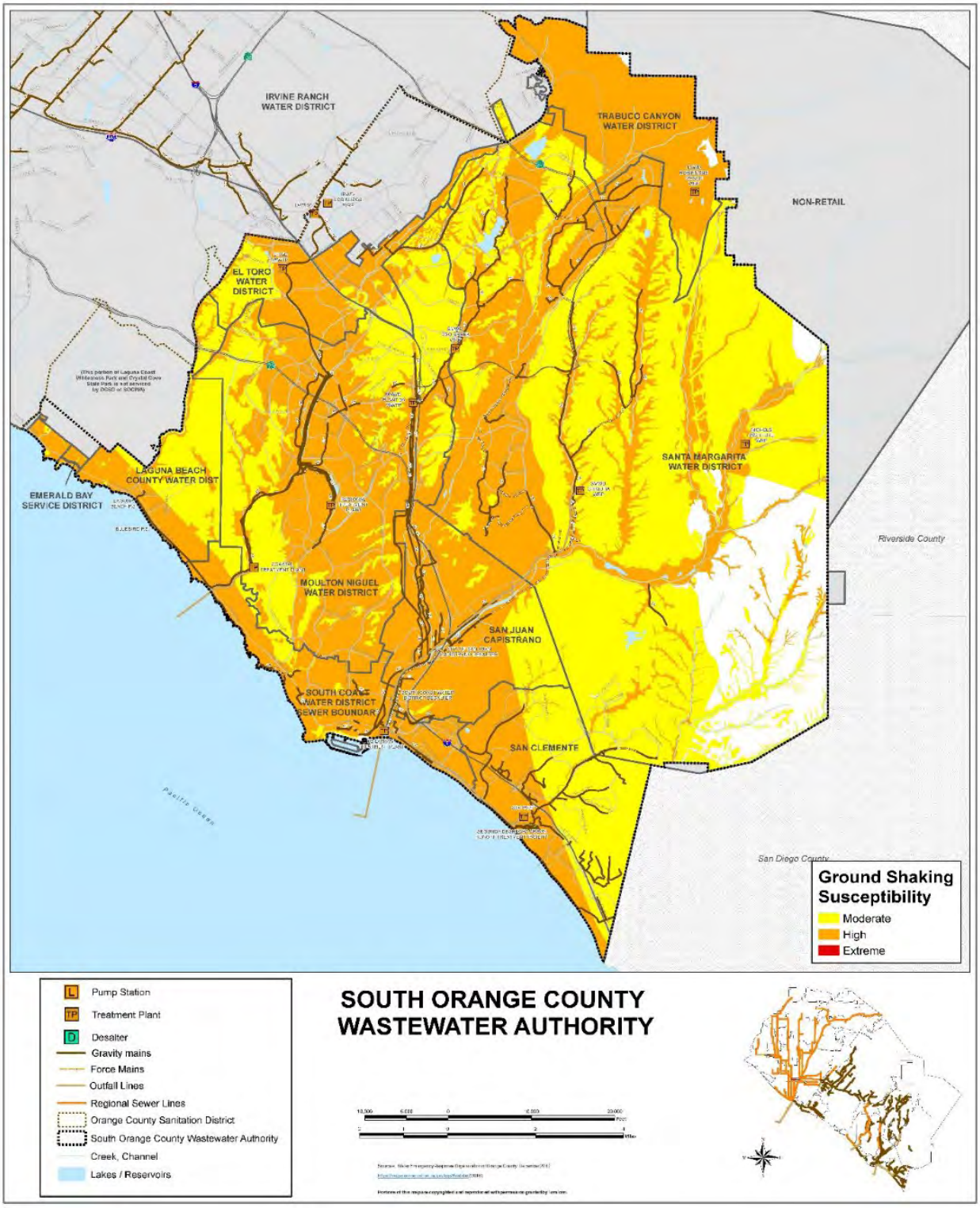


Exhibit D-7. Liquefaction Hazard and SOCWA Wastewater Infrastructure

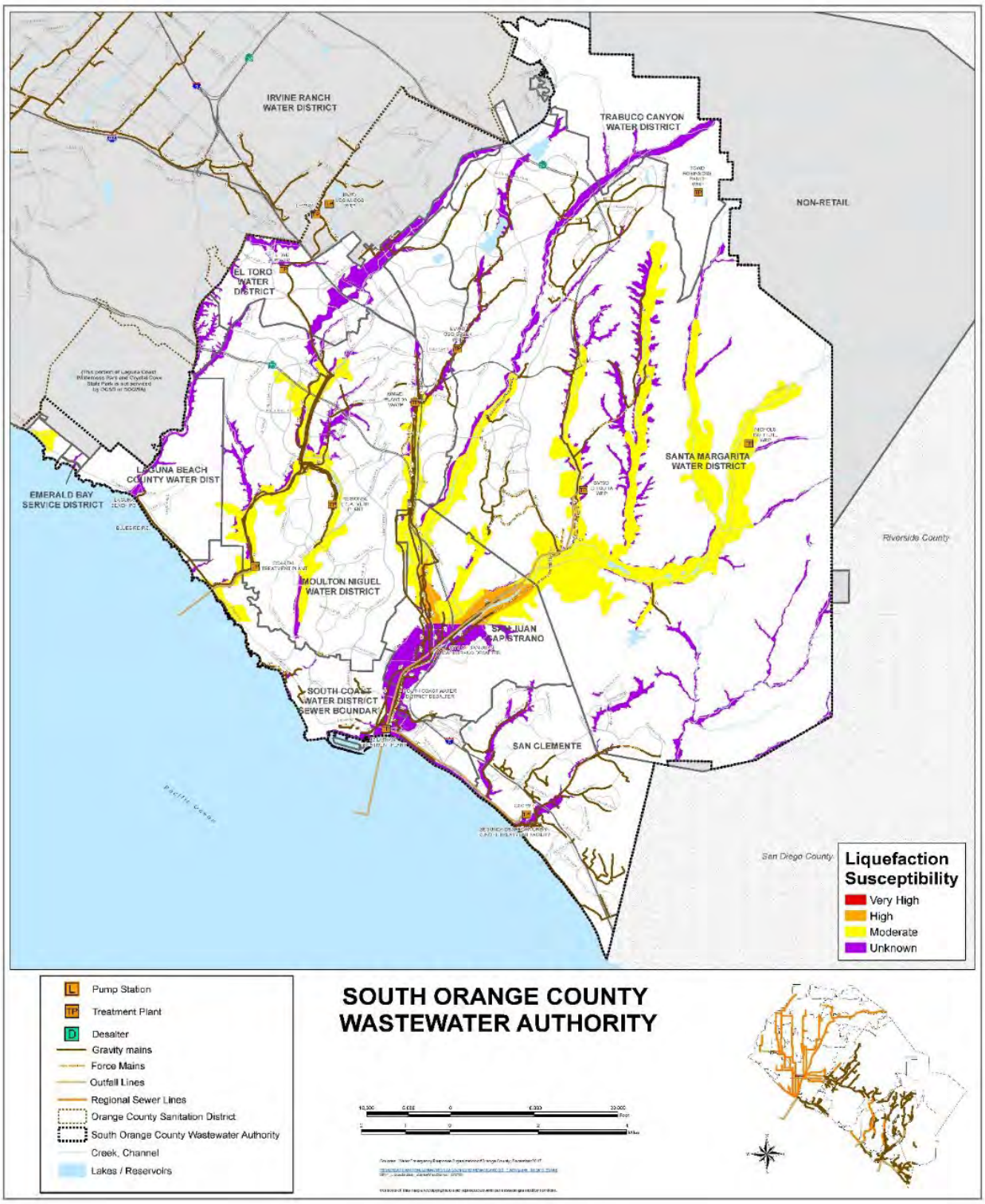


Exhibit D-8. Landslide Hazard and SOCWA Wastewater Infrastructure

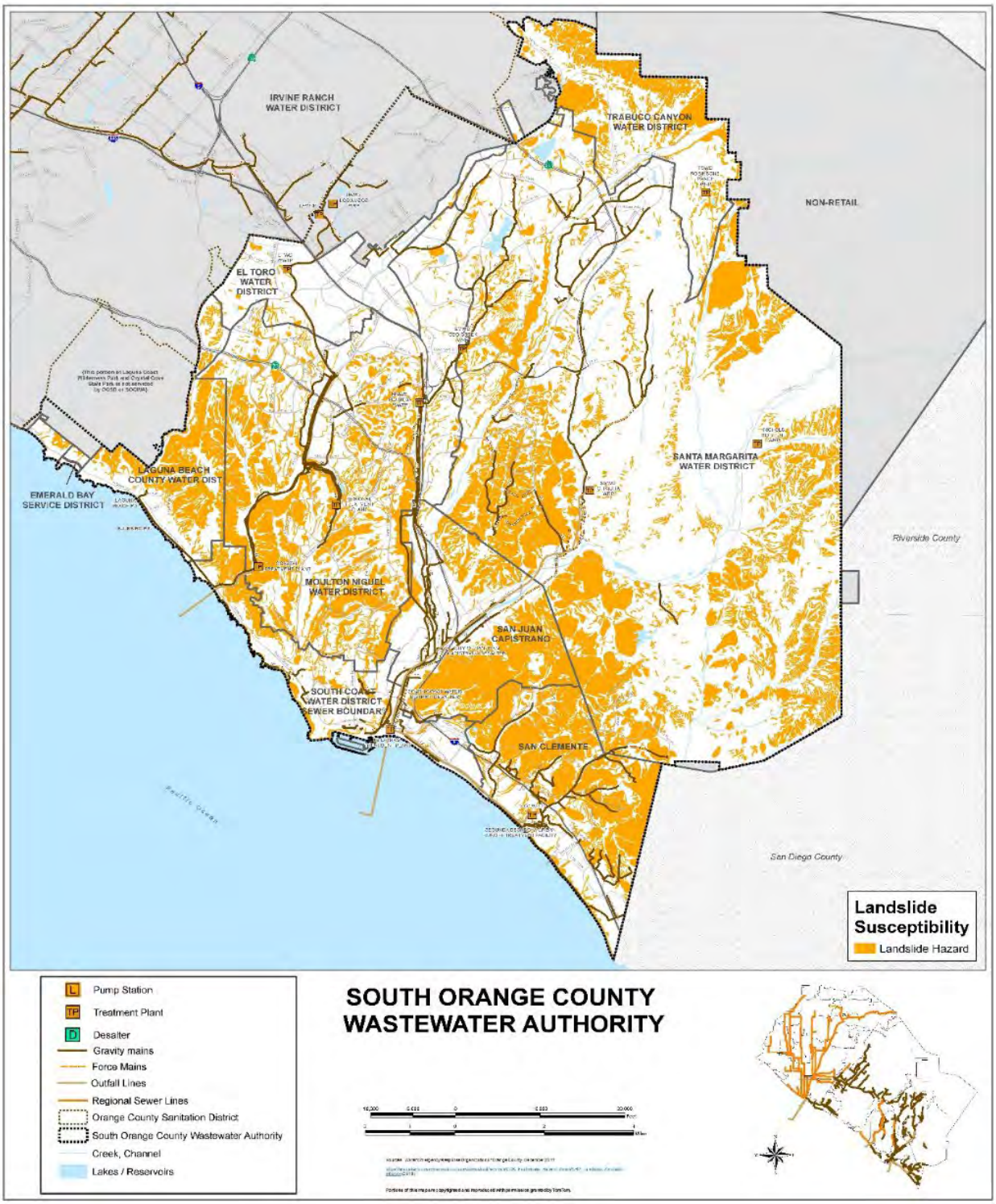
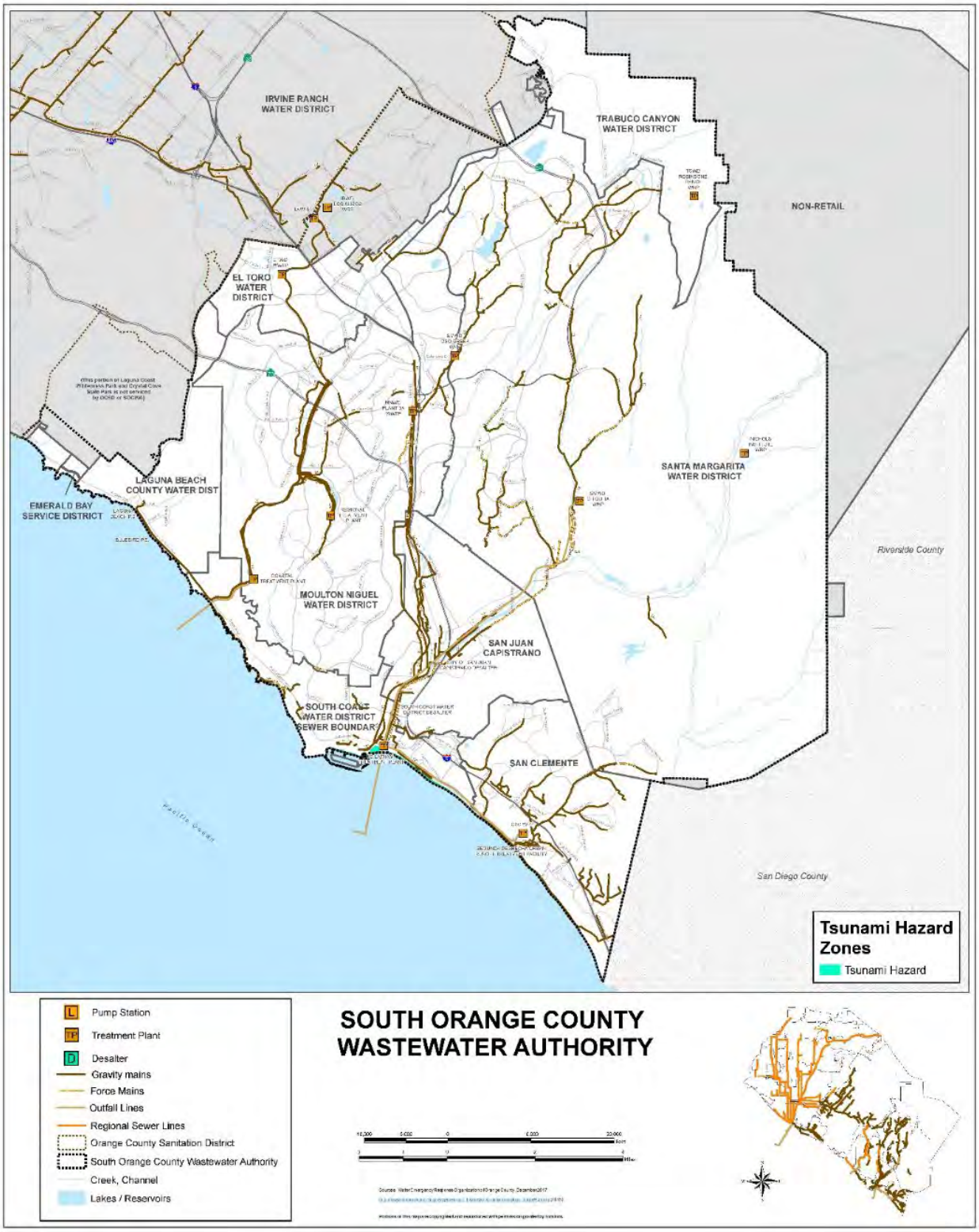


Exhibit D-9. Tsunami Hazard and SOCWA Potable Water Infrastructure



D.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within SOCWA's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

SOCWA's infrastructure is outlined in **Exhibit D-10**, which lists the number infrastructure assets are located within the mapped hazard zones identified above.

Exhibit D-10. SOCWA Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type		
		Lift Stations (#)	Treatment Plants (#)	Wastewater Pipelines (miles)
Fire Hazard Zone	Moderate	0	0	2.8
	High	0	0	7.9
	Very High	0	0	13.5
FEMA Flood Zone	100-Year	0	0	10.9
	500-Year	0	1	3.3
Alquist-Priolo Rupture Zone		0	0	0
Seismic Shaking	Moderate	0	0	2.9
	High	2	2	37.7
	Extreme	0	0	0
Liquefaction	Moderate	0	0	16.7
	High	1	3	1.7
	Very High	0	0	0
	Unknown	0	0	7.2
Landslide Zone		0	0	8.0
Tsunami Zone		2	3	0.2

A majority of SOCWA's pipeline system is in areas susceptible to a high amount of ground shaking during an earthquake. Additionally, SOCWA does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone.

Changes in Land Use and Development

SOCWA provides services to a large area and is impacted by the land use changes and new developments that occur across the southern portion of Orange County. Land use within SOCWA's service area is primarily residential housing, both single family and multi-family developments. The southern portion of Orange County has high potential for development due to vacant areas being gradually transitioned to residential and commercial mixed use areas. To ensure SOCWA can maintain service to the growing population of the 7 agencies they serve, development of the J.B. Latham Treatment Facility was started to increase the efficiency of the system.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Flood	Climate change is expected to cause some higher-level flood waters within SOCWA service area along the San Juan Creek and other creeks and rivers throughout the area. The 100-year flooding event may expand into the 500-year flood zones on a more frequent basis.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within SOCWA's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazard: Power Outage	Climate change will likely increase SOCWA's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact SOCWA facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within SOCWA's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the SOCWA service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Severe Weather: Windstorm	The challenges to SOCWA from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Wildfire	Climate change is expected to cause an increase in wildfires throughout the majority of the SOCWA service area due to the large national forests and nature preserves.
Hazards of Medium Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to SOCWA's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to SOCWA's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for SOCWA from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Tsunami	SOCWA's vulnerability to tsunamis is not expected to change due to climate change.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within SOCWA's service area as a result of climate change.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact SOCWA as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact SOCWA's service area as described in the base plan.
Hazards of Low Concern	
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated

Hazard	Climate Change Vulnerabilities
	during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within SOCWA's service area. The vulnerability follows that described in the Base Plan.
Geological Hazards: Land Subsidence	SOCWA's vulnerability to land subsidence is not expected to change due to climate change.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	SOCWA's vulnerability changes in contamination and saltwater intrusion due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

D.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. SOCWA's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits D-11a through D-11d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. SOCWA has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit D-11a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Engineering	SOCWA complies with applicable building codes and works within the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified SOCWA will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	City/County	SOCWA complies with applicable zoning ordinances and works within the service area.
Subdivision Ordinance or Regulations	City/County	SOCWA complies with applicable subdivision ordinances or regulations within the service area.
Special Purpose Ordinance	Operations/Engineering/ Environmental Compliance	SOCWA complies with applicable special purpose ordinances within the service area.

Site Plan Review Requirements	Operations/Engineering	Site Plans are reviewed regularly, updated, and provided to local police, fire, and various county agencies (such as OCHCA and OCIAC). **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Capital Improvements Plan	Engineering	Part of SOCWA's 10-Year Planning/Budgeting Process **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	Environmental Compliance	Updated annually or as needed when hazard identification arises. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure SOCWA is better prepared for future incidents and can anticipate their communities' needs.
Water Discharge Requirements	Environmental Compliance	Monthly reporting of applicable spills.
Continuity of Operations Plan		SOCWA follows their Continuity of Operations Plan and ensures it is kept up to date.

How can these capabilities be expanded and improved to reduce risk?
▪ Continue conducting disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Continue evaluating ability to contract with local fuel distributors and gas stations, and other possible

emergency contract options, for emergency backup supply.

- As a component of the annual review of the agency's emergency response plan ensure mitigation actions are included and updated as needed.
- Continue evaluating disaster response fuel analysis and contingency planning with WEROC as a component of the CA Southern California Catastrophic Plan.
- Continue evaluating the ability to contract with local fuel distributors and gas stations for emergency backup supply.

Exhibit D-11b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering	Engineering staff are involved with hazard mitigation.
Planners or Engineer(s) with an Understanding of Natural and/or Human-Caused Hazards	Engineering	Engineering staff are involved with hazard mitigation.
Emergency Manager	Environmental Compliance	Staff is trained in FEMA ICS and able to support efforts.
Lab Specialist	Environmental Compliance	Staff is aware of proper sampling and analytical techniques to complete if a hazard presents itself.
Floodplain Manager	Engineering	Reviews 100-year flood information and incorporates into engineering designs.
Mutual aid agreements		SOCWA is engaged in mutual aid agreements.

How can these capabilities be expanded and improved to reduce risk?

- Have all agency registered engineers and other qualified individuals attend CalOES Safety Assessment Program (SAP) training for building inspections.
- Continue completion of specialized trainings identified for employees at agency to complete to properly prepare for emergencies.
- Annual review with agency personnel and city personnel to ensure mitigation actions are included in the emergency response plan.

Exhibit D-11c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Engineering/ Operations	As needed grant funding to repair damages caused by hazards. **Expansion and Improvement:** During annual budgeting SOCWA can highlight HMP strategies that support funding needs for the CIP.
Grants	Engineering/ Operations	As needed grant funding to repair damages caused by hazards. **Expansion and Improvement:** SOCWA can coordinate with MWDOC to better understand how grant support could be conducted that benefits the entire planning area as a whole.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Finance Department to incorporate mitigation actions into agency budget through planning meetings and when funding is identified. ▪ Engineering Department to include mitigation actions in Capital Improvement Plan related to the construction of new structures or retrofit improvements to existing structures.

Exhibit D-11d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Public Awareness and Education	All Departments of SOCWA	Multiple life/safety trainings completed for emergency preparedness and response in the event of various manmade or natural disasters. **Expansion and Improvement:** New training focused on mitigation strategies and implementation can help

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to SOCWA. ▪ Work with partner agencies to host/engage community outreach and public education. ▪ Use social media and agency website to engage the community and public education.

D.7 MITIGATION STRATEGY

D.7.1 Mitigation Goals

SOCWA adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

D.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit D-12,** SOCWA Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit D-12. SOCWA Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Adopt a policy for design of non-combustible facilities to reduce the threat and impact of structure fires.	All facilities	Wildfire and Urban Fire	$35,000	Engineering	Long Term	Capital	Existing, Ongoing
Develop a comprehensive approach to reducing the possibility of damage and losses due to structural fire/wildfire.	Coastal and Regional Treatment Plants	Wildfire and Urban Fire	$35,000	Operations/ Engineering	Long Term	Capital	In Progress
Keep Emergency Operations Plan up to date.	All facilities	All Hazards		Emergency Management	Long Term	Capital	Existing, Ongoing
MEDIUM PRIORITY							
Conduct additional workshops for awareness of hazardous materials incidents for all employees.	All facilities	All Hazards		Health and Safety	Long Term	Capital	Existing
Conduct routine site inspections of structures and facilities and follow-up on any reported structural deficiencies or mitigation measures.	All facilities	All Hazards	$16,000/yr	Operations	Long Term	Capital	Existing, Ongoing
Continue and expand cooperation with all outside agencies regarding human caused hazards.	All facilities	All Hazards		Emergency Management	Long Term	Capital	Existing, Ongoing
Continue and expand education for administrative and field personnel on possible human caused hazards.	All facilities	All Hazards		Emergency Management	Long Term	Capital	Existing, Ongoing
Continue and expand safety training for all district personnel who may come in contact with said materials.	All facilities	All Hazards		Health and Safety	Long Term	Capital	Existing, Ongoing
Continue daily site checks at critical locations.	All facilities	All Hazards		Operations	Long Term	Capital	Existing
Develop a comprehensive approach to reducing the possibility of damage and losses due to earthquake and landslide.	All facilities	Landslides, EQ		Operations/ Engineering	Long Term	Capital	In Progress
Develop procedures for mobilizing personnel and pre-positioning resources and equipment.	All facilities	All Hazards		Operations	Long Term	Capital	Existing, Ongoing
Follow the Asset Management Plan for replacement and refurbishment of facilities.	All facilities	All Hazards	>$70 Million	Operations/ Engineering	Long Term	Capital	Existing, Ongoing
Identify the process and develop procedures for checking critical wastewater facilities and equipment, including testing systems.	All facilities	All Hazards		Operations	Long Term	Capital	Existing, Ongoing
Improve security at key facilities and install surveillance equipment.	All facilities	All Hazards	$90,000	Operations	Long Term	Capital	Existing, Ongoing

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Implement Vulnerability Risk Assessment recommendations.	All facilities	All Hazards		Engineering	Long Term	Capital	Existing, Ongoing
Modify SCADA system, when feasible, to look for additional parameters of operation that may indicate problem areas.	All facilities	All Hazards		Operations/ Engineering	Long Term	Capital	Existing
Perform a seismic study analysis for all structures and facilities.	All facilities	All Hazards	$45,000	Engineering	Long Term	Capital	Existing, Ongoing
Protect and reinforce facilities within flood plain areas, rivers and creeks or relocate facilities out of harm's way.	All facilities	Flood		Operations	Long Term	Capital	Existing
Protect facilities within flood plain areas.	Coastal Treatment Plant	All Hazards		Operations	Long Term	Capital	Existing
Provide routine maintenance around facilities to avoid the chance of fire threat and reducing the fuel source.	All facilities	Wildfire and Urban Fire	$40,000	Operations	Long Term	Capital	Existing
Standardize and upgrade older lift station electrical and instrumentation systems.	All facilities	All Hazards	$250,000	Operations	Long Term	Capital	Existing
Survey and improve site fencing and other forms of hardening deterrence to facilities including the use of camera and wireless communications.	All facilities	All Hazards	$110,000	Operations	Long Term	Capital	Existing, Ongoing
Upgrade SCADA system to existing sites as needed.	All facilities	All Hazards	$80,000	Operations/ Engineering	Long Term	Capital	Existing
LOW PRIORITY							
Develop a comprehensive approach to improve tsunami emergency notification and response procedures.	JB Latham and Coastal Treatment Plants	Coastal Erosion		Emergency Management	Long Term	Capital	Existing

D.8 PLAN INTEGRATION

SOCWA's Capital Budget, Wastewater Master Plan, Fire Protection and Evacuation Plan, and SOCWA Safety Manual (including but not limited to SOCWA Emergency Response and Disaster Contingency Procedure, SOCWA Grounds and Building Security Procedure, SOCWA Fire Prevention Procedure, and SOCWA Hazardous Material Handling Procedure) are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, SOCWA incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment information was used to help inform the SOCWA Fire Prevention Plan.
- The risk assessment information was used to update the hazard analysis in SOCWA's Emergency Operations Plan.

SOCWA will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this Plan.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex E: Costa Mesa Sanitary District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

COSTA MESA SANITARY DISTRICT ANNEX

Costa Mesa Sanitary District (CMSD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, CMSD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to CMSD.

This annex details the hazard mitigation planning elements specific to CMSD and describes how CMSD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by CMSD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to CMSD with a focus on the risk assessment and mitigation strategies.

E.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit E-1** lead the CMSD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with CMSD staff and the consulting team supporting the effort.

Exhibit E-1. Planning Team Lead

Primary Point of Contact
Name: Scott Carroll
Title: General Manager
Telephone: 949-645-8400 x223
Email: scarroll@cmsdca.gov

CMSD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as CMSD's internal hazard mitigation planning development team.

Exhibit E-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Mark Esquer	District Engineer
Noelani Middenway	District Clerk & PIO
Gina Terraneo	Senior Management Analyst

Outreach to the public within CMSD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, CMSD published a webpage with information on the MJHMP. CMSD discussed the planning process at several public meetings, including a Board of Directors meeting on August 26, 2024 and a Citizens Advisory Committee Meeting on November 13, 2024. In addition, social media such as Facebook, X, Instagram and Nextdoor were used for outreach purposes.

E.2 JURISDICTION PROFILE

Service Population: 118,200

Costa Mesa Sanitary District (CMSD) was formed in 1944 by a group of concerned community members for the purpose of controlling the disposal of trash within the Costa Mesa community. In 1953 the CMSD expanded from trash collection to include owning and maintaining a wastewater collection system. Today CMSD is an independent special district that collects and transmits wastewater to Orange County Sanitation District facilities for treatment and provides trash collection and transmittal to recycling facilities. CMSD serves a population of 118,200 residents across the City of Costa Mesa and portions of the City of Newport Beach, and unincorporated Orange County.

CMSD is governed by a publicly elected, five-member Board of Directors who are elected by division to serve a four-year term. The Board of Directors sets policy, establishes service rates, and oversees district operations. CMSD uses an annual service charge that is levied through property taxes.

E.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that CMSD faces, distinct from that of the county-wide planning area. The hazard profiles in the base plan discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

CMSD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the CMSD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect CMSD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit E-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit E-3. CMSD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Costa Mesa Sanitation
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	Medium
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Low
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Low
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Low
Flood	Likely	Medium	Limited	Negligible	Medium	Medium
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	Low
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Low
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	Medium
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Low
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Low
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Low

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to CMSD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit E-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and CMSD.

E.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit E-4. Flood Hazard and CMSD Infrastructure

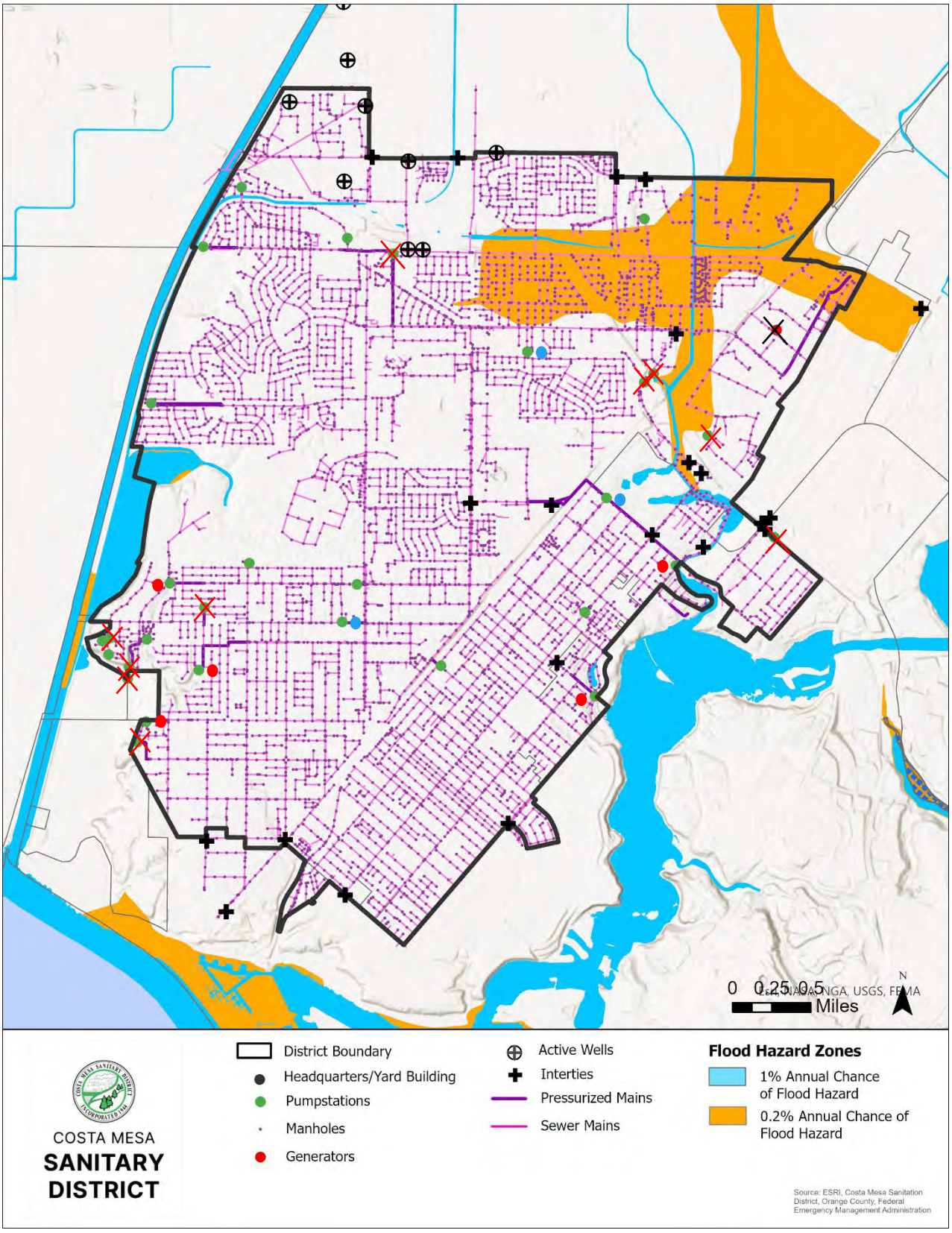


Exhibit E-5. Seismic Shaking Hazard and CMSD Infrastructure

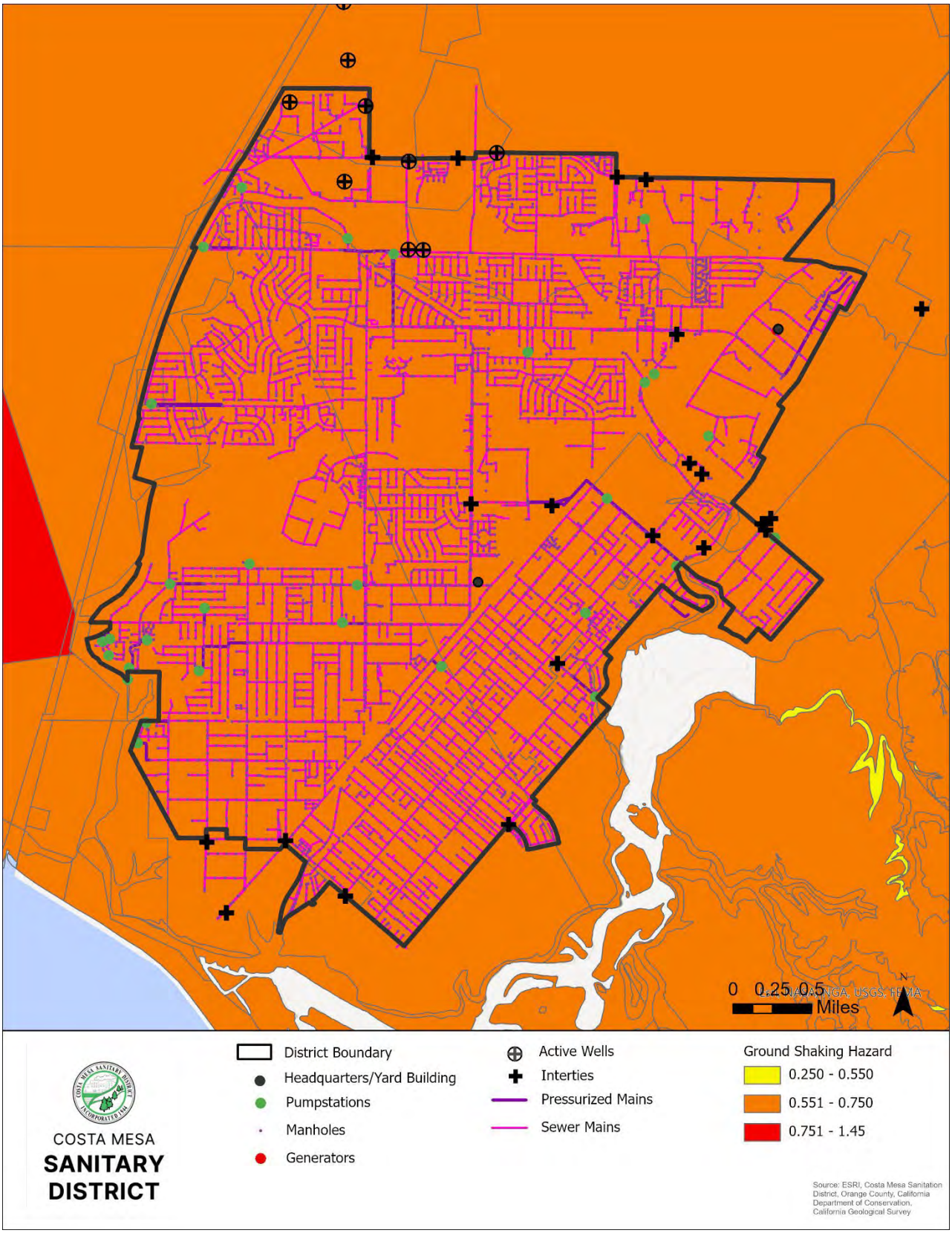


Exhibit E-6. Liquefaction Hazard and CMSD Infrastructure

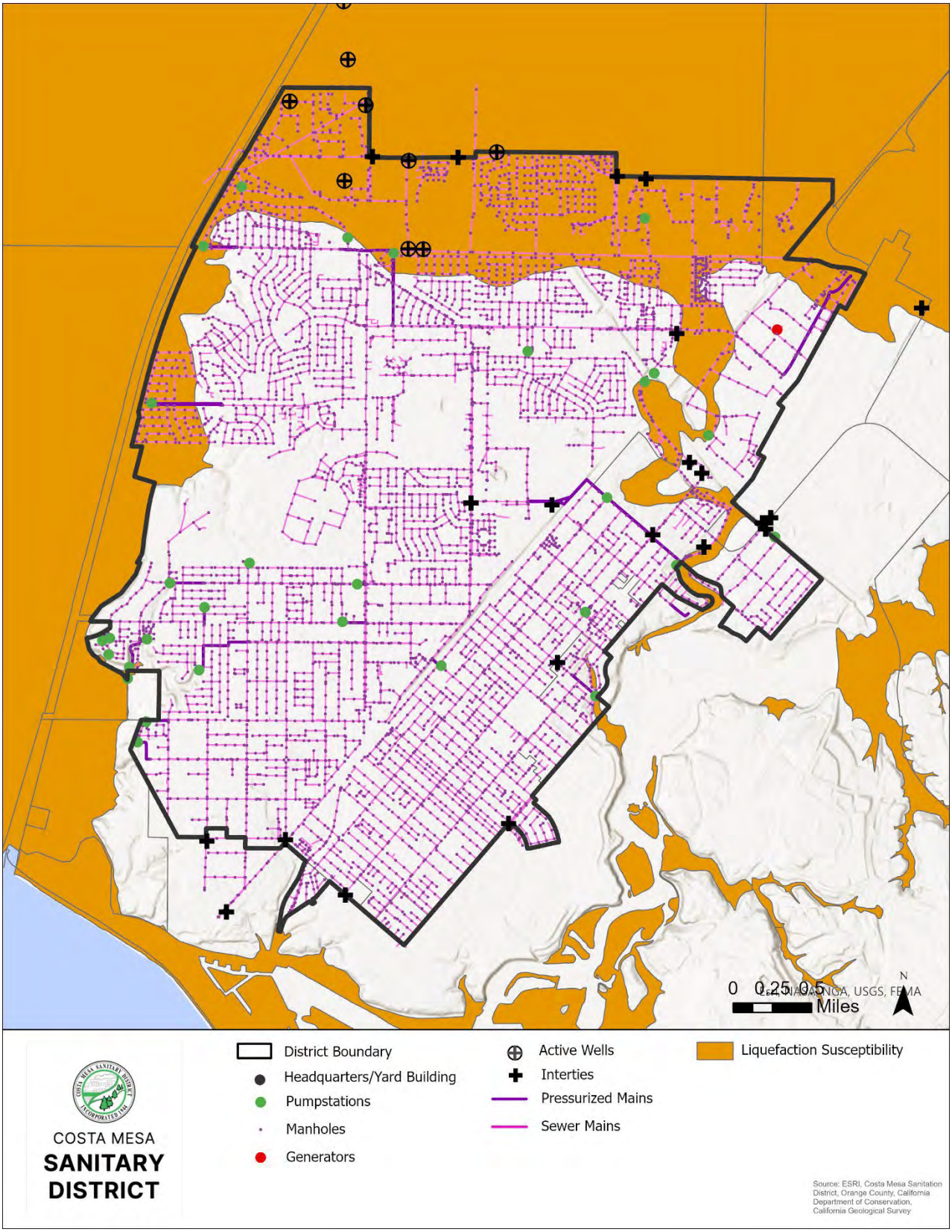


Exhibit E-7. Landslide Hazard and CMSD Infrastructure

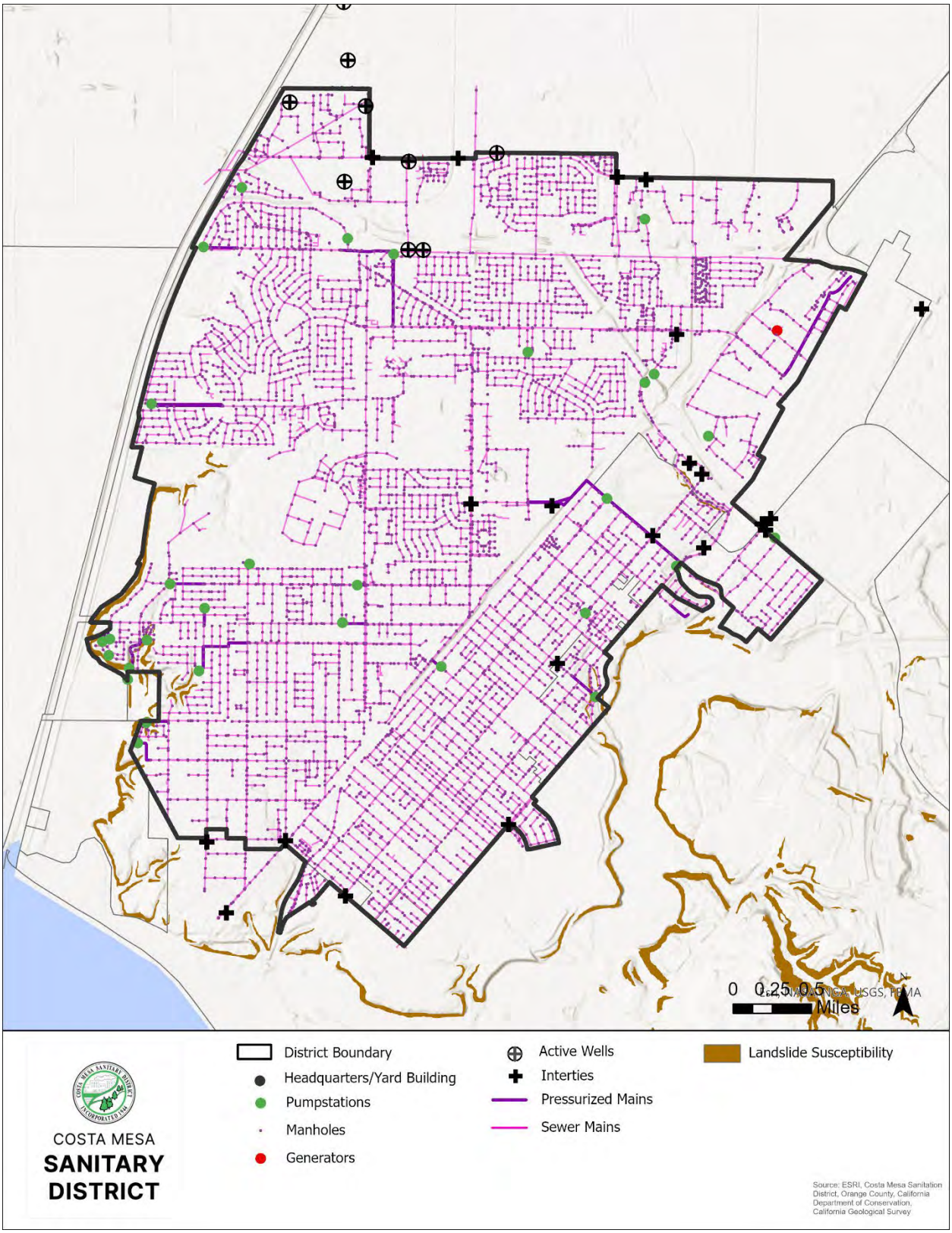
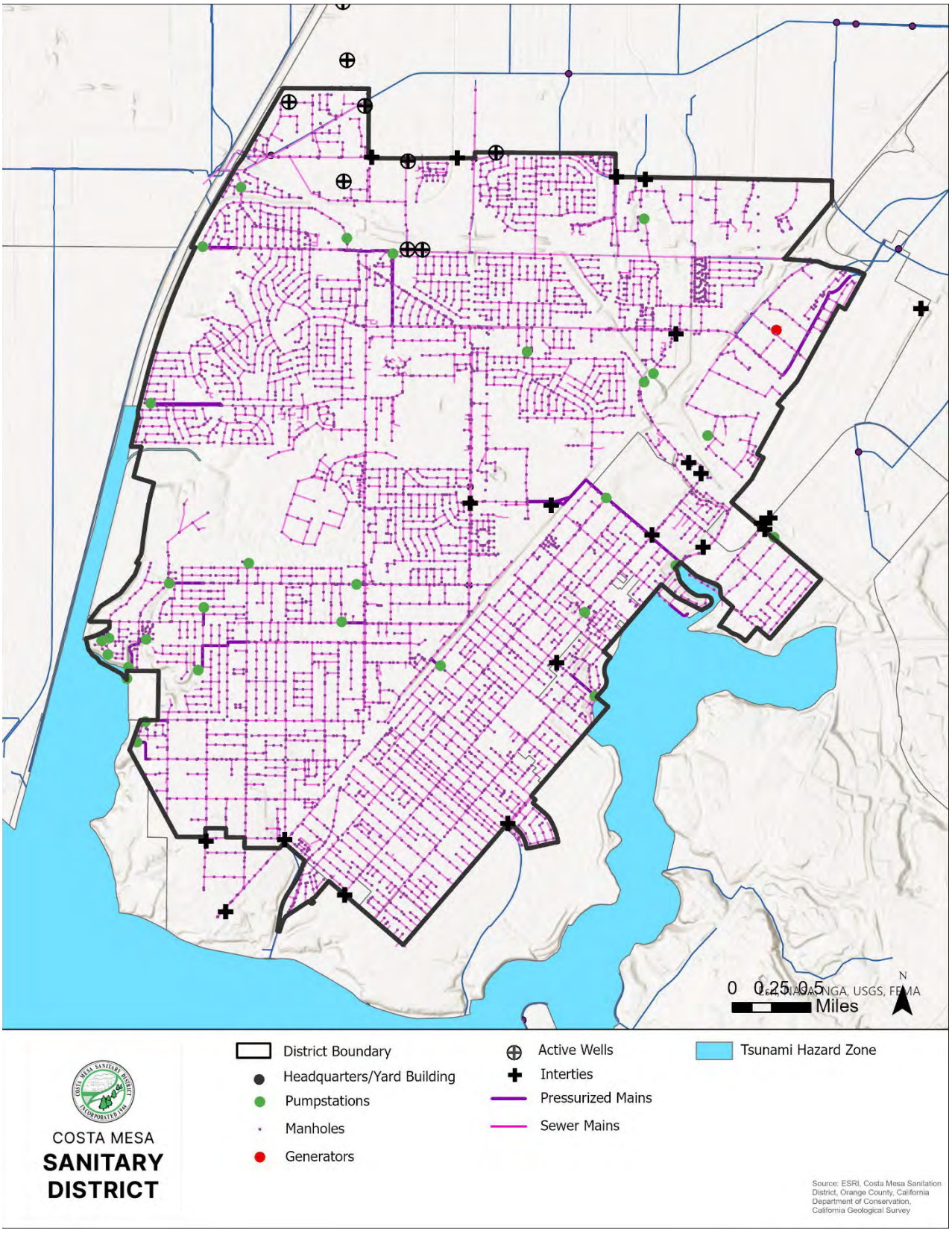


Exhibit E-8. Tsunami Hazard and CMSD Infrastructure



E.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within CMSD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

CMSD's infrastructure is outlined in **Exhibit E-9**, which lists the number infrastructure assets are located within the mapped hazard zones identified above.

Exhibit E-9. CMSD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type			
		Administrative Buildings (#)	Lift Stations (#)	Manholes (#)	Wastewater Pipelines (miles)
Fire Hazard Zone	Moderate	0	0	0	0
	High	0	0	0	0
	Very High	0	0	0	0
FEMA Flood Zone	100-Year	0	0	61	95
	500-Year	0	0	502	586
Alquist-Priolo Rupture Zone		0	0	0	0
Seismic Shaking	Moderate	0	0	0	0
	High	2	20	4707	6,156
	Extreme	0	0	0	0
Liquefaction	Moderate	0	0	0	0
	High	0	9	1,075	1,270
	Very High	0	0	0	0
	Unknown	0	0	0	0
Landslide Zone		0	2	17	35
Tsunami Zone		0	1	9	11

CMSD's service area and its associated infrastructure is within an area identified as having a high risk of seismic shaking and high risk of liquefaction during an earthquake. Additionally, CMSD has multiple pressure control stations and miles of pipeline running through 100-year and 500-year flood zones.

Changes in Land Use and Development

CMSD serves the City of Cost Mesa as well as portions of Newport Beach and unincorporated Orange County. Within this service area, some large residential developments have occurred that have increased the wastewater demand on CMSD. These developments include a 393-unit apartment project and a 200-unit apartment project, both within the City of Costa Mesa. To support current and future demand for wastewater services, CMSD identified various rehabilitation projects on their wastewater infrastructure in their 2021 Wastewater Master Plan Update, though there have been no new asset locations built in the last five years.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Human-Caused Hazard: Power Outage	Climate change will likely increase CMSD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact CMSD facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within CMSD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the majority of the northern and western portions of CMSD's service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Hazards of Medium Concern	
Flood	Climate change is expected to cause some higher-level flood waters along the Santa Ana River on the western border of CMSD's service area with the 100-year flooding events potentially expanding into the 500-year flood zones on a more frequent basis.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides around the eastern and southern portions of CMSD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within CMSD's service area as a result of climate change.
Severe Weather: Windstorm	The challenges to CMSD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Wildfire	Climate change is expected to cause a moderate increase in wildfires within CMSD's service area around Talbert Regional Park.
Hazards of Low Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to CMSD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to CMSD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Tsunami	CMSD's vulnerability to tsunamis is not expected to change due to climate change.
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within CMSD's service area. The vulnerability follows that described in the base plan.
Geological Hazards: Land Subsidence	CMSD's vulnerability to land subsidence is not expected to change due to climate change.

Hazard	Climate Change Vulnerabilities
Human-Caused Hazards: Contamination/ Saltwater Intrusion	CMSD's vulnerability changes in contamination and saltwater intrusion due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact CMSD as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact CMSD's service area as described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

E.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. CMSD's internal development team collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits E-10a through E-10d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. CMSD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit E-10a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Chapter 10.03 - Emergencies of CMSD's Operations Code (Page 86)	Administration	CMSD Operations Code
Emergency Operations Plan	Administration	The plan ensures the most effective and economical allocation of resources for the maximum benefit and protection of the community in time of emergency. The plan utilizes the Standard Emergency Management System (SEMS) and the National Incident Management System (NIMS). **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure CMSD is better prepared for future incidents and can anticipate their communities' needs.
EOC Activation Plan	Administration	Describes when and how to activate the EOC.

Lift Station Emergency Plan	Engineering	Plans identify how many pumper trucks are needed if an SSO occurred. The plan also identifies traffic routes and location of manholes. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure CMSD is better prepared for future incidents and can anticipate their communities' needs.
Capital Improvements Plan	Engineering	Describes future wastewater infrastructure improvements. The plan ensures infrastructure is replaced at the end of its useful life and prevents emergency sanitary sewer overflows from occurring.
Growth Management Ordinances	Administration	Chapter 6.05 of CMSD's Operations Code

How can these capabilities be expanded and improved to reduce risk?
▪ Applying for Federal and State grants for forcemain projects to create redundancy.

Exhibit E-10b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Emergency Manager	Administration	Responsible for overseeing CMSD's Emergency Operations Plan, coordinating emergency preparedness training, and overall management of CMSD's Emergency Operations Center (EOC)
Grant writing	Administration	Departments are responsible for researching, preparing, submitting, and managing grant proposals/reports.
Mutual aid agreements	Administration	Cal Water/Wastewater Agency Response Network (WARN) and Water/Wastewater Emergency Response Organization of Orange County (WEROC)

Exhibit E-10c. Financial Capabilities Summary

Fixture Fees	Engineering	New development pays these fees to support agency wide improvement measures. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Authority to Levy Taxes for Specific Purposes	Finance	CMSD can levy special taxes pursuant to California Government Code section 50077

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy.

Exhibit E-10d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
CMSD newsletter	Community Outreach	The 4-page newsletter is mailed to over 23,000 homes 4x a year. **Expansion and Improvement:** Incorporate mitigation information and analysis into newsletters to continue sharing information with customers.
Social media (Facebook, Instagram, X, YouTube)	Community Outreach	**Expansion and Improvement:** Increase the use of social media resources for hazard mitigation related content and information.
Website	Community Outreach	
Events	Community Outreach	A booth where staff is disseminating information at special events such as, Eco Expo, Earth Day, compost/paper shredding, concerts in the park, etc.
Press releases	Community Outreach	News about the organization are disseminated to newspaper agencies and to community members, via social media. Press releases are posted on CMSD website.

Resource/ Programs	Agency or Department	Description/Comments
Customer surveys	Community Outreach	Every biennial, the district will survey 1,000 residents about services provided.
Email subscription	Community Outreach	Residents can subscribe to CMSD's email list to receive notification about certain topics. **Expansion and Improvement:** Incorporate mitigation information and analysis into emails to continue sharing information with customers.

E.7 MITIGATION STRATEGY

E.7.1 Mitigation Goals

CMSD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

E.7.2 Mitigation Actions

The internal development team identified mitigation actions to address the risk assessment and capabilities identified above. **Exhibit E-11,** CMSD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

The status column includes information regarding which part of the planning, engineering, and design process each action is currently in. This information helps CMSD better understand how these actions integrate into their current planning and programming for capital improvements.

Exhibit E-11. CMSD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
South Coast Plaza Sewer Replacement	South Coast Plaza	All Hazards	$2 Million	Engineering	2025	Assessment fees and Private sources	In Design
Elden Lift Station Forcemain Redundancy Project #341	Elden Lift Station	All Hazards	$15 Million	Engineering	2026	Grants, loans, assessment fees	In Design
21st Street Lift Station Forcemain Rehabilitation Project #339	21st Street Lift Station	All Hazards	$220,000	Engineering	2025-26	Assessment fees	Pre-Design
Grade 4 Sewer Pipeline Repairs Project #336	Community wide	All Hazards	$300,000	Engineering	2025-26	Assessment fees	Pre-Design
Sea Bluff Lift Station Rehabilitation Project	Sea Bluff Lift Station	All Hazards	$335,000	Engineering	2025-26	Assessment fees	Pre-Design
California Lift Station Forcemain Rehabilitation	California Lift Station	All Hazards	$200,000	Engineering	2025-26	Assessment fees	Pre-Design
Mendoza Lift Station Forcemain Rehabilitation & Redundancy	Mendoza Lift Station	All Hazards	$165,000	Engineering	2025-26	Assessment fees	Pre-Design
Gisler Lift Station Forcemain Rehabilitation & Redundancy	Gisler Lift Station	All Hazards	$1 Million	Engineering	2025-26	Assessment fees	Pre-Design
Harbor Lift Station Improvements	Harbor Lift Station	All Hazards	$1 Million	Engineering	2025-26	Assessment fees	Pre-Design
MEDIUM PRIORITY							
AI Systems integration to eliminate or reduce SSOs by taking meter readings and flow levels and monitors system for advanced warning of an SSO.	Community wide	All Hazards	$500,000	Administration/Engineering	2026-27	Assessment Fees	Planning
LOW PRIORITY							
Rehabilitation Master Plan development to identify potential rehabilitation and replacement needs.	Community wide	All Hazards	$50,000	Engineering	2029-30	Assessment Fees	Planning

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Systemwide CCTV review and analysis to better identify sewer rehabilitation and replacement.	Community wide	All Hazards	$1 Million	Engineering	2026-27	Assessment fees	Planning

E.8 PLAN INTEGRATION

CMSD's biennial budget and Strategic Plan are used to implement mitigation initiatives identified in this annex. Other local planning mechanisms that may be used to implement the mitigation strategy include WEROC Meetings, City-District Liaison Meetings, and MWDOC Member Agency Group Meeting. After adoption of the MJHMP, the district will continue to integrate mitigation priorities into these documents.

CMSD will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this plan.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex F: El Toro Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

EL TORO WATER DISTRICT ANNEX

El Toro Water District (ETWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, ETWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to ETWD.

This annex details the hazard mitigation planning elements specific to ETWD and describes how ETWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by ETWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to ETWD with a focus on the risk assessment and mitigation strategies.

F.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit F-1** lead the ETWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with ETWD staff and the consultant team supporting the effort.

Exhibit F-1. Planning Team Attendance

Primary Point of Contact
Name: Sherri Seitz
Title: Public Affairs Manager/Emergency Management Coordinator
Telephone: (949) 353-7969
Email: sseitz@etwd.com

ETWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as ETWD's internal hazard mitigation planning development team.

Exhibit F-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Sherri Seitz	Public Affairs Manager/Emergency Management Coordinator
Dennis Cafferty	General Manager
Scott Hopkins	Operations Superintendent
Hannah Ford	Director of Engineering
Mike Miazga	IT Manager
Vishav Sharma	Chief Financial Officer
Garth Botha	Pump Stations Foreman
Vinnie Coppola	Safety Officer/Compliance Program Coordinator
Jeff Webster	Transmission & Distribution Foreman

Outreach to the public within ETWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, ETWD published a webpage with information on the MJHMP process. Staff utilized Facebook and the District's newsletter to announce the planning efforts and direct residents to the website. ETWD also held a public engagement meeting at the November 2024 ETWD Community Advisory Group Meeting to discuss the hazard mitigation process.

F.2 JURISDICTION PROFILE

Service Population: 51,800

ETWD was formed in September 1960 under provisions of the California Water District Law (Division 13, Section 34000 et seq. of the Water Code of the State of California). ETWD is governed by a publicly elected Board of Directors consisting of five Board Members. The Board of Directors establishes District policies and Rules and Regulations. ETWD's service area, which is nearly completely developed, includes 5,350 acres in South Orange County. ETWD is bordered by the Irvine Ranch Water District (IRWD) to the north and west, the Laguna Beach County Water District (LBCWD) to the southwest, the Moulton Niguel Water District (MNWD) to the east and south, and the Santa Margarita Water District (SMWD) to the northeast. ETWD also shares a small border with Trabuco Canyon Water District (TCWD) in the north-east. ETWD provides water, sewer, and recycled water service to a population of 51,800 in portions of Laguna Hills, Lake Forest, Mission Viejo, Aliso Viejo, and all of the city of Laguna Woods.

ETWD maintains and operates the largest covered drinking water reservoir in Orange County with a capacity of 275 million gallons. SMWD and MNWD share capacity in the regional reservoir. ETWD distributes potable water for domestic consumption, irrigation and fire protection. ETWD staff operates and maintains six water storage reservoirs, nine pumping stations, and over 170 miles of distribution pipelines. ETWD also collects, treats and recycles wastewater. ETWD staff maintains a Water Recycling Plant, 11 sewer pumping stations, 158 miles of sewer collection pipelines, and the recycled water system including the Tertiary Treatment Plant, Recycled Water Pump Station and 24 miles of recycled water pipelines.

ETWD's domestic water demands are met from the supply imported from Metropolitan through MWDOC and supply from the Baker Water Treatment Plant. ETWD receives imported (potable) water from Metropolitan via the Allen-McColloch Pipeline (AMP) and the East Orange County Feeder #2 (EOCF#2). The Baker water supply is delivered via the South County Pipeline through an interconnection with MNWD.

F.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that ETWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

ETWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the ETWD development team discussed which hazards should or should not be profiled in the base plan. This discussion

resulted in the identification of the following hazards that affect ETWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit F-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit F-3. El Toro Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to ETWD
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Low
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	High
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	High
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	N/A
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Low
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazard: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	N/A

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to ETWD's service area.*

Exhibit F-3. El Toro Hazard Identification (cont.)

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit F-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and ETWD.

F.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit F-4. Fire Hazard and ETWD Potable Infrastructure

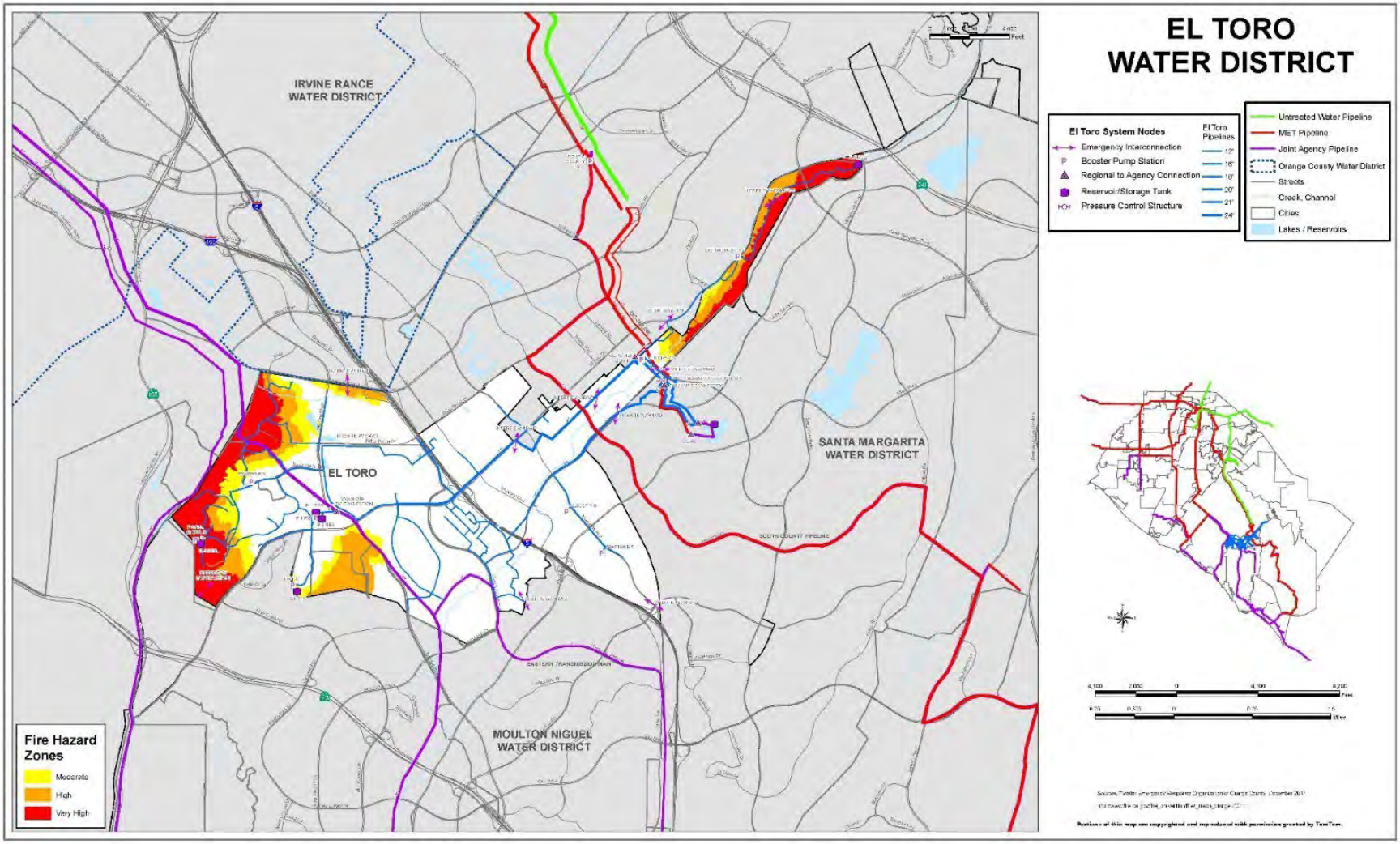


Exhibit F-5. Fire Hazard and ETWD Wastewater Infrastructure

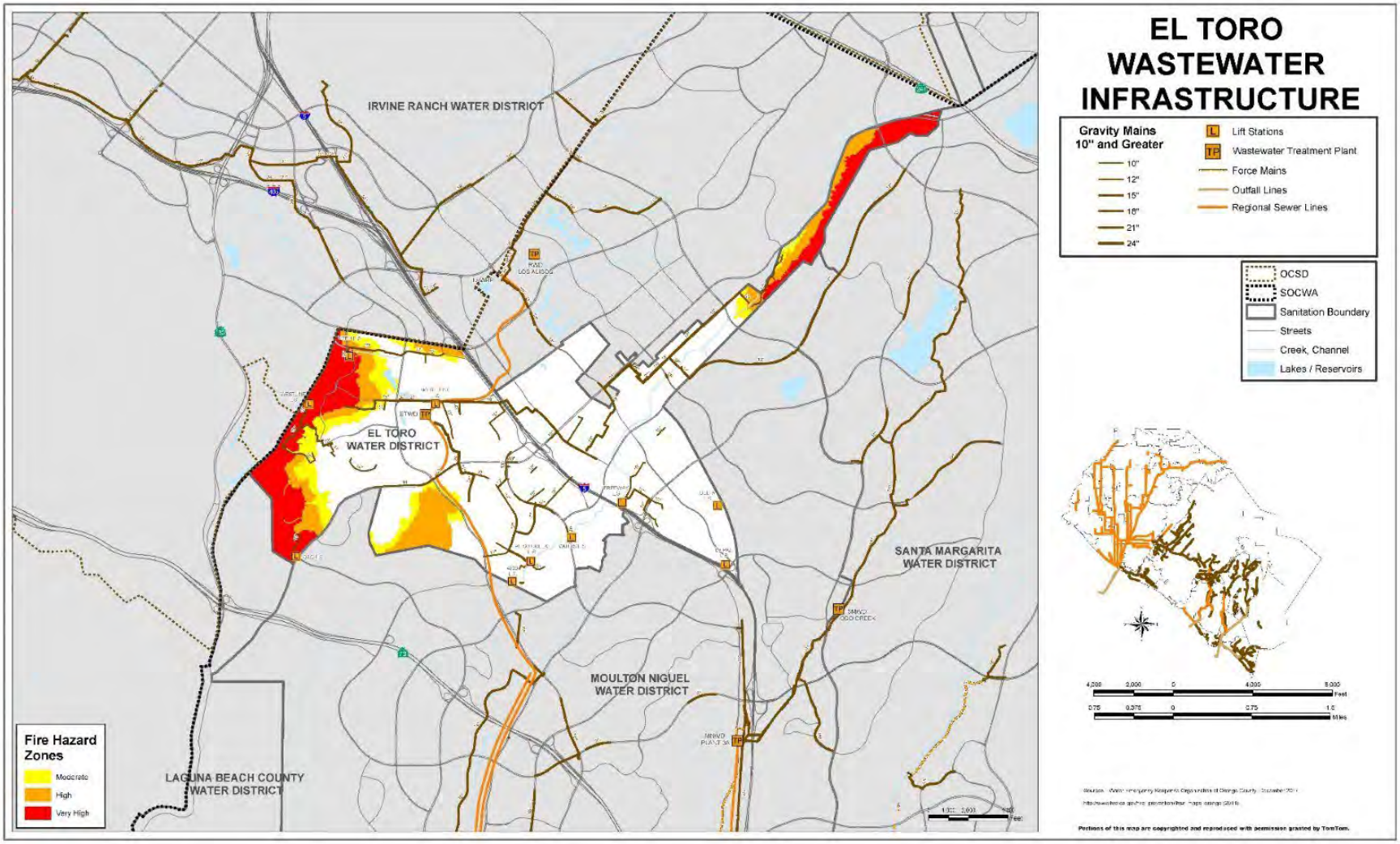


Exhibit F-6. Flood Hazard and ETWD Potable Infrastructure

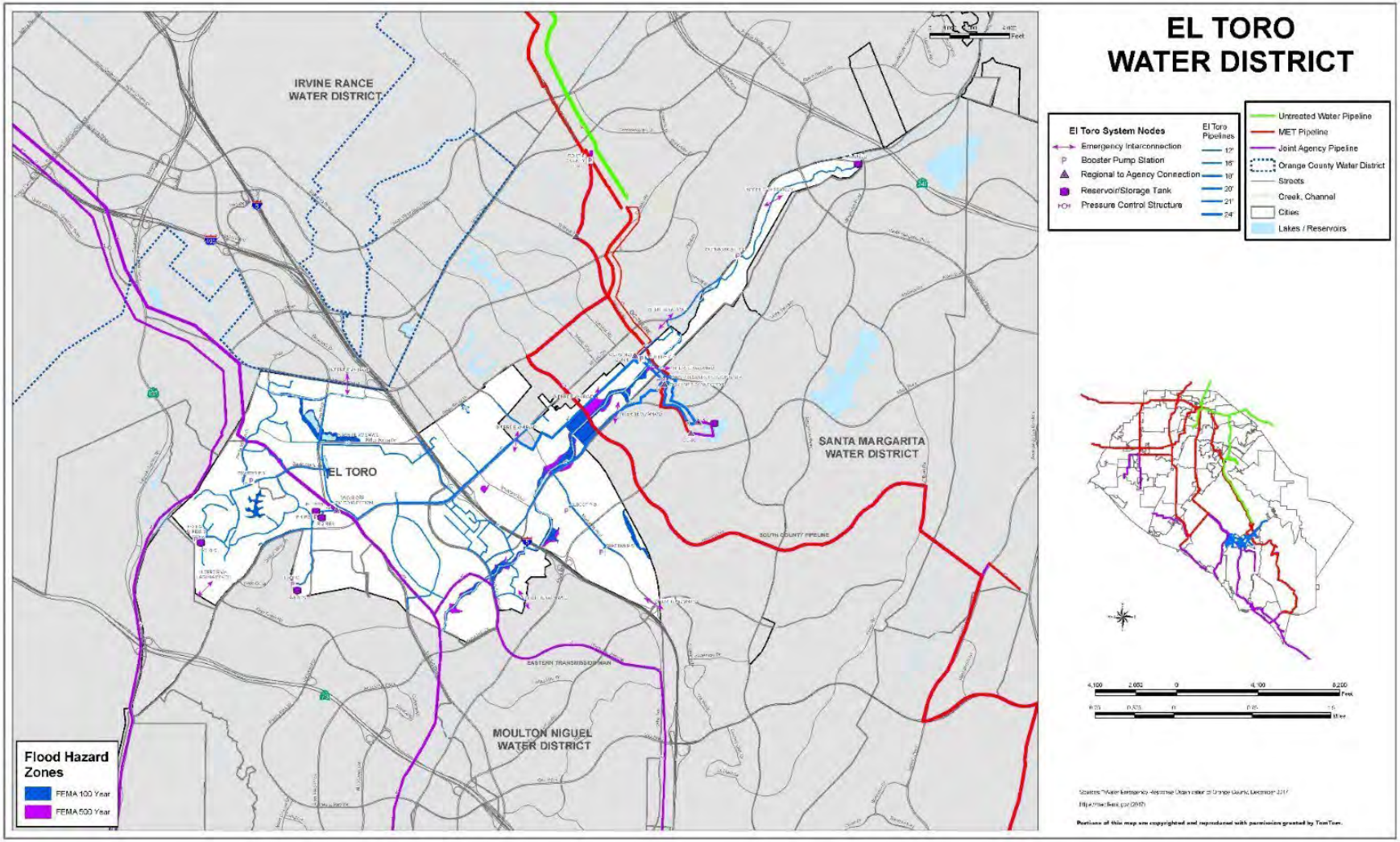


Exhibit F-7. Flood Hazard and ETWD Wastewater Infrastructure

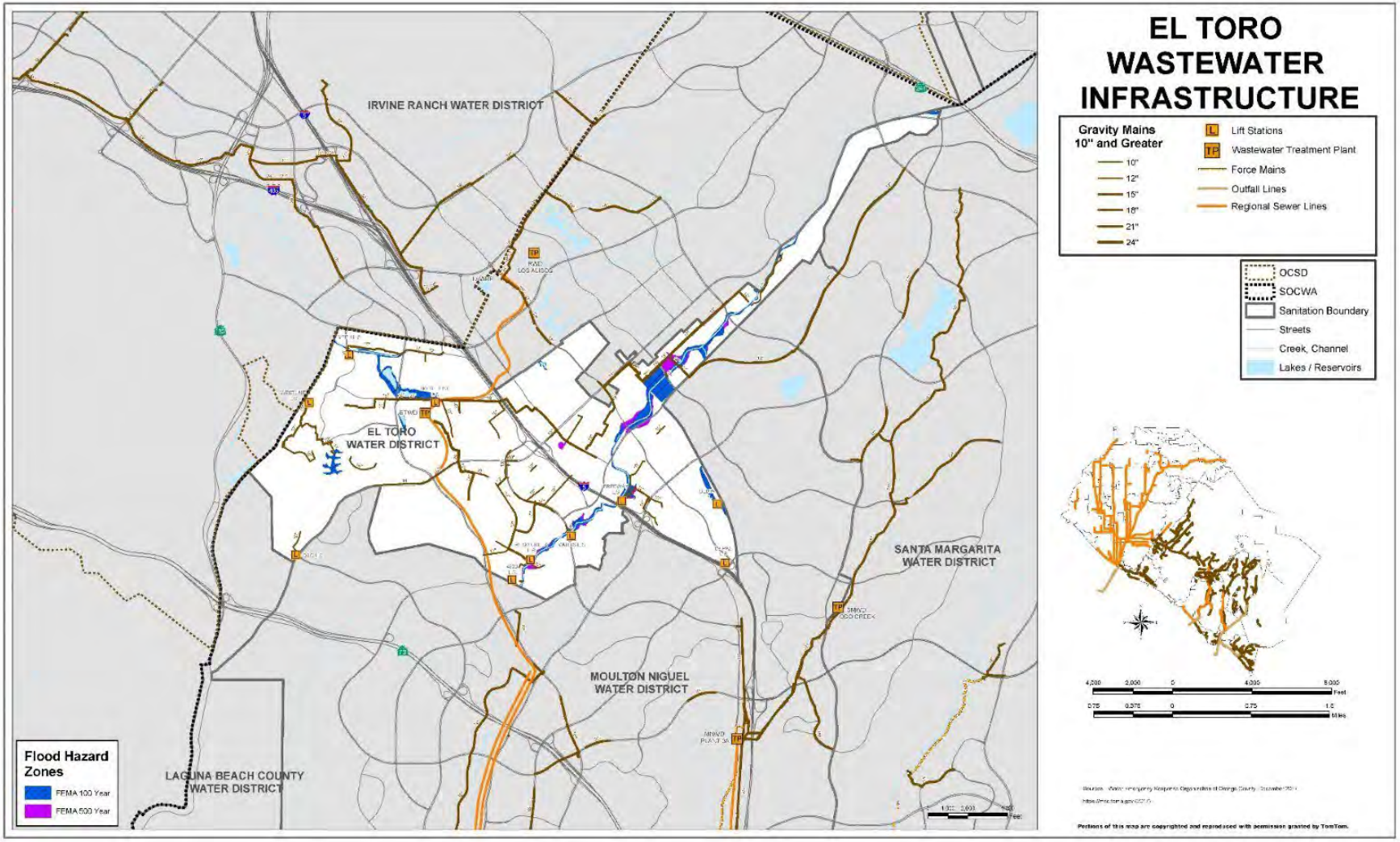


Exhibit F-8. Seismic Shaking Hazard and ETWD Potable Infrastructure

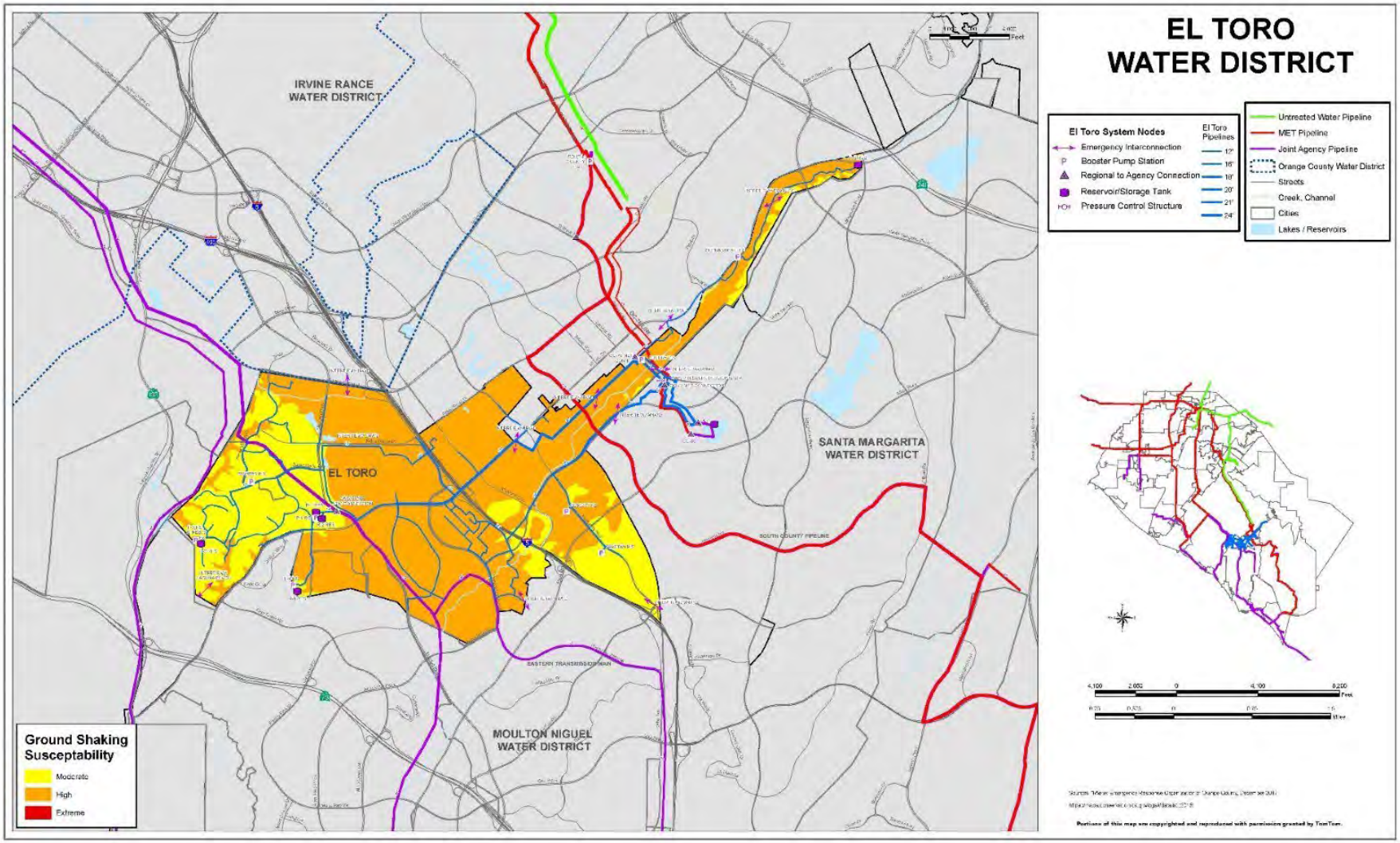


Exhibit F-9. Seismic Shaking and ETWD Wastewater Infrastructure

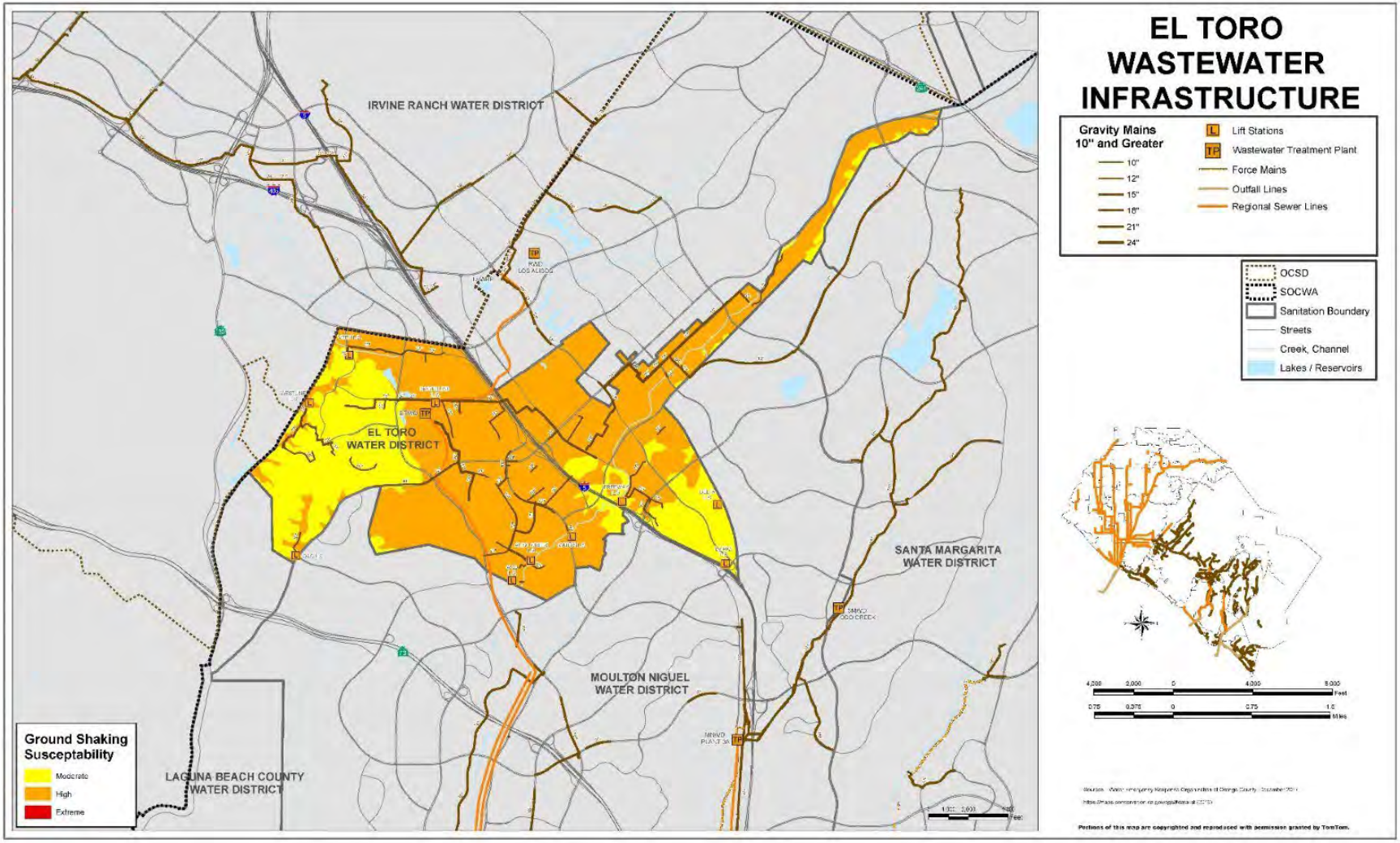


Exhibit F-10. Liquefaction Hazard and ETWD Potable Infrastructure

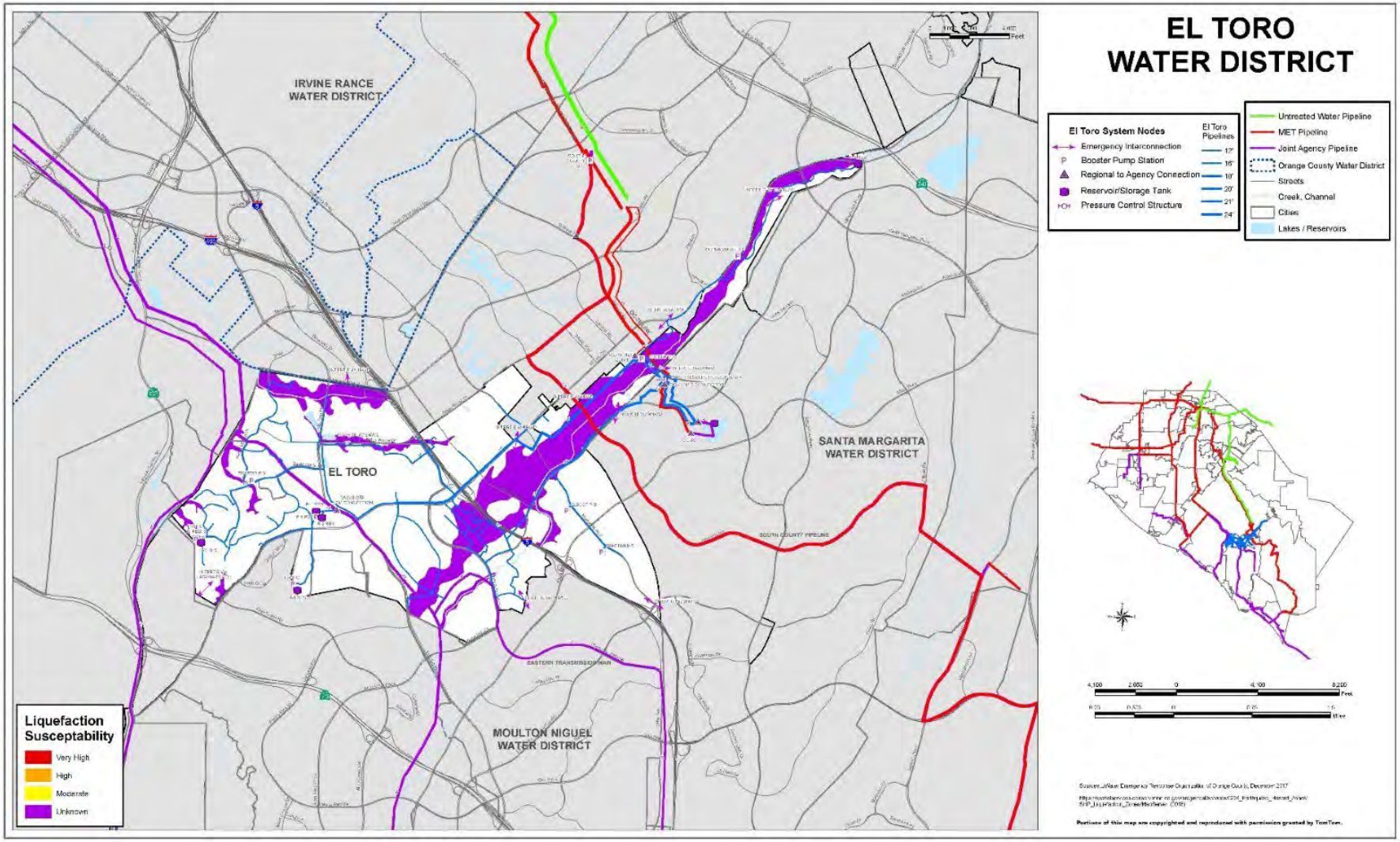


Exhibit F-11. Liquefaction Hazard and ETWD Wastewater Infrastructure

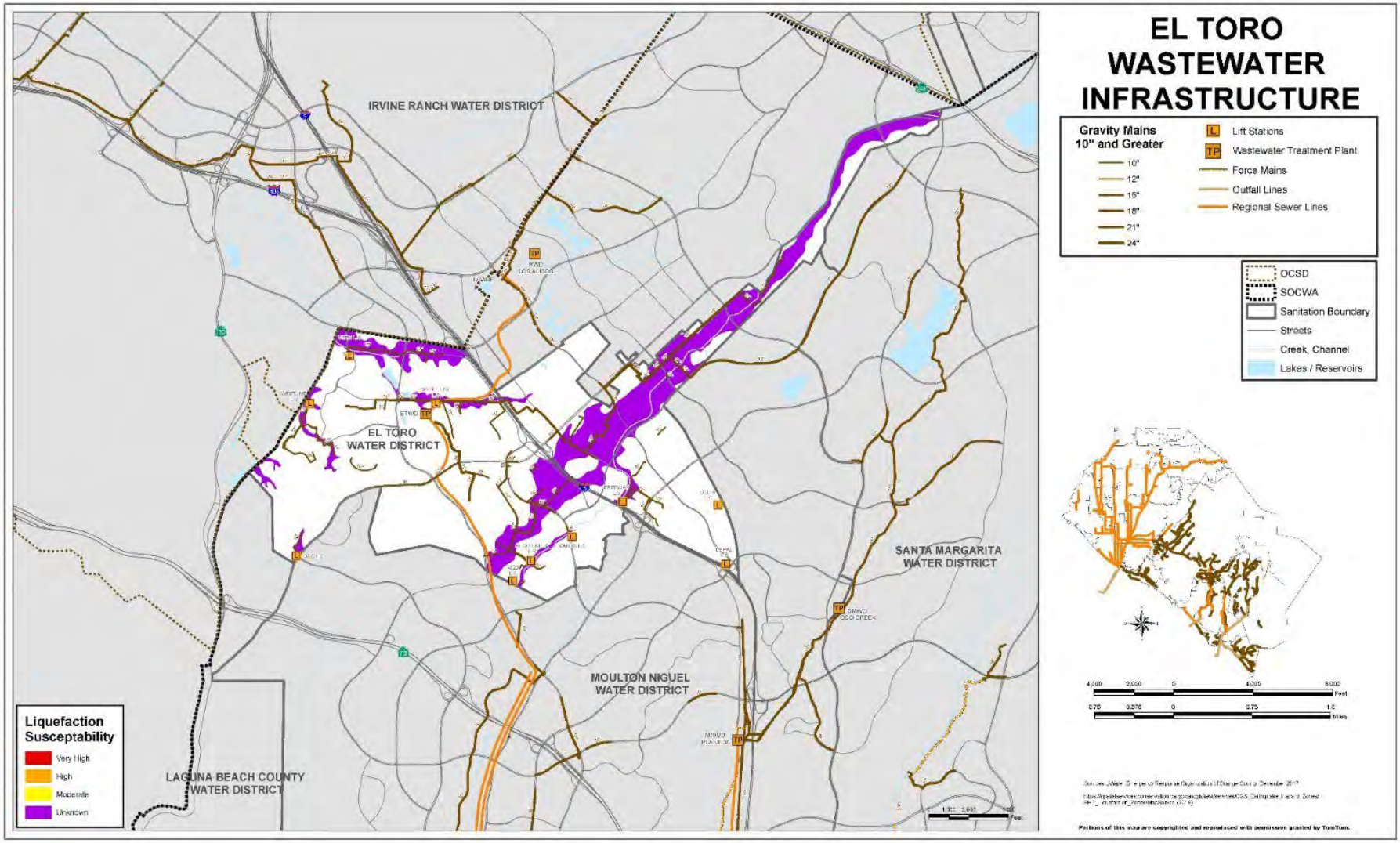


Exhibit F-12. Landslide Hazard and ETWD Potable Infrastructure

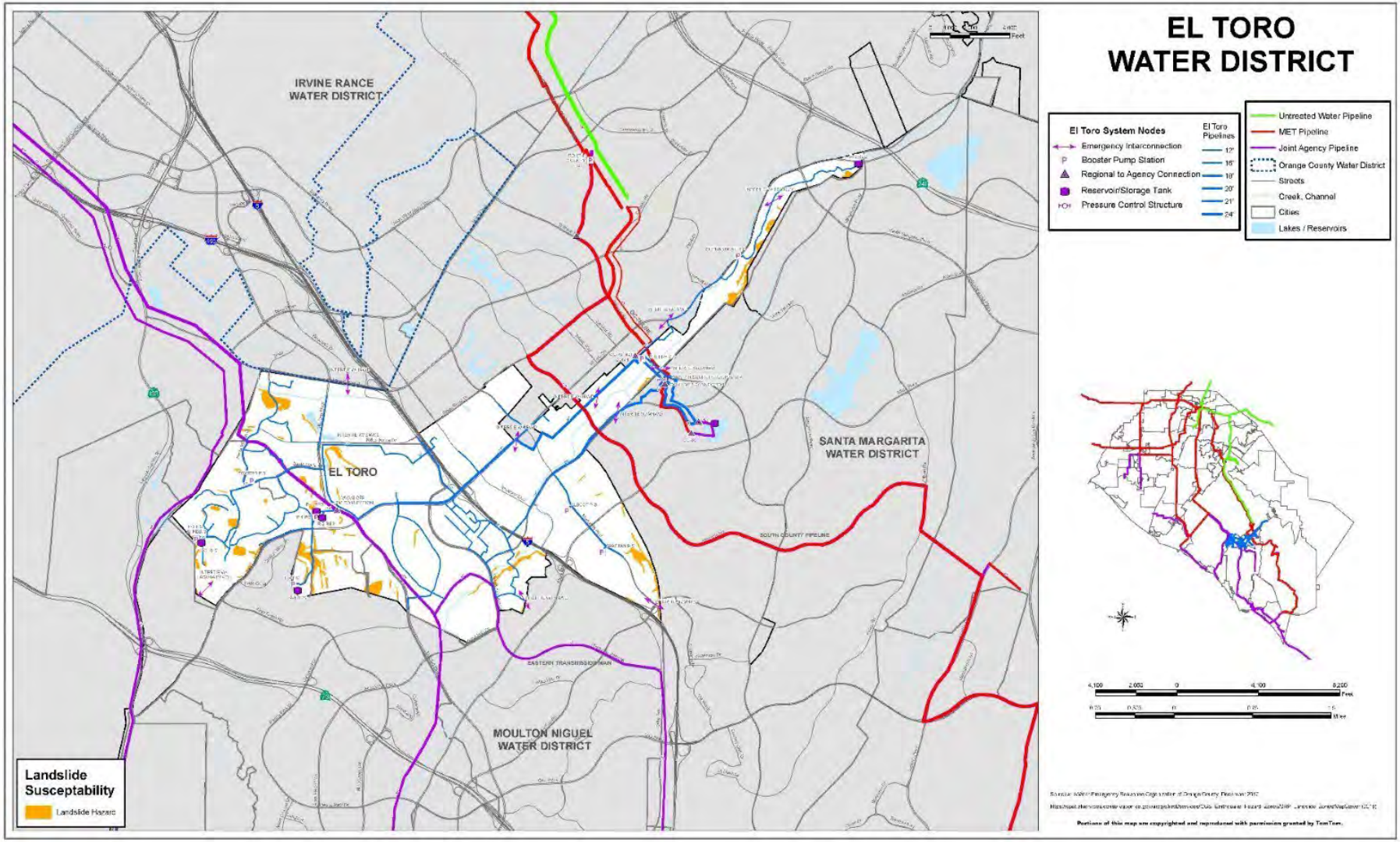
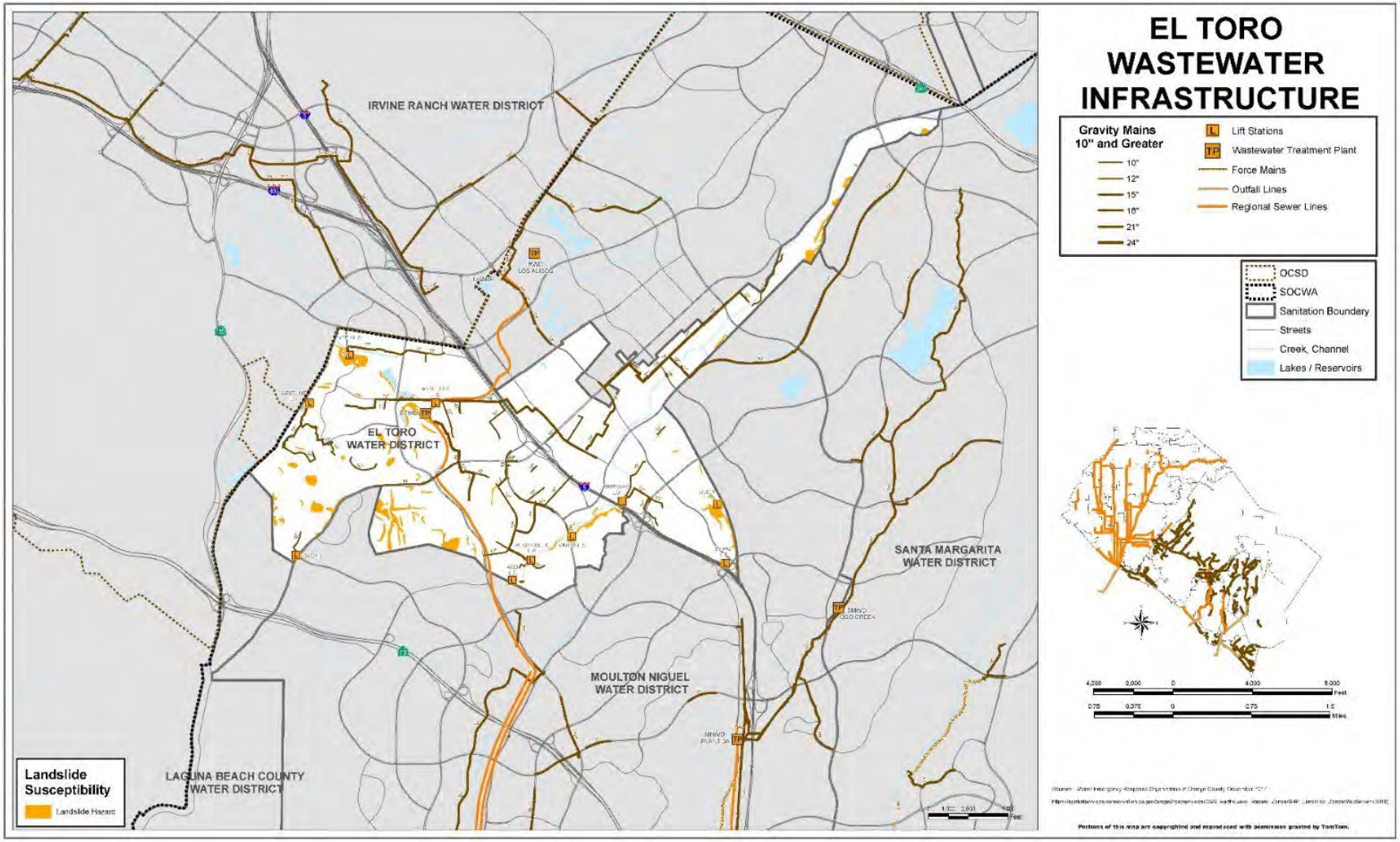


Exhibit F-13. Landslide Hazard and ETWD Wastewater Infrastructure



F.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within ETWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

ETWD's infrastructure is outlined in **Exhibit F-14**, which lists the number of infrastructure assets located within the mapped hazard zones identified above.

Exhibit F-14. El Toro Water Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Interties (#)	Pump Stations (#)	Pressure Control Stations (#)	Reservoirs (#)	Potable Pipelines (miles)	Wastewater Pipeline (miles)
Fire Hazard Zone	Moderate	2	1	0	1	1.7	1.5
	High	1	1	0	0	0.9	0.8
	Very High	2	1	0	2	1.8	1.3
FEMA Flood Zone	100-Year	0	0	0	0	0.7	1.0
	500-Year	0	0	0	0	0.3	0.5
Alquist-Priolo Rupture Zone		0	0	0	0	0	0
Seismic Shaking	Moderate	3	6	1	5	5.3	3.1
	High	11	3	0	1	12.8	15.9
	Extreme	0	0	0	0	0	0
Liquefaction	Moderate	0	0	0	0	0	0
	High	0	0	0	0	0	0
	Very High	0	0	0	0	0	0
	Unknown	5	2	0	0	5.0	8.3
Landslide Zone		1	2	0	0	0.6	0.1
Tsunami Zone		0	1	0	0	0	0

Several infrastructure types are located within areas identified as high and very high fire hazard zones, areas identified as being at risk for moderate and high ground shaking during an earthquake and within landslide zones. Additionally, ETWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone.

Changes in Land Use and Development

ETWD serves approximately 5,430 acres of developed land that consists of the City of Laguna Woods and portions of the cities of Lake Forest, Aliso Viejo, Laguna Hills, and Mission Viejo. Approximately 55% of the service area is used for residential housing. Current land development projects within the ETWD service area includes 'The Village at Laguna Hills' project that would create 1,500 multi-family residential units and generate approximately 195,340 gallons per day (gpd) of potable water demand. With the redevelopment of the Laguna Hills Mall and creation of

new office spaces, hotels, and restaurants within the Village at Laguna Hills, commercial potable water demand is estimated to increase by 68,120 gpd. Additional developments are planned on Mill Creek and Ridge Route that may result in over 500 new dwelling units (flows have not yet been estimated). Projects within ETWD are planned to ensure demand is met with these increases such as the improvement of the Aliso Creek Lift Station, the South County Pipeline Turnout Project, and rehabilitations within the WRP.

Projects within ETWD are planned to ensure demand is met with these increases such as the construction of the JTM Pump Station, and the replacement of the El Toro Regional Reservoir Cover and Liner.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Flood	Climate change is expected to cause some higher-level flood waters within the Lake Forest area of ETWD's service area.
Human-Caused Hazard: Power Outage	Climate change will likely increase ETWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact ETWD facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within the ETWD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the ETWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact ETWD as described in the base plan.
Wildfire	Climate change is expected to cause an increase in wildfires on the western portion of ETWD's service area in the Laguna Woods area and in the northern portion near Seville Park and Wilderness Glen Park.
Hazards of Medium Concern	
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within ETWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact ETWD's service area as described in the base plan.

Hazard	Climate Change Vulnerabilities
Hazards of Low Concern	
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within ETWD's service area. The vulnerability follows that described in the Base Plan.
Geological Hazards: Land Subsidence	ETWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Severe Weather: Windstorm	The challenges to ETWD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

F.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. ETWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits F-15a through F-15d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. ETWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit F-15a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo and Aliso Viejo	ETWD complies with applicable building codes and works with the Cities within the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified ETWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo, Aliso Viejo. and County of Orange	ETWD complies with applicable zoning ordinances within the service area.
Subdivision Ordinance or Regulations	City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo, Aliso Viejo. and County of Orange	ETWD complies with applicable subdivision ordinance or regulations within the service area.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Special Purpose Ordinance	ETWD Engineering, Collections System, Administrative and Customer Service Departments	ETWD ordinances: Water Shortage and Supply; Fats, Oil and Grease (FOG), Cross Connection and Industrial Waste Discharge.
Growth Management Ordinances	City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo, Aliso Viejo. and County of Orange	ETWD complies with applicable growth management ordinances within the service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, ETWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	ETWD Engineering Department	ETWD provides plan check for new development for compliance with standards for water, wastewater and recycled water. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Master Plan	ETWD Engineering Department, City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo and Aliso Viejo	ETWD periodically updates its Master plan to define long term projects and operations. ETWD is also integrated into each City's General Plan update process.
Capital Improvements Plan	ETWD	ETWD updates its 10-year capital improvement plan annually as part of the budget process. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Economic Development Plan	City of Laguna Woods, Lake Forest, Laguna Hills, Mission Viejo, Aliso Viejo	ETWD complies with applicable economic development management plans within the service area.
Emergency Response Plan	ETWD	ETWD maintains and periodically updates its Emergency Response Plan and provides training to its staff per the NIMS/SEMS requirements. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure ETWD is better prepared for future incidents and can anticipate their communities' needs.
Dams	ETWD Engineering and Operations Department/Department of Safety of Dams	ETWD complies with the DSOD & CRWQCB requirements.
Cross Connection Control Policy Handbook & Title 22	ETWD Engineering and Operations Department	ETWD administers a Cross Connection Control program in compliance with Cross Connection Control Policy Handbook and monitors compliance with Title 22 with its recycled water users.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Wastewater	ETWD Operations Department	ETWD maintains a sewer collection and wastewater treatment plant system in compliance with all regulatory requirements.
Waste Discharge Requirements	ETWD Engineering and Operations Departments/Regional Water Quality Control Board	ETWD complies with all applicable waste discharge requirements and monitors compliance with customers and contractors as appropriate.

How can these capabilities be expanded and improved to reduce risk?

- Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements.
- Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan.
- Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.
- Ensure hazard mitigation actions are reviewed and incorporated, where feasible, to Water and Wastewater Master Plan updates.
- Ensure hazard mitigation actions are reviewed during annual updates to the 10-year Capital Improvement Plan.
- Implement a process to ensure mitigation actions identified in the hazard mitigation plan are reviewed as part of the update to the Emergency Operations/Emergency Response Plan, Urban Water Management Plan, and the Asset Management Program's consequence of failure scoring.

Exhibit F-15b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Outside Consultants	ETWD staff utilizes an outside consultant with input from staff, as necessary.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	ETWD Engineering Departments	2 Engineers; 1 Inspector.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	Outside Consultants	ETWD staff utilizes an outside consultant with input from staff, as necessary.
Floodplain manager	County of Orange	The agency coordinates with the County Floodplain Manager.
Surveyors	Outside Consultants	ETWD staff utilizes an outside consultant with input from staff, as necessary.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	ETWD Engineering and Operations Departments	Specific to water, wastewater and recycled water.
Personnel Skilled in GIS and/or HAZUS	ETWD Information Technology and Engineering Department	IT Manager, Director of Engineering and Senior Engineer.
Emergency Manager	ETWD	General Manager
Grant Writers	Director of Engineering	ETWD staff utilizes an outside consultant with input from staff, as necessary.
Lab Specialist & Lab Staff	ETWD Laboratory Department	1 Lab Supervisor; 1 Lab technician.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Grant writing	ETWD Engineering Department and Outside Consultants	Director of Engineering ETWD utilizes and outside consultant with input from staff, as necessary.
Hazard data and information	Outside Consultants	ETWD utilizes and outside consultant and WEROC with input from staff, as necessary.
Mutual aid agreements	WEROC and CalWARN	ETWD utilizes WEROC and CalWARN with input from staff, as necessary.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (CalOES) Safety Assessment Program (SAP) training for building inspections. ▪ Coordinate with external agencies and outside consultants to periodically review the Hazard Mitigation Plan and update the status of mitigation actions. ▪ Work with external agencies and outside consultants to identify information that should be included in future updates.

Exhibit F-15c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	ETWD Engineering and Finance Departments	Capital Construction Reserves **Expansion and Improvement:** During annual budgeting ETWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	ETWD Finance Department	Subject to voter approval
Fees for Water, Sewer (Rate Structure)	ETWD Finance Department	ETWD has a rate structure which is used to charge customers. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Impact Fees for Homebuyers or Developers for New Developments/Homes	ETWD Engineering and Finance Departments	Capital Facilities Fees
Incur Debt Through General Obligation Bonds	ETWD Finance Department	Subject to voter approval
Incur Debt Through Special Tax and Revenue Bonds	ETWD Finance Department	Special Tax Subject to voter approval
Grants	ETWD Engineering and Finance Departments	Emergency management will work with engineering to identify and apply for available grants. **Expansion and Improvement: ETWD** can coordinate with MWDOC to better understand how grant support could be conducted that benefits the agency and the entire planning area as a whole.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Ensure the District's rates, fees and charges allow for the continuation of critical operations and maintenance programs designed to preserve and extend the useful life of infrastructure. ▪ Consider alternative funding sources, such as grants or low interest loans to maximize ETWD's ability to protect, preserve and enhance the infrastructure.

Exhibit F-15d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Boil Water Notices	DDW/ETWD	Per the DDW guidance, ETWD would issue this notice to inform residents on how to use drinking water during an emergency.
Construction Alerts	ETWD Engineering and Public Relation Departments	ETWD would utilize this type of notice to inform residents of any construction located in their area.
Community Outreach Events	ETWD Public Relations Department	ETWD attends multiple events each year hosted by other agencies. (i.e., South County Disaster Preparedness Expo). ETWD communicates on a variety of topics including emergency preparedness.
Alert OC	County of Orange/WEROC/ETWD Public Relations Department	ETWD participates in the County of Orange Alert OC emergency notification system to alert residents in case of an emergency by phone, email and/or text.
Newsletter	ETWD Public Relations Department	The ETWD newsletter provides an opportunity to educate residents how ETWD prepares for emergencies and how residents can prepare for an emergency. **Expansion and Improvement:** Incorporate mitigation information and analysis into newsletters to continue sharing information with residents.
Website	ETWD Public Relations Department and IT Department	The ETWD website provides an opportunity to educate residents on how ETWD prepares for emergencies, how the residents can prepare for an emergency and/or provide information during an emergency. ETWD will develop an emergency preparedness page for the website.
Social Media	ETWD Public Relations Department	ETWD social media accounts provide an opportunity to communicate to the community prior to an emergency and quickly during an emergency. **Expansion and Improvement:** Increase the use of social media resources for hazard mitigation related content and information
Press Releases	ETWD Public Relations Department	ETWD would utilize this type of notice to inform residents on emergency preparedness information and/or during an emergency.
Laguna Woods Village Television	Laguna Woods Village Television/ETWD	Communicate to Laguna Woods residents on emergency preparedness and during an emergency.
Bill Stuffer/Bill Message	ETWD Public Relations Department	Communicate to residents on emergency preparedness.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to ETWD. ▪ Work with emergency management organizations to continually expand educational resources that can be made available to the community.

- Continue to look for opportunities, such as community events, to provide hazard information, promote community awareness and identify emergency preparedness measures.

F.7 MITIGATION STRATEGY

F.7.1 Mitigation Goals

ETWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

F.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit F-16,** ETWD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit F-16. El Toro Water Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Install parallel or replace sewer force mains where feasible and appropriate.	District wide	Wildfire, Flood, Seismic Shaking	Unknown	Operations	Short Term	District Capital Reserves	Ongoing
Relocate the Effluent Transmission Main deep under Aliso Creek to mitigate its currently vulnerable state exposed within the creek and replace Aliso Creek Lift Station Emergency Generator.	Ocean Outfall Line	Severe Weather, Flood, Seismic Shaking; Power Outages	$900,000	Operations/ Engineering	Short Term	District Capital Reserves	New
MEDIUM PRIORITY							
Participate in South Orange County Reliability Projects.	All	Wildfire, Flood, Seismic Shaking	Unknown	Engineering	Long Term	District Capital Reserves	Ongoing
Install stationary generator at P-3 Pump Station.	Midzone	Wildfire, Flood, Seismic Shaking	$250,000	Operations	Short Term	District Capital Reserves	Ongoing
Continue to coordinate with SOCWA regarding the condition and potential replacement schedule for the Effluent Transmission Main.	Ocean Outfall Line	Wildfire, Flood, Seismic Shaking	Unknown	Operations	Long Term	District Capital Reserves	Ongoing
Implement La Paz Lift Station Slope/Panel Stabilization project.	LaPaz Station	Wildfire, Flood, Seismic Shaking, Seismic Landslide	$20,000	Operations/ Engineering	Short Term	District Capital Reserves	Ongoing
Implement WRP Holding Pond stabilization project.	WRP	Wildfire, Flood, Seismic Shaking, Seismic Landslide	$506,000	Operations/ Engineering	Long Term	District Capital Reserves	New
Provide maintenance around facilities in fire prone areas to avoid the chance of fire threat by reducing the fuel source.	Reservoir 3, Reservoir 5, Oso Sewer Lift Station, and Westline Sewer Lift Station	Wildfire	Various	Operations/ Engineering	Immediate	Annual Operating Budget	Existing
Provide special vegetation cleanups at critical facilities to remove unwanted vegetation (e.g. fallen limbs, leaves, pine needles and weeds) as needed to avoid the chance of fire threat by reducing the fuel source.	P-1, P-3, P-4, Reservoir 5, Reservoir 6, and the Holding Pond	Wildfire	$75,000	Operations/ Engineering	Immediate	Annual Operating Budget	Existing
Rehabilitate the Aliso Creek Lift Station to increase its capacity and protect against sewer spills.	Aliso Creek	Severe Weather, Flood, Seismic Shaking	$8,394,000	Operations	Short Term	District Capital Reserves	New

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Replace critical wastewater conveyance systems (such as the Effluent Transmission Main and Westline force mains) made of Techite piping, a material prone to catastrophic failure.	District Wide	Severe Weather, Flood, Seismic Shaking	Unknown	Operations	Long Term	District Capital Reserves	New
Replace Mathis Lift Station Emergency Generator	Mathis	Power Outage	$156,800	Operations	Long Term	District Capital Reserves	New
Replace Westline Lift Station Emergency Generator	Westline	Power Outage	$267,000	Operations	Short Term	District Capital Reserves	New
Replace Veeh Lift Station Emergency Generator	Veeh	Power Outage	$262,000	Operations	Long Term	District Capital Reserves	New
Replace MPR Emergency Generator	MPR	Power Outage	$62,000	Operations	Long Term	District Capital Reserves	New
Replace Warehouse Backup Emergency Generator	Warehouse	Power Outage	$344,000	Operations	Long Term	District Capital Reserves	New
Purchase portable emergency generator.	District Wide	Power Outage	$313,000	Operations	Long Term	District Capital Reserves	New
Evaluate the need for additional diesel storage.	District Wide	Power Outage	Unknown	Operations	Long Term	District Capital Reserves	New
Improve areas in the distribution system identified in the Master Plan to provide adequate fire flow.	District Wide	Power Outage	$2,000,000	Operations	Long Term	District Capital Reserves	New
LOW PRIORITY							
Relocate Fuel Storage Tanks at WRP Above Ground.	WRP	Wildfire, Flood, Seismic Shaking	$450,000	Operations	Long Term	District Capital Reserves	Existing
Install additional storage at sewer lift stations to enhance response time in the event of pump station failures.	All	Wildfire, Flood, Seismic Shaking	Unknown	Operations/ Engineering	Long Term	District Capital Reserves	Ongoing
Conduct a seismic vulnerability assessment of critical facilities.	All	Seismic Shaking and Liquefaction	Unknown	Engineering	Long Term	District Capital Reserves	Ongoing
Implement Infiltration & Intrusion Study Flow Monitoring Project.	District Wide	Flood	Unknown	Operations	Long Term	District Capital Reserves	Ongoing

F.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Configure and backup server VM's to a cloud cold site.
  - **Status:** Complete.
- **Mitigation:** Install Cyber Security Monitoring System
  - **Status:** Complete.
- **Mitigation:** Demolish abandoned water treatment plant.
  - **Status:** Complete.
- **Mitigation:** Install additional wet well storage and emergency overflow storage at the Oso Lift Station as a component of the Oso Lift Station Improvement Project.
  - **Status:** Complete.
- **Mitigation:** Implement protective measures for the 4920 Lift Station influent siphon at creek crossing.
  - **Status:** Complete.
- **Mitigation:** Replace sodium hypochlorite storage tanks at Reservoir 6 to prevent a chemical spill.
  - **Status:** Complete.
- **Mitigation:** Purchase trailer mounted wastewater emergency pump.
  - **Status:** Complete.
- **Mitigation:** Aliso Creek Lift Station Emergency Pump.
  - **Status:** Complete.
- **Mitigation:** Replace Ocean Outfall Pump Station Emergency Generator
  - **Status:** Complete.

F.8 PLAN INTEGRATION

ETWD's capital budget, Water Master Plan, Wastewater Master Plan and Annual Operating Budget are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, ETWD will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, ETWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- Risk assessment information used to update the hazard analysis in the ETWD Emergency Operations Plan.
- Hazard profiles and risk assessment informed the Water Master Plan and the provision of an adequate supply of water as an essential service to ensure public health and safety, community well-being, and economic growth.

ETWD will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this Plan.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex G: Laguna Beach County Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

LAGUNA BEACH COUNTY WATER DISTRICT ANNEX

Laguna Beach County Water District (LBCWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, LBCWD representatives were part of the HMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to LBCWD.

This annex details the hazard mitigation planning elements specific to LBCWD and describes how LBCWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by LBCWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to LBCWD with a focus on the risk assessment and mitigation strategies.

G.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit G-1** lead the LBCWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with LBCWD staff and the consultant team supporting the effort.

Exhibit G-1. Planning Team Lead

Primary Point of Contact
Name: Leo Lopez
Title: Risk and Resiliency Officer
Telephone: (949)494-1041
Email: llopez@lbcwd.org

LBCWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as LBCWD's internal hazard mitigation planning development team.

Exhibit G-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Chris Regan	Assistant General Manager

Outreach to the public within LBCWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, LBCWD published a webpage with information on the MJHMP process. Additionally, a new post was released on their news webpage.

G.2 JURISDICTION PROFILE

Service Population: 19,820

Laguna Beach is well known as a unique beach community and artist's colony. LBCWD provides water services to 19,820 people within an 8.5 square mile area, including portions of the City of Laguna Beach, a portion of Crystal Cove State Park, and the community of Emerald Bay. LBCWD serves approximately 3,800-acre feet of water annually to its 8,488 customers. There are 21 water storage reservoirs with a total storage capacity of 33.5 million gallons. LBCWD staff operates and maintains 36 pumps in 11 pumping stations and 135 miles of distribution pipelines ranging in diameter from 4 to 16 inches.

The area's sewer and storm drain services are managed by the Water Quality Department of the City of Laguna Beach. The department is organized into two divisions: Wastewater and Water Quality. Wastewater is responsible for maintaining 95 miles of sewer lines, 26 pump stations and the four-mile North Coast Interceptor that transmits sewage to the regional treatment plant operated by SOCWA. Water Quality is a new division formed to implement the water quality permit approved by the San Diego Regional Water Quality Control Board in 2002. The new permit identifies multiple tasks cities and counties must complete to comply with the permit and reduce water pollution.

G.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that LBCWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

LBCWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the LBCWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect LBCWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit G-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the primary plan.

Exhibit G-3. LBCWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Base Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to LBCWD
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards – Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards –Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	Medium
Severe Weather – Windstorm	Highly Likely	Large	Limited	Negligible	Medium	High
Severe Weather – Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Low
Severe Weather – Drought	Highly Likely	Large	Negligible	Negligible	Medium	High
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	N/A
Flood	Likely	Medium	Limited	Negligible	Medium	Medium
Coastal Hazards – Coastal Storms	Likely	Small	Limited	Limited	Medium	Medium
Coastal Hazards – Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Medium
Seismic Hazards – Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	Low
Geological Hazards –Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	High
Coastal Hazards – Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Medium
Human-Caused Hazards – Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards – Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Low
Human-Caused Hazards – Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards – Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	N/A
Geological Hazards – Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	N/A
Coastal Hazards – Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Low

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to LBCWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit G-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and LBCWD.

G.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit G-4. Fire Hazard and LBCWD Potable Water Infrastructure

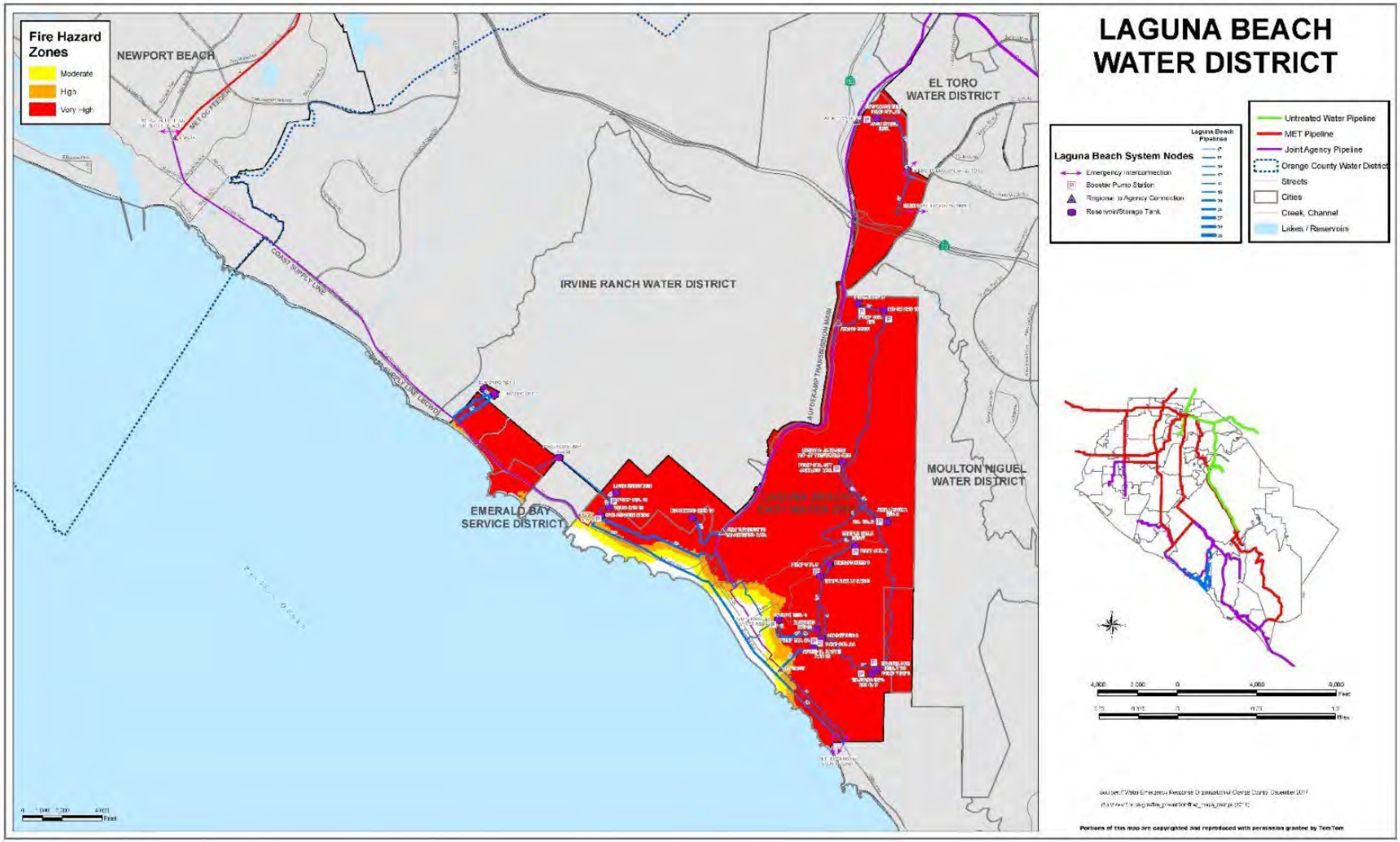


Exhibit G-5. Flood Hazard and LBCWD Potable Water Infrastructure

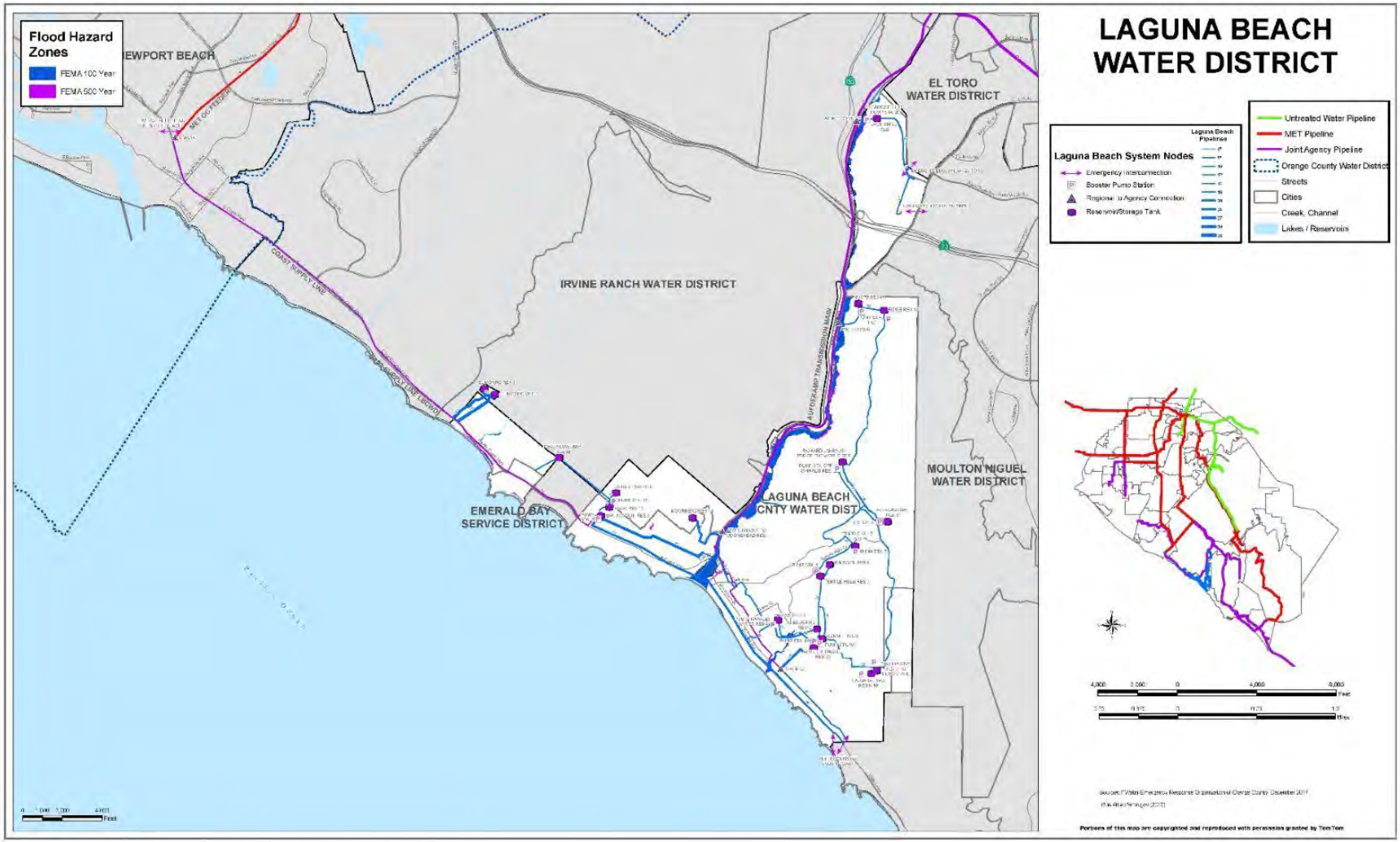


Exhibit G-6. Seismic Shaking Hazard and LBCWD Potable Water Infrastructure

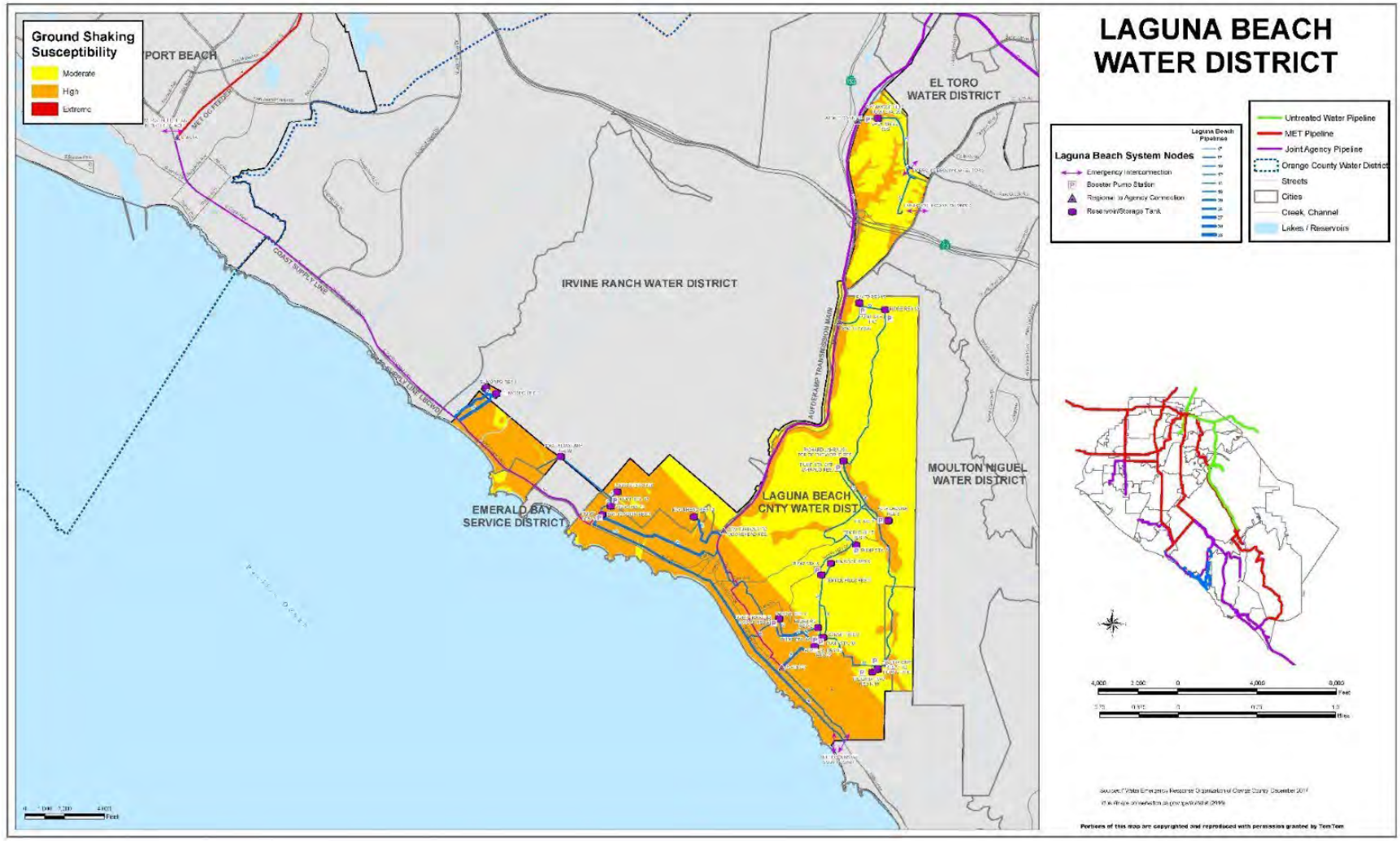


Exhibit G-7. Liquefaction Hazard and LBCWD Potable Water Infrastructure

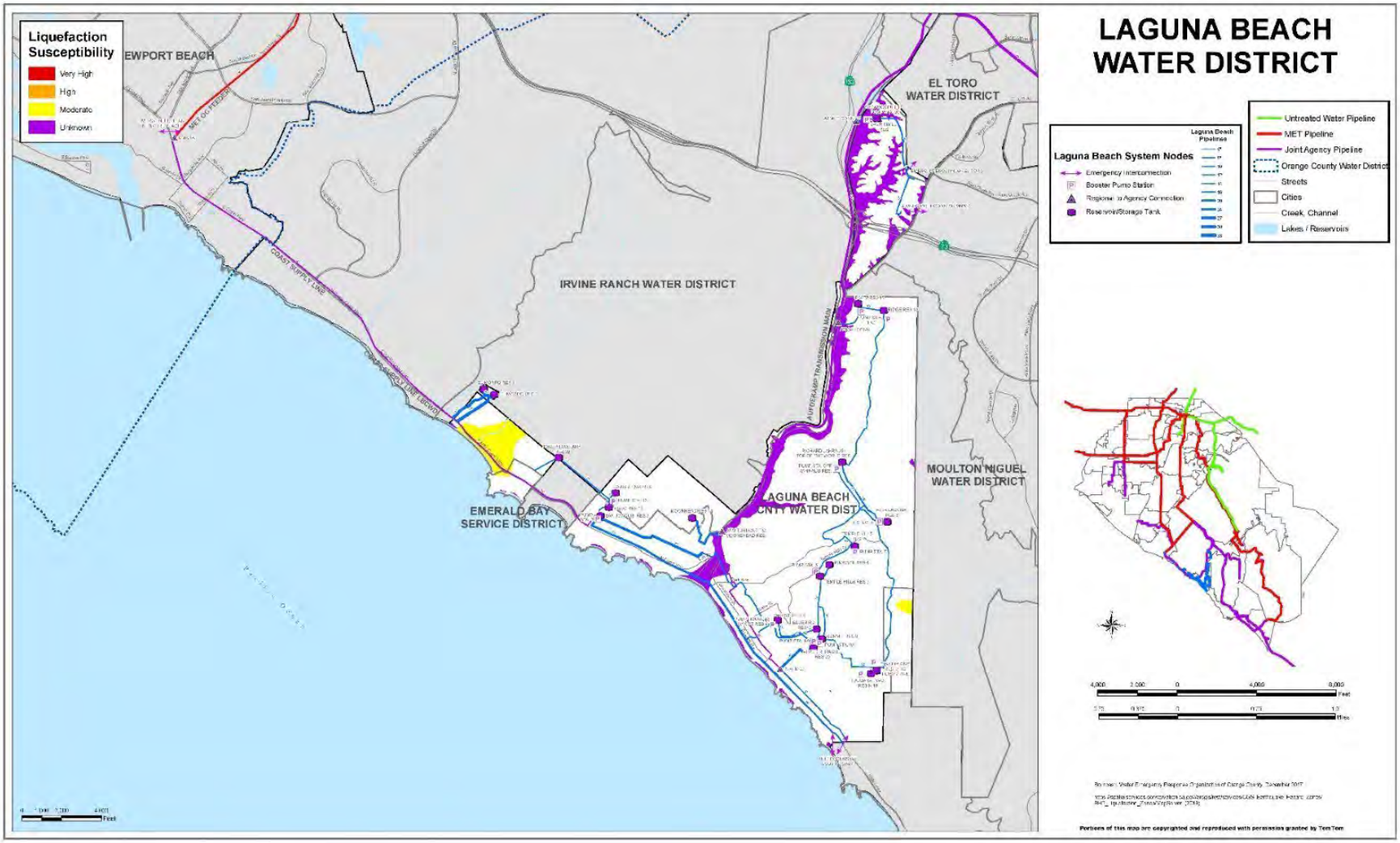


Exhibit G-8. Landslide Hazard and LBCWD Potable Water Infrastructure

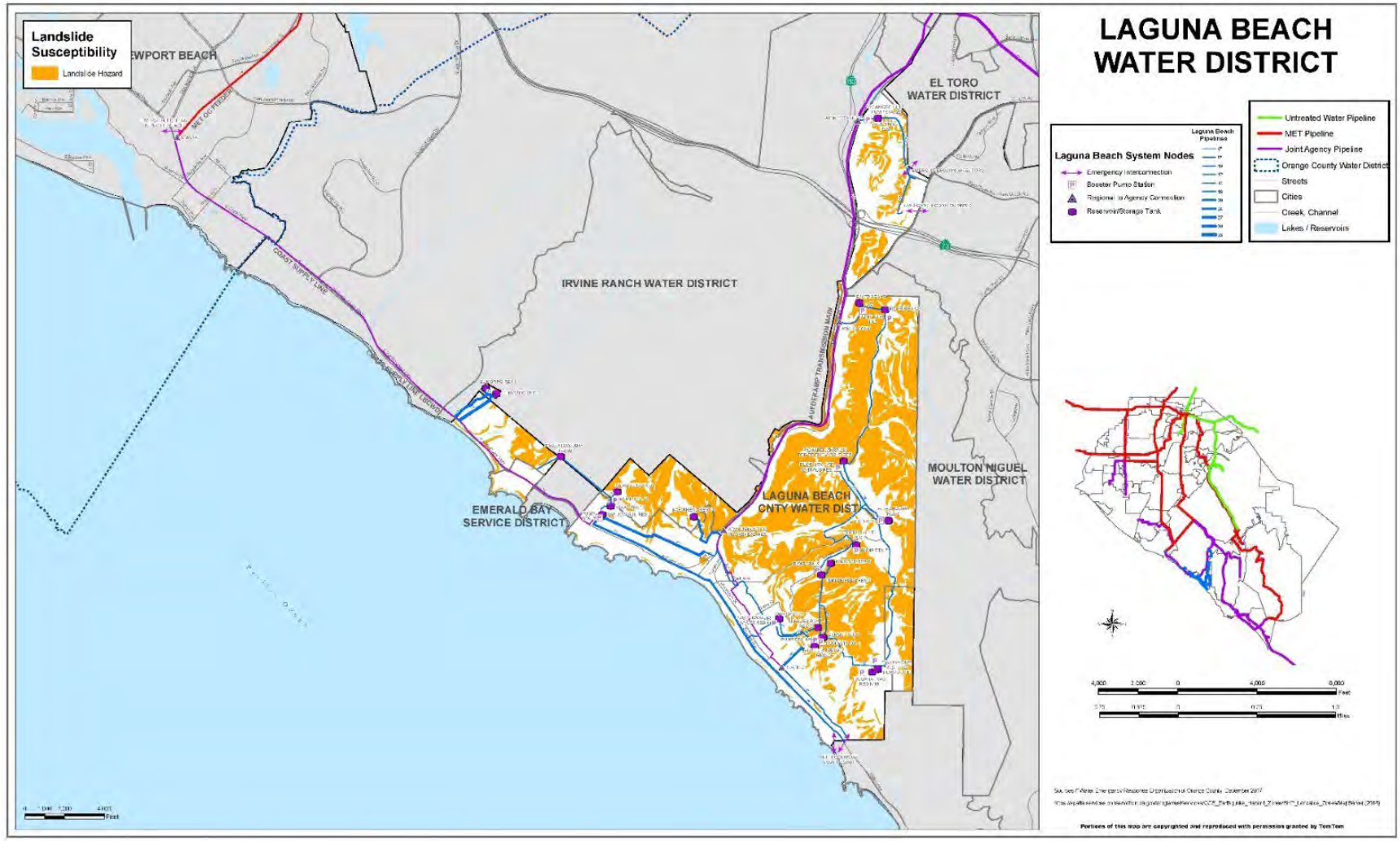
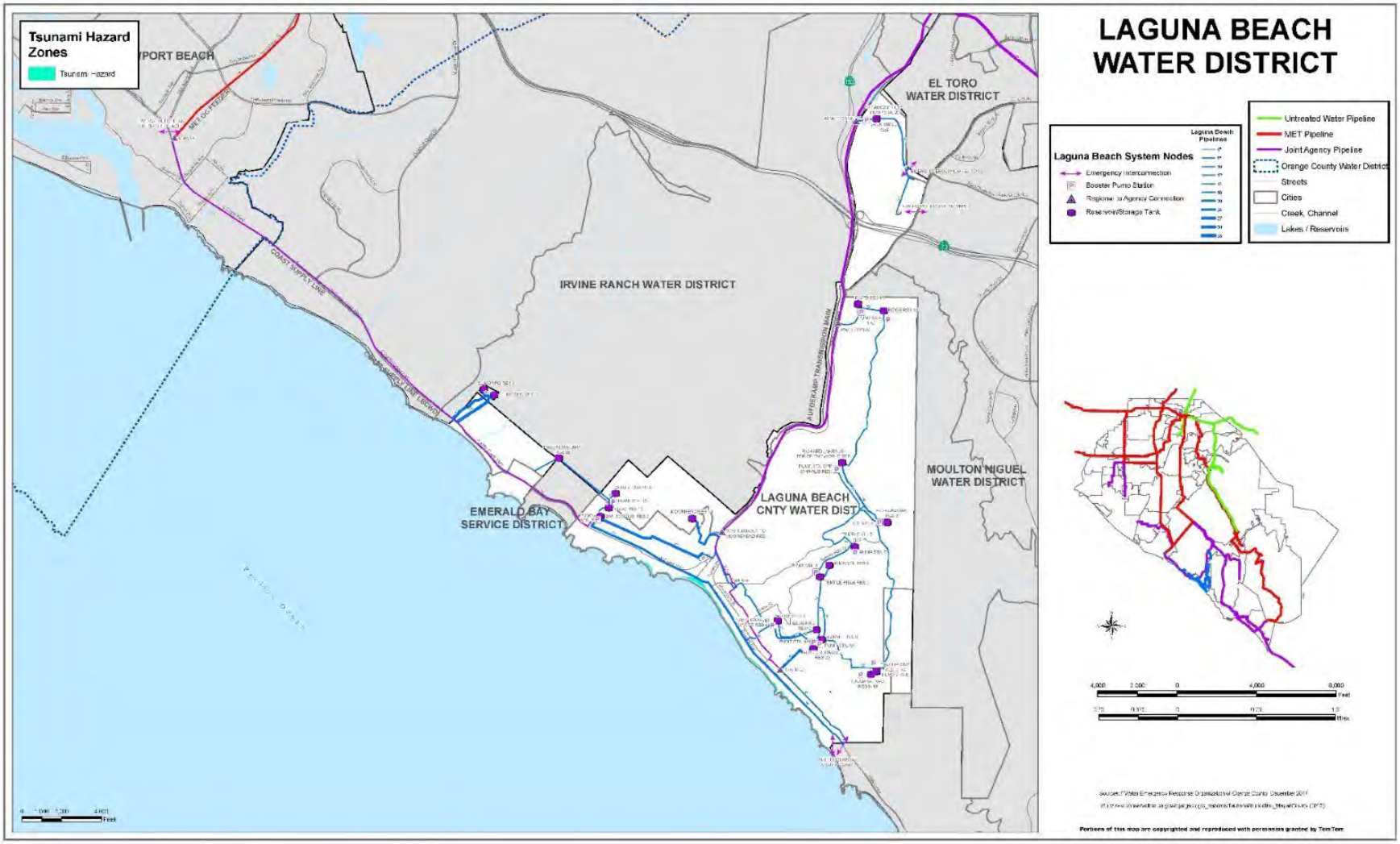


Exhibit G-9. Tsunami Hazard and LBCWD Potable Water Infrastructure



G.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within LBCWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

LBCWD's infrastructure is outlined in **Exhibit G-10**, which lists the number infrastructure assets are located within the mapped hazard zones identified above.

Exhibit G-10. LBCWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type						
		Interties (#)	Pump Stations (#)	Treatment Plants (#)	Reservoirs (#)	Wells (#)	Potable Pipelines (miles)	Helo Pad (#)
Fire Hazard Zone	Moderate	1	1	0	2	0	1.1	0
	High	0	1	0	2	0	1.7	0
	Very High	0	3	0	3	0	14.8	0
FEMA Flood Zone	100-Year	0	1	0	0	0	0.5	0
	500-Year	1	0	0	0	0	0.1	0
Alquist-Priolo Rupture Zone		0	0	0	0	0	0	0
Seismic Shaking	Moderate	0	7	0	0	0	7.4	0
	High	13	12	1	3	10	11.8	1
	Extreme	0	0	0	0	0	0	0
Liquefaction	Moderate	0	1	1	1	5	0	0
	High	4	1	0	0	5	0	0
	Very High	0	0	0	0	0	0	0
	Unknown	0	0	0	0	0	1.0	0
Landslide Zone		0	2	0	0	0	3.0	0
Tsunami Zone		0	14	0	0	0	0	2

Much of LBCWD's potable pipelines are located within areas identified as very high fire hazard zones. Several interties, pump stations, reservoirs, and wells, as well as a treatment plant are in areas susceptible to a high amount of seismic shaking and liquefaction. Additionally, LBCWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone.

Changes in Land Use and Development

LBCWD serves portions of the City of Laguna Beach, a portion of Crystal Cove State Park, and the community of Emerald Bay. These communities served by LBCWD are built out with the majority of land used for residential neighborhoods and commercial areas. Open land within LBCWD's service area consists of steep terrain and protected natural areas where development is unlikely to occur. Due to the limited availability for development within the LBCWD service area there is some increase in demand expected, but only by approximately 200-300 gallons per day (gpd). To ensure LBCWD is able to meet current and future demands, various projects have been performed and are

planned throughout the LBCWD system. One of the largest projects LBCWD is committed to is the advancement of the Doheny Desalination Plant that will allow partnering water agencies to use the ocean's salt water as a source of potable water.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across LBCWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazard: Power Outage	Climate change will likely increase LBCWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact LBCWD facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within LBCWD's service area.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact LBCWD as described in the base plan.
Severe Weather: Windstorm	The challenges to LBCWD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Wildfire	Climate change is expected to cause an increase wildfires within the entire LBCWD service area due to the high wildland coverage and Laguna Coast Wilderness Park directly to the west.
Hazards of Medium Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to LBCWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to LBCWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for LBCWD from climate change will mirror the impacts discussed in the base plan.
Flood	Climate change is expected to cause some higher-level flood waters within LBCWD along the Laguna Canyon Road with the 100-year flooding events potentially expanding into the 500-year flood zones on a more frequent basis.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the LBCWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Hazards of Low Concern	
Coastal Hazards: Tsunami	LBCWD's vulnerability to tsunamis is not expected to change due to climate change.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.

Hazard	Climate Change Vulnerabilities
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within LBCWD's service area as a result of climate change.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact LBCWD's service area as described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

G.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. LBCWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits G-11a through G-11d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. LBCWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit G-11a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Engineering Department, LBCWD	LBCWD complies with applicable building codes and works with cities located within the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified LBCWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	Cities within the LBCWD jurisdiction.	LBCWD complies with applicable zoning codes and works with cities located within the service area.
Subdivision Ordinance or Regulations	City/County	LBCWD complies with applicable subdivision ordinance or regulations and works with cities located within the service area.
Special Purpose Ordinance	City/County	LBCWD complies with applicable special purpose ordinances and works with the cities located within the service area.
Growth Management Ordinances	City/County	LBCWD complies with applicable growth management ordinances and works with the cities located within the service area.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		Expansion and Improvement: Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, LBCWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	City/County	LBCWD complies with applicable site plan review requirements and works with cities located within the service area. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plan	City/County	LBCWD complies with applicable General Plan requirements and works with cities located within the service area.
Capital Improvements Plan	Engineering Department, LBCWD	Revised annually. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Economic Development Plan	City/County	LBCWD complies with applicable economic development plans and works with cities located within the service area.
Emergency Response Plan	All Departments.	State and Local jurisdictions. Continually updated and maintained. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure LBCWD is better prepared for future incidents and can anticipate their communities' needs.
Comprehensive/ Master Plan	All Departments	LBCWD follows its 10-year Master plan which was developed in 2018.

How can these capabilities be expanded and improved to reduce risk?
▪ Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ As a component of the annual review of the agency's emergency response plan ensure mitigation actions are included and updated as needed. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the CA Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.

Exhibit G-11b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Engineering Department, LBCWD	State and Local jurisdictions. 1 Senior Engineer Planner; 1 Engineer Technician. Attend trainings, continuing education related to land use planning and hazard mitigation.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering Department, LBCWD	State and Local jurisdictions. 1 Senior Engineer Planner; 1 Engineer Technician.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	Engineering Department, LBCWD	State and Local jurisdictions. 1 Senior Engineer Planner.
Surveyors	Engineering Department, LBCWD	State and Local jurisdictions. 1 Senior Engineer Planner; 1 Engineer Technician.
Personnel Skilled in GIS and/or HAZUS	Engineering Department, LBCWD	State and Local jurisdictions. 1 GIS Technician.
Water Quality	Engineering Department	LBCWD – 1 Water Quality Specialist.
Grant writing	General Manager and Management Staff	District staff write and solicit grants when appropriate and available.
Mutual aid agreements	All Departments	LBCWD participates in CalWARN and WEROC.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend CalOES Safety Assessment Program (SAP) training for building inspections. ▪ Identify specialized training for additional employees at agency to properly prepare for emergencies. ▪ Annual review with agency personnel and city personnel to ensure mitigation actions are included in the emergency response plan. ▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program.

Exhibit G-11c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech. **Expansion and Improvement:** During annual budgeting LBCWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech.
Fees for Water, Sewer, Gas, or Electric Service	Finance Department & Customer Service Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech. Collects water rates and fees only. **Expansion and Improvement:** Analysis of future fees for services should analyze

Financial Resources	Agency or Department	Description/Comments
		potential mitigation funding support opportunities to capture funding for these projects.
Impact Fees for Homebuyers or Developers for New Developments/Homes	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech. Capacity fees for water only.
Incur Debt Through General Obligation Bonds	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech.
Incur Debt Through Private Activity Bonds	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech.
Withhold Spending in Hazard-Prone Areas	Finance Department, LBCWD	1 Manager of Finances; 1 Accountant; 1 Senior Accountant Tech.
Grants	Financial and Administrative Services Department	1 Manager of Financial and Administrative Services.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Finance Department to incorporate mitigation actions into agency budget through planning meetings and when funding is identified. ▪ Ensure the inclusion of mitigation actions in capital improvements plan as they relate to the construction of new structures or retrofit improvements to existing structures.

Exhibit G-11d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Water Conservation	Water Use Efficiency Department and Public Affairs	LBCWD hosts the SmartScape Expo and participates at local community events to educate residents. Water Use Efficiency Specialist and Assistant General Manager.
Local News	Public Affairs	LBCWD has relationships with local news outlets and provides press releases, interviews, photos ops, and media tours when appropriate.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to LBCWD. ▪ Work with partner agencies to host/engage community outreach and public education. ▪ Use social media and agency website to engage the community and public education.

G.7 MITIGATION STRATEGY

G.7.1 Mitigation Goals

LBCWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

G.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit G-12,** LBCWD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit G-12. LBCWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Develop a partnership with South Coast Water District for diesel fuel.	All Facilities	All Hazards	Unknown			Budget	New
Drought mitigation – partner with Fountain Valley and Newport Beach on wells in the basin.	All Facilities	Drought	Unknown			Budget	New
Build a third helipad station in partnership with Long Beach.		All Hazards	Unknown			Budget, Grant	New
Develop, update, and maintain an emergency communications plan that establishes lines of communication to be utilized during disaster events.	All Facilities	All Hazards	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going
Seismically evaluate buried or partially buried concrete reservoirs and vaults.	Reservoirs	Seismic Hazards: Seismic Shaking	Unknown	Engineering	Immediate	Budget, Grant	Existing, On Going
MEDIUM PRIORITY							
Develop comprehensive and proactive approaches to reduce possibility of damages and losses by including hazard review and mitigation in new project design and existing facility upgrades.	All Facilities	Wildfire, Flood, Landslide	Unknown	Emergency Management	Immediate	Budget	Existing, On Going
Develop and maintain mutual aid agreements with other utility groups for support and assistance during a disaster.	All Facilities	Wildfire, Flood, Landslide, Saltwater Contamination, Drought, and Winds	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going
Leak test all reaches of the ATM and CSL.	ATM and CSL	All Hazards	$350,000	Operations	Immediate	Budget, Grant	Existing, On Going
Maintain an active preventive maintenance program on all the components of the Aufdenkamp Transmission Main (ATM), the Coast Supply Line (CSL), Cross Town Feeder, and Laguna Pacific Main.	ATM, the CSL, Cross Town Feeder, and Laguna Pacific Main	All Hazards	Unknown	Operations	Immediate	Budget, Grant	Existing, On Going
Maintain an effective training program on the proper operation of all routine, safety, and emergency equipment.	All Facilities	Wildfire, Flood, Winds Landslide, Drought	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going
Participate and coordinate with WEROC and other member agencies in hazard and disaster preparedness.	All Facilities	Wildfire, Flood, Landslide, Saltwater Contamination, Drought, and Winds	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Perform semi-annual inspections for facilities prior to seasonal hazard events (fire season, rain season).	All Facilities	Wildfire, Flood, Landslide, Winds, Power Outage	Unknown	Operations	Immediate	Budget, Grant	Existing, On Going
Practice disaster response procedures through training and practice drills.	All Facilities	All Hazards	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going
Provide NIMS training for staff as required through FEMA and CalEMA and update NIMSCAST annually.	All Facilities	Wildfire, Flood, Landslide; Saltwater Contamination; Drought and Winds	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going
Risk and Resilient Analyst “Keepers of the Plan” to promote cooperative knowledge of the District's Emergency Operations Plan and staff involvement in disaster response preparations.	All Facilities	Wildfire, Flood, Landslide, Saltwater Contamination, Drought, and Winds	Unknown	Emergency Management	Immediate	Budget, Grant	New
Seismically retrofit existing steel reservoirs that are 20 years and older.	All Facilities	Seismic Hazard: Seismic Shaking	Unknown	Engineering/ Operations	Immediate	Budget, Grant	Existing, On Going
Work with the City of Laguna Beach to review and approve project plans that may impact District resources.	All Facilities	All Hazards	Unknown	Emergency Management	Immediate	Budget, Grant	Existing, On Going

G.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Develop a CSL and ATM isolation plan.
  - **Status:** Complete and revised as needed
- **Mitigation:** Potable water tank trailer.
  - **Status:** Complete.

G.8 PLAN INTEGRATION

LBCWD's capital budget, Water Master Plan, and Emergency Operations Plan are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, LBCWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- Mitigation actions were prioritized and implemented in the capital budget.
- The risk assessment and mitigation actions were used to inform LBCWD's Water Master Plan and Urban Water Management Plan.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex H: Moulton Niguel Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

MOULTON NIGUEL WATER DISTRICT ANNEX

Moulton Niguel Water District (MNWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, MNWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to MNWD.

This annex details the hazard mitigation planning elements specific to MNWD and describes how MNWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by MNWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to MNWD with a focus on the risk assessment and mitigation strategies.

H.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit H-1** lead the MNWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with MNWD staff and the consultant team supporting the effort.

Exhibit H-1. Planning Team Leads

Primary Point of Contact	Alternate Point of Contact
Name: Len Barton	Name: Cristina Garcia
Title: Safety & Emergency Manager	Title: Admin Analyst
Telephone: (949) 416-1646	Telephone: (949) 425-3568
Email: lbarton@mnwd.com	Email: cgarcia@mnwd.com

MNWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as MNWD's internal hazard mitigation planning development team.

Exhibit H-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Matthew Brown	IT Officer
Adrian Tasso	Operations
Dan Horn	Operations
Jesus Garibay jr.	Water reuse
Vicki Osborn	Support
Dan West	Operations
Kelsey Coleman	Communications
Ronin Goodall	Operations
Todd Dmytryshyn	Engineering
Jennifer Dooley	GIS Administrator

Outreach to the public within MNWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, MNWD

published a webpage with information on the MJHMP process. The MJHMP survey was posted to their website to increase engagement.

H.2 JURISDICTION PROFILE

Service Population: 170,000

MNWD was formed in November 1960 under provisions of the California Water District Law, Division 13 of the Water Code of the State of California. MNWD is governed by a publicly elected Board of Directors comprised of seven directors. The Board of Directors approves policy, establishes rates and charges for service, and adopts an annual budget to ensure ratepayers have a reliable, sustainable, and economic water and wastewater treatment services. MNWD is in the southern portion of the County of Orange and provides water and wastewater treatment service to over 170,000 customers. MNWD is almost entirely developed and encompasses all or portions of the cities of Aliso Viejo, Laguna Niguel, Laguna Hills, Mission Viejo, Dana Point, and San Juan Capistrano. MNWD, water supplies include approximately 75 percent imported water from Metropolitan through MWDOC and approximately 25 percent recycled water serving landscape irrigation services.

H.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that MNWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

MNWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the MNWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect MNWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit H-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit H-3. MNWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Moulton Niguel Water
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	High
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Medium
Flood	Likely	Medium	Limited	Negligible	Medium	High
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	High
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	High
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	High
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Low
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	High
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	High
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	High
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	High
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Medium
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	High

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to MNWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit H-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and MNWD.

H.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water and wastewater systems, as applicable.

Exhibit H-4. Fire Hazard and MNWD Potable Infrastructure

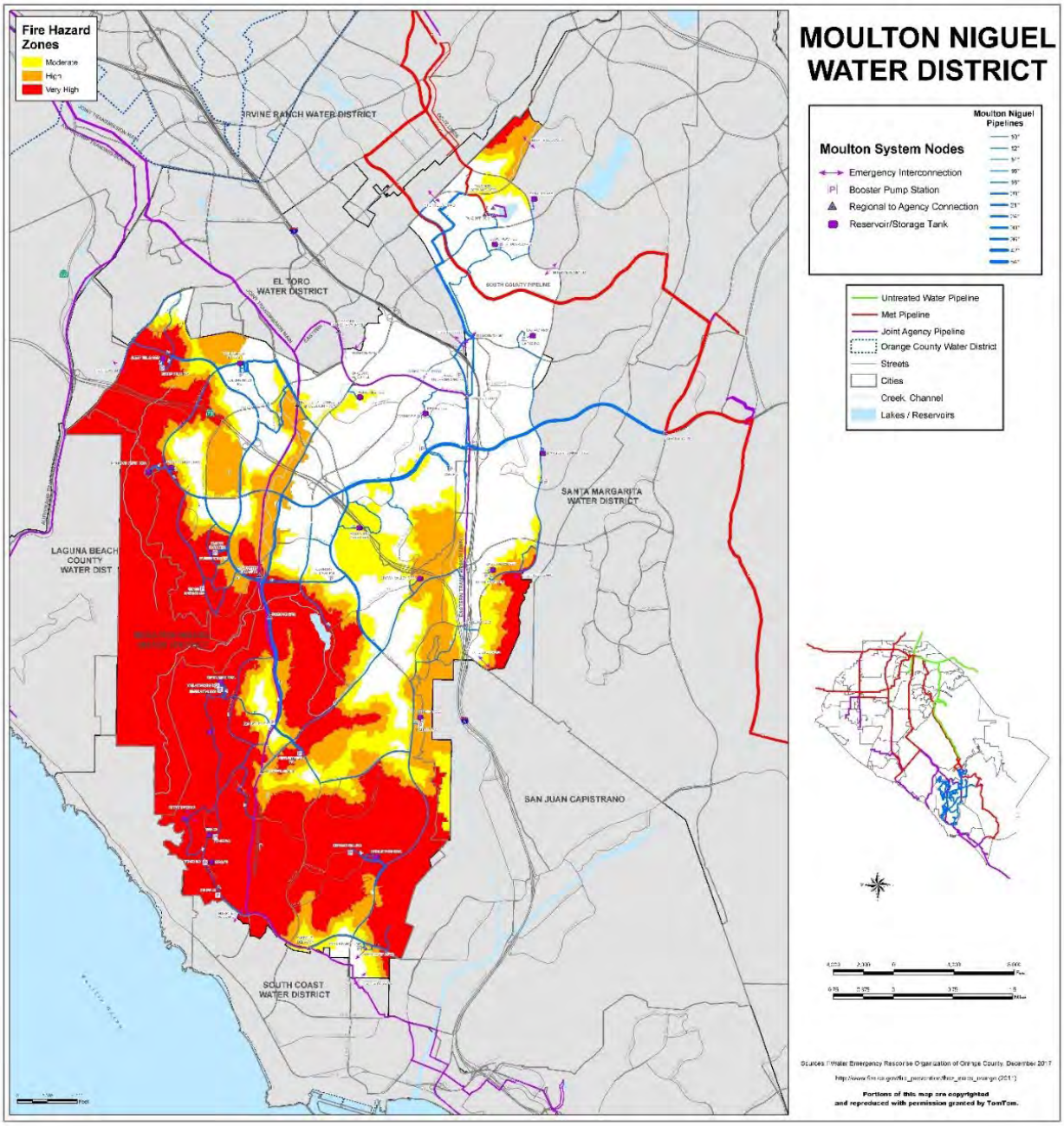


Exhibit H-5. Fire Hazard and MNWD Wastewater Infrastructure

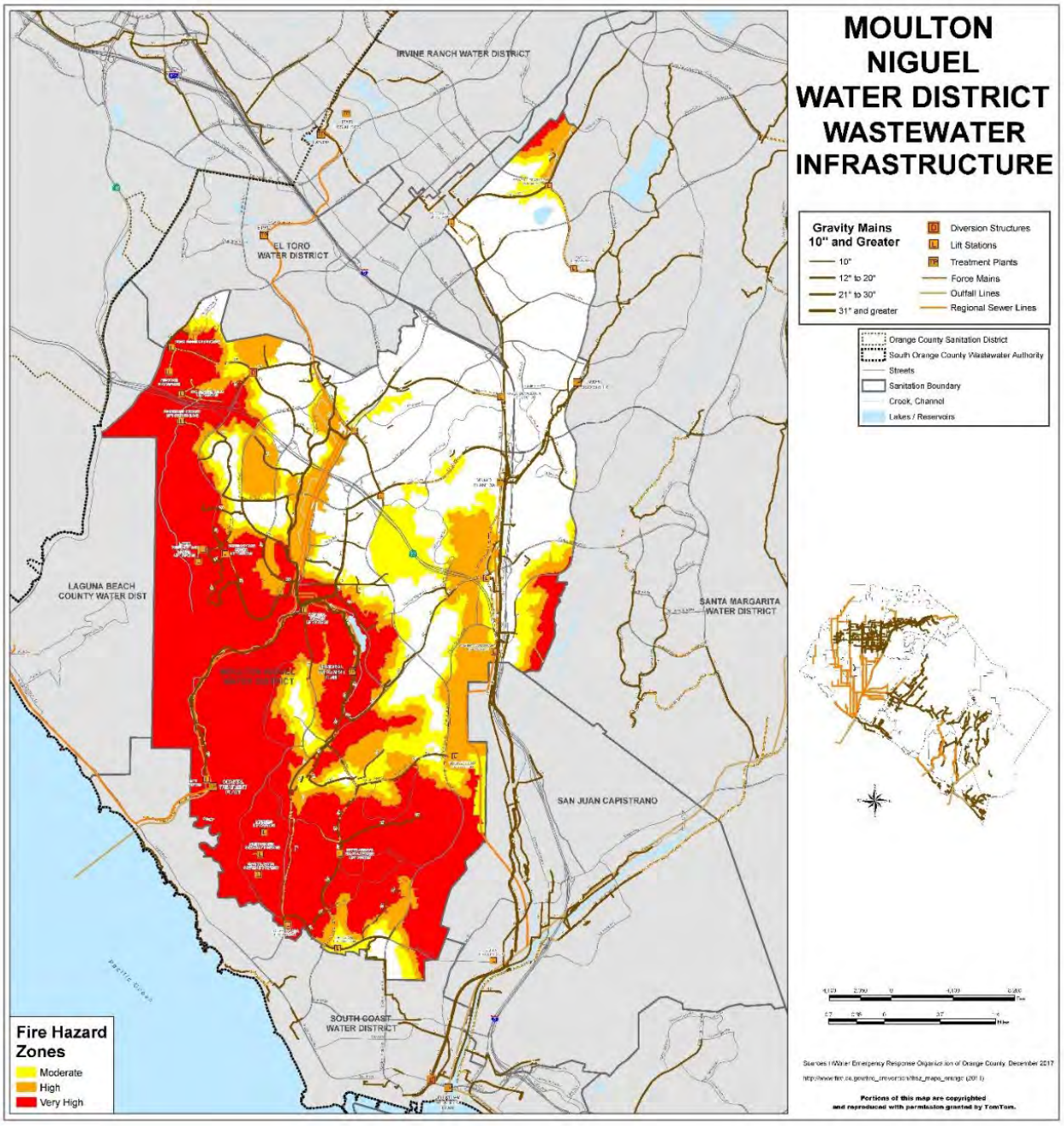


Exhibit H-6. Flood Hazard and MNWD Potable Infrastructure

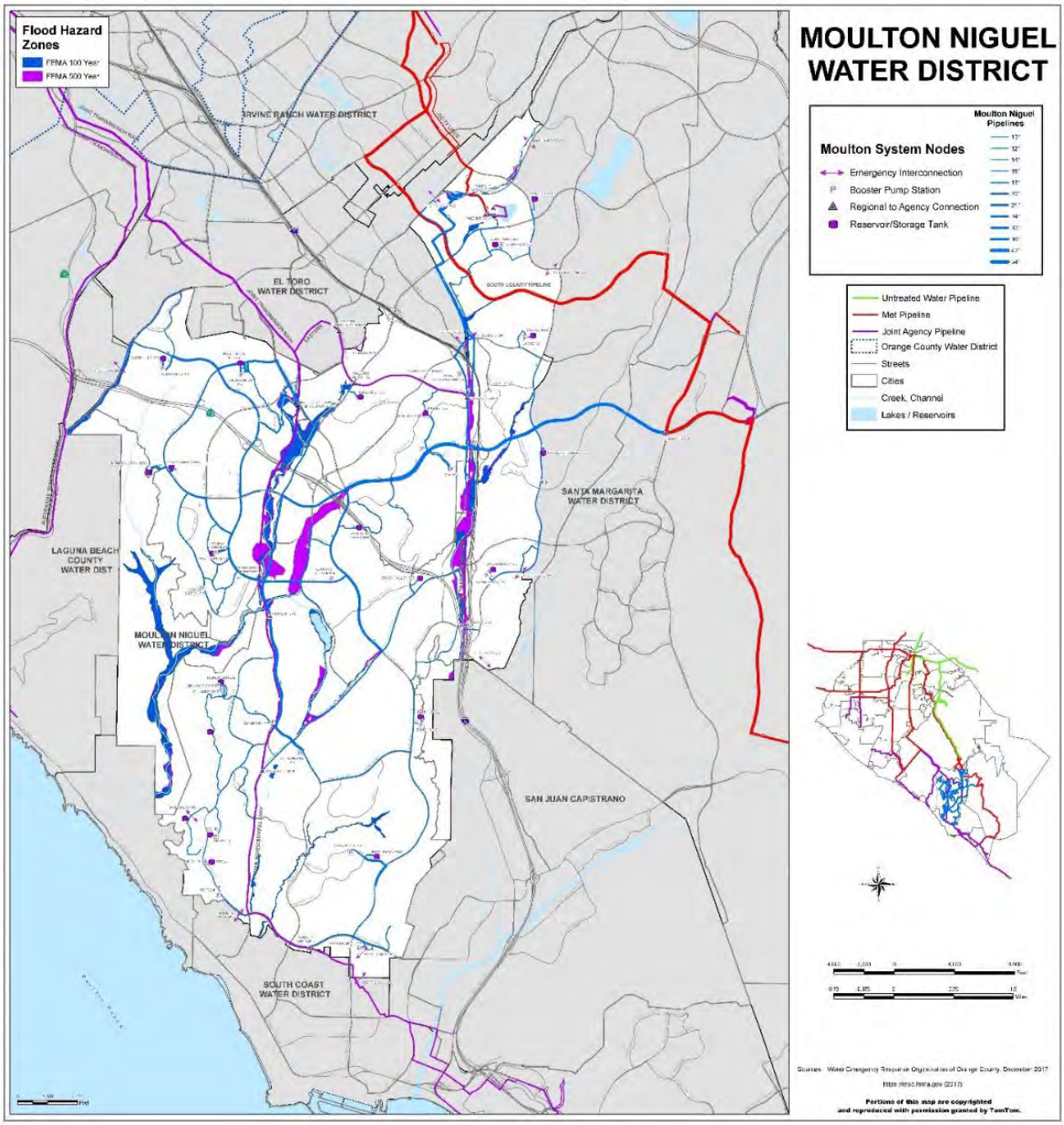


Exhibit H-7. Flood Hazard and MNWD Wastewater Infrastructure

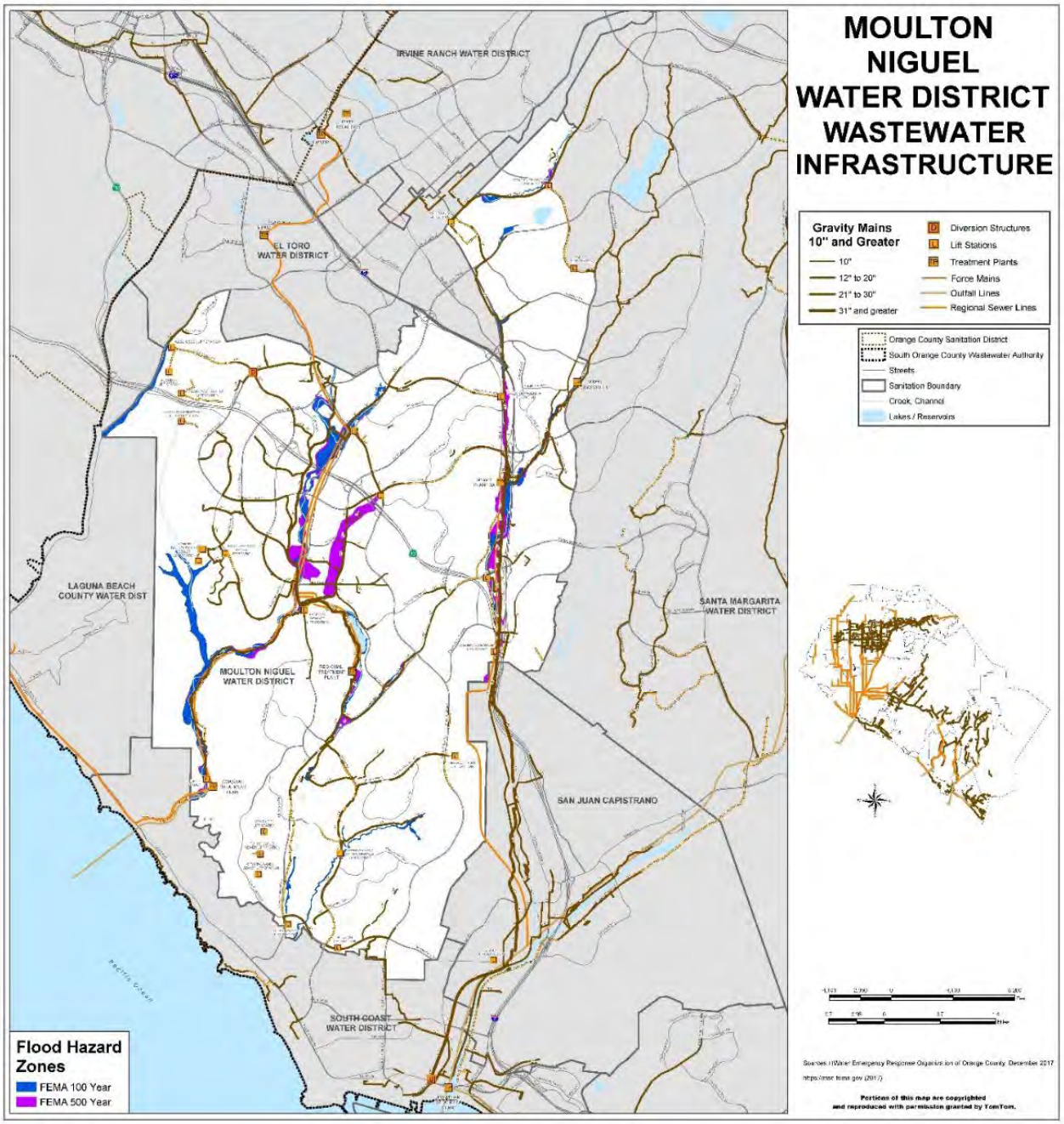


Exhibit H-8. Seismic Shaking Hazard and MNWD Potable Infrastructure

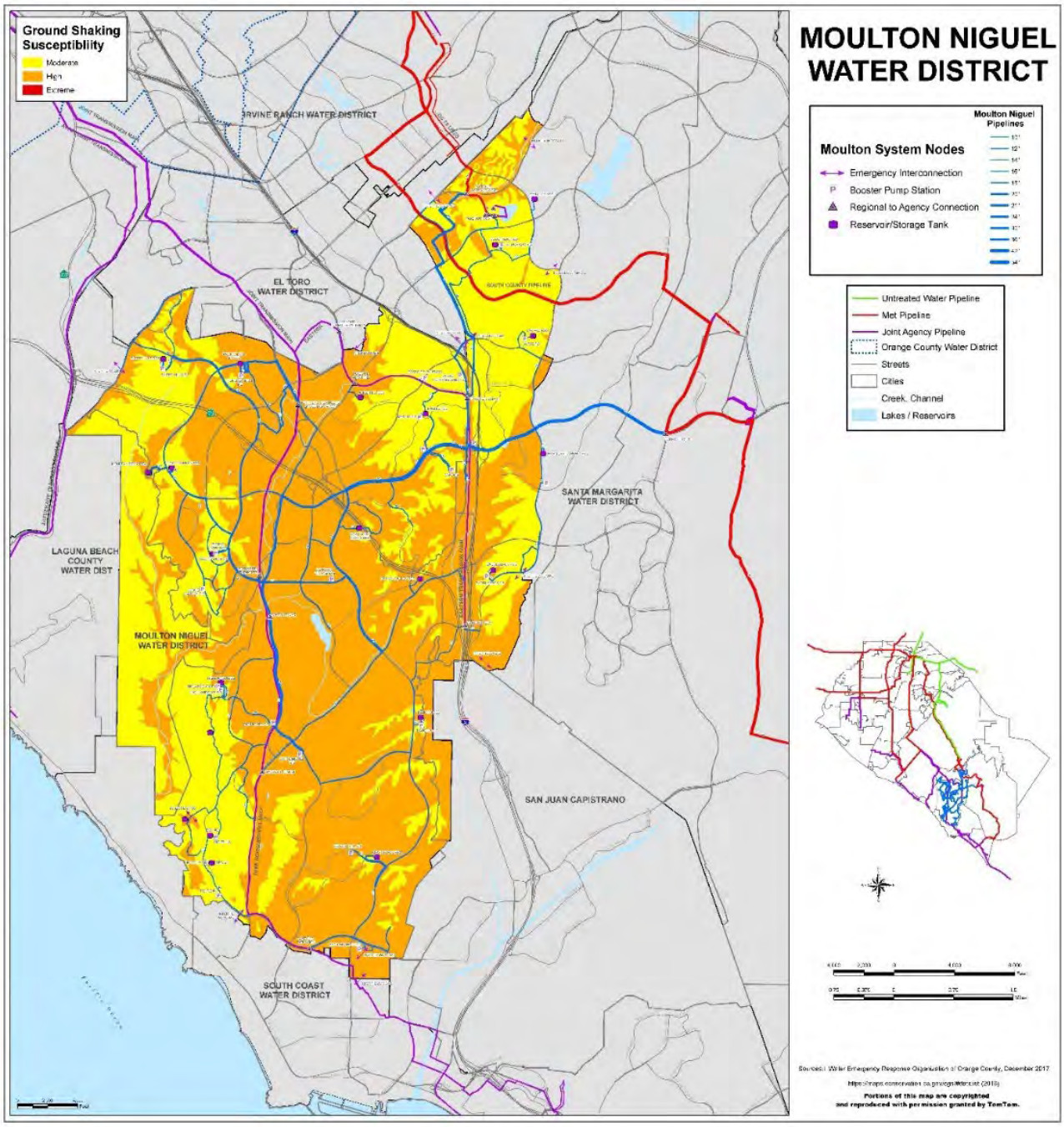


Exhibit H-9. Seismic Shaking and MNWD Wastewater Infrastructure

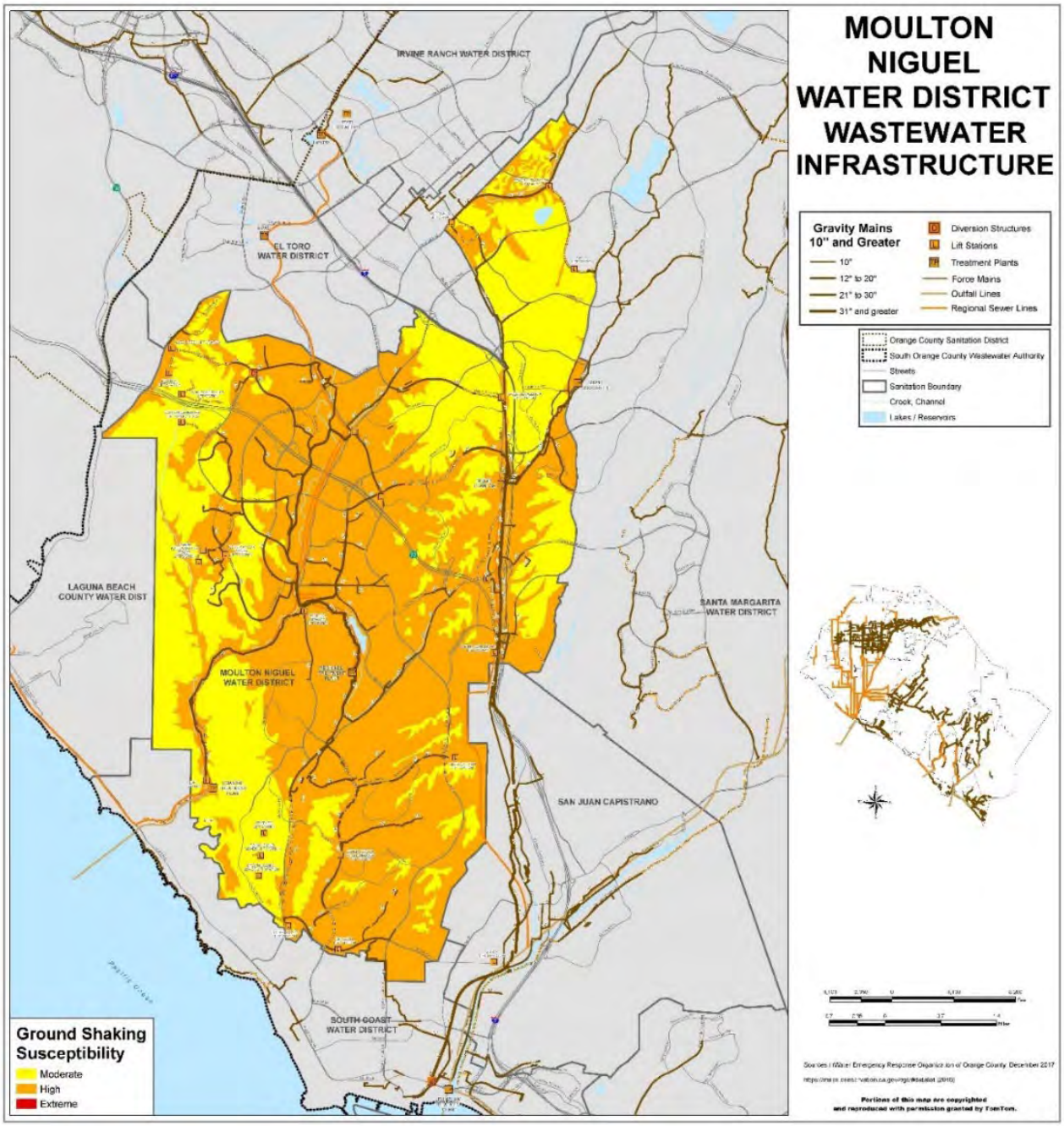


Exhibit H-10. Liquefaction Hazard and MNWD Potable Infrastructure

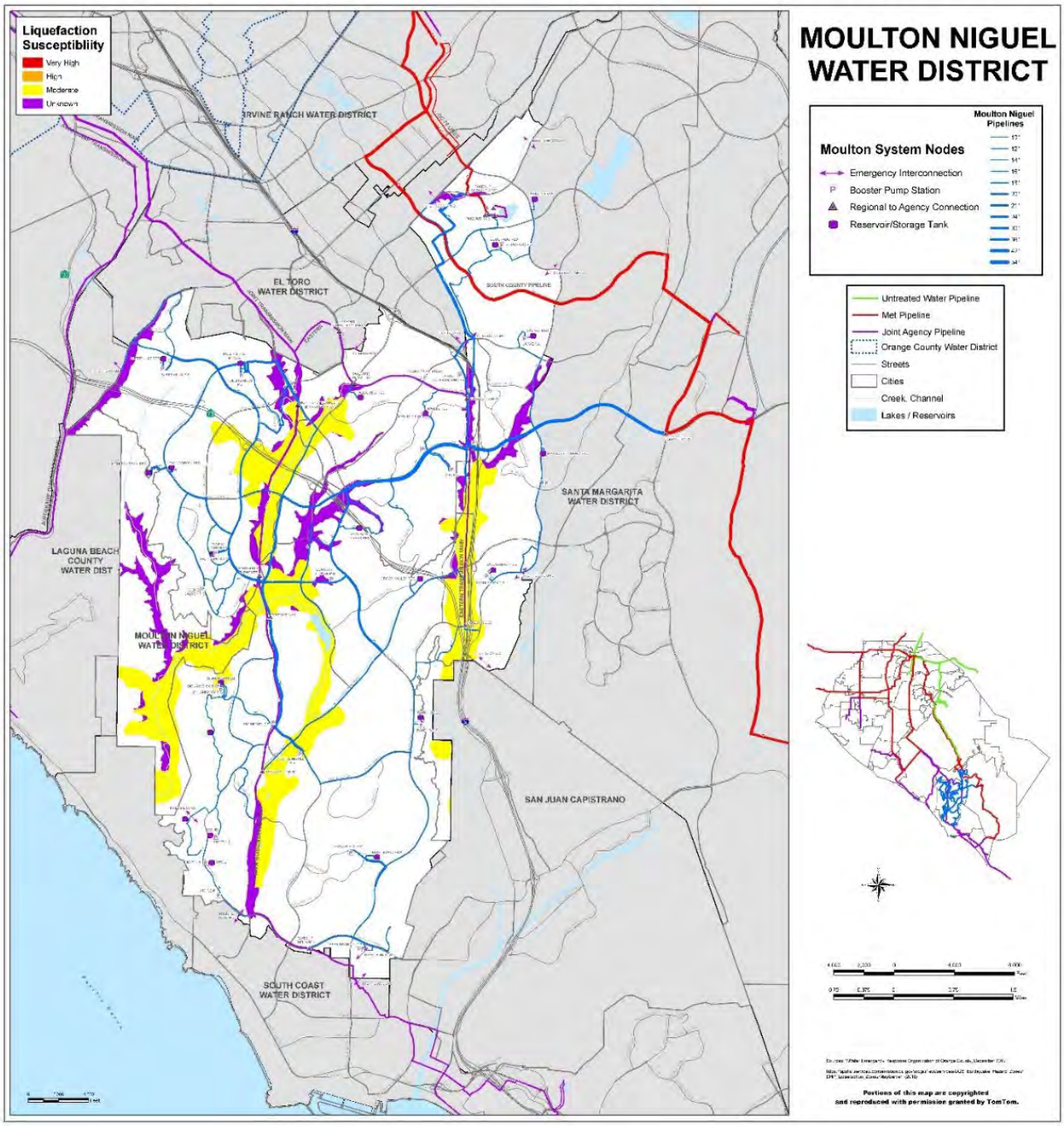


Exhibit H-11. Liquefaction Hazard and MNWD Wastewater Infrastructure

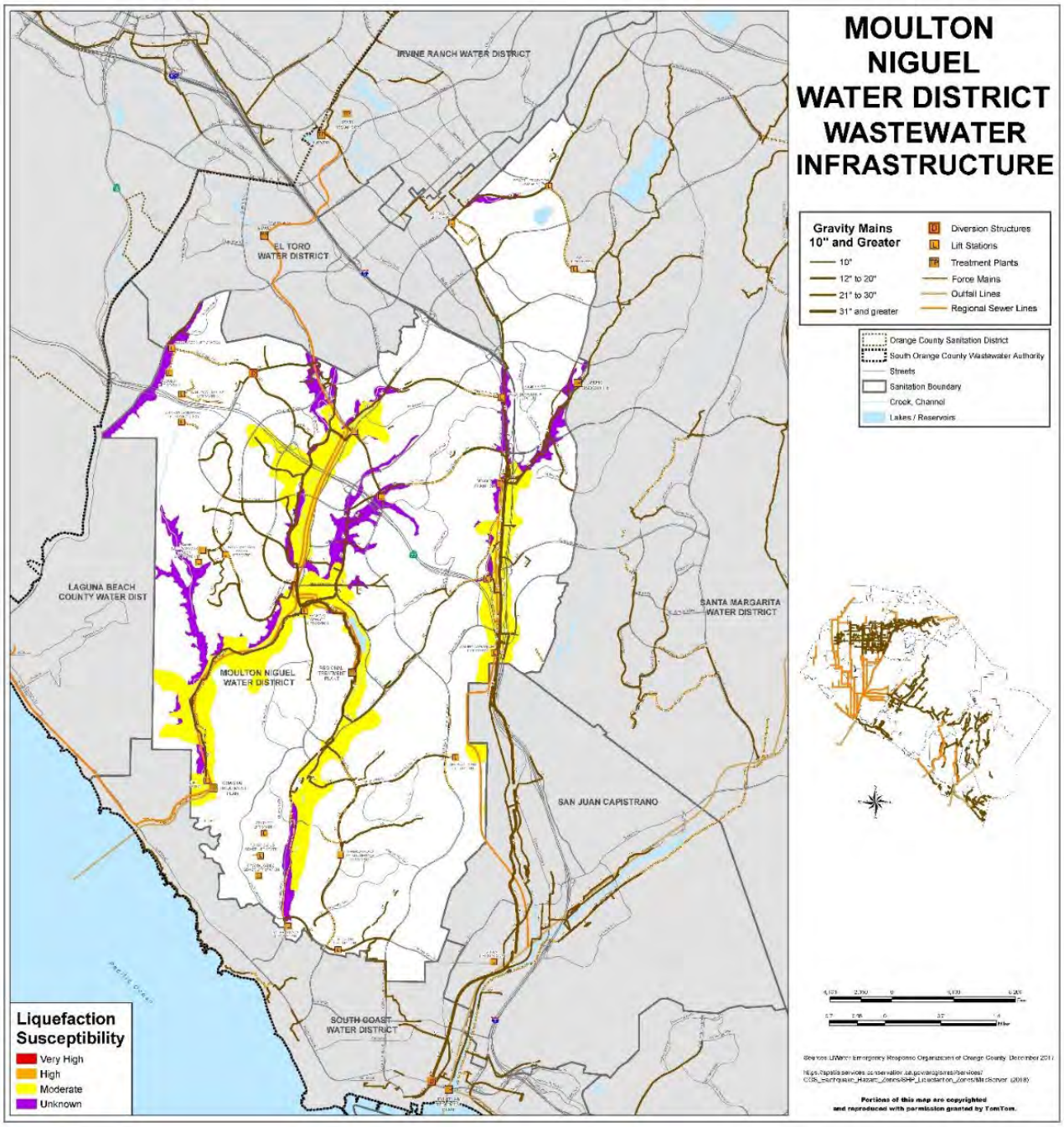


Exhibit H-12. Landslide Hazard and MNWD Potable Infrastructure

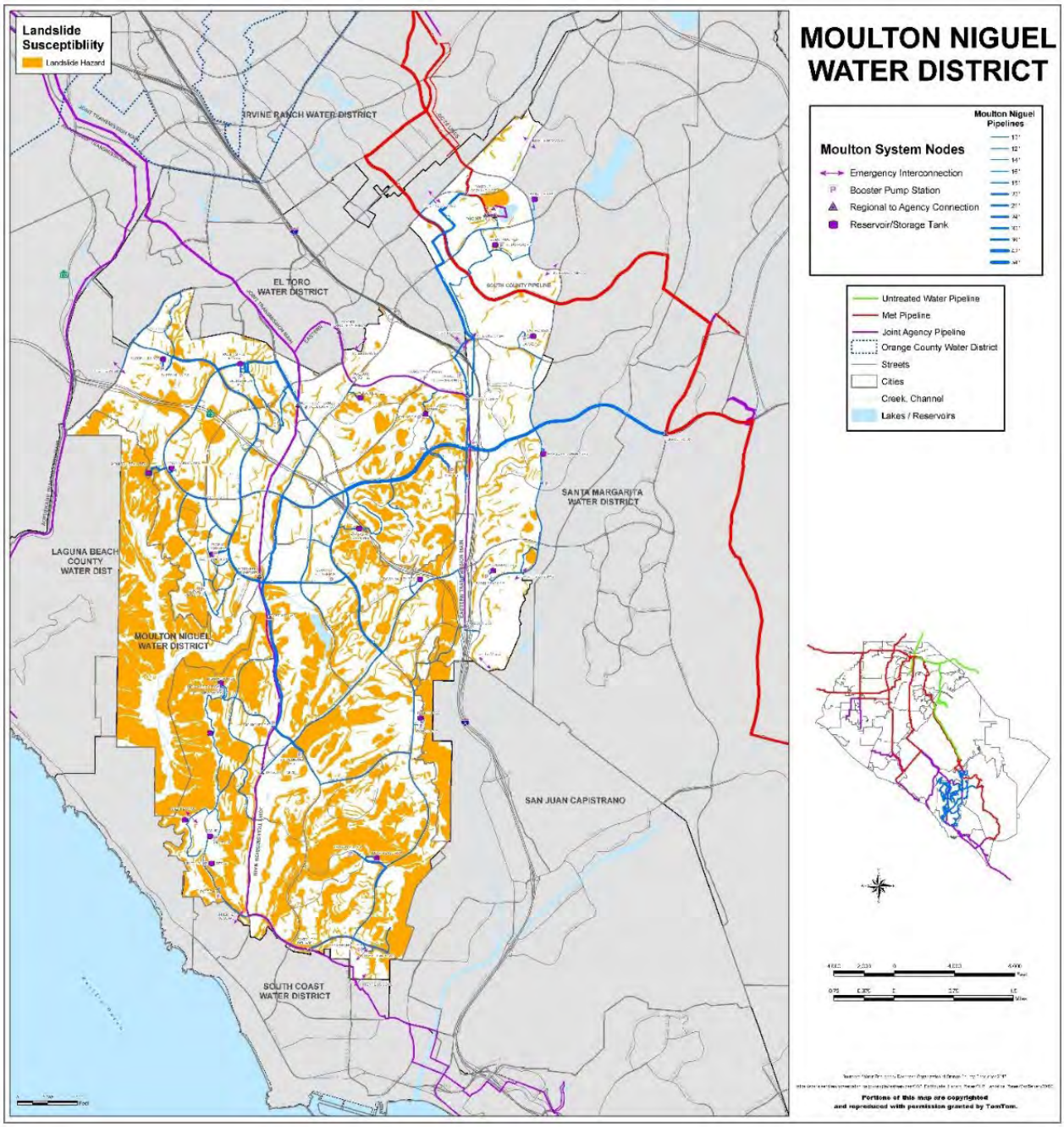
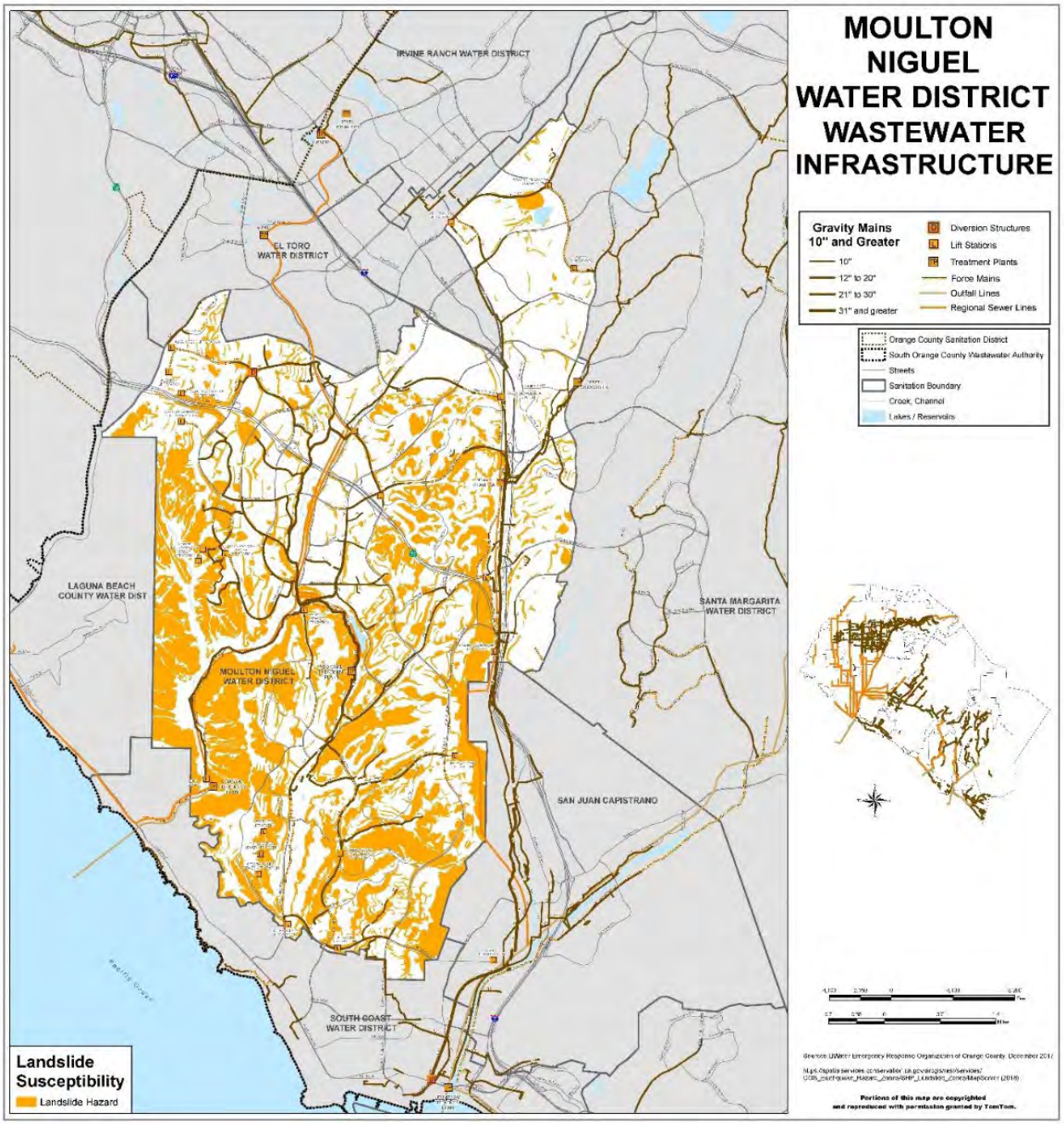


Exhibit H-13. Landslide Hazard and MNWD Wastewater Infrastructure



H.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within MNWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

MNWD's infrastructure is outlined in **Exhibit H-14**, which lists the number infrastructure assets are located within the mapped hazard zones identified above.

Exhibit H-14. Moulton Niguel Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Interties (#)	Pump Stations (#)	Reservoirs (#)	Potable Pipeline (miles)	Wastewater Pipeline (miles)	Effluent Pipeline (miles)
Fire Hazard Zone	Moderate	1	1	1	30.7	8.0	0.5
	High	1	3	5	40.5	9.9	1.0
	Very High	5	9	11	61.5	21.4	1.6
FEMA Flood Zone	100-Year	0	0	0	4.5	6.5	0.5
	500-Year	0	0	0	9.2	7.3	2.1
Alquist-Priolo Rupture Zone		0	0	0	0	0	0
Seismic Shaking	Moderate	5	14	19	74.1	9.1	0
	High	7	8	6	165.2	59.3	5.2
	Extreme	0	0	0	0	0	0
Liquefaction	Moderate	0	3	1	8.3	39.0	0
	High	0	0	0	0	1.2	0
	Very High	0	0	0	0	0	0
	Unknown	2	1	0	30.9	22.0	0
Landslide Zone		1	4	0	24.5	6.9	2.8
Tsunami Zone		0	0	0	0	0	0.6

Much of MNWD's potable and wastewater assets are in very high fire hazard areas and high hazard seismic shaking areas. MNWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone.

Changes in Land Use and Development

The service area of MNWD covers approximately 18,577 acres with over 50% of the service area being used for residential land uses such as single-family homes and multi-family homes. The second largest land use within the MNWD service area is open space and park lands that covers just under 6,000 acres. The future growth within the service area is anticipated to be restricted to redevelopment and infill activities due to the restricted amount of developable land, including the pending sale of the approximate 91 acre Cet Holifield Federal Building located at 24000 Avila Road in Laguna Niguel To meet planned water demands outlined in the 2021 Urban Water Management Plan, MNWD has had several projects running in the past five years and has a variety of projects

planned. Projects such as the Aliso Creek Lift Station Rehabilitation and the Crown Valley Parkway Pipeline Replacement will increase the resilience of MNWD wastewater infrastructure to allow the system to meet current and future demand and avoid potential spills or overflows of sewage. Within the MNWD potable water system, projects such as reservoir seismic retrofits, replacement of the reservoir management systems, rehabilitation of pipelines, rehab of pressure reducing stations, and generator replacement have all been completed or being completed, to increase the resilience of the potable water system and ensure the continued delivery of drinking water to MNWD's customers.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to MNWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storm to MNWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Tsunami	MNWD's vulnerability to tsunamis is not expected to change due to climate change.
Flood	Climate change is expected to cause some higher-level flood waters within MNWD along Aliso Creek with the 100-year flooding event potentially expanding into the 500-year flood zones on a more frequent basis.
Geological Hazards: Land Subsidence	MNWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across MNWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazard: Power Outage	Climate change will likely increase MNWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact MNWD facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within MNWD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the MNWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within MNWD's service area as a result of climate change.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact MNWD as described in the base plan.

Hazard	Climate Change Vulnerabilities
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is expected to increase the risk wildfires within MNWD's service area, especially in the areas near Laguna Niguel Regional Park, Dripping Cave, and adjacent to Crystal Cove State Park.
Hazards of Medium Concern	
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within MNWD's service area. The vulnerability follows that described in the Base Plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact MNWD's service area as described in the base plan.
Severe Weather: Windstorm	The challenges to MNWD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Hazards of Low Concern	
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for MNWD from climate change will mirror the impacts discussed in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.

H.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. MNWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits H-15a through H-15d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. MNWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives already underway by the Agency. These have been included at the bottom of each table.

Exhibit H-15a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Cities of Aliso Viejo, Laguna Hills, Laguna Niguel, Mission Viejo, Dana Point, OCFA, AQMD	MNWD complies with applicable building codes and works with cities and agencies within the service areas. **Expansion and Improvement:** As retrofits and replacement projects are identified MNWD will

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	Cities of Aliso Viejo, Laguna Hills, Laguna Niguel, Mission Viejo, Dana Point, County of Orange	MNWD complies with applicable zoning ordinances and works with cities and agencies within the service areas.
Subdivision Ordinance or Regulations	Cities of Aliso Viejo, Laguna Hills, Laguna Niguel, Mission Viejo, Dana Point, County of Orange	MNWD complies with applicable subdivision ordinances and regulations and works with cities and agencies within the service areas.
Special Purpose Ordinance	County of Orange, Army Corps. of Engineers, Fish & Game (Fed/State), SWRCB, RWQCB	MNWD complies with applicable special purpose ordinances and works with agencies as necessary.
Growth Management Ordinances	Cities of Aliso Viejo, Laguna Hills, Laguna Niguel, Mission Viejo, Dana Point, County of Orange	MNWD complies with applicable growth management ordinances and works with cities and agencies within the service areas. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, MNWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	Cities of Aliso Viejo, Laguna Hills, Laguna Niguel, Mission Viejo, Dana Point, County of Orange, OCFA, OCTA, CAL Trans, MNWD	MNWD uses District Standards for project submittals and works with local agencies for any additional requirements. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plan	MNWD	Includes: Long Range Water Reliability Plan, Recycled Water Optimization Study, Urban Water Management Plan, and Resiliency Action Plan (RAP). Additionally, MNWD complies with applicable General Plans within the service areas. **Expansion and Improvement:** Integration of future projects from UWMPs into Local Hazard Mitigation Plans can ensure both plans are supporting the necessary improvements needed to ensure future water supplies and minimize risks to hazards and disasters.
Capital Improvements Plan	MNWD	Annual Capital Improvement Plan, 10-year Capital Improvement Plan.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		Expansion and Improvement: Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Economic Development Plan	Local Cities	MNWD complies with applicable economic development plans and works with cities within the service areas.
Emergency Response Plan	MNWD, Local Cities, State, Federal	MNWD Emergency Response Plan, work with local agencies to support local emergency response planning. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure MNWD is better prepared for future incidents and can anticipate their communities' needs.
Water Discharge Requirements	State Water Resources Control Board	Regulatory requirements for the discharge of waste.
Short/Long term Comprehensive Plans	MNWD, Local Districts	MNWD has several long and short term plans including Urban Water Management Plan; Water Shortage Contingency Plan; Long-Range Water Reliability Plan; and Integrated Regional Water Management Plan. These plans are reviewed and updated/edited on a regular basis to ensure mitigation strategies adequately meet MNWD needs.
Continuity of Operations Plan	MNWD	In development, MNWD currently relies on their Emergency Response Plan.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ Include hazard mitigation actions in annual updates of all appropriate planning documents. ▪ Continue to enhance interagency cooperation with neighboring water districts, WEROC and OCFA on procedures to obtain resources in case of emergency. ▪ Implement outputs of MNWD's Resiliency Action Plan (RAP) starting with Business Continuity Plan development.

Exhibit H-15b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Engineering Department	Provides information regarding MNWD development standards.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering Department	Eleven Engineers responsible for designing and building code compliant infrastructure.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	Local Cities, Outside Consultants	City, county, and agency has planners with expertise in land development practices.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Floodplain manager	County of Orange	The agency coordinates with the County Floodplain Manager.
Surveyors	Outside Consultants	MNWD staff utilizes outside consultants with input from staff, as necessary.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	County of Orange, WEROC, OCIAC	Work with the County, WEROC, and OCIAC to assess vulnerabilities.
Personnel Skilled in GIS and/or HAZUS	Engineering	3 GIS Technicians.
Emergency Manager	MNWD	Deputy General Manager
Grant Writers	Outside Consultants	MNWD staff utilizes outside consultants with input from staff, as necessary.
Lab Specialist & Lab Staff	South Orange County Wastewater Authority	Contract with South Orange County Wastewater Authority.
Mutual aid agreements	WEROC & CalWARN	Formal mutual aid agreements with WEROC and CalWARN
Information Technology & Communications Staff	MNWD	5 IT staff responsible for maintaining IT and communications equipment with support from outside consultants. **Expansion and Improvement:** Ensure all IT staff attend Urban Area Security Initiative (UASI) Cyber Security Fundamentals for Response Operations and Continuity course,

How can these capabilities be expanded and improved to reduce risk?
▪ Develop water loss mass balance model to strategically identify water loss for Proactive Leak Detection team. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (CalOES) Safety Assessment Program (SAP) training for building inspections.

Exhibit H-15c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	MNWD	**Expansion and Improvement:** During annual budgeting MNWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	MNWD	MNWD has the authority to levy taxes for the purpose of funding debt service payments on voter approved general obligation debt.
Fees for Water, Sewer, Gas, or Electric Service	MNWD	MNWD does have fees for water and sewer services.
Impact Fees for Homebuyers or Developers for New Developments/Homes	MNWD	MNWD charges capacity fees to new or expanded developments that are intended to establish parity between the new connection and the existing

		customers who have invested in the system.
Incur Debt Through Private Activity Bonds		The MNWD Board has the authority to acquire private bonds from the bank when necessary.

How can these capabilities be expanded and improved to reduce risk?
▪ Continue to track any and all available funding opportunities related to hazard mitigation and natural disasters. Apply for, secure, and implement as many as possible.

Exhibit H-15d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Community Forum	Communications	Event hosted by MNWD. Opportunity to educate residents on a variety of issues.
Monthly Newsletter/Bill Insert	Communications	Newsletter sent electronically to customers monthly. Different topics and events are highlighted each month. **Expansion and Improvement:** Incorporate mitigation information and analysis into newsletters to continue sharing information with customers.
Other Agency Outreach Events	Communications	MNWD attends multiple events each year that are hosted by other agencies. We communicate with the community about a variety of topics including emergency preparedness.
Customer Emails	Communications	Use of customer email to disseminate information. **Expansion and Improvement:** Incorporate mitigation information and analysis into emails to continue sharing information with customers.
Business Continuity Planning	Multi-Departmental	MNWD staff meets bi-weekly to proactively maintain operating during and after disruptive events. Key aspects of business continuity planning include: risk assessment, business impact analysis, strategic planning, and communication.
Resiliency Action Plan (RAP)	Multi-Departmental	Over the past 18 months, MNWD staff has worked to develop a Resiliency Action Plan (RAP). RAP outlines a sequence of actions for implementing global best practices and insights from various industries, providing a comprehensive framework aimed at enhancing organization resiliency and business continuity.
Speakers Bureau	Communications	MNWD staff speak to community groups, such as schools, church groups, other community groups, about water related topics.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to MNWD. ▪ Incorporate an emergency preparedness message into District social media outreach at least once monthly

H.7 MITIGATION STRATEGY

H.7.1 Mitigation Goals

MNWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

H.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit H-16,** MNWD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit H-16. Moulton Niguel Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Cybersecurity enhancements and ongoing capabilities to improve ability to withstand cyber threats.	District Wide	Human-Caused Hazards: Terrorism (Cyber Threat)	$150,000/yr	IT/Operations	Short Term	Budget	Existing, Ongoing
OASIS Water Resource Center DPR Facility.	Regional Treatment Plant	Severe Weather: Drought	$200-300 Million	Engineering /Operations	Short Term	Budget	New
OCWD Groundwater Basin Emergency Interconnection with City of Santa Ana's East Station Well Site.	City of Santa Ana East Station Site	Severe Weather: Drought	$20 Million	Engineering /Operations	Short Term	Budget	New
Plant 3A Liquids Handling Improvements	Plant 3A	Flood; Human-Caused Hazard: Power Outage	$14.5 Million	Engineering /Operations	Short Term	Budget	New
Lower Salada LS Force Main Replacement	Lower Salada	Flood	$10 Million	Engineering /Operations	Short Term	Budget	In Progress
Replace existing force mains (20”, 24” Techite pipe) from Regional Lift Station.	Regional Lift Station	All Hazards	$30 Million	Engineering /Operations	Short Term	Budget	Existing, Ongoing
Upgrade existing reservoir management systems	All Potable Reservoirs	All Hazards	$20 Million	Engineering /Operations	Short Term	Budget	In Progress
MEDIUM PRIORITY							
SCADA Pole Replacements	District Wide	Human-Caused Hazards: Terrorism (Cyber Threat)	$300,000	IT/Operations	Short Term	Budget	New
Eastern Transmission Main Rehabilitation	Eastern TM	Flood; Seismic Hazards: Seismic Shaking	$2 Million	Engineering /Operations	Long Term	Budget	New
Northern Transmission Main Rehabilitation	Northern TM	Flood; Seismic Hazards: Seismic Shaking	$1.5 Million	Engineering /Operations	Long Term	Budget	New
Southwestern Transmission Main Rehabilitation	Southwestern TM	Flood; Seismic Hazards: Seismic Shaking	$7 Million	Engineering /Operations	Long Term	Budget	New
Upper Salada Lift Station Force Main Rehabilitation and Replacement	Upper Salada FM	Flood; Seismic Hazards: Seismic Shaking	$6 Million	Engineering /Operations	Long Term	Budget	New
North Aliso Lift Station Reconstruction	North Aliso Lift Station	Flood; Human-Caused Hazards: Contamination	$11.2 Million	Engineering /Operations	Short Term	Budget	New

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Aliso Creek Lift Station Rehabilitation	Aliso Creek Lift Station	Flood; Human-Caused Hazards: Contamination	$9 Million	Engineering /Operations	Short Term	Budget	New
Lower Salada Lift Station Rehabilitation	Lower Salada Lift Station	Flood; Human-Caused Hazards: Contamination	$5.4 Million	Engineering /Operations	Short Term	Budget	New
Beacon Hill Pump Station Rehabilitation	Beacon Hill Pump Station	Flood; Human-Caused Hazards: Contamination	$3.2 Million	Engineering /Operations	Short Term	Budget	New
1050-Zone Secondary Feed Pump Station and Transmission Main	PID 2 Site		$8.5 Million	Engineering /Operations	Short Term	Budget	New
Plant 3A Power Generation Implementation	Plant 3A	Flood; Human-Caused Hazards: Power Outage	$6.8 Million	Engineering /Operations	Long Term	Budget	New
3A ETM Creek Bank Stabilization to address vulnerable alignment segments of secondary effluent pipeline.	Plant 3A Effluent Transmission Main	Flood; Seismic Hazards: Seismic Shaking	$2 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
3A ETM Replacement - Ave De La Vista	Plant 3A Effluent Transmission Main	Flood; Seismic Hazards: Seismic Shaking	$2.5 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
3A ETM Replacement - Camino Capo	Plant 3A Effluent Transmission Main	Flood; Seismic Hazards: Seismic Shaking	$3.5 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Construct second take-out from South County Pipeline to MNWD Diemer 30” line.	South Orange County	Flood; Human-Caused Hazards: Contamination; Seismic Hazards: Seismic Shaking	$10 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Electrical System Improvements Program to replace susceptible electrical equipment to ensure reliability.	District Wide	Flood; Human-Caused Hazards: Power Outage	$5 Million	Engineering /Operations	Short Term	Budget	In Progress
Lower Salada Lift Station Overflow Wetwell	Lower Salada	Flood; Human-Caused Hazards: Power Outage	$1.25 Million	Engineering /Operations	Short Term	Budget	Existing, Ongoing
Manhole Rehabilitation Program to improve system reliability and reduce risk of sanitary sewer overflow.	District Wide	Flood; Seismic Hazards: Seismic Shaking	$2.5 Million	Engineering /Operations	Short and Long Term	Budget	In Progress

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Mitigate unlawful sewer discharges into state waterways at Aliso Creek Parallel Sewer Force Main	Aliso Creek Lift Station	All Hazards	$2.5 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Plant 3A Solids Handling Improvements	Plant 3A	Flood; Human-Caused Hazards: Power Outage	$53.8 Million	Engineering /Operations	Short Term	Budget	In Progress
PW Easement Rehabilitation Program to address vulnerable facilities within easement.	District Wide	Geological Hazards: Landslide and Mudflow	$5 Million	Engineering /Operations	Short and Long Term	Budget	Existing, Ongoing
Relocate the existing Plant 3A transmission main away from the Oso and Trabuco Creeks.	Plant 3A Effluent Transmission Main	Human-Caused Hazards: Contamination; Seismic Hazards: Seismic Shaking	$15 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Sewer Lining Program (Niguel West, Crown Valley Parkway, Pacific Island Driver) to improve system reliability and reduce risk of sanitary sewer overflow.	District Wide	Flood; Seismic Hazards: Seismic Shaking	$5.5 Million	Engineering /Operations	Short Term	Budget	Existing, Ongoing
Video Site Surveillance System	All facilities	Human-Caused Hazards: Terrorism (MCI) and Human-Caused Hazards: Contamination	$300,000	IT/Operations	Short Term	Budget	Existing, Ongoing
LOW PRIORITY							
Connect IRWD's well field system to Allen-McColloch Pipeline.	IRWD/AMP; OC-72 Takeout	Severe Weather: Drought; Seismic Hazards: Seismic Shaking	$500,000	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Marguerite/Oso CIP Takeout facility to provide backup water supply to area.	Marguerite /Oso	Human-Caused Hazards: Contamination; Seismic Hazards: Seismic Shaking	$5 Million	Engineering /Operations	Long Term	Budget	Existing, Ongoing
Participate in the development and implementation of regional ocean desalination projects.	Orange County	Severe Weather: Drought	$200 Million	Engineering	Long Term	Budget	Existing, Ongoing
Perform Potable Water System Master Plan Update	All Facilities	All Hazards	$800,000	Engineering /Operations	Long Term	Budget	Existing, Ongoing

H.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Asset Management Program/CMMS Implementation.
  - **Status:** Completed.
- **Mitigation:** 54-Inch CIP Improvements
  - **Status:** Completed.
- **Mitigation:** Construct secondary supply pipeline to Mission Hospital.
  - **Status:** Completed.
- **Mitigation:** Develop fuel management plan for auxiliary engines and implement.
  - **Status:** Completed.
- **Mitigation:** Replacement of Point to Multi-Point Radios for SCADA System.
  - **Status:** Completed.
- **Mitigation:** Potable Water Main Replacement at 1-5 Oso Creek Crossing
  - **Status:** Completed.
- **Mitigation:** Easement Rehabilitation Program - Phase 2
  - **Status:** Removed. No longer phasing.
- **Mitigation:** Supply Reliability Enhancements - Fund 6.
  - **Status:** Removed. Became OCWD Groundwater Basin Emergency Interconnection.
- **Mitigation:** Supply Reliability Enhancements - Fund 12.
  - **Status:** Removed. Became OCWD Groundwater Basin Emergency Interconnection.

H.8 PLAN INTEGRATION

MNWD capital budget, Water Master Plan, Wastewater Master Plan and Capital Improvement Plan are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, MNWD will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, MNWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform the MNWD's Water and Wastewater Master Plans.
- Mitigation actions were incorporated into the capital budget.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex I: Mesa Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

MESA WATER DISTRICT ANNEX

Mesa Water District (Mesa Water®) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, Mesa Water representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to Mesa Water.

This annex details the hazard mitigation planning elements specific to Mesa Water and describes how Mesa Water's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by Mesa Water. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to Mesa Water with a focus on the risk assessment and mitigation strategies.

I.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit I-1** lead the Mesa Water planning team, attended meetings on behalf of Mesa Water, and coordinated the hazard mitigation planning efforts with Mesa Water staff and the consultant team supporting the effort.

Exhibit I-1. Planning Team Lead

Primary Point of Contact
Name: Carrie Fesili
Title: Water Operations Coordinator
Telephone: 949-207-5464
Email: CarrieF@MesaWater.org

Mesa Water followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as Mesa Water's internal hazard mitigation planning development team.

Exhibit I-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Andrew Wiesner	District Engineer
Bob Mitchell	Water Operations Supervisor
Karyn Igar	Senior Civil Engineer
Kaying Lee	Water Quality and Compliance Supervisor
Tyler Jernigan	Operations Manager

Outreach to the public within Mesa Water's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, Mesa Water published a webpage with information on the MJHMP process. Social media posts were made on the Facebook and Instagram platforms on August 14, August 15, August 27, and October 1, 2024, to increase engagement.

I.2 JURISDICTION PROFILE

Service Population: 110,000

Mesa Water is an independent special district that provides water service to 110,000 residents in an 18-square-mile service area that includes most of the City of Costa Mesa, parts of Newport Beach, and John Wayne Airport. Mesa Water commenced operations on January 1, 1960, through a consolidation of the City of Costa Mesa's Water Department, Fairview County Water District, Newport Mesa Irrigation District, and Newport Mesa County Water District. Mesa Water set a precedent with this consolidation as the first California water agency to merge two or more water utilities and assume both their assets and debts.

Due to the Mesa Water Reliability Facility, Mesa Water provides customers with 100 percent local groundwater supplies, pumped from Orange County's natural groundwater basin and from a deeper, amber-tinted aquifer located in Mesa Water's service area. Mesa Water is committed to the continued investment in, and proactive maintenance of, its infrastructure, which pumps, treats, and delivers more than 5 billion gallons per year of quality drinking water to homes and businesses in its community. Mesa Water owns and maintains 317 miles of pipeline, 5,139 mainline valves, 3,383 fire hydrants, three booster pump stations, nine wells, three reservoirs, and the Mesa Water Reliability Facility, which features nanofiltration technology for water treatment.

Mesa Water is governed by a publicly elected, five-member Board of Directors who are elected by division to serve a four-year term. The Board of Directors sets policy, establishes water rates, and oversees district operations. Mesa Water is one of the most efficient water agencies in Orange County, based on expenditures per capita. Additionally, Mesa Water is AAA rated by both Fitch and Standard & Poor's.

I.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that Mesa Water faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

Mesa Water's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the Mesa Water development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect Mesa Water and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit I-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit I-3. Mesa Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Mesa Water
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	Low
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards – Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards –Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather – Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Low
Severe Weather – Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Low
Severe Weather – Drought	Highly Likely	Large	Negligible	Negligible	Medium	Low
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Low
Flood	Likely	Medium	Limited	Negligible	Medium	Low
Coastal Hazards – Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards – Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards – Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards –Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Low
Coastal Hazards – Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards – Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Low
Human-Caused Hazards – Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards – Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards – Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards – Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards – Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Low

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to Mesa Water's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit I-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and Mesa Water.

I.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit I-4. Fire Hazard and Mesa Water District Potable Water Infrastructure

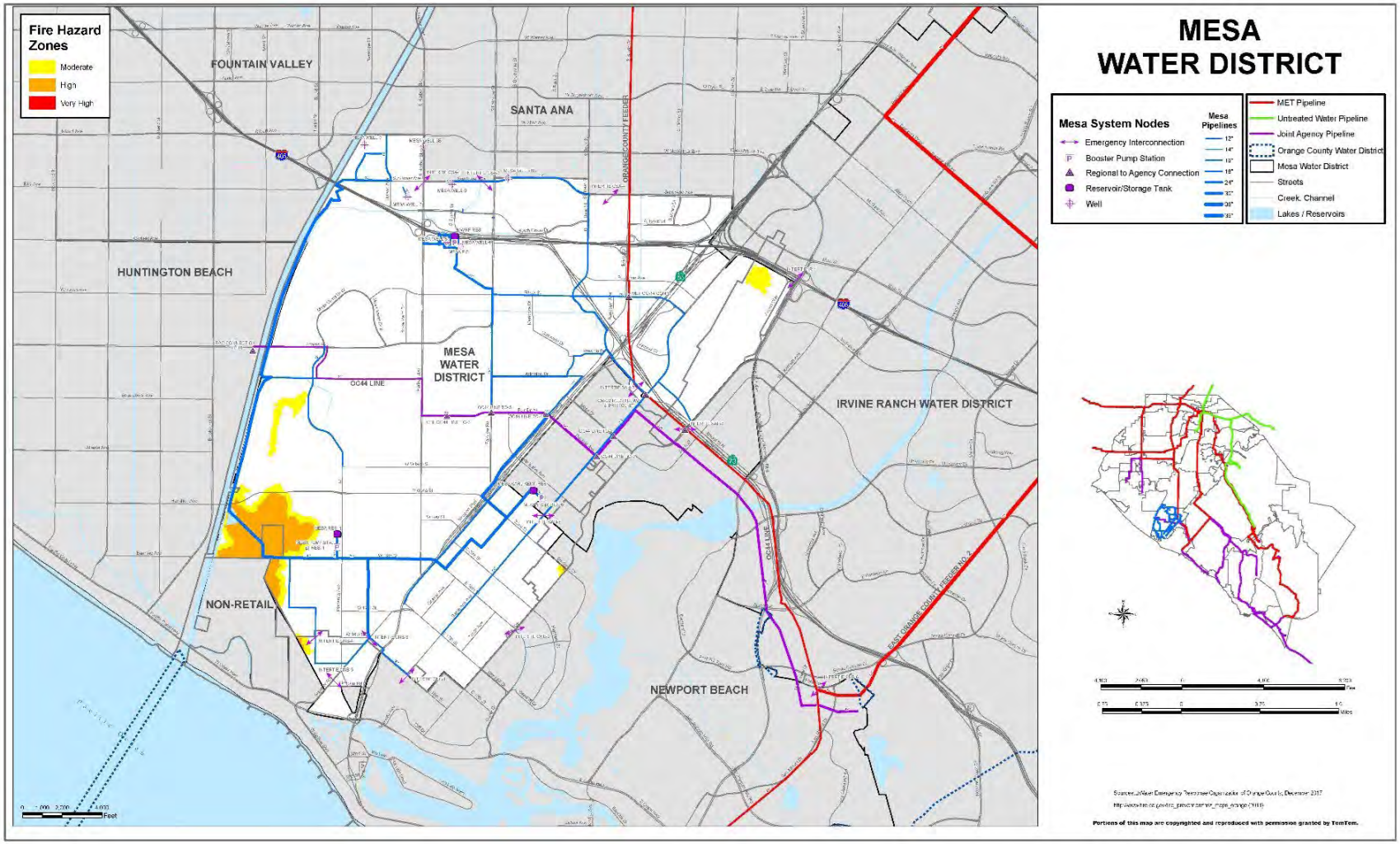


Exhibit I-5. Flood Hazard and Mesa Water Potable Water Infrastructure

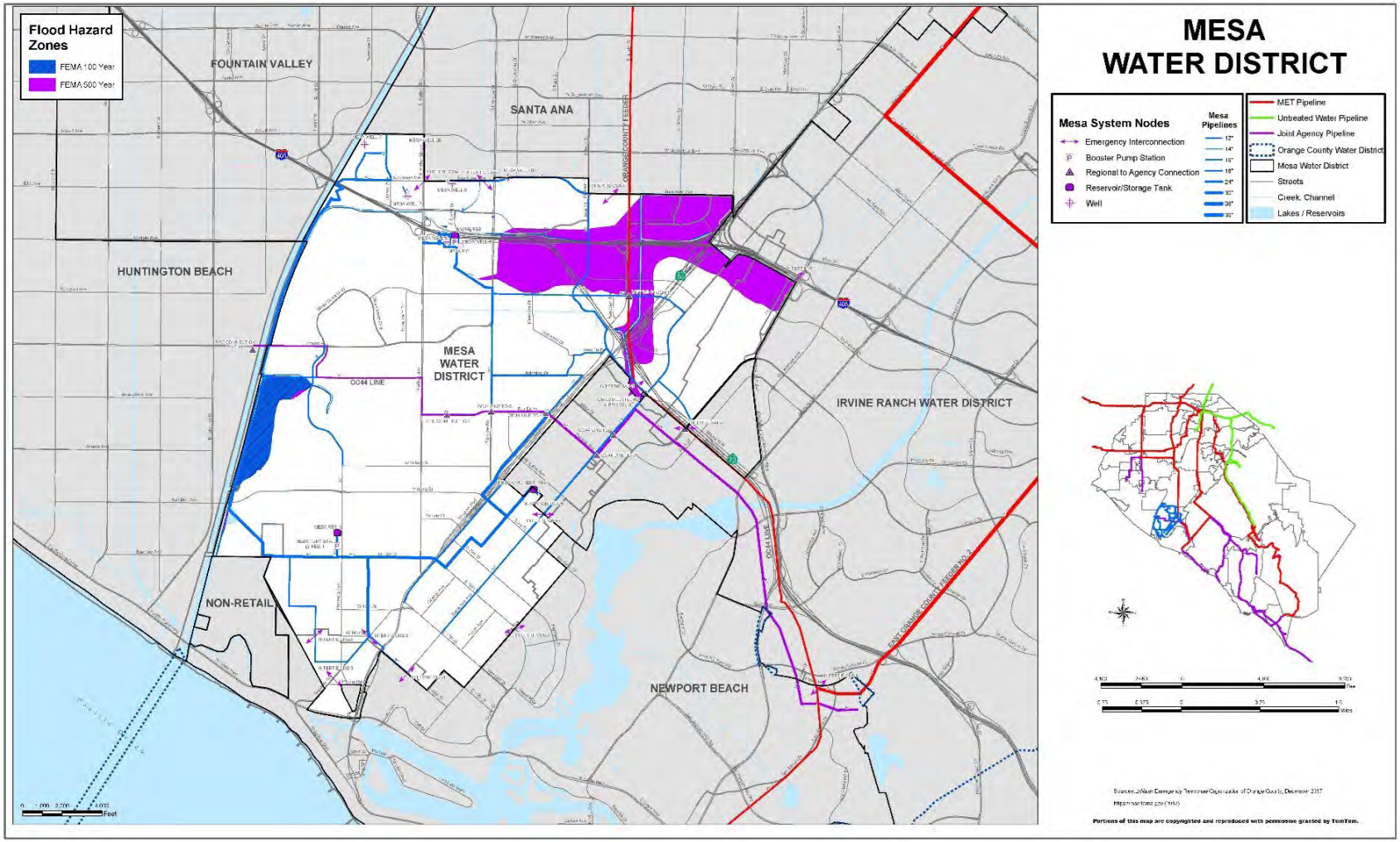


Exhibit I-6. Seismic Shaking Hazard and Mesa Water District Potable Water Infrastructure

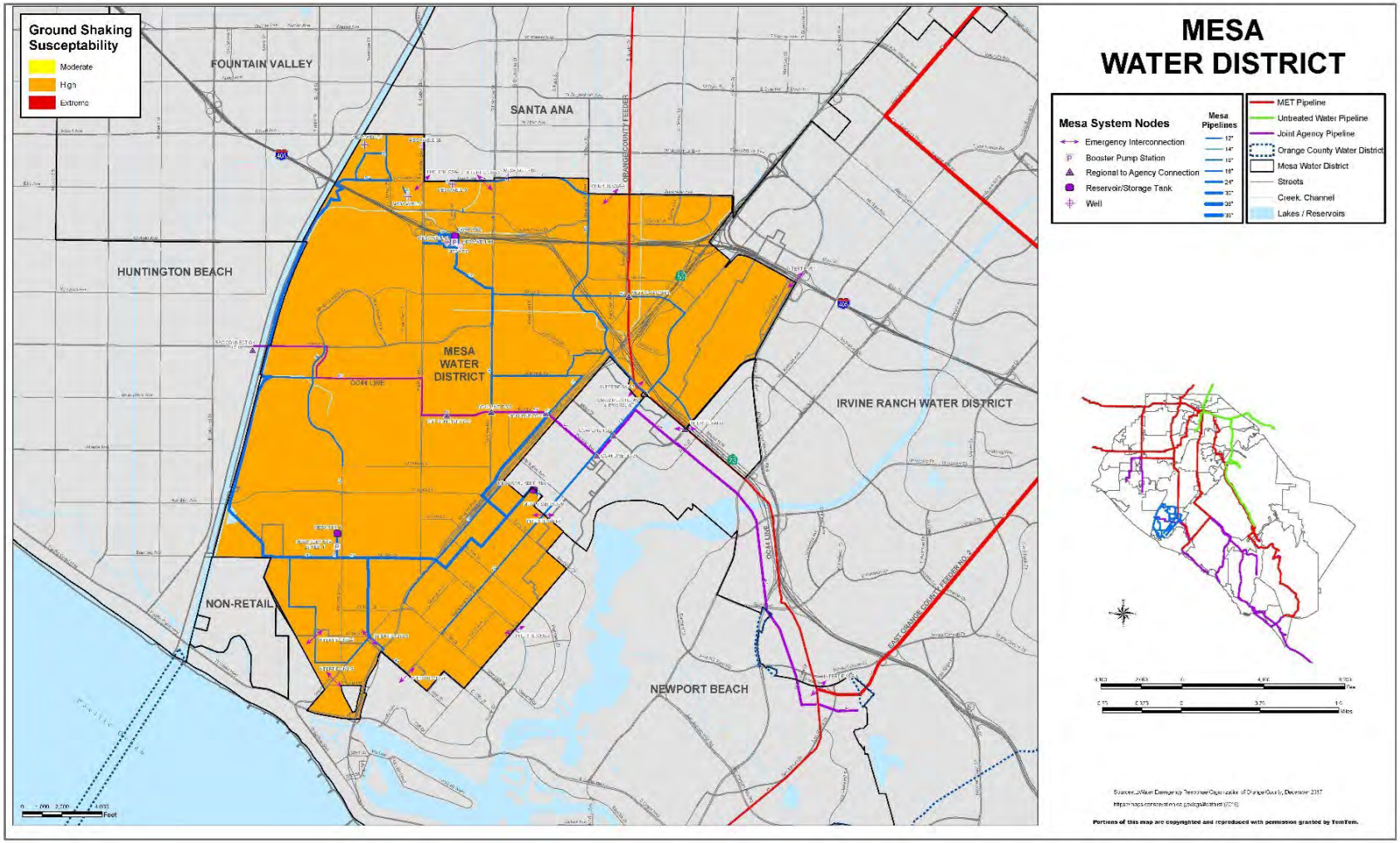


Exhibit I-7. Liquefaction Hazard and Mesa Water District Potable Water Infrastructure

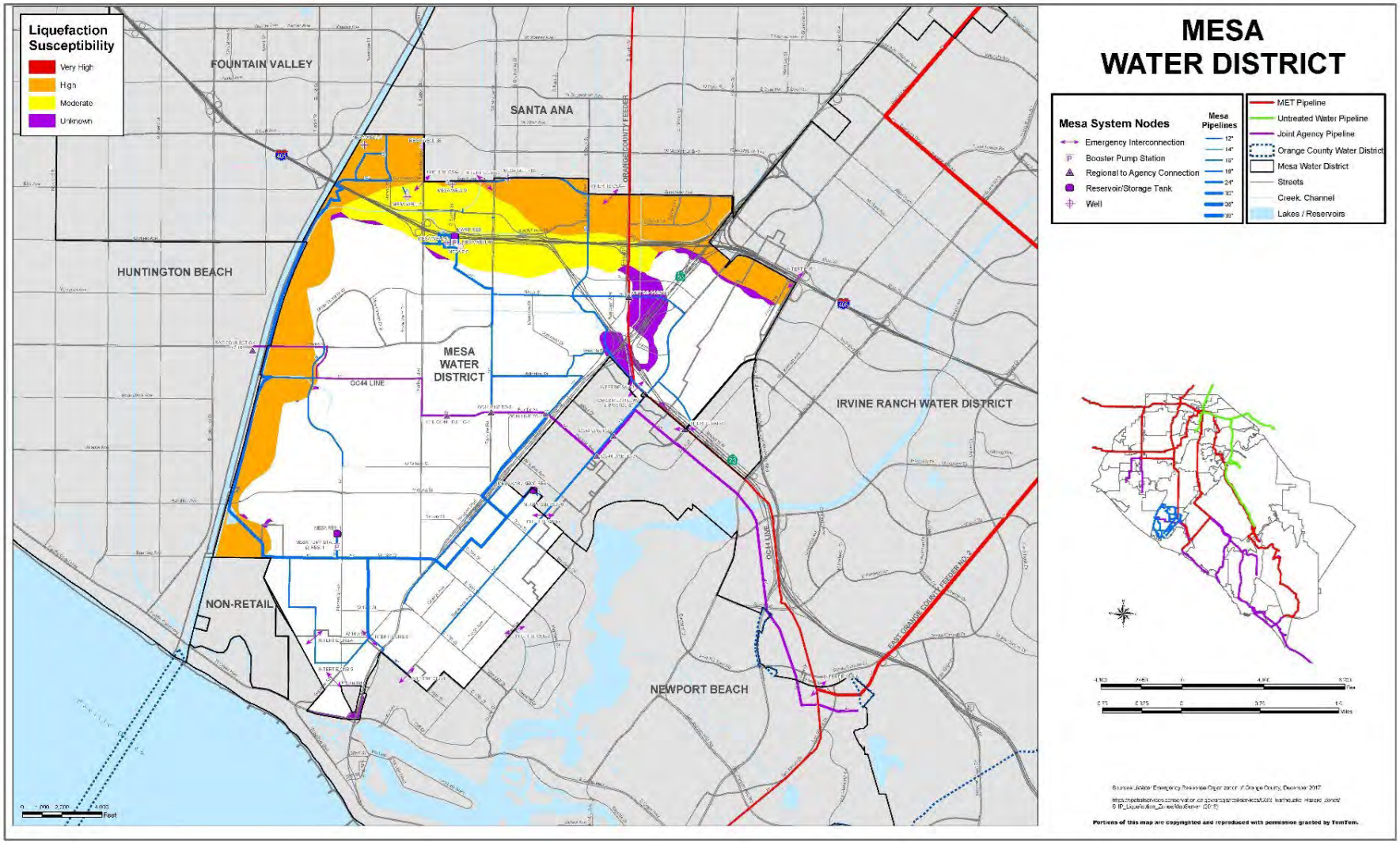


Exhibit I-8. Landslide Hazard and Mesa Water District Potable Water Infrastructure

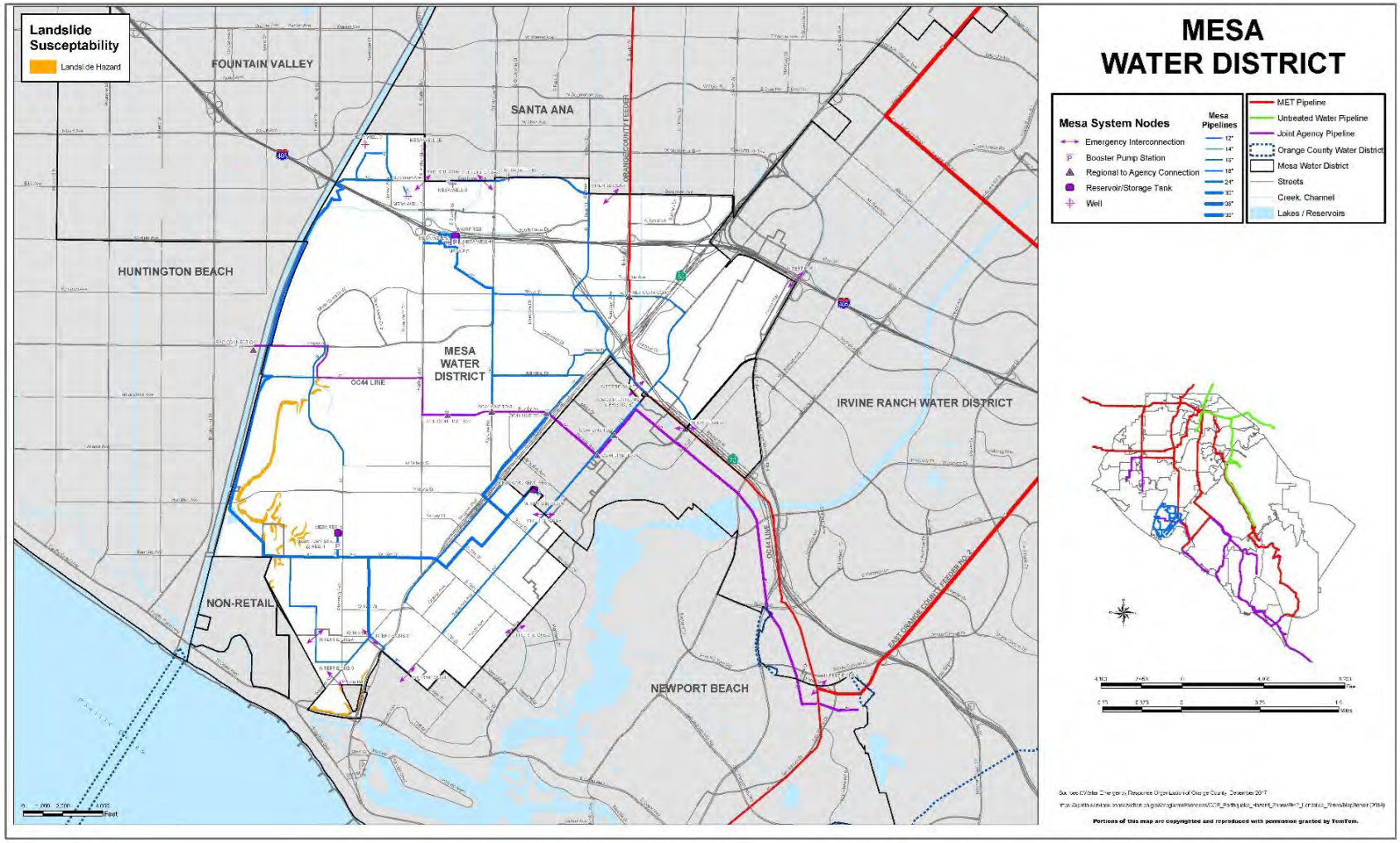
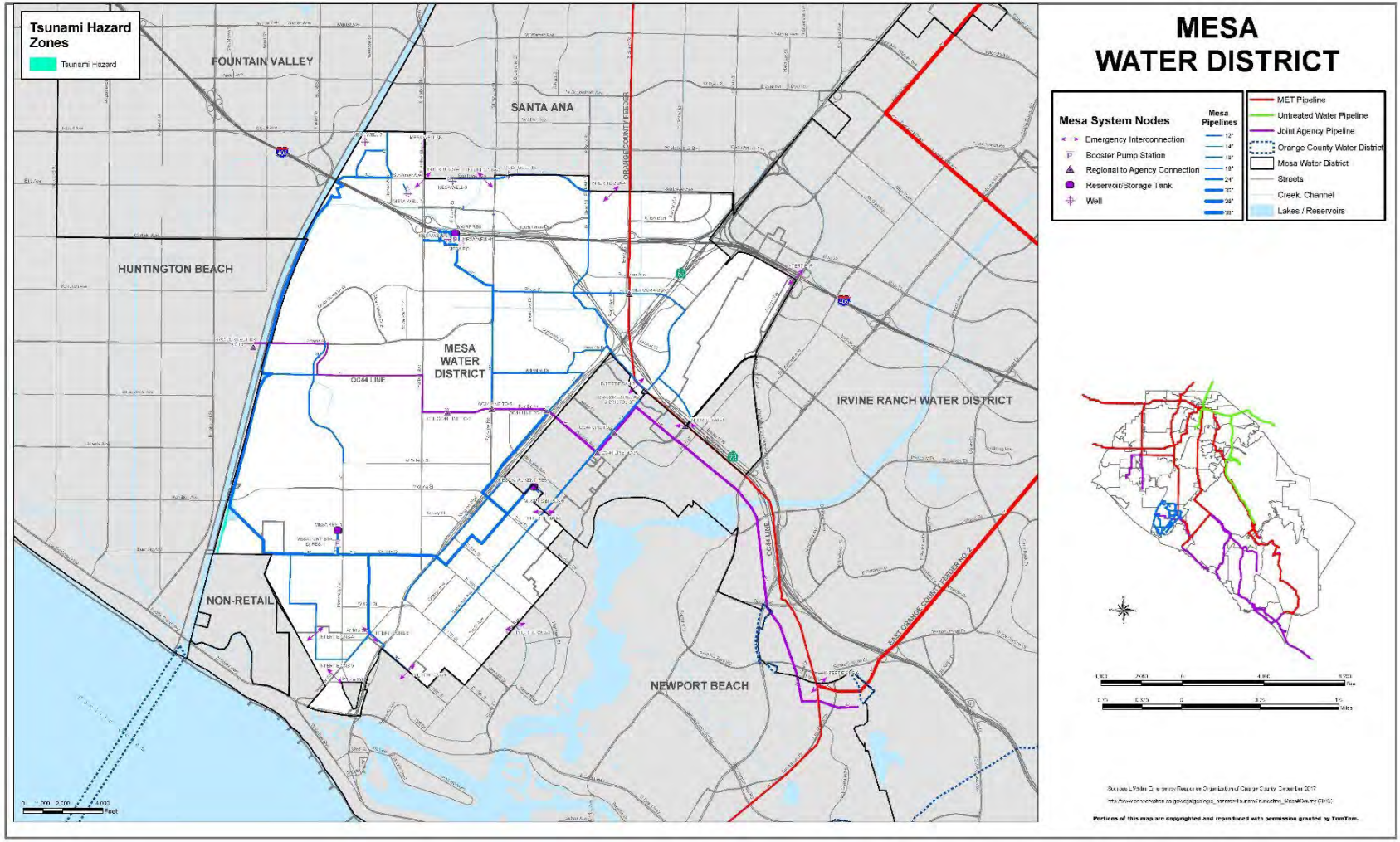


Exhibit I-9. Tsunami Hazard and MWDOC Potable Water Infrastructure



I.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within Mesa Water's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

Mesa Water's infrastructure is outlined in **Exhibit I-10**, which lists the number of Mesa Water's infrastructure assets are located within the mapped hazard zones identified above.

Exhibit I-10. Mesa Water Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Interties (#)	Pump Stations (#)	Treatment Plants (#)	Reservoirs (#)	Wells (#)	Potable Pipelines (miles)
Fire Hazard Zone	Moderate	1	0	0	0	0	0.2
	High	0	0	0	0	0	0.8
	Very High	0	0	0	0	0	0
FEMA Flood Zone	100-Year	0	0	0	0	0	1.8
	500-Year	1	0	0	0	0	1.5
Alquist-Priolo Rupture Zone		0	0	0	0	0	0
Seismic Shaking	Moderate	0	0	0	0	0	0
	High	13	3	1	3	9	32.6
	Extreme	0	0	0	0	0	0
Liquefaction	Moderate	0	1	1	1	5	1.6
	High	4	0	0	0	7	8.2
	Very High	0	0	0	0	0	0
	Unknown	0	0	0	0	0	1.1
Landslide Zone		0	0	0	0	0	0.1
Tsunami Zone		0	0	0	0	0	0.2

Mesa Water's service area and its associated infrastructure is within an area identified as having a high risk of seismic shaking. A portion of Mesa Water's service area is also located within areas identified as having moderate and high seismic liquefaction susceptibility. There are several miles of potable pipeline and infrastructure, including interties, wells, a reservoir, a treatment plant, and a pump station located within these moderate and high liquefaction susceptibility areas.

Changes in Land Use and Development

Mesa Water completed major projects in 2024, a SCADA Control Room and Wet Lab Upgrade and the Chandler Ave Well 12 and Croddy Way Well 14 and Pipeline Project. The two new potable water wells installed in Santa Ana allow Mesa Water to increase water production capacity by 8,000 gallons per minute. To connect the two wells to Mesa Water®'s distribution system, 4,500 linear feet of ductile iron transmission pipeline was constructed.

The past five years have seen various changes within the Mesa Water service area. While the majority of Mesa Water's service area is heavily built-out, there is a trend towards high density development within the service area. This high-density development will result in small to moderate population increases. These increases are met by the two new wells constructed. The majority of Mesa Water's service area covers the City of Costa Mesa which has undergone growth and development including two major construction projects: a 393-unit apartment project and a 200-unit apartment project. Along with these two large projects, smaller projects have occurred around the city.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Human-Caused Hazard: Power Outage	Climate change will likely increase Mesa Water's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact Mesa Water facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within Mesa Water's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the Mesa Water service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within Mesa Water's service area as a result of climate change.
Hazards of Medium Concern	
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Hazards of Low Concern	
Coastal Hazards: Tsunami	Due to the minimal coastal property within Mesa Water, the vulnerability to tsunamis due to climate change is not expected to increase.
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Flood	Climate change is expected to cause some higher-level flood waters within Mesa Water with the 100-year flooding event potentially expanding into the 500-year flood zones on a more frequent basis.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within Mesa Water's service area. The vulnerability follows that described in the Base Plan.
Geological Hazards: Land Subsidence	Mesa Water's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.

Hazard	Climate Change Vulnerabilities
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within Mesa Water's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact Mesa Water as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact Mesa Water's service area as described in the base plan.
Severe Weather: Windstorm	The challenges to Mesa Water from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is not expected to cause an increase wildfires within Mesa Water's service area due to the lack of urban-wildland interfaces within Mesa Water.

I.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. Mesa Water's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits I-11a through I-11d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. Mesa Water has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit I-11a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Engineering Department, Mesa Water	Mesa Water® Standards for water construction and State/local building codes. Mesa Water® Specifications and Standard Drawings for the Construction of Water Facilities – Updated April 2018. **Expansion and Improvement:** As retrofits and replacement projects are identified Mesa Water will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.

Zoning Ordinance	City/County	Mesa Water® complies with applicable zoning ordinances and works with the cities within the district service area.
Special Purpose Ordinance	City/County	Mesa Water® complies with applicable special purpose ordinances and works with the cities within the district service areas.
Site Plan Review Requirements	Engineering Department, Mesa Water	Mesa Water® reviews/approves site plans related to water construction and works with the cities within the District service area. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Capital Improvements Plan	Engineering Department, Mesa Water	Plan for continued improvement facilities and water system. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Post-Disaster Recovery Plan	Finance Department, Mesa Water	Emergency Operations Plan (EOP) contains post-incident reporting requirements. Trainings, protocols, and paperwork for post disaster fund recovery.

How can these capabilities be expanded and improved to reduce risk?

- Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements.
- Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan.
- Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.
- Implement a process to review and include as appropriate mitigation actions identified in the HMP as part of the update to the Water Master Plan and EOP.
- Continue to identify future projects to mitigate hazards

Exhibit I-11b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Engineering Department, Mesa Water	Two senior civil engineers experienced in the various land development types required to design and construct water production and distribution infrastructure.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Engineering Department, Mesa Water	Experienced in the design and construction of water production and distribution infrastructure.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Engineering Department, Mesa Water	Experienced in assessing damage and managing repairs to water infrastructure.
Personnel Skilled in GIS and/or HAZUS	Engineering Department, Mesa Water	Experienced in the use of GIS system related to water infrastructure. GIS system maintained by contractor.
Emergency Manager	Safety, Mesa Water	Two in-house staff trained to be emergency managers during EOC operation. EOC manager facilitates the overall functioning of the EOC by providing guidance and technical expertise to the director and section chiefs during EOC operations.
Lab Specialist and Lab Staff	Consultant	Water samples are sent to a contracted State-certified drinking water laboratory for analysis.
Water Quality	Operations Department, Mesa Water	Responsible for collecting water quality samples and reviewing water quality data to remain in compliance with drinking water regulations. Two water quality technicians and one water quality and compliance supervisor.

How can these capabilities be expanded and improved to reduce risk?
▪ Continue participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (CalOES) Safety Assessment Program (SAP) training for building inspections. ▪ Coordinate with department managers to review the MJHMP and progress towards implementation. ▪ Identify information that should be included in future MJHMP updates.

Exhibit I-11c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Finance Department, Mesa Water	Mesa Water has a capital improvement plan that can be adjusted to support hazard mitigation. **Expansion and Improvement:** During annual budgeting Mesa Water can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	Finance Department, Mesa Water	Mesa Water would have statutory authority to seek certain types of taxes (as referenced above) to support hazard planning or mitigation efforts (such as earthquake retrofit, flood or inundation mitigation and similar) relating to Mesa Water's properties, facilities, operations or other matters within Mesa Water's special district authority. Mesa Water does have statutory authority to seek voter approval for certain types of special taxes for specific purposes.
Fees for Water, Sewer, Gas, or Electric Service	Finance Department, Mesa Water	Fees for meter charges and consumption. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Impact Fees for Homebuyers or Developers for New Developments/Homes	Finance Department, Mesa Water	Capacity charges through new construction.
Incur Debt Through General Obligation Bonds	Finance Department, Mesa Water	Mesa Water has the ability to issue debt in order to support hazard mitigation.
Incur Debt Through Special Tax and Revenue Bonds	Finance Department, Mesa Water	Mesa Water can execute and deliver certificates of participation based on underlying installment sale and/or lease agreements. Mesa Water has authority to seek voter approval for issuance of general obligation bonded indebtedness pursuant to the provisions of the County Water District Law. Mesa Water has statutory authority to seek voter approval for certain types of special taxes for specific purposes.
Withhold Spending in Hazard-Prone Areas	Finance Department, Mesa Water	The ability of the Mesa Water Board to allocate, or withhold, spending to hazard-prone areas would depend on the involvement of Mesa Water properties, facilities and/or Mesa Water's operations within such areas.
Grants	Finance Department, Mesa Water	Federal Emergency Management Agency (FEMA) grants. **Expansion and Improvement:** Mesa Water can coordinate with MWDOC to better understand how grant

Financial Resources	Agency or Department	Description/Comments
		support could be conducted that benefits the entire planning area as a whole.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Identify potential assets and resources that may not currently be considered. ▪ Identify future Capital Improvement Plan that can support hazard mitigation.

Exhibit I-11d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Public Awareness and Education	Public Information	Website – MesaWater.org Social Media – @MesaWater on Facebook, Instagram, X (formerly known as Twitter) **Expansion and Improvement:** Increase the use of social media resources for hazard mitigation related content and information.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to Mesa Water. ▪ Identify a variety of opportunities to provide hazard information to the community and ways to minimize impacts associated with a disaster event.

I.7 MITIGATION STRATEGY

I.7.1 Mitigation Goals

Mesa Water adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

I.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit I-12,** Mesa Water Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit I-12. Mesa Water Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH							
Installation of a new security system for all sites is in process.	District Wide	Human Caused	Not disclosed	Engineering	Immediate	Budget	Nearing completion.
Maintain relationships with IRWD, City of Huntington Beach, City of Newport Beach and City of Santa Ana for interties.	Surround City Interties	Flood, Climate Change, Drought, Earthquake, Wild Land/Urban Fire Human Caused, Power Outage, High Winds	N/A	Engineering	Immediate	Budget	Ongoing.
MEDIUM							
Public awareness and education on the water's quality, drought, water conservation, and climate change	District Wide	Climate Change, Drought	$1 Million	Public Information	Long Term	Budget	Ongoing

I.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Construction of two new wells, Chandler Well 12 and Croddy Well 14 and pipeline to connect new wells to distribution system.
  - **Status:** Complete
- **Mitigation:** Well Automation Project will improve response time by allowing operators to start and stop wells remotely.
  - **Status:** Complete.
- **Mitigation:** Well Automation Project includes installing generators at existing and new well sites.
  - **Status:** Complete.
- **Mitigation:** Design to replace assets in Santa Ana Station.
  - **Status:** Complete.
- **Mitigation:** Reline section of OC-44 near San Diego Creek to reduce vulnerability to storm damage
  - **Status:** Complete.
- **Mitigation:** Conduct seismic survey of reservoir structures – retrofit as required.
  - **Status:** Removed in 2019. Seismic survey is not in the Mesa Water's 5 Year Plan.
- **Mitigation:** Conduct seismic survey of other key Mesa Water facilities – retrofit as required.
  - **Status:** Removed in 2019. Seismic survey is not in the Mesa Water's 5 Year Plan.

I.8 PLAN INTEGRATION

Mesa Water's capital budget, Water Master Plan, Production System Operating Plan, and Pipeline Integrity Testing Program are all used to implement mitigation initiatives identified in this annex. Other local planning mechanisms that may be used to implement the mitigation strategy include WEROC Meetings, City-District Liaison Meetings, Groundwater Producer's Group Meeting, and MWDOC Member Agency Group Meeting. After adoption of the MJHMP, the district will continue to integrate mitigation priorities into these documents.

Since the previous plan update, Mesa Water has incorporated information from the MJHMP into its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform Mesa Water's Urban Water Management Plan.

Mesa Water will continuously monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions will be incorporated into updates of this plan.

2024

Santa Margarita Water District

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex J: Santa Margarita Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY

WEROC

Contents

Exhibits

SANTA MARGARITA WATER DISTRICT ANNEX

Santa Margarita Water District (SMWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, SMWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to SMWD.

This annex details the hazard mitigation planning elements specific to SMWD and describes how SMWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by SMWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to SMWD with a focus on the risk assessment and mitigation strategies.

J.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit J-1** lead the SMWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with SMWD staff and the consultant team supporting the effort.

Exhibit J-1. Planning Team Lead

Primary Point of Contact
Name: Chris Lopez
Title: Safety Officer
Telephone: (949) 532-2551
Email: chrisl@smwd.com

SMWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as SMWD's internal hazard mitigation planning development team.

Exhibit J-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Daniel Peterson	Regulatory and Logistics Manager
Eric Smith	Utilities Manager

Outreach to the public within SMWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, SMWD has updated the SMWD Website to reflect the current plan description.

J.2 JURISDICTION PROFILE

Service Population: 165,000

SMWD was established in December 1964 under provisions of the California Water District Law (Section 34000 et seq. of the California Water Code), includes 62,674 acres in the southeastern corner of Orange County. SMWD is bounded on the north by El Toro Road in the City of Lake Forest, on the east by the Cleveland National Forest, on the south by United States Marine Corp Camp Pendleton and Orange County border, and on the west by the City of San Juan Capistrano and Moulton Niguel Water District. SMWD is responsible for inter-utility coordination and long-range planning to meet future water supply and wastewater treatment needs for its service area.

The Cities of Mission Viejo, Rancho Santa Margarita, a portion of San Clemente and the incorporated communities of Coto de Caza, Las Flores and Ladera Ranch, as well as the remaining undeveloped portion of the Rancho Mission Viejo are within the service boundary of Santa Margarita.

The governing body of SMWD (and all improvement districts therein) is a five-member Board of Directors, publicly elected at large for staggered four-year terms. SMWD's responsibilities as authorized by the California Water District Law are:

- Distribution of domestic water for consumption and fire protection.
- Collection and treatment of wastewater.
- Distribution of recycled water along with the collection and distribution of urban return flows for irrigation purposes.

All of SMWD's domestic water demands are imported from Metropolitan through MWDOC. SMWD receives approximately two-thirds of its imported (potable) water from Metropolitan via the regional distribution system located in Orange County (Allen-McColloch Pipeline and the East Orange County Feeder No. 2), while the remaining third comes from the Baker Treatment Plant located in Lake Forest.

J.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that SMWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

SMWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the SMWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect SMWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit J-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit J-3. SMWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Santa Margarita
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	Medium
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Medium
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	High
Flood	Likely	Medium	Limited	Negligible	Medium	Medium
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	N/A
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	N/A
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	N/A

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to SMWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit J-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and SMWD.

J.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit J-4. Fire Hazard and SMWD Potable Infrastructure

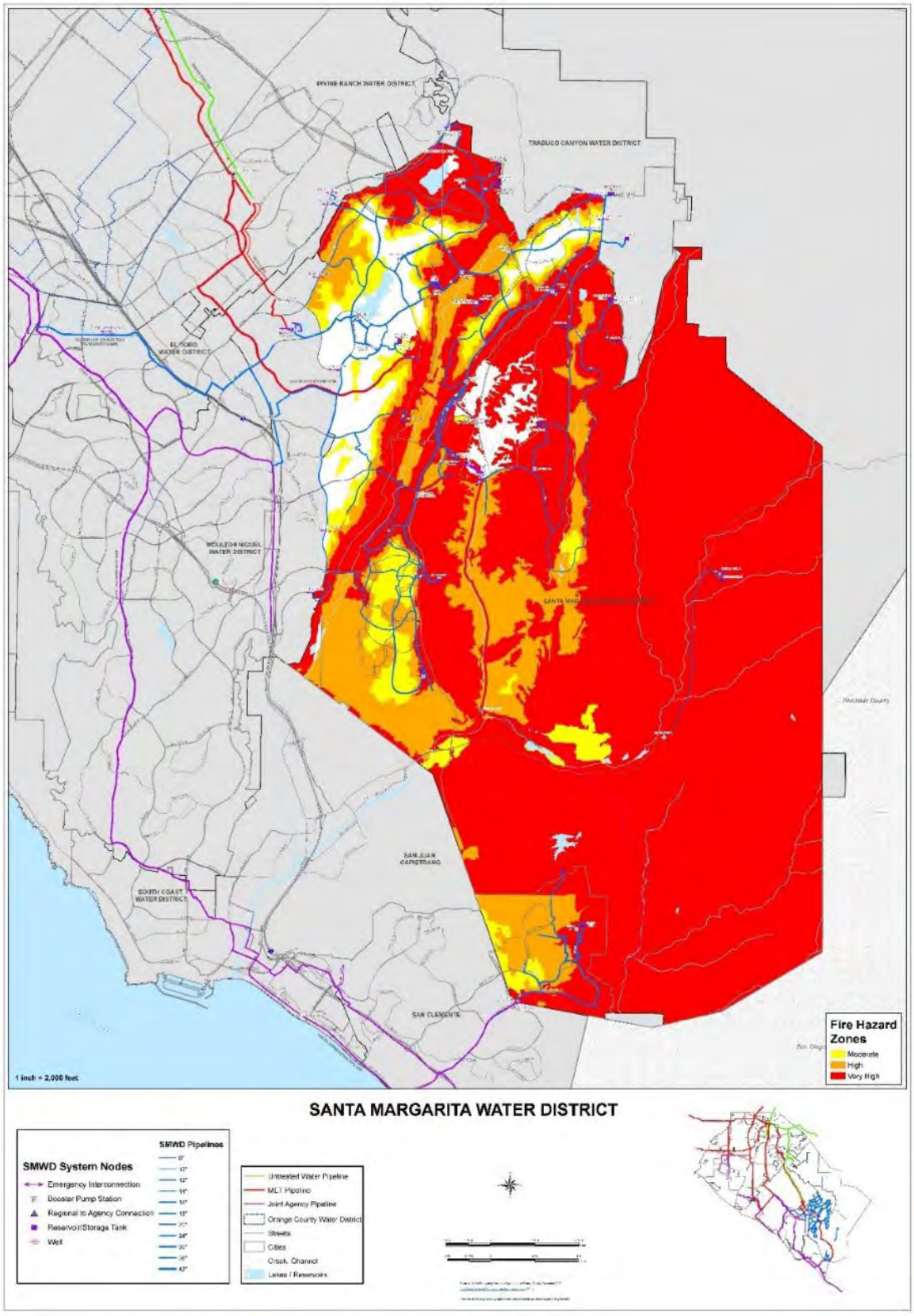


Exhibit J-5. Fire Hazard and SMWD Wastewater Infrastructure

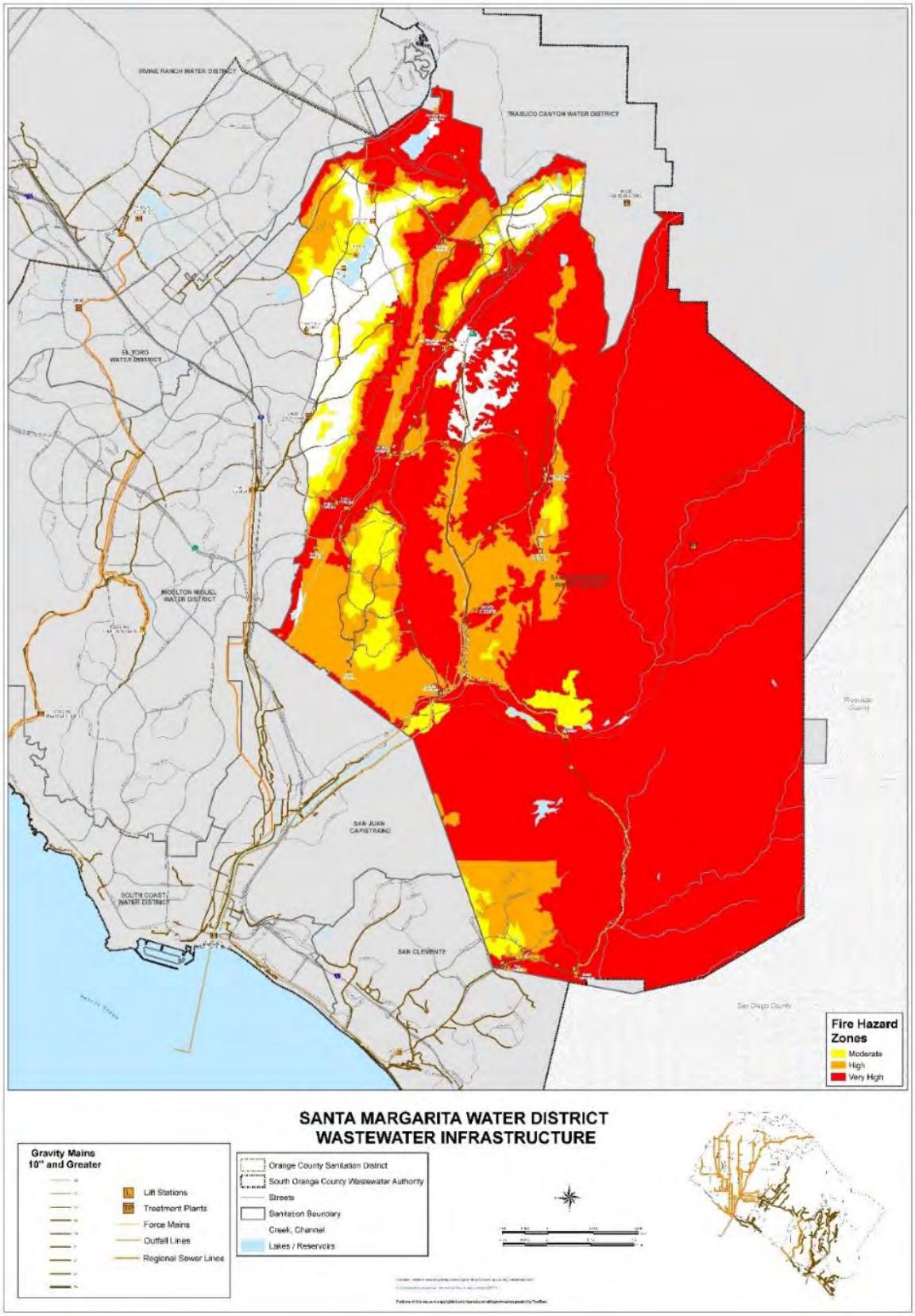


Exhibit J-6. Flood Hazard and SMWD Potable Infrastructure

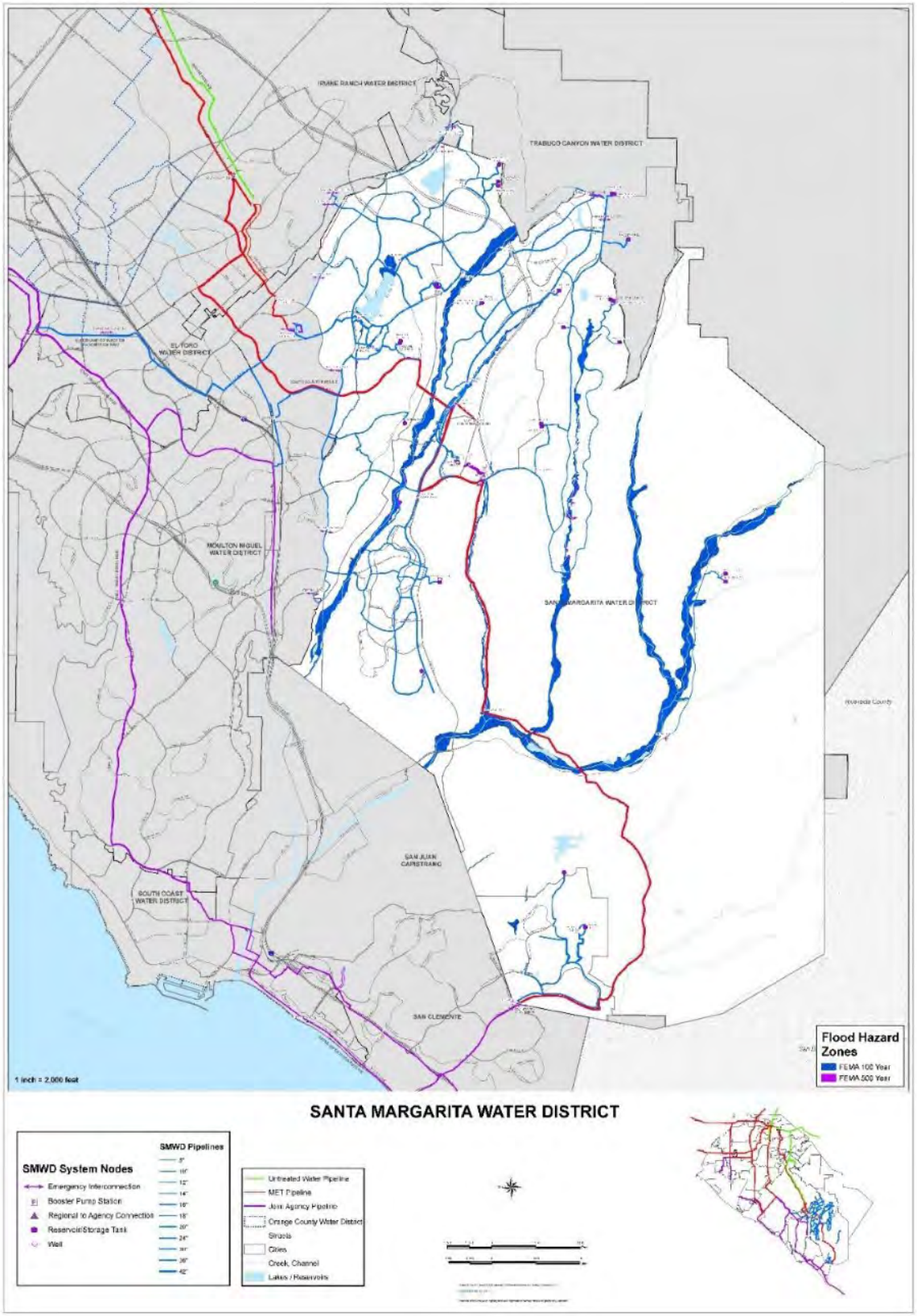


Exhibit J-7. Flood Hazard and SMWD Wastewater Infrastructure

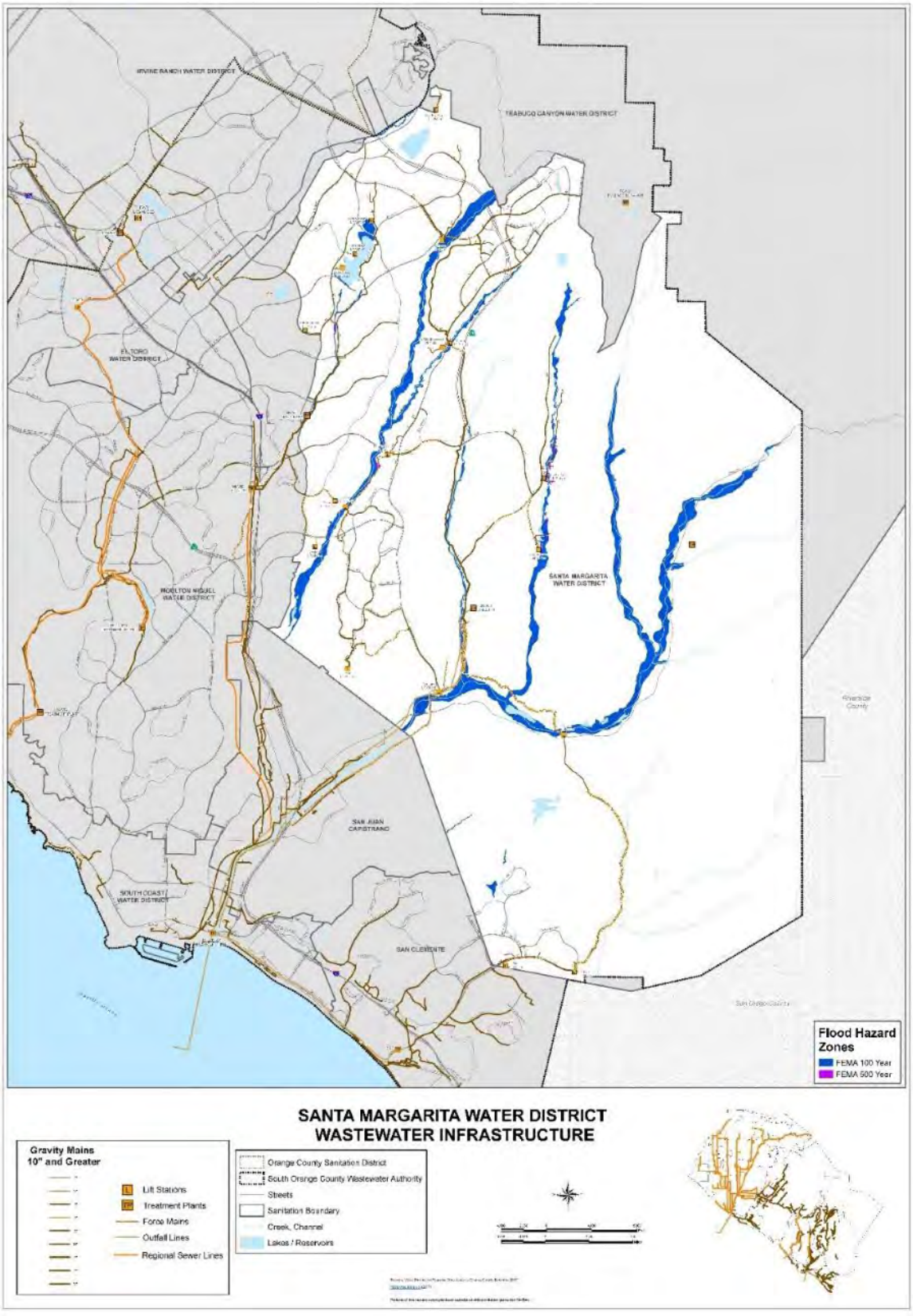


Exhibit J-8. Seismic Shaking Hazard and SMWD Potable Infrastructure

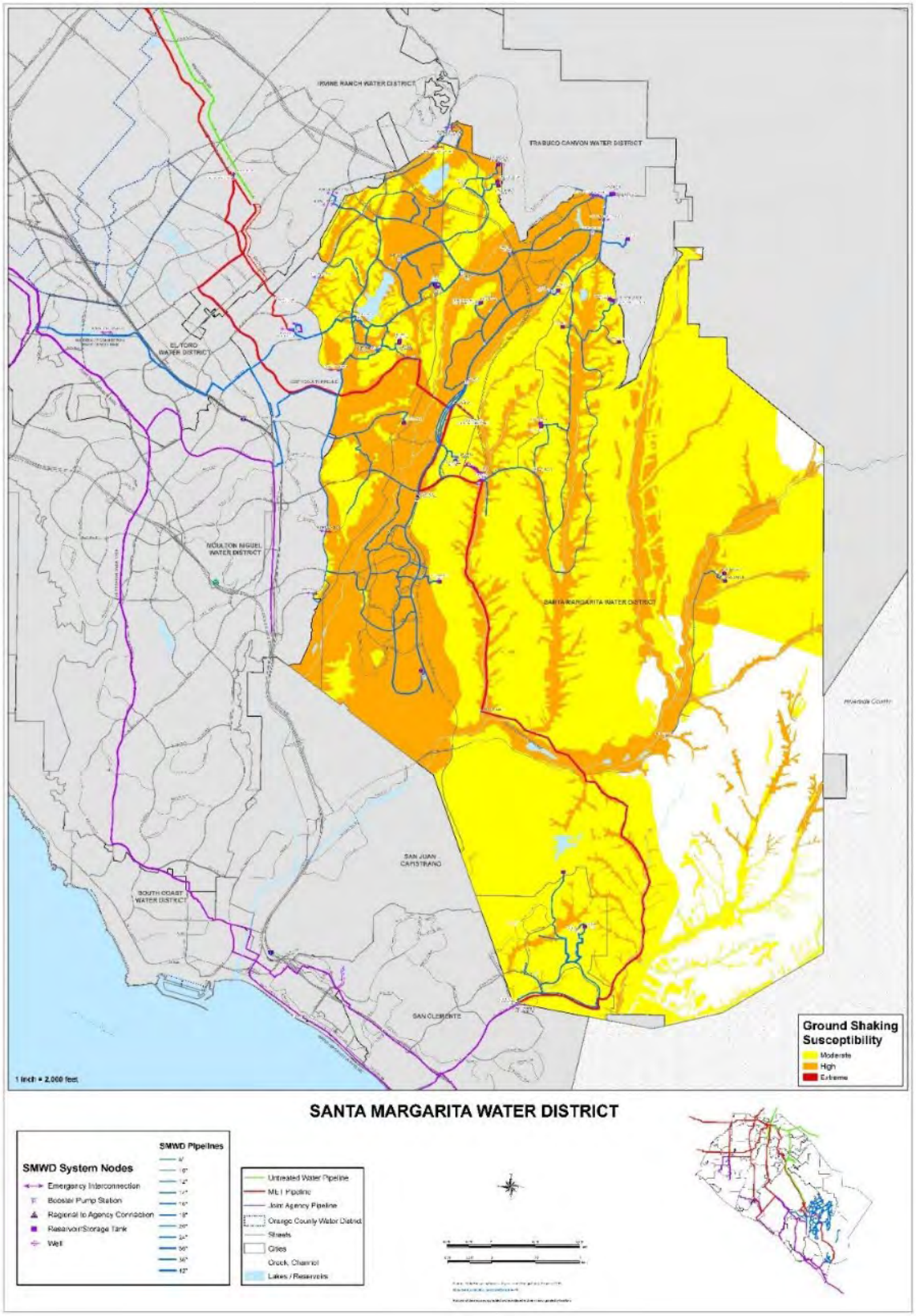


Exhibit J-9. Seismic Shaking and SMWD Wastewater Infrastructure

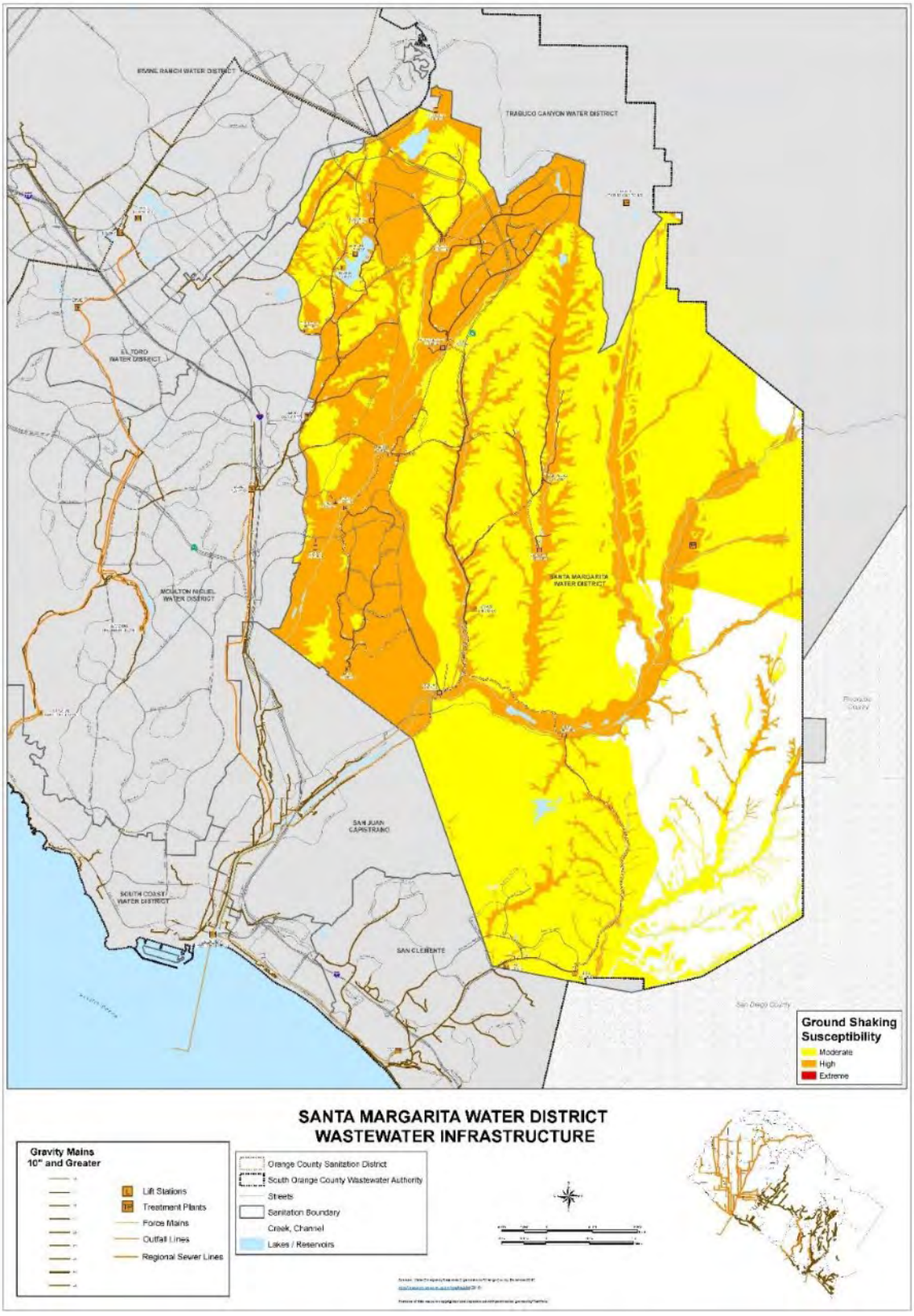


Exhibit J-10. Liquefaction Hazard and SMWD Potable Infrastructure

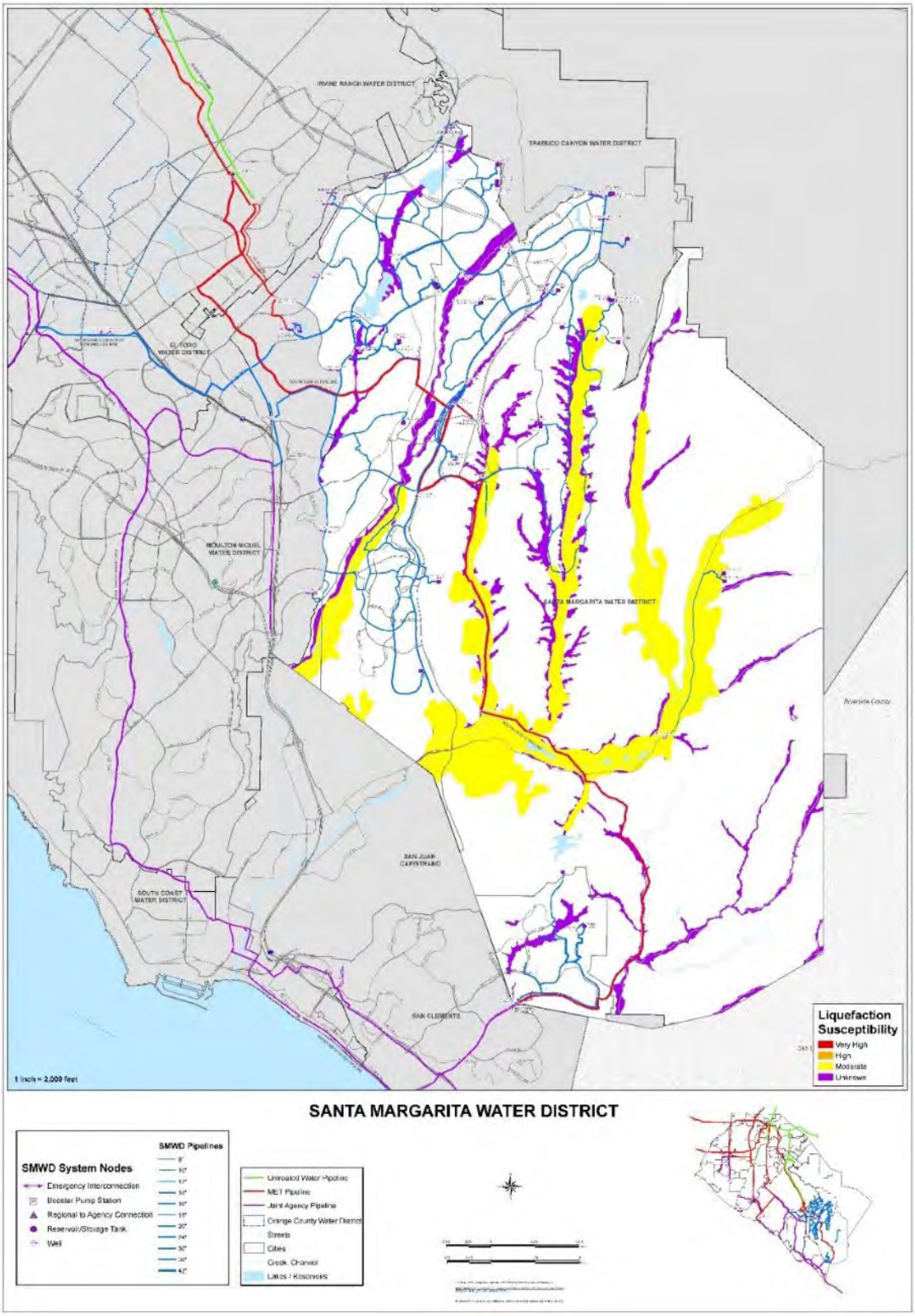


Exhibit J-11. Liquefaction Hazard and SMWD Wastewater Infrastructure

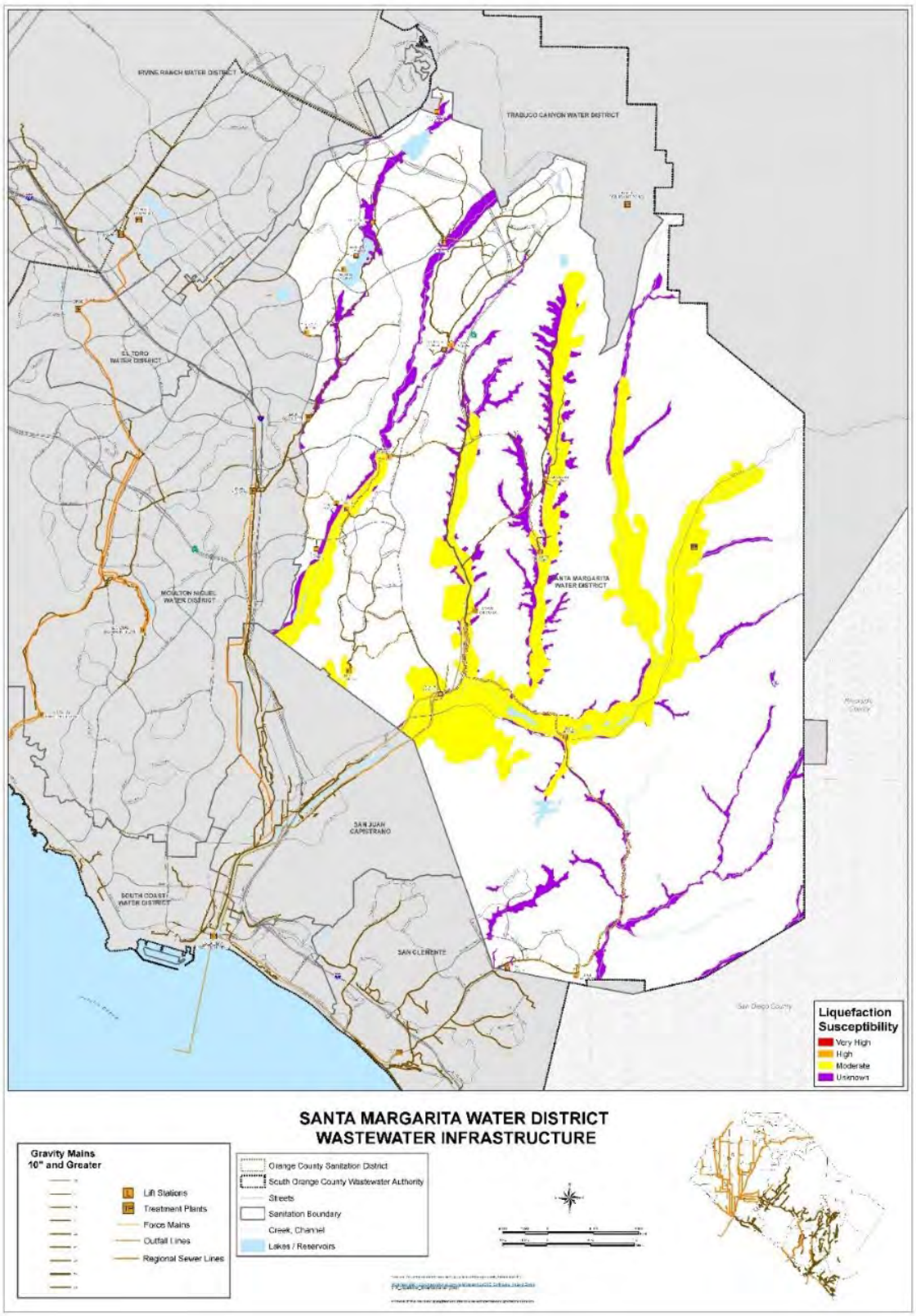


Exhibit J-12. Landslide Hazard and SMWD Potable Infrastructure

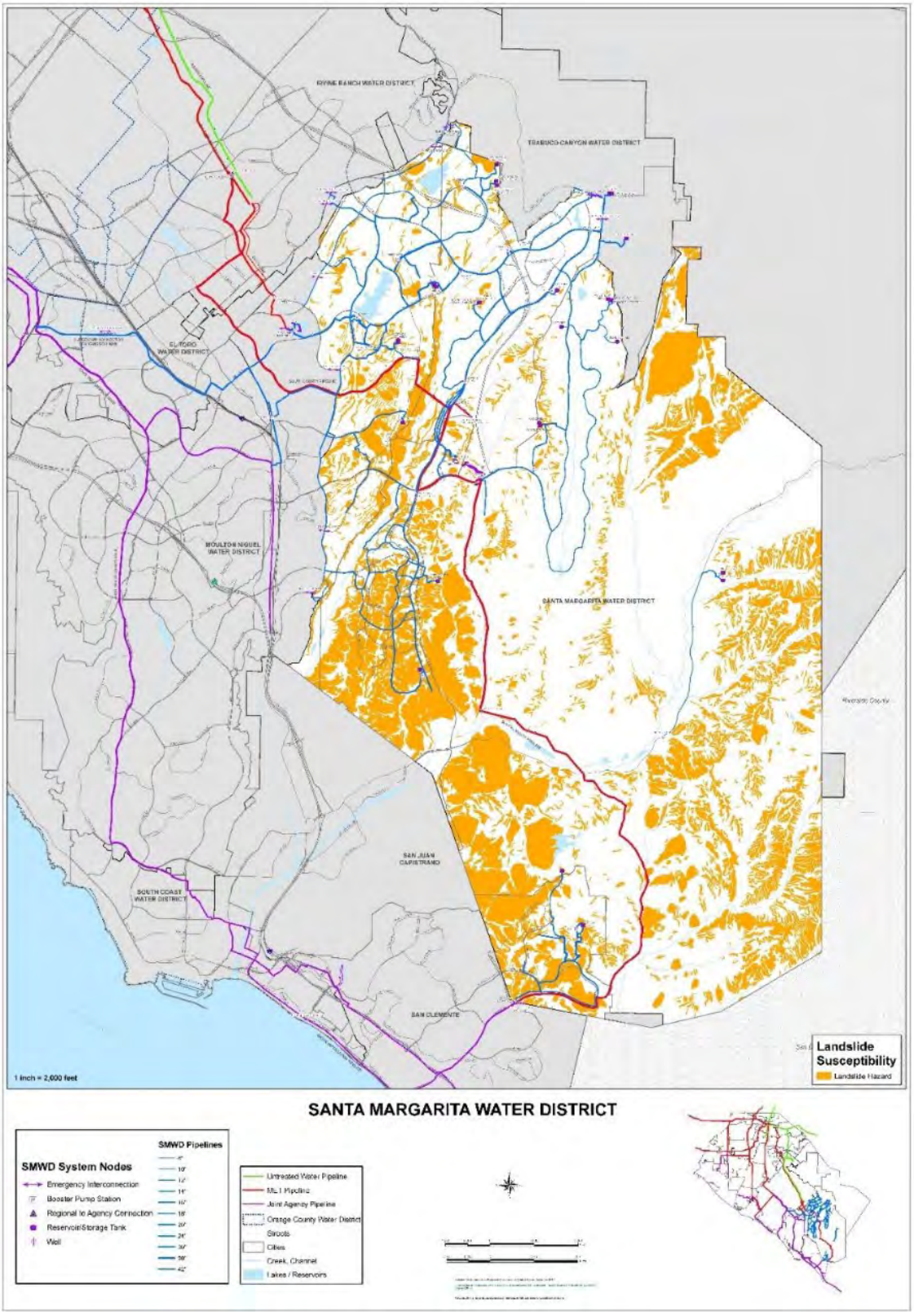
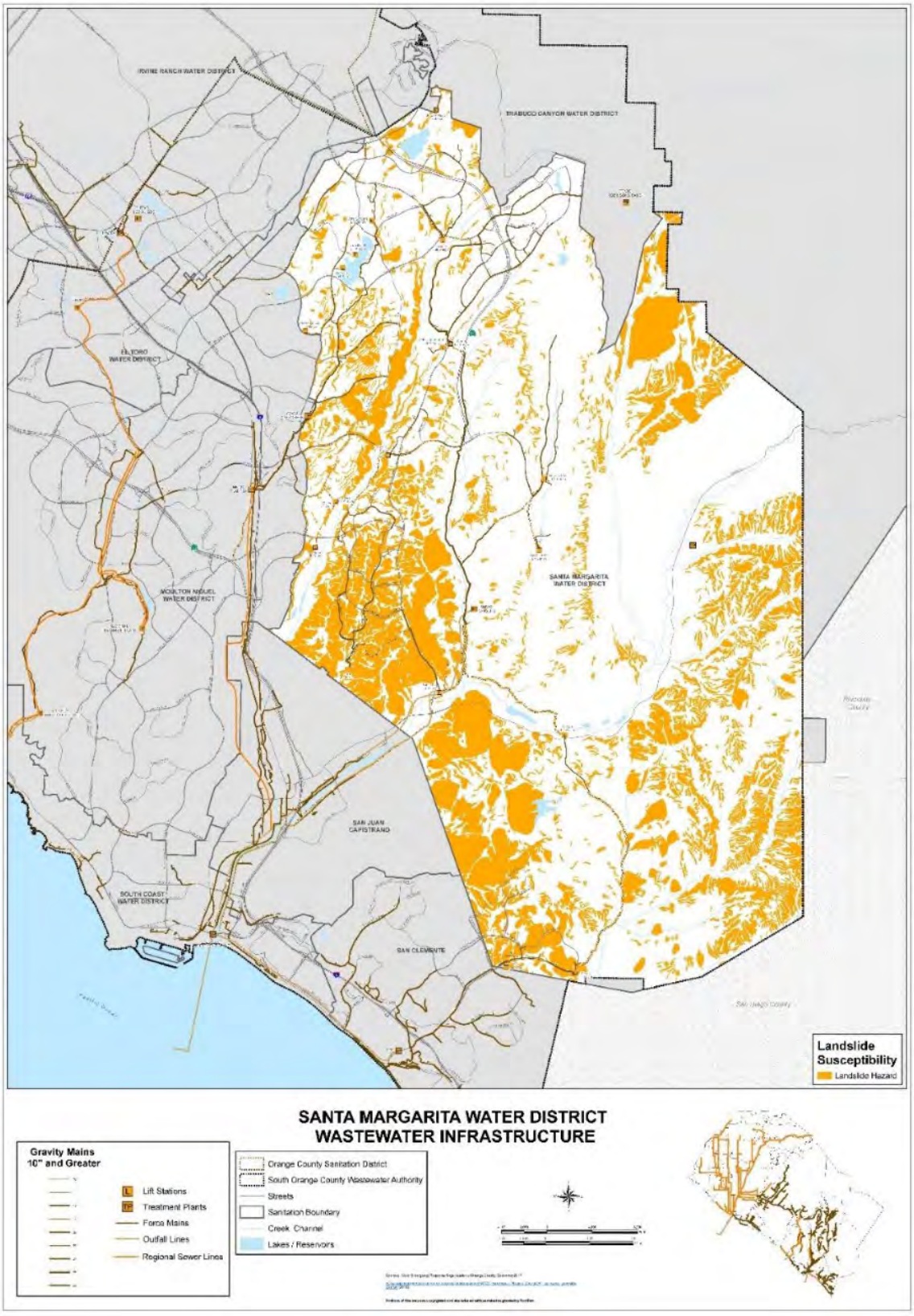


Exhibit J-13. Landslide Hazard and SMWD Wastewater Infrastructure



J.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within SMWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

SMWD's infrastructure is outlined in **Exhibit J-14**, which lists the number of infrastructure assets are located within the mapped hazard zones identified above.

Exhibit J-14. SMWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Interties (#)	Pump Stations (#)	Wells (#)	Reservoirs (#)	Wastewater Pipeline (miles)	Potable Pipelines (miles)
Fire Hazard Zone	Moderate	0	1	0	0	7.8	13.9
	High	2	1	0	0	25.5	18.9
	Very High	4	9	1	26	37.8	55.0
FEMA Flood Zone	100-Year	0	1	2	0	4.5	0.3
	500-Year	0	0	3	0	0.7	3.6
Alquist-Priolo Rupture Zone		0	0	0	0	0	0
Seismic Shaking	Moderate	2	9	0	21	23.1	40.1
	High	6	18	9	18	63.4	72.3
	Extreme	0	0	0	0	0	0
Liquefaction	Moderate	0	2	9	1	15.5	8.8
	High	0	0	0	0	0	0
	Very High	0	0	0	0	0	0
	Unknown	2	0	0	0	15.7	10.4
Landslide Zone		0	3	0	14	12.1	16.0
Tsunami Zone		0	10	8	11	0	0

Much of SMWD's potable and wastewater pipeline systems are located in very high fire hazard areas and high hazard ground shaking areas. Additionally, SMWD contains a high number of reservoirs in both very high fire hazard areas and moderate ground shaking hazard areas. After acquiring San Juan Capistrano's assets in 2021, SMWD now has multiple pump stations, wells, and reservoirs located within the tsunami zone. SMWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture.

Changes in Land Use and Development

SMWD serves a large area within Orange County including the City of Mission Viejo, City of Rancho Santa Margarita, and City of San Clemente. Additionally, SMWD serves the unincorporated areas of Coto de Caza, Las Flores, Ladera Ranch, and Rancho Mission Viejo. Since the 2019 MJHMP update, SMWD has taken over management and ownership of the City of San Juan Capistrano's water distribution and wastewater collection system. SMWD has been working in conjunction with Rancho Mission Viejo on the Ranch Plan which has been in development since 2013 and includes a

mix of residential and commercial development within the SMWD service area. Within the Ranch Plan there is projected to be 130 acres of urban activity center uses, 258 acres of business park uses, 39 acres of neighborhood retail development, and up to two golf courses. Beyond the Ranch Plan, SMWD anticipates greater potential development within the vacant areas of South Orange County as they transition to residential and commercial mixed-use areas.

In anticipation of the potential growth of residential and commercial areas, SMWD has been striving to meet growing demand through various projects and development. The largest plan in place is for SMWD to participate in the design and construction of the Doheny Ocean Desalination Project. SMWD has also collaborated with California State Parks at the Doheny State Beach Campgrounds to update the 122 campgrounds with new water and sewer hookups. The wastewater collection system has been updated for future demand increased through the installation of the Coto de Caza Lift Station's 154,000-gallon emergency storage basin for potential overflow and the construction of a new 3.0 million gallon per day secondary clarifier at the Chiquita Water Reclamation Plant.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Dam/Reservoir Failure	There are no direct climate change impacts anticipated on dam/reservoir failure, however fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design could increase the vulnerability of Trampas Canyon Reservoir and Dam, causing potential issues for SMWD.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within SMWD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the SMWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Wildfire	Climate change is expected to cause an increase in wildfires within SMWD's service area due to the proximity to Pinos Peak, Ronald W Caspers Wilderness Park, and other nature preserve areas with high wildfire vulnerability.
Hazards of Medium Concern	
Flood	With the San Juan Creek and Trabuco Creek running through the SMWD service area, climate change is expected to cause more frequent flooding with the 100-year flood events expanding into the 500-year flood zones more frequently.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across SMWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	SMWD's vulnerability changes in contamination and saltwater intrusion due to climate change are expected to follow the changes outlined in the base plan.

Hazard	Climate Change Vulnerabilities
Human-Caused Hazard: Power Outage	Climate change will likely increase SMWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact facilities.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is not anticipated to increase vulnerability at this time.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact SMWD similar to impacts described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact SMWD's service area similarly to the impacts described in the base plan.
Severe Weather: Windstorm	The challenges to SMWD from climate change's impacts on Windstorms is expected to follow the impacts described in the base plan.
Hazards of Low Concern	
Geological Hazards: Land Subsidence	SMWD's vulnerability to land subsidence is not expected to change due to climate change.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

J.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. SMWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits J-15a through J-15d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. SMWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit J-15a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	State and local jurisdiction	SMWD complies with applicable building codes and works with cities within the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified SMWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Zoning Ordinance	Local jurisdiction	SMWD complies with applicable zoning codes and works with cities within the service area.
Subdivision Ordinance or Regulations	Local jurisdiction	SMWD complies with applicable subdivision ordinance or regulations and works with cities within the service area.
Special Purpose Ordinance	County of Orange Flood Control District/ Orange County Fire Authority / USACE / USFWS / CDFG	SMWD complies with applicable special purpose ordinances and works with cities within the service area.
Growth Management Ordinances	Local jurisdiction	SMWD complies with applicable growth management ordinances and works with cities within the service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, SMWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	Local jurisdiction/SMWD	Site Plans reviews to determine impacts on facilities. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plan	SMWD	Based on water supply verification. Emergency water storage capability.
Capital Improvements Plan	SMWD Evaluates its facilities on a scheduled basis	Capital improvement plans are derived from the water and sewer master plans, as well as known problems that may develop in between plan updates. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Economic Development Plan		SMWD complies with economic development plans and works with cities within the service area.
Emergency Response Plan	Internal E.R.P.	ERP is based on NIMS and SEMS concepts. ERP Utilizes WEROC Resources and multi-agency support. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure SMWD is better

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		prepared for future incidents and can anticipate their communities' needs.
Post-Disaster Recovery Plan	Incorporated into the SMWD E.R.P.	Describes policies and procedures for resource recovery.
Vulnerability Assessment	Internal Facility Assessments. Homeland Security Guidelines Referenced Throughout Assessments	Services Provided by Consulting Firms. Continuous Updates Regarding Cyber Security.
Dams	Department of Safety of Dams	Annual Assessment.
VA ERP	Internal/OES/DHS/Consultants	Services Provided by Consulting Firms. Continuous Updates Regarding Cyber Security.
Water Discharge Requirements	RWQCB	Regulatory Compliance.
Comprehensive/ Master Plan	SMWD	SMWD has a Master Plan in place for both water and wastewater systems

How can these capabilities be expanded and improved to reduce risk?

- Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements.
- Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan.
- Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.
- Implement newly identified hazard information into the next Emergency Response Plan.
- Continue to audit the Sewer System Management Plan (S.S.M.P) on a bi-annual basis.
- Remote 24/7 monitoring camera trailers have been installed at the SMWD Chiquita Water Reclamation Plant.

Exhibit J-15b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	SMWD Engineering Staff/Consultants	Provides information regarding the City's zoning and land use regulations and development standards. The Planning Division coordinates with other City departments in the review of new development projects for regulatory compliance. The Division also analyzes projects and prepares and presents reports to the Planning Commission for its bimonthly meetings.
Emergency Manager	SMWD Utilities Manager	Delegate roles and responsibilities.
Floodplain manager	OCFCD	The agency coordinates with the County Floodplain Manager.
Grant Writers	Consultants/Limited SMWD Staff	Evaluate & recommend.
Surveyors	Consultants	Contract service providers are on-call.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	SMWD Emergency Response Plan Staff	Assessment done in accordance with SMWD emergency response plan.
Personnel Skilled in GIS and/or HAZUS	SMWD SCADA, GIS, I.T. Department Personnel	Maps available displaying infrastructure.
Water Quality Lab	SMWD Lab Staff	Water Quality lab located at Chiquita Wastewater Treatment Facility.
Mutual aid agreements	SMWD Administration	SMWD has mutual aid agreements in place.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (Aloes) Safety Assessment Program (SAP) training for building inspections. ▪ SMWD utilizes alternate power resources. ▪ SMWD utilizes recycled water technologies to bring wastewater to title 22 standards for reuse. ▪ SMWD envisions additional reservoirs. ▪ Increase automatic meter reading capabilities through new technology and staffing. ▪ SMWD has installed and implemented the use of battery backup systems at various critical locations such as pump stations/ Treatment Plants.

Exhibit J-15c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	SMWD Engineering Department, Operations Department, and Finance Department	Annual review of capital requirements and forecasting future cap needs. **Expansion and Improvement:** During annual budgeting SMWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	SMWD/County of Orange	SMWD typically levies taxes for 1) special assessment tax obligation debt service and 2) general obligation debt service payments.
Fees for Water, Sewer, Gas, or Electric Service	SMWD Customer Service Department/Board of Directors/SMWD Finance Department	SMWD, through the Prop 218 process, is able to charge customers fees for water and sewer services. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Incur Debt Through General Obligation Bonds	SMWD Finance and Engineering Department	Through a general election, SMWD can incur debt through general obligation bonds.
Incur Debt Through Special Tax and Revenue Bonds	SMWD Finance and Engineering Department	SMWD may incur special tax or revenue bonds as needed through the appropriate legal process.
Grants	SMWD Finance and Engineering Department	SMWD actively pursues available grants.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Increase ability to provide water/sewer services to neighboring agencies as cost-share projects. ▪ Pursue additional grant opportunities. ▪ Utilize grant opportunities/funding for C.I.P.

Exhibit J-15d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
National Night Out	Multi Agency	Public Outreach Event Focusing on Emergency Response and Safety.
Ladera Ranch Spring Celebration	Multi Agency	Public Outreach Event Focusing on Emergency Response and Safety.
Annual -Web EOC Training	SMWD	Refresher Training to Focus on Web EOC-Data Input and Resource Acquisition. **Expansion and Improvement:** New trainings focused on mitigation strategies and implementation can help
SMWD ERP/DAM EAP Operational Exercises	SMWD	Training to Focus on EOC Positions and Functionality.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to SMWD Water. ▪ Incorporate mitigation and emergency preparedness concepts into Community Water Use Workshops. ▪ Educate businesses on Fats, Oils and Greases Ordinances (F.O.G.) ▪ Conduct recycled water education tours of facilities. ▪ Continue to expand the district's social media presence and incorporate mitigation and preparedness concepts into posts.

J.7 MITIGATION STRATEGY

J.7.1 Mitigation Goals

SMWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

J.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit J-16,** SMWD's Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit J-16. SMWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Work with OCFA to ensure that facilities are meeting best practices near fire risk areas.	Multiple Facilities	All Hazards	Labor	Emergency Management	Immediate	Operating Budget	Existing, Ongoing
Complete Phase 3 of SCADA Plan to provide redundancy in communications network.	Multiple Facilities	All Hazards	$300,000	Operations/IT	Immediate	CIP Budget	Existing, Ongoing
Expand San Juan Ground Water Plant (SJGWP) Capabilities	SJGWP	All Hazards	$34 Million	Engineering /Operations	Short Term	CIP Budget	Existing, Ongoing
Protect and properly maintain Upper Chiquita Reservoir.	Upper Chaquita Reservoir	All Hazards	Labor	Operations	Immediate	Operating Budget	Existing, Ongoing
Evaluate and update lift station emergency overflow response plans.	Lift Stations	All Hazards	Labor	Emergency Management	Immediate	CIP Budget	Existing, Ongoing
Upgrade Chiquita Water Reclamation Plant Influent Lift Station	CWRP	Dam/Reservoir Failure	$17 Million	Engineering	Short Term	Operating Budget	Existing, Ongoing
Continue preventative maintenance schedules at facilities to ensure they remain in working order.	Multiple Facilities	All Hazards	Labor		Immediate	CIP Budget	Existing, Ongoing
Work with OCFA to ensure that facilities are meeting best practices near fire risk areas.	Multiple Facilities	Wildfire, Urban Fire	Labor	Emergency Management	Immediate	Operating Budget	Existing, Ongoing
Install water quality analyzers that remotely send water quality info via SCADA.	Multiple Facilities	Human-Caused Hazards: Contamination /Saltwater Inundation	$10,000 per site	Operations	Immediate	Budgeted	Existing, Ongoing
MEDIUM PRIORITY							
Implement cathodic protection program to ensure corrosion control for pipelines	Multiple Facilities	All Hazards	$300,000/yr	Operations	Long Term	CIP Budget	Existing, Ongoing
Standardize and upgrade older lift station's electrical and instrumentation system.	Multiple Facilities	All Hazards	Unknown	Engineering /Operations	Long Term	CIP Budget	Existing, Ongoing
Improve active and passive security at facilities.	Multiple Facilities	Human-Caused Hazards: Terrorism (MCI)	Unknown	Operations	Immediate	Operating Budget	Existing, Ongoing
Build dashboards that allow for increased monitoring of constituents of concern.	Multiple Facilities	Human-Caused Hazards: Contamination /Saltwater Inundation	Labor	Operations	Immediate	Budget	Existing, Ongoing

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
LOW PRIORITY							
Exercise and maintain emergency interconnections.	Multiple Facilities	All Hazards	Unknown	Operations	Short Term	CIP Budget	Existing, Ongoing
Continue to seek additional regional resources for reliability (gas, equipment, etc.)	Multiple Facilities	All Hazards	Unknown	Emergency Management	Long Term	Operating Budget	Existing, Ongoing
Install reservoir management systems at key locations.	Reservoirs	Human-Caused Hazards: Terrorism (MCI)	$11 Million	Operations	Short Term	CIP Budget	Existing, Ongoing
Continually monitoring the public water supply and requiring the installation of State Health Department approved backflow prevention devices on all hazardous potable services. All fires systems are upgraded to a Double-Check Detector Assembly if the site is being refurbished.	Multiple Facilities	Human-Caused Hazards: Contamination /Saltwater Inundation	$1 Million	Emergency Management	Long Term	Budget	Existing, Ongoing

J.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Build Trampas Canyon Reservoir.
  - **Status:** Complete.
- **Mitigation:** Construct emergency storage facilities where applicable.
  - **Status:** Complete.
- **Mitigation:** Install flexible connections at steel tank reservoirs.
  - **Status:** Complete.
- **Mitigation:** Maintain sewer bypass pump and fittings trailer for emergency bypass operations.
  - **Status:** Complete.
- **Mitigation:** Provide long-term sustainable bypass capability at high-risk lift stations.
  - **Status:** Complete.
- **Mitigation:** Purchase emergency antenna trailers to allow for failure of multiple facilities.
  - **Status:** Complete.
- **Mitigation:** Upgrade Collections Crew with two additional combo units to provide reliable response to sewer spills and ability to perform preventative maintenance.
  - **Status:** Complete.
- **Mitigation:** Update Emergency Action Plans for existing dams and provide updates to relevant agencies.
  - **Status:** Complete.
- **Mitigation:** Update Emergency Action Plans for Trampas Canyon Reservoir Dam and provide to relevant agencies.
  - **Status:** Complete.
- **Mitigation:** Update the inundation study for existing dams.
  - **Status:** Complete.

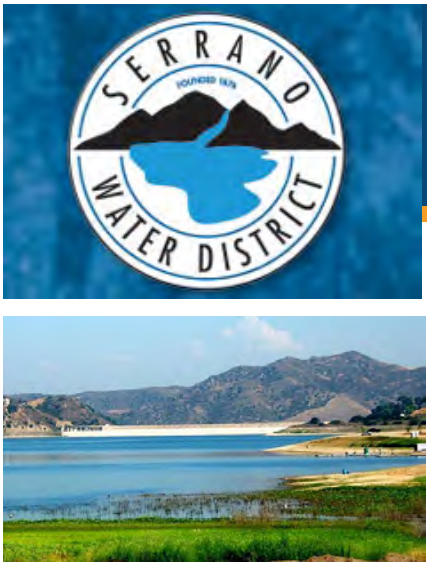
J.8 PLAN INTEGRATION

SMWD's capital budget, Water Master Plan, Wastewater Master Plan and Sewer System Management Plan are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, SMWD will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, SMWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform SMWD's Water and Wastewater Master Plans, Sewer System Management Plan, and Urban Water Management Plan.
- The risk assessment informed the need for additional studies, such as the dam inundation study.

2024



Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex K: Serrano Water District

Contents

Exhibits

SERRANO WATER DISTRICT ANNEX

Serrano Water District (Serrano Water®) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, Serrano Water representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to Serrano Water.

This annex details the hazard mitigation planning elements specific to Serrano Water and describes how Serrano Water's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by Serrano Water. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to Serrano Water with a focus on the risk assessment and mitigation strategies.

K.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit K-1** lead the Serrano Water planning team, attended meetings, and coordinated the hazard mitigation planning efforts with Serrano Water staff and the consultant team supporting the effort.

Exhibit K-1. Planning Team Lead

Primary Point of Contact
Name: Jerry Vilander
Title: General Manager
Telephone: (714) 538-0079
Email: jerryv@serranowater.org

Serrano Water followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as Serrano Water's internal hazard mitigation planning development team.

Exhibit K-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Jennifer Westrum	Administrative Assistant

Outreach to the public within Serrano Water's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, Serrano Water published a webpage with information on the MJHMP process. The MJHMP survey was posted to their blog platforms on to increase engagement.

K.2 JURISDICTION PROFILE

Service Population: 6,500

Serrano was formed in 1927 under the California Water Code and serves a population of 6,500 in the City of Villa Park and a small portion of the City of Orange. Serrano is an independent governmental body with an elected Board of Directors. It is separate and distinct from the City of Villa Park's Municipal Government. Serrano receives its water supply mostly from local surface water, which is stored in Santiago Reservoir (Irvine Lake), and groundwater from three wells located within the City of Villa Park. Annually, Serrano provides about 3,000 acre-feet of water serving primarily large lot single family homes and one shopping center. About once every 10 years, Serrano supplements its local water supply with raw imported water from Metropolitan through MWDOC.

Serrano owns a percentage of the capacity of Irvine Lake and the dam forming the lake; Irvine Ranch Water District owns the balance. The annual operation of Irvine Lake varies depending on the amount of local runoff.

The water Serrano receives out of Irvine Lake can be either locally generated runoff, imported water, or some combination thereof. Water is supplied from Irvine Lake to the Serrano treatment plant, located about 1.5 miles away, through a 24-inch gravity flow supply line that has a capacity of about 17 cubic feet per second (cfs). Serrano's existing water treatment plant can produce about 3,000 gallons per minute (gpm) and its wells can produce about 4,000 gpm for a peak supply of about 7,000 gpm. In recent years, Serrano has been using their treatment plant to supply 1,000 to 1,500 acre-feet of water to the City of Orange through interconnections.

K.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that Serrano Water faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

Serrano Water's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the Serrano Water development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect Serrano Water and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit K-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit K-3. Serrano Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Serrano Water
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	Medium
Wildfire	Highly Likely	Medium	Critical	High	High	Medium
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	Medium
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	Low
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Medium
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	High
Flood	Likely	Medium	Limited	Negligible	Medium	Low
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	N/A
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Low
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Medium
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	N/A

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to Serrano Water's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit K-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and Serrano Water.

K.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit K-4. Fire Hazard and Serrano Water District Potable Water Infrastructure

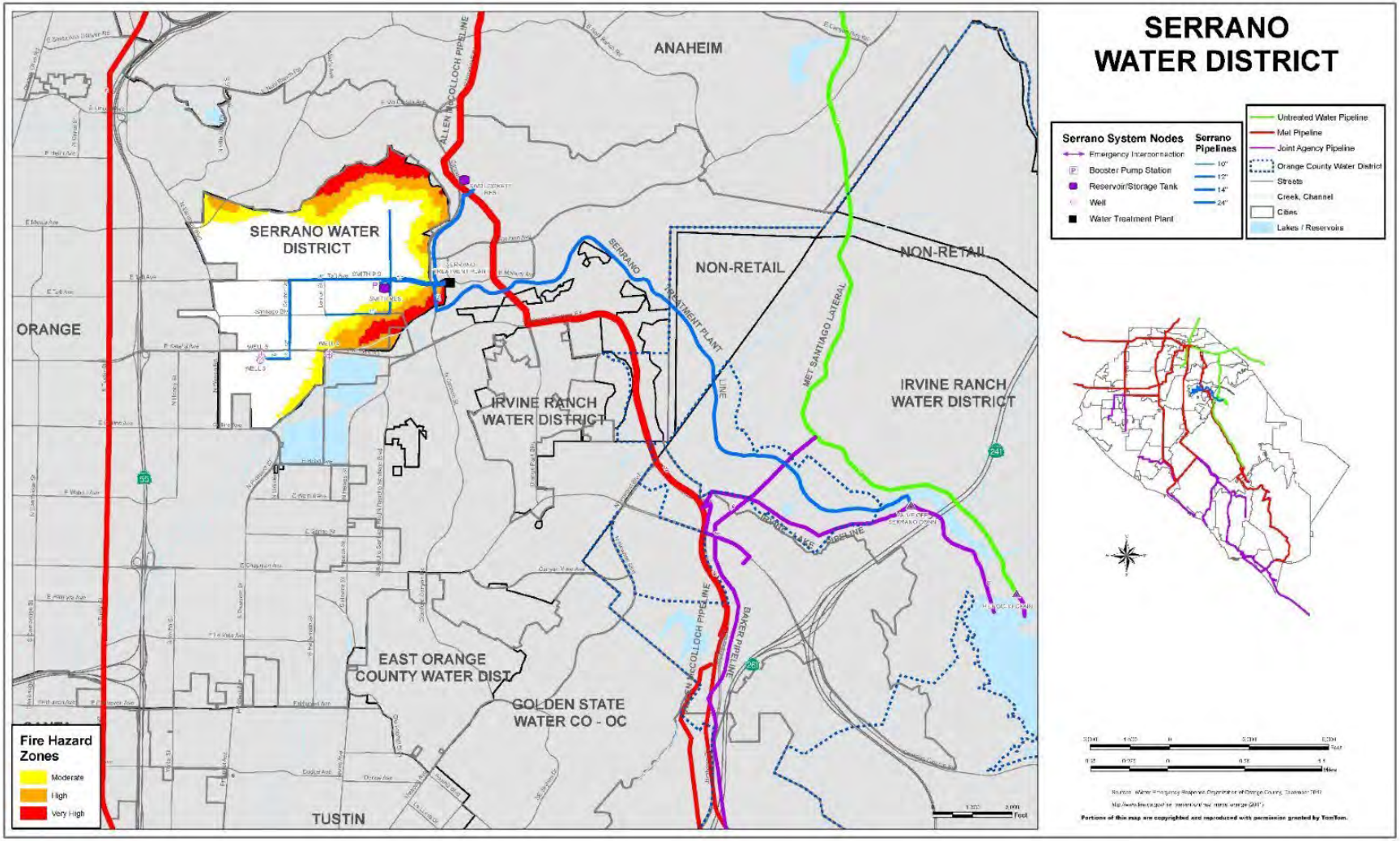


Exhibit K-5. Flood Hazard and Serrano Water District Potable Water Infrastructure

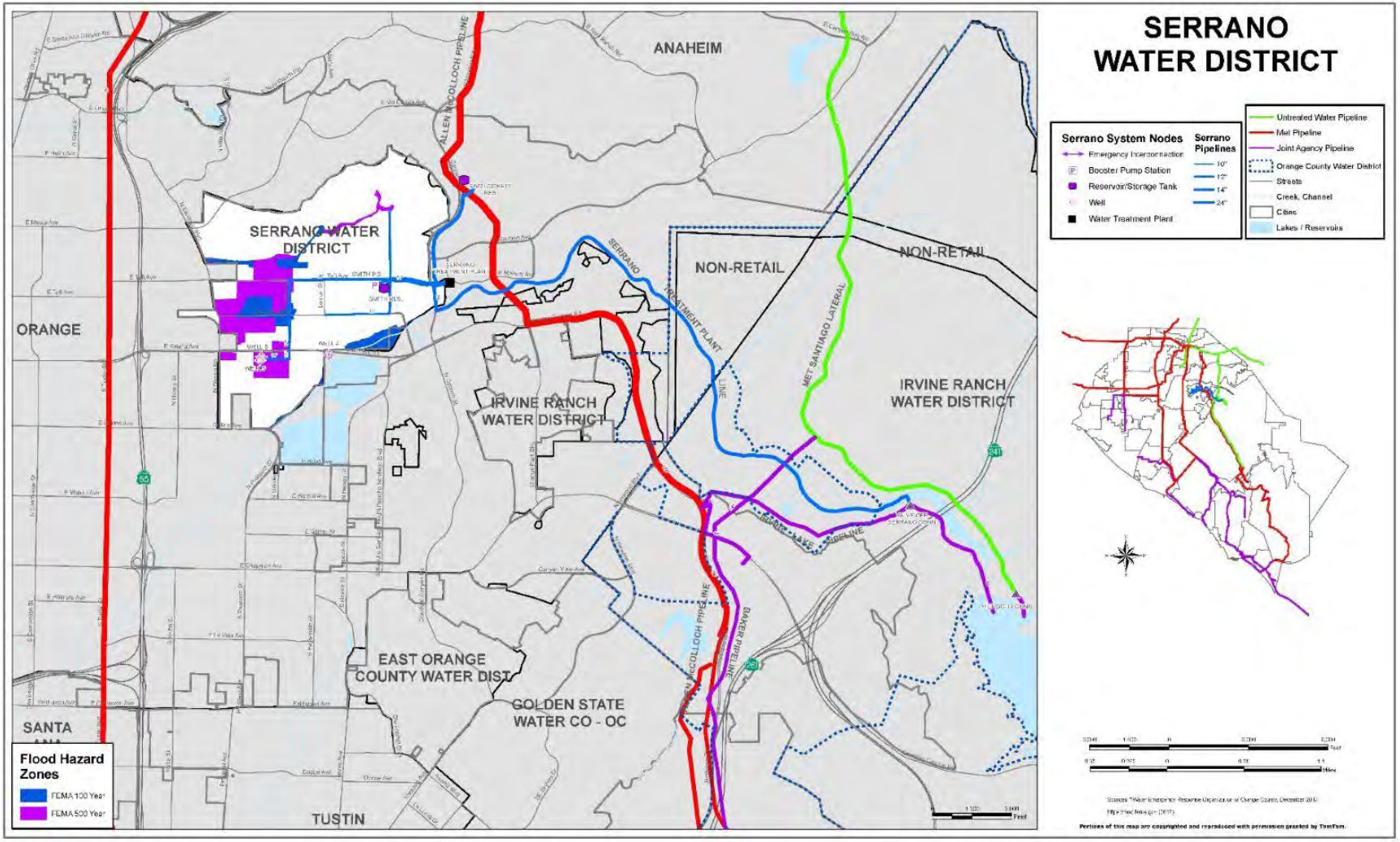


Exhibit K-6. Seismic Shaking Hazard and Serrano Water District Potable Water Infrastructure

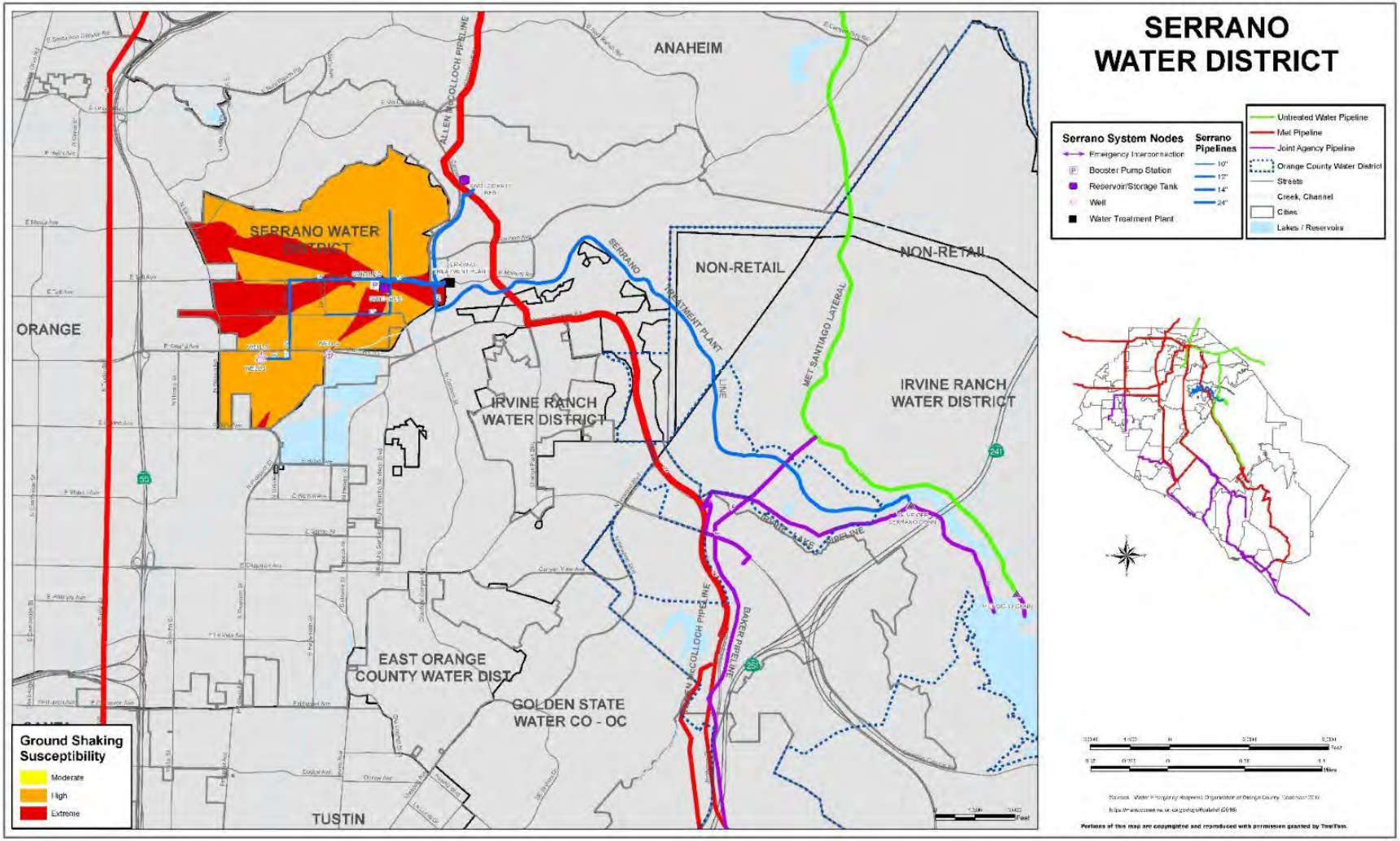


Exhibit K-7. Liquefaction Hazard and Serrano Water District Potable Water Infrastructure

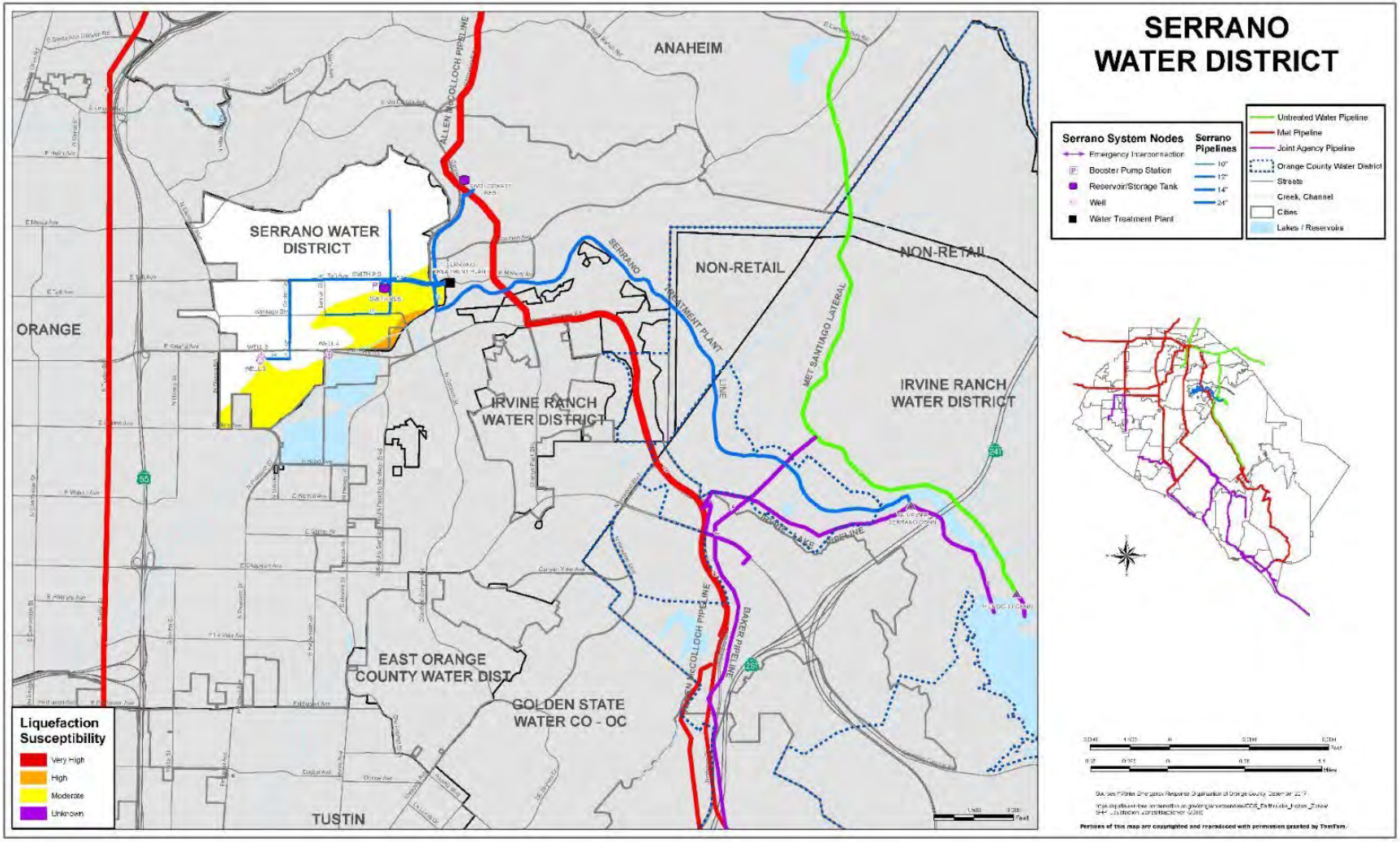
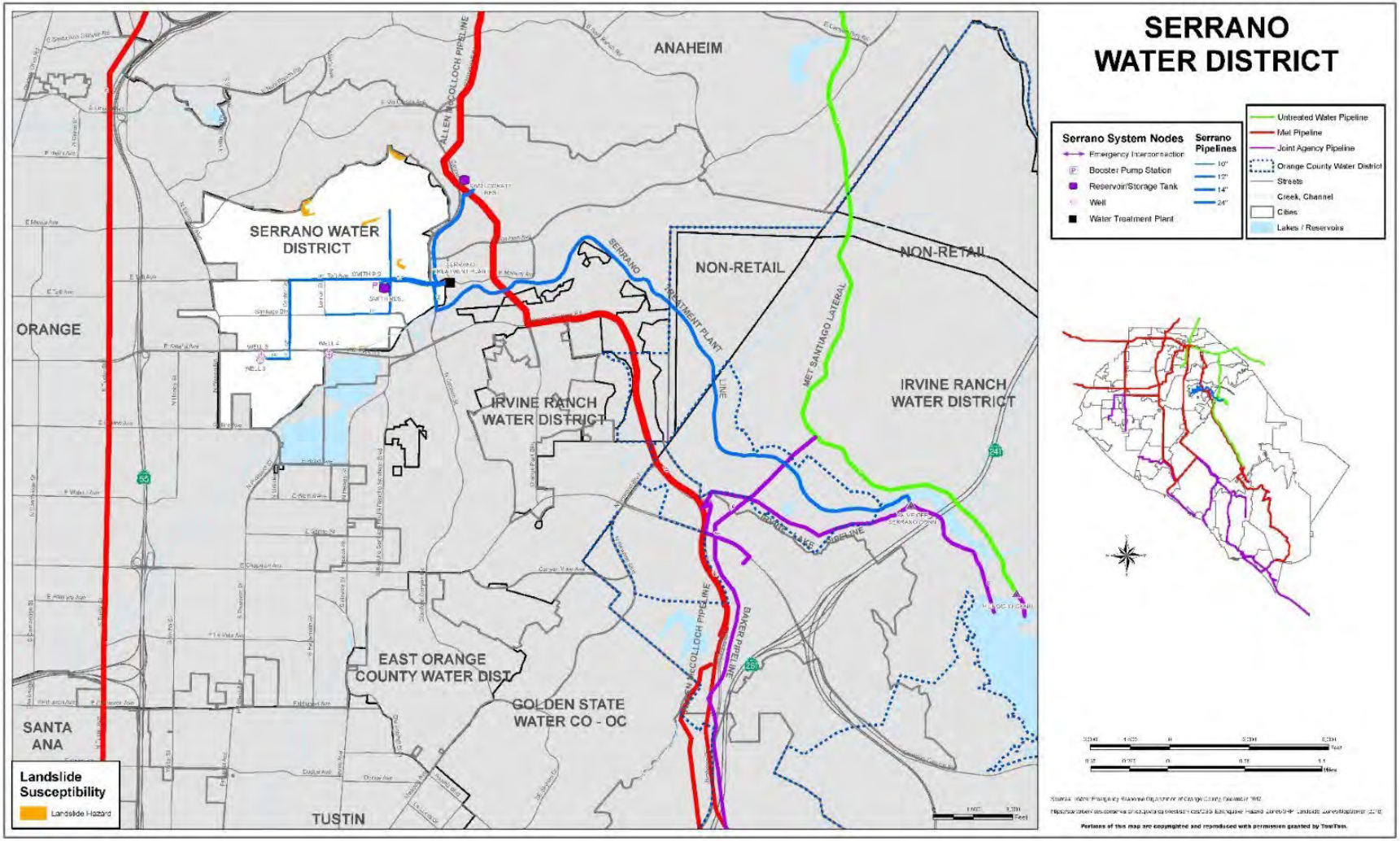


Exhibit K-8. Landslide Hazard and Serrano Water District Potable Water Infrastructure



K.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within Serrano Water's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

Serrano Water's infrastructure is outlined in **Exhibit K-9**, which lists the number of Serrano Water's infrastructure assets are located within the mapped hazard zones identified above.

Exhibit K-9. Serrano Water Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type				
		Pump Stations (#)	Treatment Plants (#)	Reservoirs (#)	Wells (#)	Potable Pipelines
Fire Hazard Zone	Moderate	0	0	0	0	1.5
	High	0	0	0	1	2.5
	Very High	0	1	1	0	2.8
FEMA Flood Zone	100-Year	0	0	0	0	4.9
	500-Year	0	0	0	2	0.5
Alquist-Priolo Rupture Zone		0	0	0	0	0
Seismic Shaking	Moderate	0	0	0	0	0
	High	1	0	1	3	3.3
	Extreme	0	1	1	0	5.3
Liquefaction	Moderate	0	1	0	1	4.7
	High	0	0	0	0	1.4
	Very High	0	0	0	0	0
	Unknown	0	0	0	0	0.4
Landslide Zone		0	0	0	0	0
Tsunami Zone		0	0	0	0	0

Serrano Water has a treatment plant and reservoir within a very high fire hazard zone and an extreme seismic shaking zone. Several miles of potable pipeline and two wells are located in the 500-year FEMA flood zone. Serrano Water has infrastructure or pipelines in all hazard areas except the Alquist-Priolo Rupture Zone, any landslide zones, or the tsunami zone.

Changes in Land Use and Development

Serrano Water serves the City of Villa Park and a small portion of the City of Orange over a 4.7 square mile service area. The land within this service area is largely built out with single family homes and retail locations. Remaining vacant land is expected to be developed into additional dwelling units but is projected to have a minor impact on service demand. Despite the low estimated change in service demand, Serrano Water has pursued updates to the Santiago Creek Dam in shared effort with Irvine Ranch Water District by updating the outlet tower and improving the dam spillway in 2023. These updates ensure the dam meets current state regulatory requirements, satisfy operational requirements, and extent the lift and reliability of the facilities.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Dam/Reservoir Failure	There are no direct climate change impacts anticipated on dam/reservoir failure, however fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design could increase the vulnerability of Santiago Creek Dam, causing potential issues for Serrano Water.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Hazards of Medium Concern	
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazard: Power Outage	Climate change will likely increase Serrano Water's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact Serrano Water facilities.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within Serrano Water's service area.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact Serrano Water as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact Serrano Water's service area similarly to the impacts described in the base plan.
Severe Weather: Windstorm	The challenges to Serrano Water from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change may increase wildfires on the outskirts of Serrano Water's service area, however is not expected to increase wildfires within the majority of the service area due to the lack of vacant or undeveloped area.
Hazards of Low Concern	
Flood	Climate change is not expected to cause much impact on Serrano Water due to the lack of creeks or rivers running through the service area. Some flood waters may be seen around the Santiago Creek Recharge Basin on a more frequent basis.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within Serrano Water's service area. The vulnerability follows that described in the Base Plan.
Geological Hazards: Land Subsidence	Serrano Water's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across Serrano Water's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.

Hazard	Climate Change Vulnerabilities
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the Serrano Water service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.

K.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. Serrano Water's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits K-10a through K-10d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. Serrano Water has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit K-10a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City of Villa Park/City of Orange	Serrano Water complies with applicable building codes and works with cities within the service areas. **Expansion and Improvement:** As retrofits and replacement projects are identified Serrano Water will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	City of Villa Park/City of Orange	Serrano Water complies with applicable zoning codes and works with cities within the service areas.
Subdivision Ordinance or Regulations	City of Villa Park/City of Orange	Serrano Water complies with subdivision ordinances and regulations and works with cities within the service areas.
Special Purpose Ordinance	City of Villa Park/City of Orange	Serrano Water complies with special purpose ordinances and works with cities within the service areas.
Growth Management Ordinances	City of Villa Park/City of Orange	Serrano Water complies with growth management ordinances and works with cities within the service areas. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, Serrano Water can help better

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	Serrano Water looks at this for placement of gutter	Serrano Water performs site plan reviews as needed. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plan	City of Villa Park/City of Orange	Serrano Water complies with the city's general plan.

How can these capabilities be expanded and improved to reduce risk?
▪ Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ Incorporate hazard information into the next General Plan Update. Ensure that new regulations are incorporated as needed. ▪ Implement a process to ensure mitigation actions identified in the hazard mitigation plan are reviewed as part of the update to the Capital Improvements Program, Water Master Plan, and Emergency Operations Plan

Exhibit K-10b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	City and Serrano Water (additional staff would be hired on as needed contract)	Serrano Water does not have in-house engineers- all engineer work hired as needed; work with MWPOC staff on regional level.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	City and Serrano Water (additional staff would be hired on as needed contract)	Serrano Water does not have in-house engineers- all engineer work hired as needed; work with MWPOC staff on regional level.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	City of Villa Park and City of Orange	City, county, and agency has planners with expertise in land development practices.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Serrano Water	Staff attend hazard mitigation meetings and expect additional training; attend training.
Emergency Manager	Management	General Manager of Serrano Water.
Grant Writers	Consultant	Serrano Water District Outsource.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend California Governor's Office of Emergency Services (CalOES) Safety Assessment Program (SAP) training for building inspections. ▪ Coordinate with department managers to review the MJHMP and progress towards implementation. ▪ Identify information that should be included in future MJHMP updates.

Exhibit K-10c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Serrano Water District/Finance	Annual review of capital requirements and forecasting future cap needs. **Expansion and Improvement:** During annual budgeting Serrano Water can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	Do not do	The district typically levies taxes for 1) special assessment tax obligation debt service and 2) general obligation debt service payments.
Fees for Water, Sewer, Gas, or Electric Service	Set rates SWD	The district, through the Prop 218 process, is able to charge customers fees for water and sewer services. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Impact Fees for Homebuyers or Developers for New Developments/Homes	Serrano Water + City	Through a general election, the district can incur debt through general obligation bonds.
Incur Debt Through General Obligation Bonds	Serrano Water District/Administration and Board of Directors	Serrano Water may incur special tax or revenue bonds as needed through the appropriate legal process.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Coordinate with other organizations, and agencies to identify potential assets and resources that may not currently be considered.

Exhibit K-10d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Various; as needed	In house and as needed consultants	Information outreach is conducted for specific programs or projects as necessary.
Newsletter	Serrano Water District	Serrano Water publishes a newsletter to provide information to its customers. **Expansion and Improvement:** Incorporate mitigation information and analysis into newsletters to continue sharing information with customers.

Resource/ Programs	Agency or Department	Description/Comments
Press Release	Serrano Water District	Press releases are used to inform customers of essential information.
Brochures	Serrano Water District	Brochures are used to inform and educate customers on specific water topics.
Website	Serrano Water District	Serrano Water's website is updated regularly and used to provide information.
Town Hall Meetings	Serrano Water District	Meetings held to discuss important water topics affecting customers, such as drought.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to Serrano Water. ▪ Identify a variety of opportunities to provide hazard information to the community and ways to minimize impacts associated with a disaster event.

K.7 MITIGATION STRATEGY

K.7.1 Mitigation Goals

Serrano Water adopts the hazard mitigation goals developed by the planning team; refer to **Section 4.**

K.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit K-11,** Serrano Water's Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit K-11. Serrano Water Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Improve structural characteristics of reservoirs and pump stations; consider flexible connections at reservoirs for seismic activity. Replace water tank and upgrade pump station to meet current seismic requirements.	All facilities	Seismic Hazards: Seismic Shaking	$9 Million	Engineering	Long Term	Budget	Existing, Ongoing
MEDIUM PRIORITY							
Coordinate with Irvine Ranch Water District on dam inundation mapping, training, and exercises.	Santiago Creek Dam	Dam/Reservoir Failure	Unknown			Budget	New
LOW PRIORITY							
Secure above ground assets in all buildings, booster stations, reservoirs, pressure reducing stations, emergency interties, water systems, water reclamation plant, lift station, pipelines, and bridge crossings.	All Facilities	Seismic Hazards: Seismic Shaking	$50 Million	Operations /Engineering	Long Term	Capital Improvement Fund	Existing, Ongoing

K.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Identify all major fuel pipelines, rail transportation corridors, manufacturing facilities, and their vulnerability relative to hazardous materials releases.
  - **Status:** Completed. Serrano Water does not own any assets of concern in these areas.
- **Mitigation:** Protect facilities within flood plain area around Irvine Lake
  - **Status:** Removed in 2024. Facilities were transferred to Irvine Ranch Water District.
- **Mitigation:** Place protective measures in rivers and creeks or relocate facilities out of flood harm's way.
  - **Status:** Removed in 2024. Facilities were transferred to Irvine Ranch Water District.
- **Mitigation:** Install jointless pipelines in all creek crossings.
  - **Status:** Removed in 2024. No creek crossings in Serrano Water's service area.
- **Mitigation:** Develop a comprehensive approach to reducing the possibility of damage and losses due to structural fire/wildfires.
  - **Status:** Removed in 2024. Facilities were transferred to Irvine Ranch Water District.
- **Mitigation:** Create a fire management plan outlining various impacted facilities and vulnerabilities,
  - **Status:** Removed in 2024. Facilities were transferred to Irvine Ranch Water District.
- **Mitigation:** Share all infrastructure/building information with local, county, and state fire agencies.
  - **Status:** Removed in 2024. Facilities were transferred to Irvine Ranch Water District.

K.8 PLAN INTEGRATION

Serrano Water's capital budget, Water Master Plan, and Emergency Response Plan are all used to implement mitigation initiatives identified in this annex. Serrano Water will update its Emergency Response Plan that will establish protocol and incorporate applicable areas of the MJHMP. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into these documents.

Since the pervious Plan Update, Serrano Water incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform Serrano Water's Master Plan and Urban Water Management Plan.
- The Capital Budget was used to implement mitigation initiatives identified in the previous Plan.
- The risk assessment informed the need for additional studies, such as dam inundation.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex L: South Coast Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

SOUTH COAST WATER DISTRICT ANNEX

South Coast Water District (SCWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, SCWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to Section 2 of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to SCWD.

This annex details the hazard mitigation planning elements specific to SCWD and describes how SCWD 's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by SCWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to with a focus on the risk assessment and mitigation strategies.

L.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit L-1** lead the SCWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with SCWD staff and the consultant team supporting the effort.

Exhibit L-1. Planning Team Leads

Primary Point of Contact	Alternate Point of Contact
Name: Blaise Bautsch	Name: Sunny Lee
Title: Safety and Health Manager (also EOC manager)	Title: Compliance and Risk Program Manager
Telephone: (949) 342-2162	Telephone: (949) 342-1241
Email: bbautsch@scwd.org	slee@scwd.org

SCWD followed the planning process detailed in Section 2 and formed an internal team to support and provide information for the plan update. The following staff served as SCWD's internal hazard mitigation planning development team.

Exhibit L-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Chris Newton	Operations Supervisor
Kyle Gough	Transmission Main Manager
Steve Dishon	Water Resources Manager
Gina Knight	Director of Human Resources

Outreach to the public within SCWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, SCWD published a webpage with information on the MJHMP process including a link to the MJHMP survey to increase engagement.

L.2 JURISDICTION PROFILE

Service Population: 40,000

SCWD was formed in 1932 under the County Water District Act and currently occupies 5,300 acres of land along Orange County's southern coastline. From its inception, SCWD was an independent "special" district, a form of local government created by the people to provide a "specialized" service. Special districts operate under state law, independent of county government. A Board of Directors, elected by the voters of the District, has the power to establish policies, fix rates, construct and maintain facilities and perform any other act necessary to provide water and sanitation service for present and future consumers. Day-to-day operations are administered by a general manager who is appointed by the Board of Directors.

SCWD has gone through several consolidations and reorganizations to accommodate the needs of the community, as well as to provide the most efficient water and sanitary services possible. South Cost Water currently serves approximately 12,330 potable water, 17,300 wastewater, and 192 recycled water customer accounts. The area serviced by SCWD has an estimated population of 35,000 residents and over two million visitors a year. SCWD purchases imported water from Metropolitan through MWDOC. SCWD incorporated local groundwater into its water supply portfolio in 2008 with the construction of the 1-million gallon per day (MGD) Groundwater Recovery Facility (GRF). Water produced at the GRF is pumped from the San Juan Basin.

SCWD uses secondary effluent received from the Coastal Wastewater Treatment Plant (CTP) and further treats it at the Advanced Wastewater Treatment (AWT) facility and the Aliso Creek Water Reclamation Facility (ACWRF) to Title 22 recycled water standards for landscape irrigation use.

Due to SCWD's hilly terrain, much of the water must be pumped and stored in reservoirs to maintain constant pressure. SCWD's total water storage capacity of approximately 22 million gallons (mg) is maintained in 14 reservoirs. An additional 12.5 mg of storage is available in the 48-mg Bradt Reservoir, located along the Joint Transmission Main (JTM) at the south end of the system. Additionally, SCWD owns 16.6 mg of emergency potable water storage in a regional reservoir, Upper Chiquita Reservoir, located in Rancho Santa Margarita.

Water is moved to upper elevations through approximately 147 miles of local mains using a system of seven pump stations. As an additional safeguard to assure the water supply, SCWD maintains a series of "inter-ties" with neighboring water districts, which can be activated in an emergency.

Since 2000, SCWD has operated, maintained, and administered the Joint Regional Water Supply System (JRWSS) that distributes imported drinking water from Metropolitan Water District of Southern California (MWD) throughout south Orange County. The system includes over 30 miles of water transmission mains and two reservoirs in San Clemente that hold a total of 60 mg of water. Bradt Reservoir has a capacity of 48 mg, and Schlegel Reservoir has a capacity of 12 mg. The JRWSS is jointly owned by and provides water to SCWD District, Irvine Ranch Water District, El Toro Water District, Moulton Niguel Water District, the City of San Juan Capistrano, the City of San Clemente and three agencies of the San Diego County Water Authority (SDCWA): San Onofre Nuclear Generating Station (SONGS), Camp Pendleton, and San Onofre State Park. As of 2016, SONGS is undergoing the decommissioning process.

Wastewater is moved through SCWD service area through 136 miles of sewer lines along with 2 miles of force mains and 13 sewer lift stations. SCWD also manages a unique sewer tunnel and

main in South Laguna, which transports an average of 1.2 mgd of wastewater from Dana Point and South Laguna Beach to the CTP.

Since 1982, SCWD has provided recycled water to customers. The current capacity of the recycled water for SCWD distribution system is supplied by the ACWRF and AWT facility. The AWT receives influent from the adjacent SOCWA CTP. Recycled water is further refined at the ACWRF for some recycled water customers. The CTP located just outside of SCWD's northeast boundary in unincorporated County land (Aliso and Wood Canyon Wilderness Park) and is designed to produce 2.61 mgd of recycled water.

L.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that SCWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

SCWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the SCWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect SCWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit L-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit L-3. SCWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to South Coast
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Medium
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Medium
Flood	Likely	Medium	Limited	Negligible	Medium	Medium
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	Medium
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	Medium
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	Low
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	Medium
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Medium
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Low
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Medium
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Medium
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	Medium

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to SCWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit L-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and SCWD.

L.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit L-4. Fire Hazard and SCWD Potable Water Infrastructure

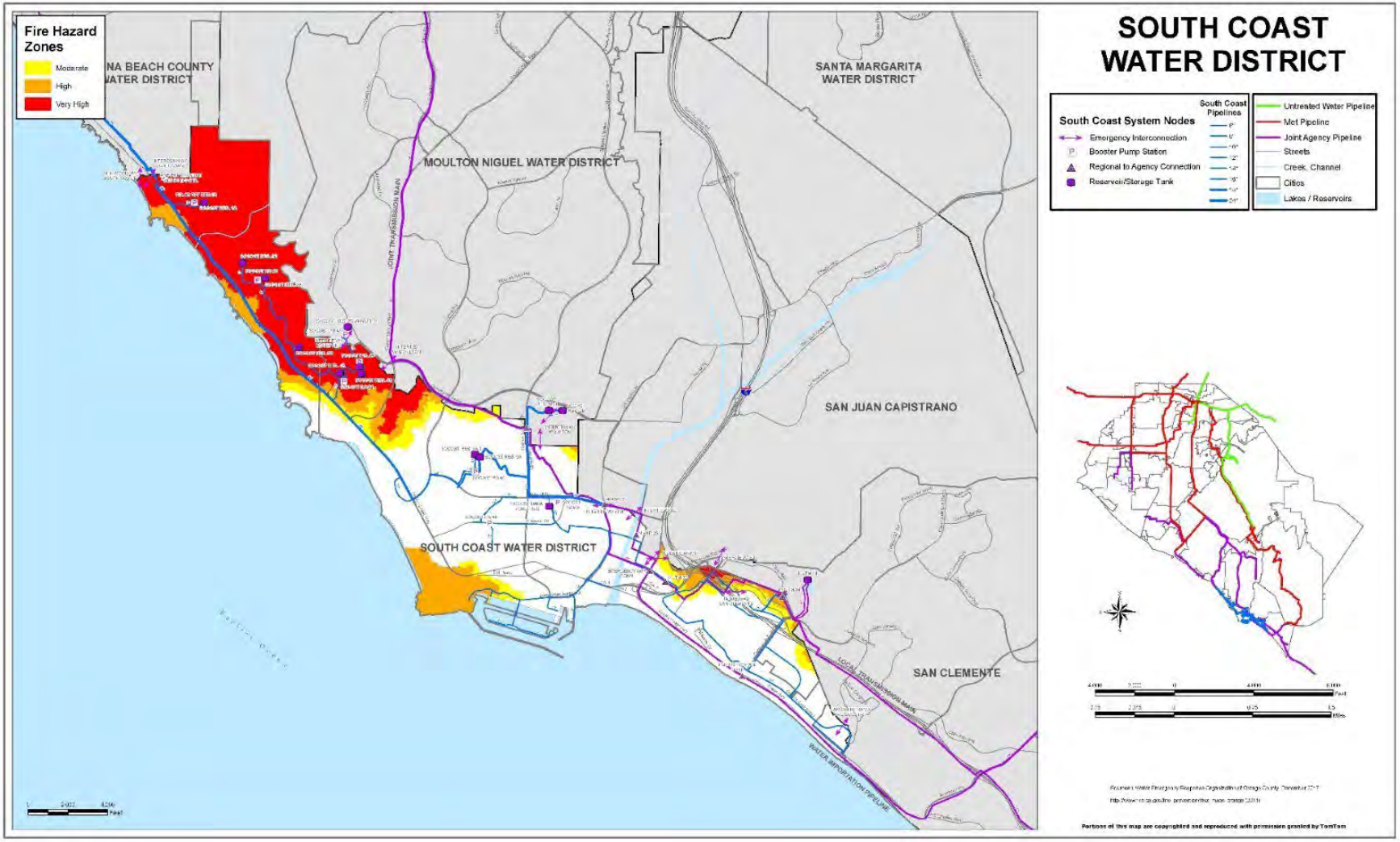


Exhibit L-5. Fire Hazard and SCWD Wastewater Infrastructure

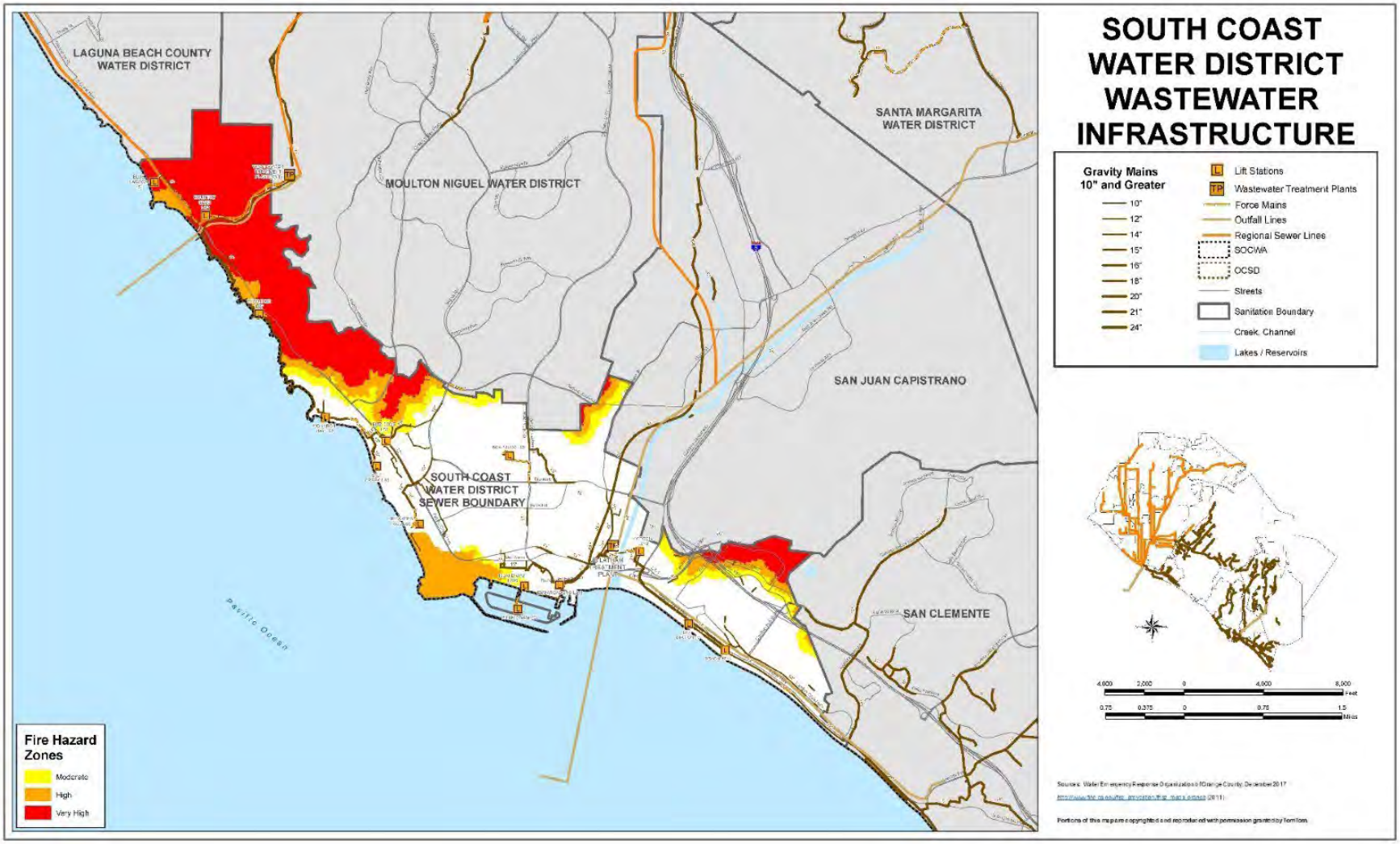


Exhibit L-6. Flood Hazard and SCWD Potable Water Infrastructure

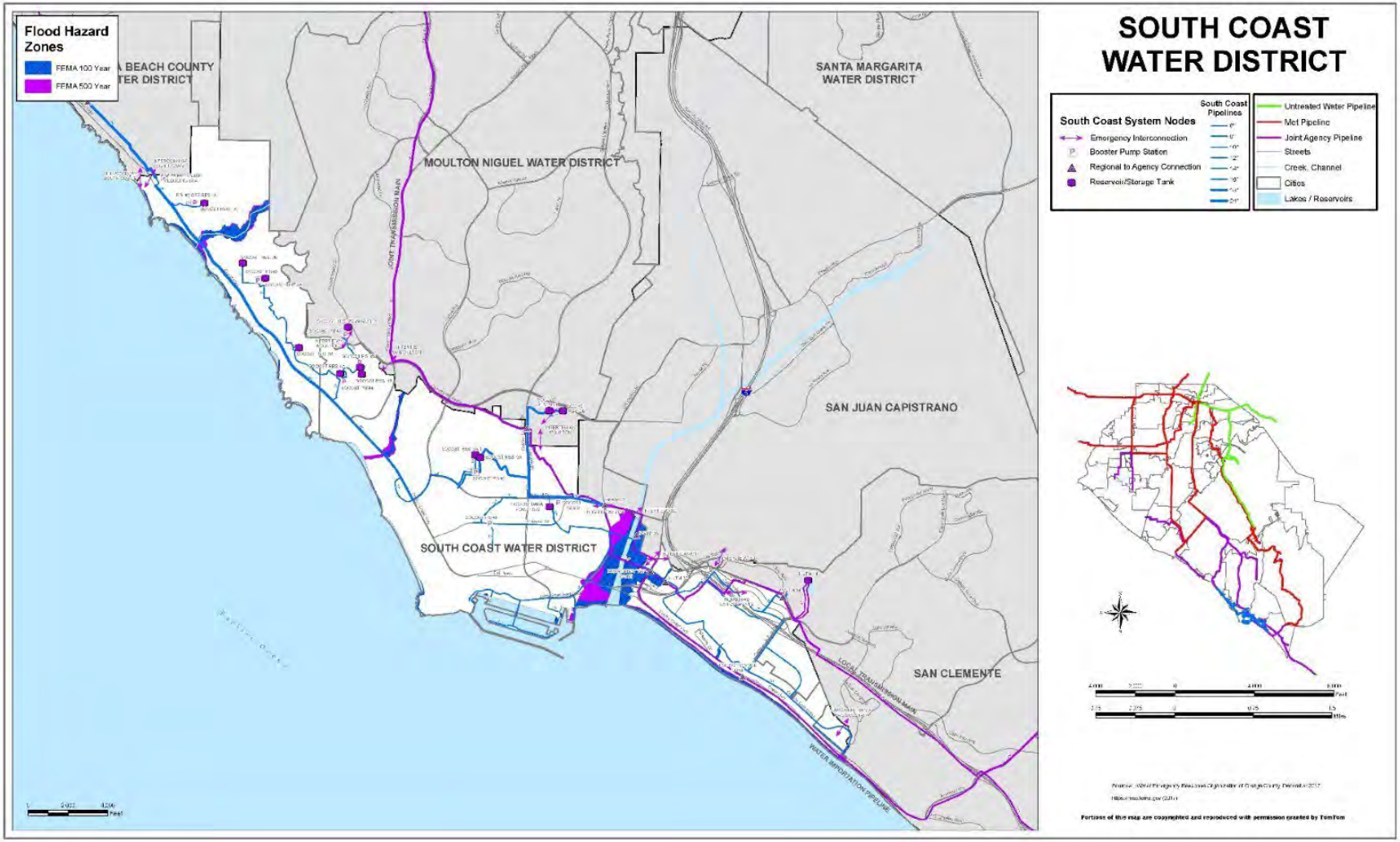


Exhibit L-7. Flood Hazard and SCWD Potable Water Infrastructure

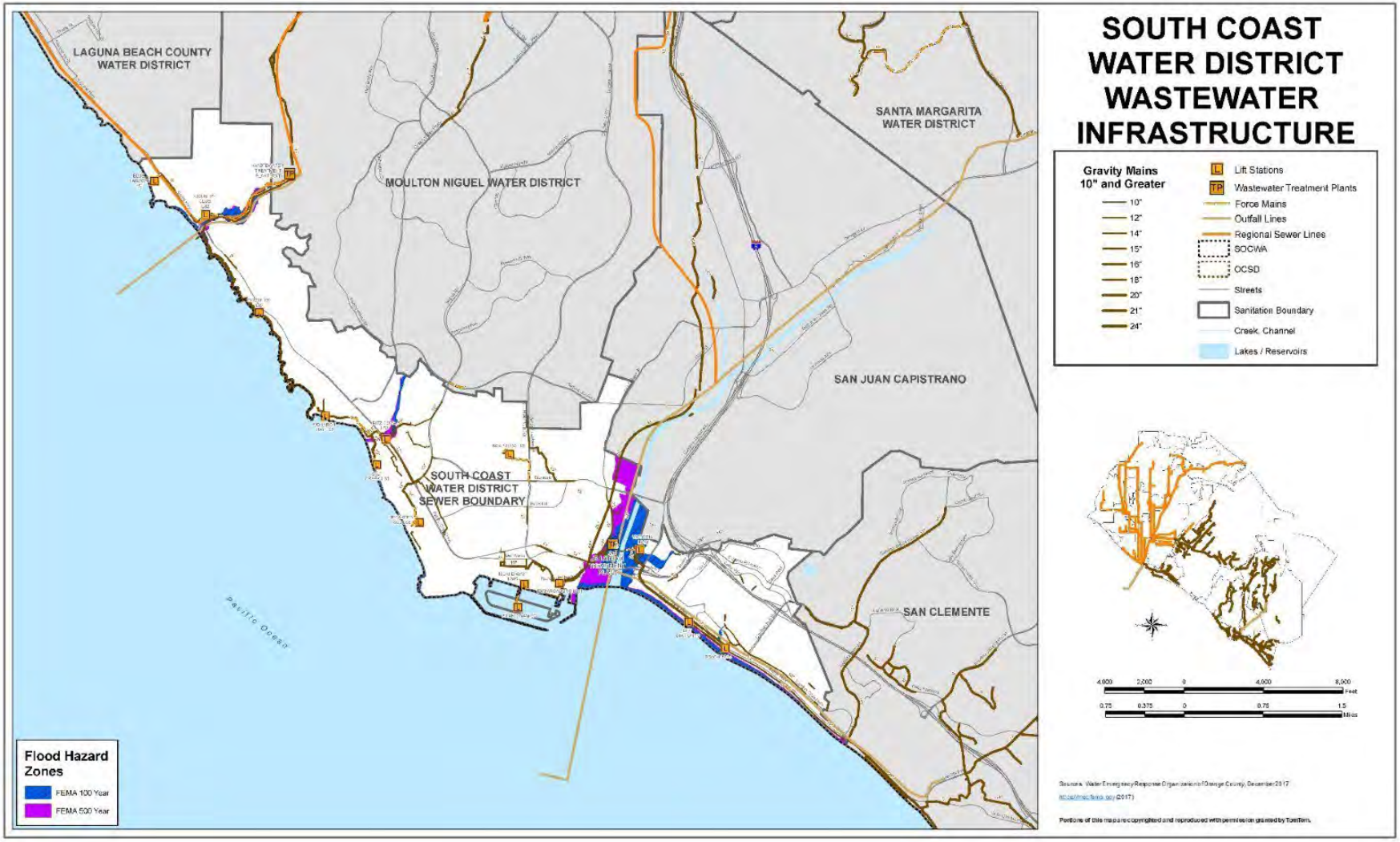


Exhibit L-8. Seismic Shaking Hazard and SCWD Potable Water Infrastructure

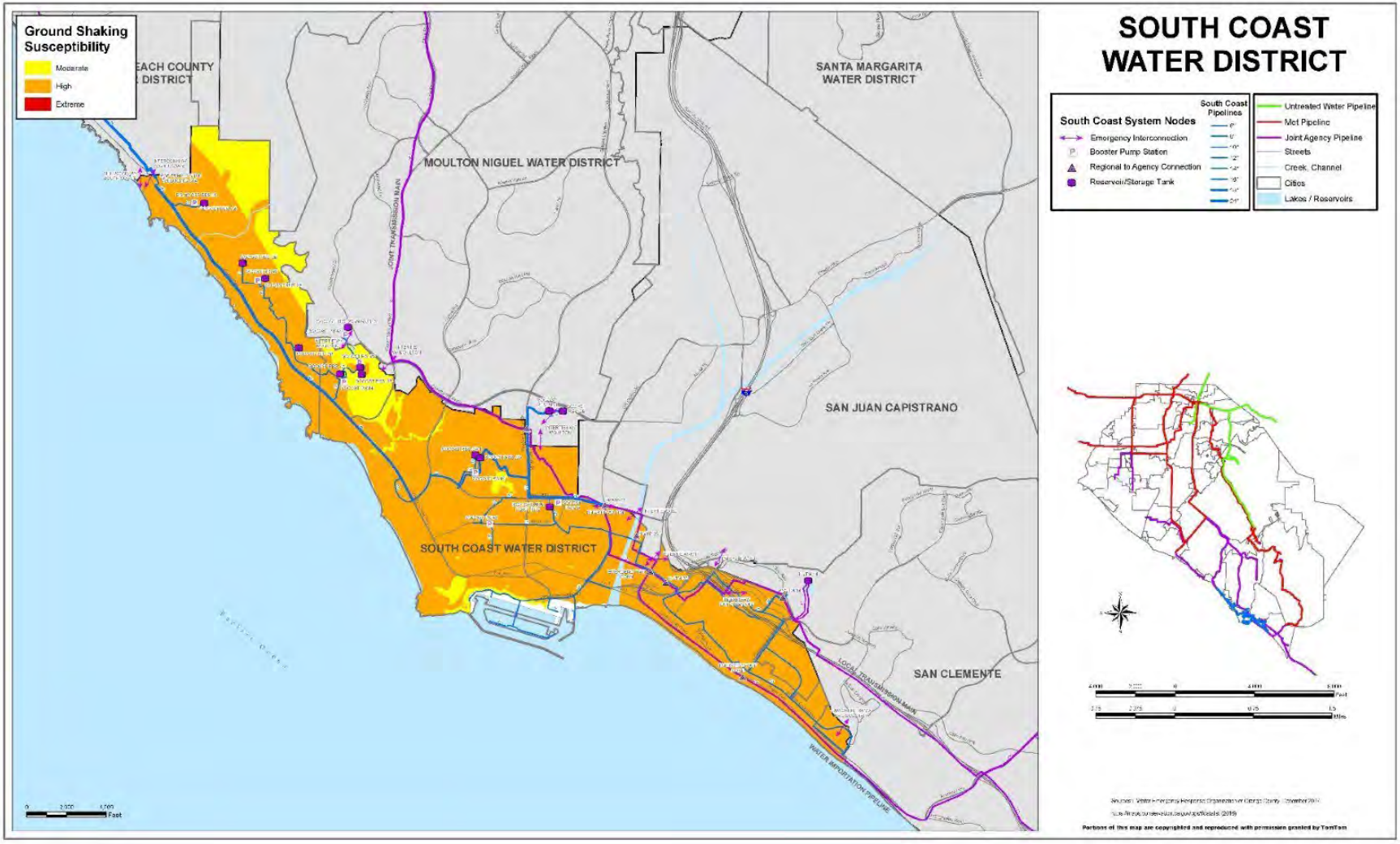


Exhibit L-9. Seismic Shaking and SCWD Wastewater Infrastructure

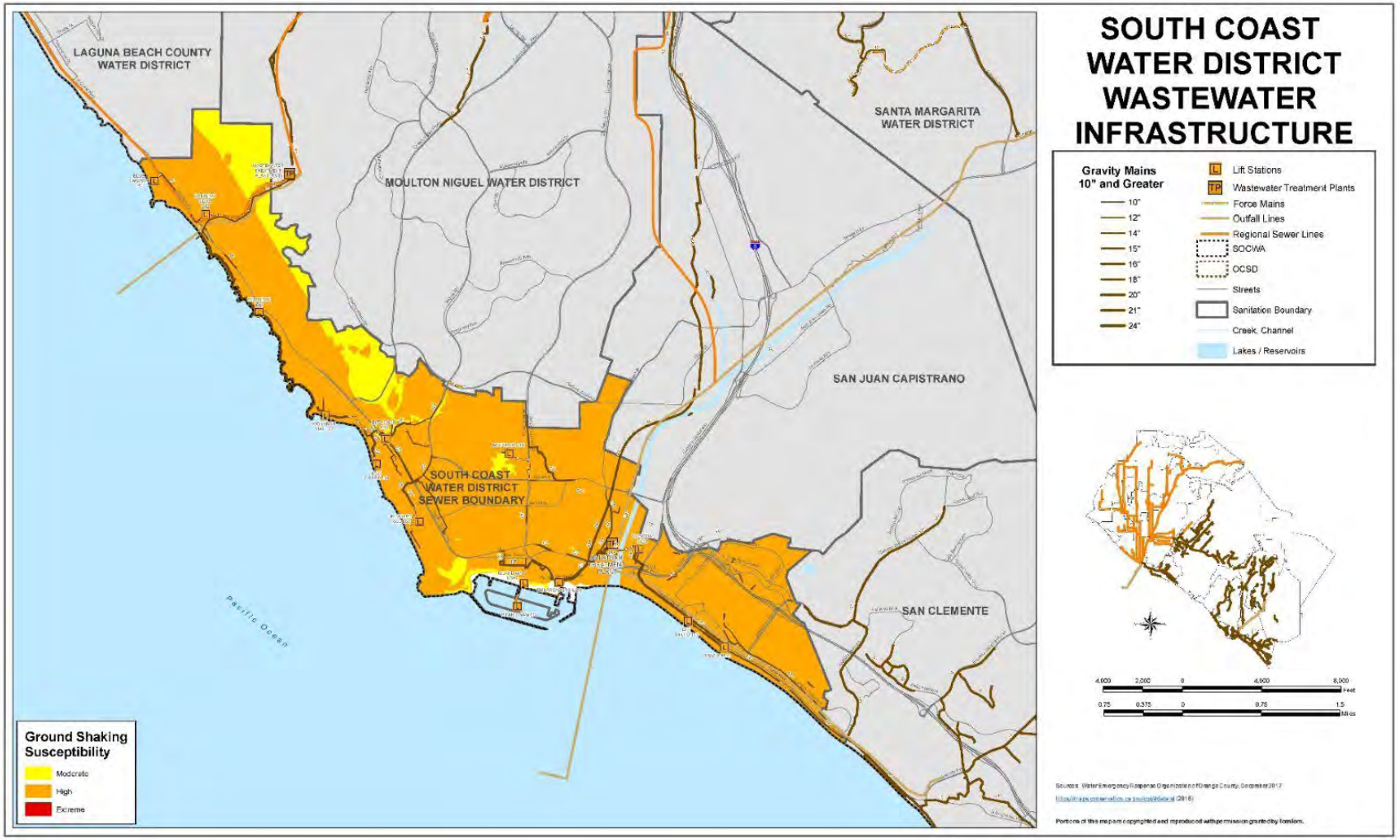


Exhibit L-10. Liquefaction Hazard and SCWD Potable Water Infrastructure

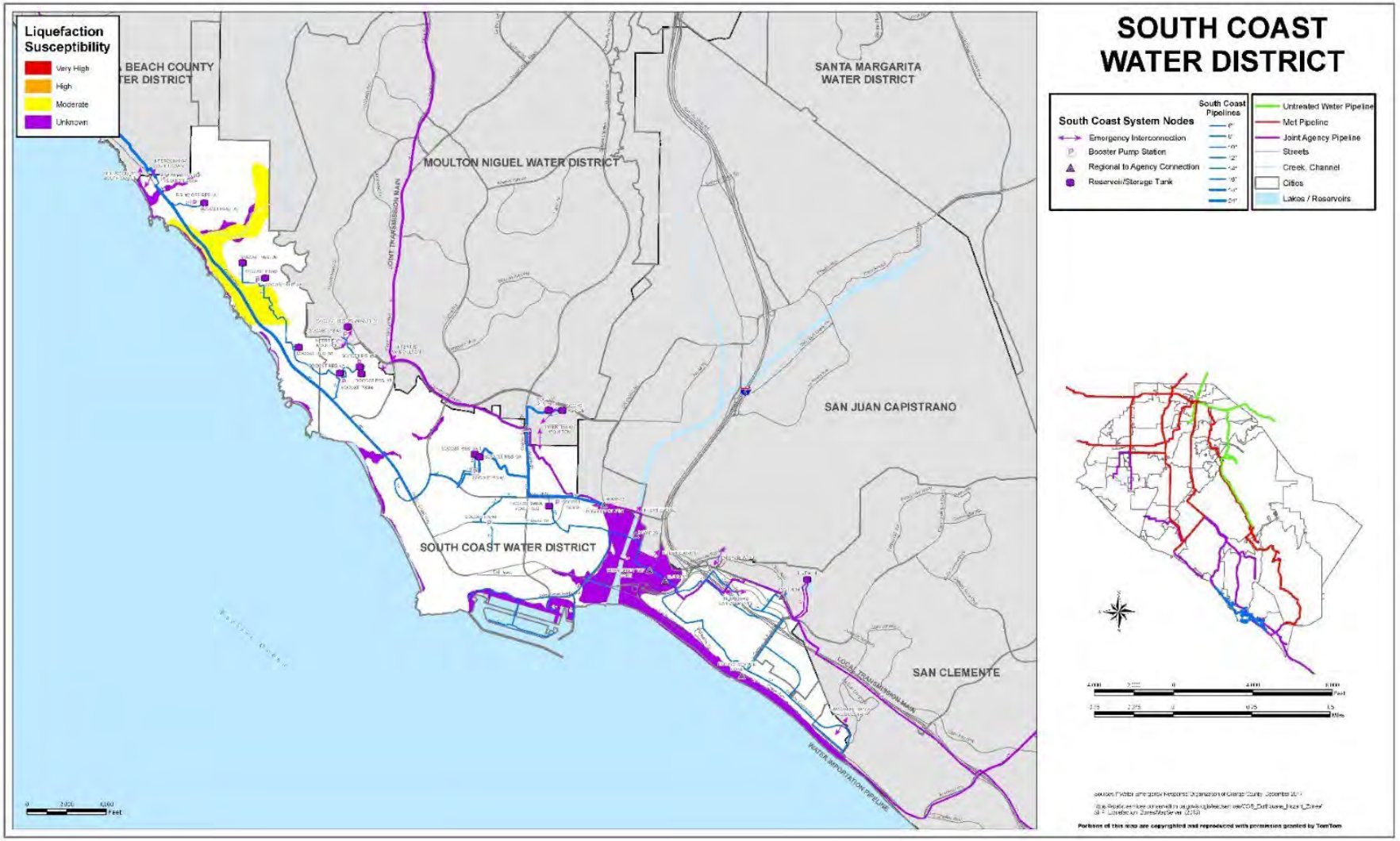


Exhibit L-11. Liquefaction Hazard and SCWD Wastewater Infrastructure

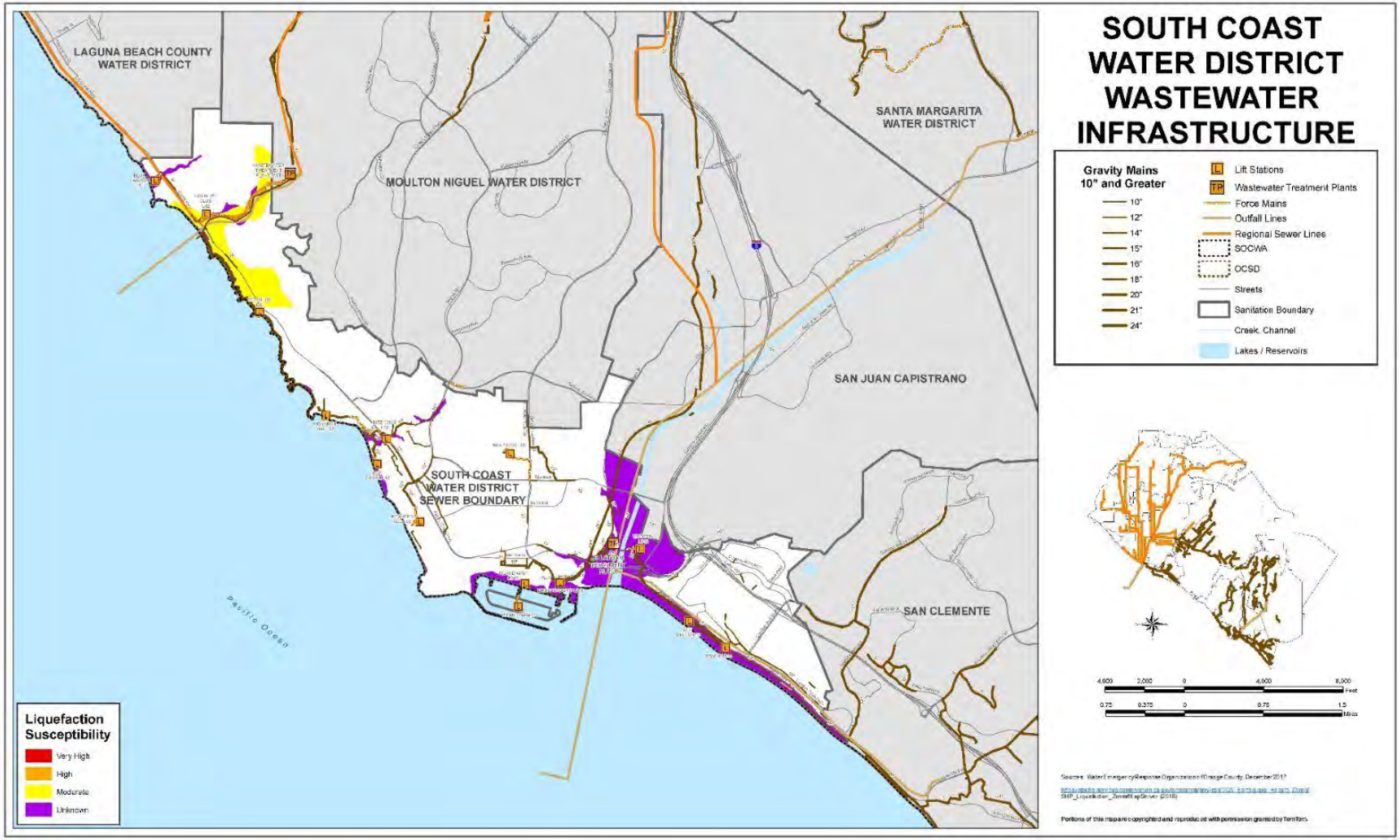


Exhibit L-12. Landslide Hazard and SCWD Potable Water Infrastructure

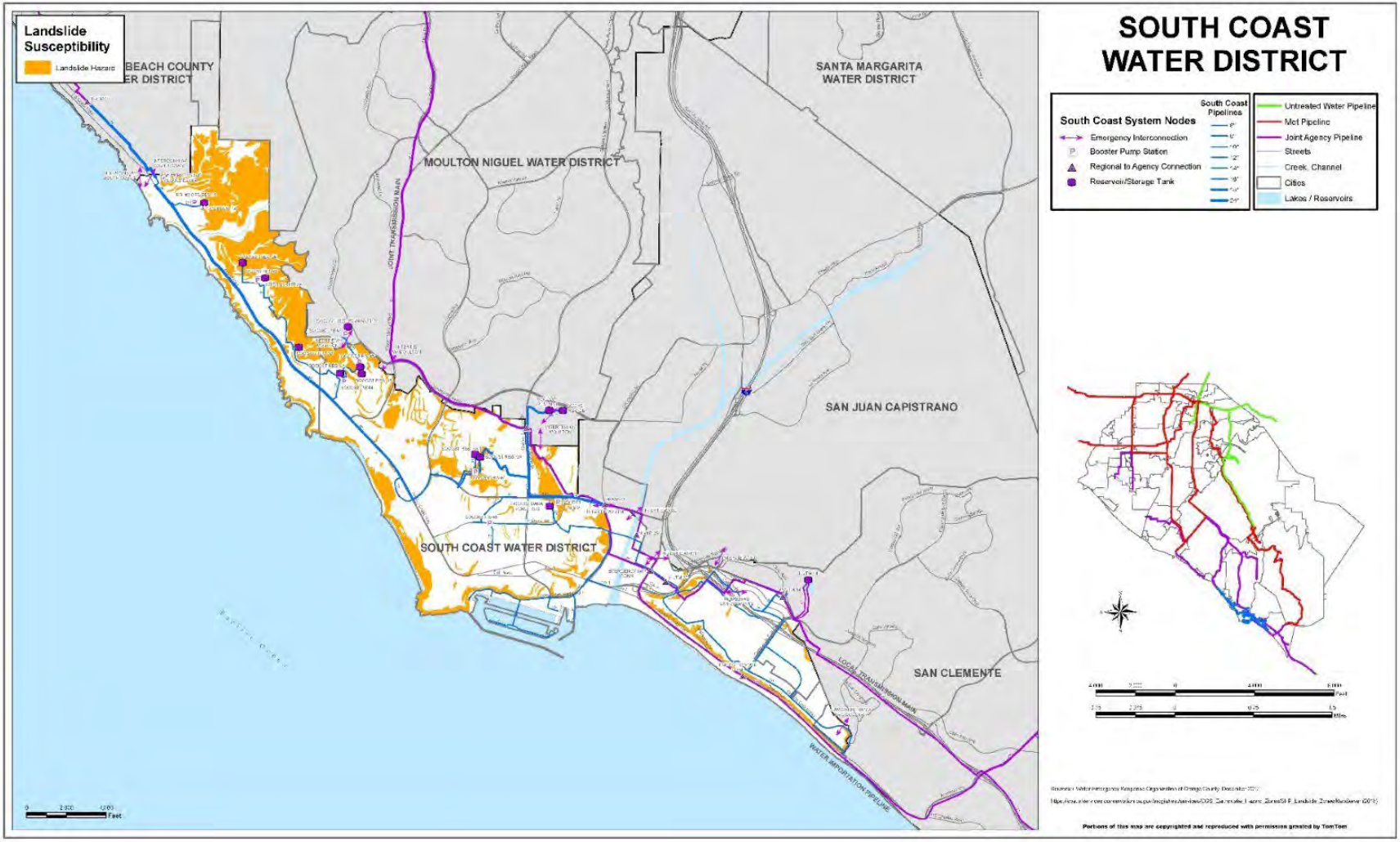


Exhibit L-13. Landslide Hazard and SCWD Wastewater Infrastructure

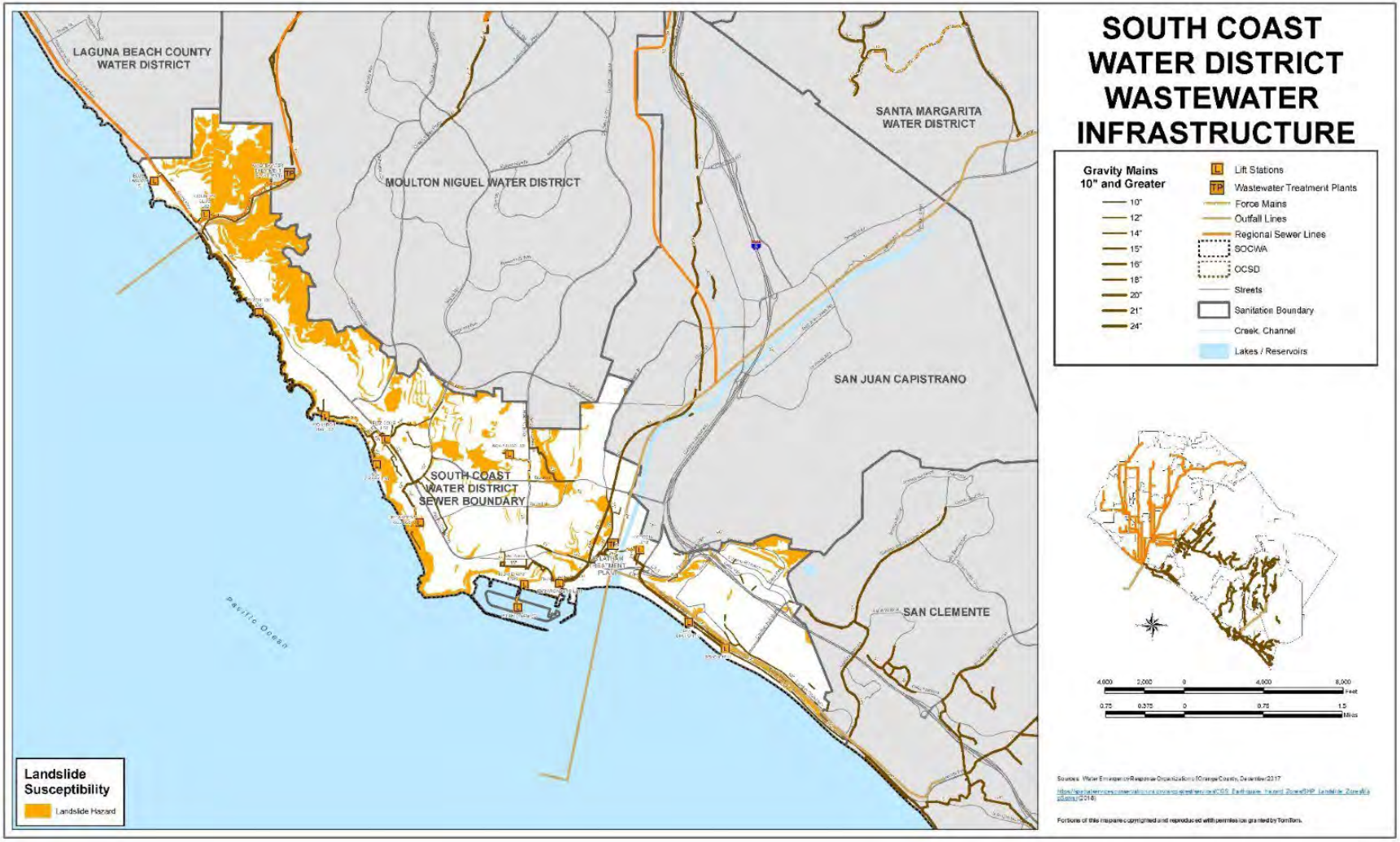


Exhibit L-14. Tsunami Hazard and SCWD Potable Water Infrastructure

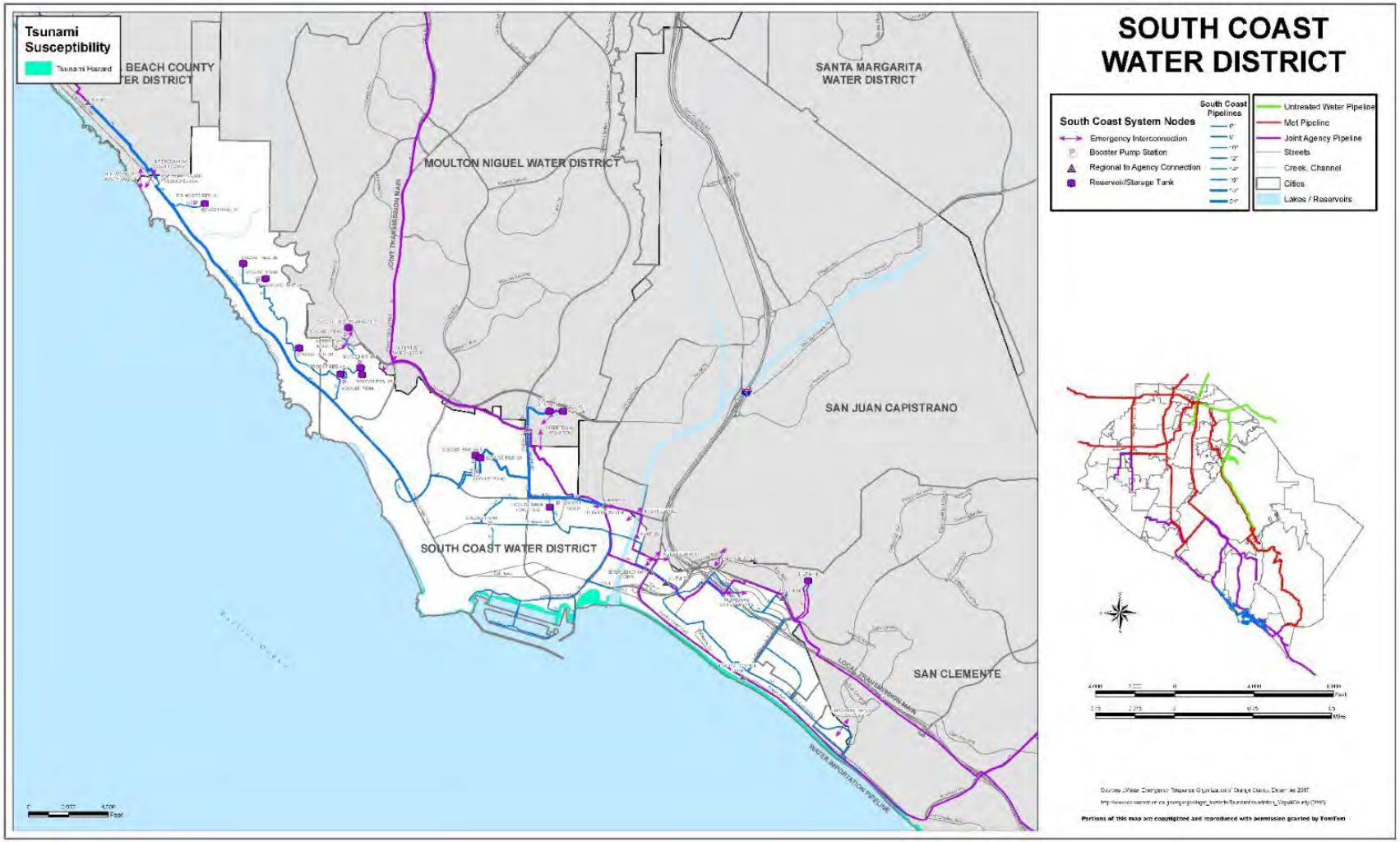
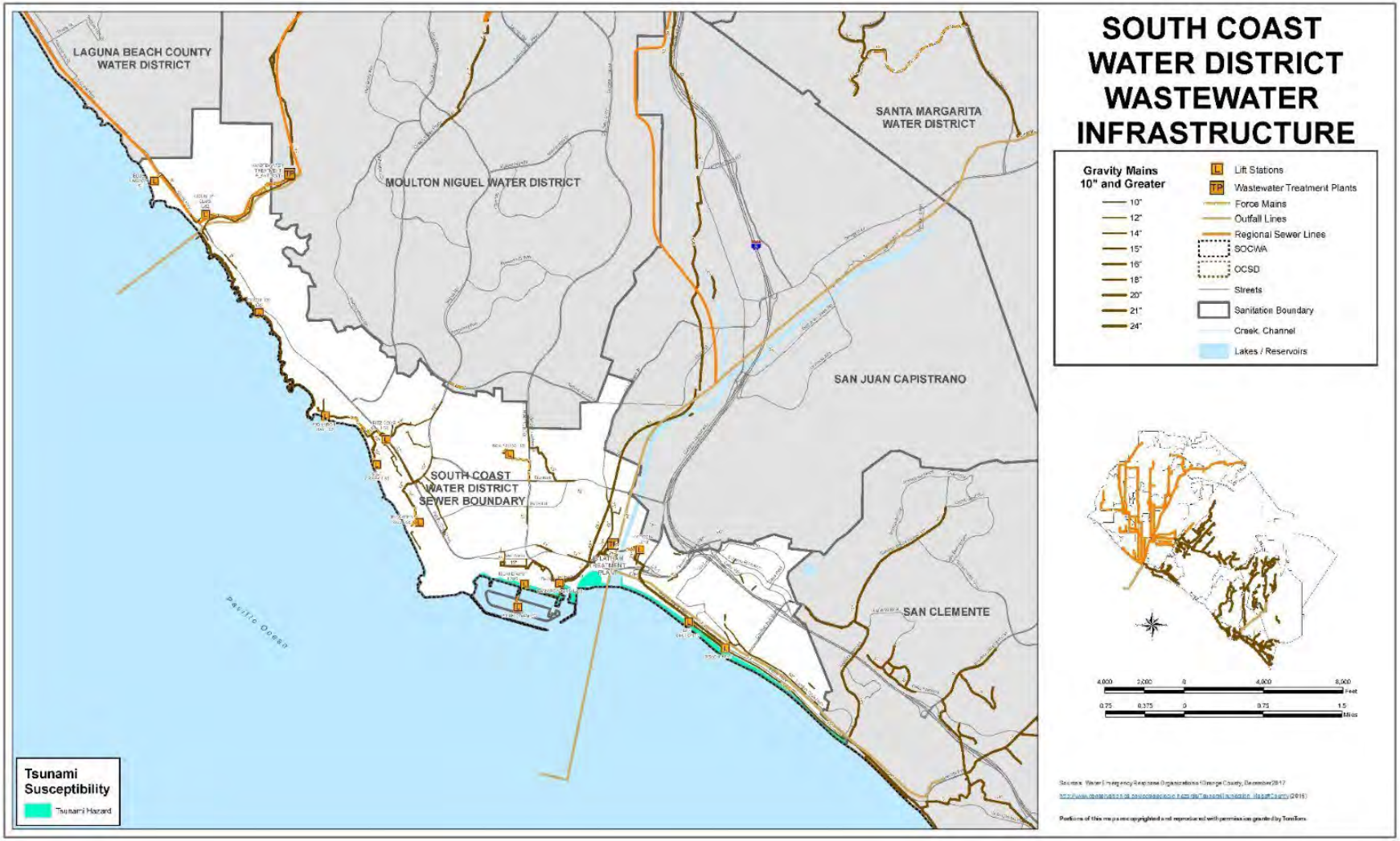


Exhibit L-15. Tsunami Hazard and SCWD Wastewater Infrastructure



L.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within SCWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

SCWD's infrastructure is outlined in **Exhibit L-16**, which lists the number of infrastructure assets located within the mapped hazard zones identified above.

Exhibit L-16. SCWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type						
		Interties (#)	Pump Stations (#)	Pressure Reducing Stations (#)	Reservoirs (#)	Wastewater Lift Stations (#)	Potable Pipelines (miles)	Wastewater Pipeline (miles)
Fire Hazard Zone	Moderate	3	0	0	1	1	1.6	0.7
	High	0	0	0	1	0	2.0	2.0
	Very High	3	6	1	8	0	4.4	4.6
FEMA Flood Zone	100-Year	1	0	0	0	4	0.6	4.3
	500-Year	0	0	0	0	0	0.9	1.8
Alquist-Priolo Rupture Zone		0	0	0	0	0	0	0
Seismic Shaking	Moderate	1	2	0	3	0	1.1	0.5
	High	11	7	1	10	0	21.5	23.1
	Extreme	0	0	0	0	0	0	0
Liquefaction	Moderate	0	0	0	0	0	1.2	4.2
	High	0	0	0	0	0	0	0
	Very High	0	0	0	0	0	0	0
	Unknown	3	0	0	0	0	3.4	7.0
Landslide Zone		0	3	0	4	0	1.7	3.1
Tsunami Zone		0	0	0	0	4	0.6	0.7

Much of SCWD's potable water and wastewater pipeline systems are located in very high fire hazard areas and extreme seismic shaking hazard areas There are also several miles of wastewater pipeline located in an area identified at risk for the 100-year flood. Additionally, SCWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone.

Changes in Land Use and Development

The SCWD service area has undergone a variety of developments in the past five years. The service area of SCWD is comprised mostly of single family and multi-family residential areas with the second largest land use being undeveloped, protected, or otherwise vacant land. Large construction projects that increase the number of residential homes within the SCWD service area

may cause an increase in demand for potable water and wastewater services. Currently within the City of Dana Point, approximately 39 3-story mixed-use units and 18 3-story condos are under construction creating 57 new residential connections and over 12,000 square feet of new commercial space that SCWD may supply with potable water and wastewater services.

Future projects as the Doheny Village's Victoria Boulevard Apartments in the City of Dana Point have the potential to add more than 700 new service connections. To ensure SCWD is able to meet growing demand, future projects such as the San Juan Watershed Project and the Doheny Desalination Project are in place that could allow for enhanced water reliability.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Human-Caused Hazard: Power Outage	Climate change will likely increase SCWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact SCWD facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within SCWD's service area.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the SCWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Wildfire	Climate change is expected to cause an increase in wildfires within the northwestern portion of SCWD's service area due to the vast acreage of wilderness in the Crystal Cove State Park and Aliso Creek.
Hazards of Medium Concern	
Coastal Hazards: Coastal Erosion	The anticipated impacts associated with coastal erosion to SCWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Coastal Storms	The anticipated impacts associated with coastal storms to SCWD's service area from climate change will mirror the impacts discussed in the base plan.
Coastal Hazards: Sea Level Rise	The anticipated impacts to vulnerability to sea level rise for SCWD from climate change will mirror the impacts discussed in the Base Plan. Due to the vast mileage of coastal property within SCWD's service area, climate change may have a large impact on the assets located near the coastline.
Coastal Hazards: Tsunami	SCWD's vulnerability to tsunamis is not expected to change due to climate change.
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Flood	Climate change is expected to cause some higher-level flood waters along Aliso Creek and the San Juan Creek with the 100-year flooding events potentially expanding into the 500-year flood zones on a more frequent basis.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within SCWD's service area. The vulnerability follows that described in the Base Plan.

Hazard	Climate Change Vulnerabilities
Geological Hazards: Land Subsidence	SCWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within SCWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact SCWD as described in the base plan.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact SCWD's service area as described in the base plan.
Severe Weather: Windstorm	The challenges to SCWD from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Hazards of Low Concern	
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within SCWD's service area as a result of climate change.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

L.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. SCWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits L-17a through L-17d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. SCWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit L-17a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with applicable building codes and works with cities within the service areas. While there are building codes, SCWD is not responsible for maintaining the city's building codes and ordinances. **Expansion and Improvement:** As retrofits and replacement projects are identified SCWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with applicable zoning codes and works with cities within the service areas. While there are zoning ordinances, SCWD is not responsible for maintaining the city's ordinances.
Subdivision Ordinance or Regulations	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with subdivision ordinances and regulations and works with cities within the service areas. While there are subdivision ordinances or regulations, SCWD is not responsible for maintaining the city's ordinances.
Special Purpose Ordinance	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with special purpose ordinances and works with cities within the service areas. While there may be special purpose ordinances, SCWD is not responsible for maintaining the cities' ordinances.
Growth Management Ordinances	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with growth management ordinances and works with cities within the service areas. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, SCWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	SCWD	Adhere to SCWD's Site Plan requirements. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
Capital Improvements Plan	SCWD	Adhere to SCWD's Capital Improvement Plan. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	SCWD	As a member of the Orange County Operational Area (OA), SCWD shall coordinate with other OA member organizations, in both response and recovery procedures. This plan builds upon previous efforts to enhance the emergency and disaster preparedness, response, and recovery capabilities and includes the critical elements of the Standardized Emergency Management System (SEMS), the NIMS, the National Response Framework (NRF) and the Incident Command System (ICS). The ERP

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
		is continually updated as information changes. With comprehensive updates planned every 5 – 7 years. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure SCWD is better prepared for future incidents and can anticipate their communities' needs.
Economic Development Plan	City of Dana Point, City of Laguna Beach, City of San Clemente	SCWD complies with economic development plans and works with cities within the District service areas. While cities may maintain an economic development plan, SCWD is not responsible for this item.
Water Discharge Requirements	SCWD/ Regional Water Quality Control Board (San Diego Region)	In general, the Waste Discharge Requirements (WDRs) Program (sometimes also referred to as the "Non Chapter 15 (Non 15) Program") regulates point discharges that are exempt pursuant to Subsection 20090 of Title 27 and not subject to the Federal Water Pollution Control Act. Exemptions from Title 27 may be granted for nine categories of discharges (e.g., sewage, wastewater, etc.) that meet, and continue to meet, the preconditions listed for each specific exemption. The scope of the WDRs Program also includes the discharge of wastes classified as inert, pursuant to section 20230 of Title 27. The SCWD maintains and NPDES permit for potable water discharges issued by the State Water Resources Control Board. The District also discharges to the San Juan Creek Ocean Outfall under the NPDES permit held by the South Orange County Wastewater Authority (SOCWA).

How can these capabilities be expanded and improved to reduce risk?
▪ Conduct a risk and resilience assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ Implement a process to ensure mitigation actions identified in the hazard mitigation plan are reviewed as part of the update to the General Plan, Capital Improvement Plan and Emergency Response Plan. ▪ Incorporate hazard mitigation plan as part of training to SCWD's engineers and professionals in construction practices related to buildings and/or infrastructure.

Exhibit L-17b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	City of Dana Point, Laguna Beach & San Clemente	While there are city, county, state, federal and private consultant resources for scientists familiar with the hazards of the community, SCWD does not specifically employ any planners or engineers that are tasked with this duty.

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	SCWD	Licensed Civil Engineers and certified building evaluators.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	Cities, County of Orange, State of CA	While there are city, county, state, federal and private consultant resources for scientists familiar with the hazards of the community, SCWD does not specifically employ any planners or engineers that are tasked with this duty.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	Environmental, Health and Safety (EHS) Office	1 EHS Manager familiar with responding to emergencies and assessing vulnerabilities to hazards; 1 Compliance and Emergency Specialist.
Personnel Skilled in GIS and/or HAZUS	SCWD Engineering Department	Agency employs GIS personnel
Emergency Manager	SCWD/ EHS Office	1 EHS Staff dedicated to emergency management and environmental compliance.
Scientists Familiar with the Hazards of the Community	County of Orange, State of CA	1 EHS Manager familiar with responding to emergencies and assessing vulnerabilities to hazards. Additionally, there are city, county, state, federal and private consultant resources for scientists familiar with the hazards of the community.
Floodplain manager	County of Orange, State of CA	While there are city, county, state, federal and private consultant resources for scientists familiar with the hazards of the community, SCWD does not specifically employ a floodplain manager.
Surveyors	SCWD Engineering	Outsourced as needed.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in MWDOC Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice program. ▪ Have all agency-registered engineers and other qualified individuals attend CalOES Safety Assessment Program (SAP) training for building inspections. ▪ Coordinate with department managers to review the MJHMP and progress towards implementation.

Exhibit L-17c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Finance Department	Annual review of capital requirements and forecasting future cap needs. **Expansion and Improvement:** During annual budgeting SCWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	SCWD/County of Orange	SCWD typically levies taxes for 1) special assessment tax obligation debt service and 2) general obligation debt service payments.
Fees for Water, Sewer, Gas, or Electric Service	Finance Department	SCWD is able to charge customers fees for water and sewer services through the Prop 218 process.

Financial Resources	Agency or Department	Description/Comments
		Expansion and Improvement: Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Incur Debt Through General Obligation Bonds	Finance Department	Through a general election, SCWD can incur debt through general obligation bonds.
Incur Debt Through Special Tax And Revenue Bonds	Finance	SCWD may incur special tax or revenue bonds as needed through the appropriate legal process.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Coordinate with other departments, organizations, and agencies to identify potential assets and resources that may not currently be considered.

Exhibit L-17d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
Website	Public Information Office and Emergency Management/ EHS office	The SCWD website is robust and can be quickly modified to contain an emergency flash screen to point residents to lifesaving information.
Social Media Program (Facebook, Twitter, Instagram, NextDoor, etc.)	Public Information Office	SCWD has an extensive social media program and may reach thousands of individuals, which allows SCWD to disseminate information quickly and accurately. **Expansion and Improvement:** Increase the use of social media resources for hazard mitigation related content and information.
AlertOC	Public Information Office	Emergency calling/texting/email service that calls out to alert residents of important/emergency situations.
Constant Contact	Public Information Office	An email list-serv that may be used to inform residents or others.
Media Outreach	Public Information Office	SCWD communicates effectively with the media on a regular basis.
Dialog Tech	Customer Service/Information Technology	Reverse customer call list based on billing information.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to Mesa Water. ▪ Work with other jurisdiction, such as City of San Clemente and other organizations to identify available resources available to the public and opportunities to provide the information to the community. ▪ Identify a variety of opportunities to provide hazard information to the community and ways to minimize impacts associated with a disaster event.

L.7 MITIGATION STRATEGY

L.7.1 Mitigation Goals

SCWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

L.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit L-18,** SCWD's Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit L18. SCWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Retrofit 30-year-old above ground storage tank and remove underground storage tanks.	Lift Station 6 and West Street	All Hazards	Unknown			Budget	New
Update or Relocate fueling station			Unknown			Budget	New
Perform a feasibility study and update of the Master Plan for electrification of fleets, infrastructure, and operations to comply with new California requirements.	District Wide	Human-Caused Hazards: Power Outage	Unknown			Budget	New
Build a Desalination Plant at Doheny Beach Park in Dana Point.	Vicinity of Dohney Beach Park, Dana Point, CA	All Hazards	$50 Million	Engineering	Long Term	Grants, Capital Budget, Possible P3	Existing, Ongoing
Relocation of approximately 4,000 linear feet of 60" JTM pipeline that was found distressed through internal inspection	JRWSS	All Hazards	$10.8 Million	Operation /Engineering	Long Term	Budget	Existing, Ongoing
Complete Ground Water Recovery Facility well expansion	Zone 391	All Hazards	$2.7 Million	Operations	Long Term	Budget	Existing, Ongoing
Fire alarm upgrades	Laguna Beach and Dana Point	Wildfire; Urban Fire	$200,000	Operations	Short Term	Capital Improvement Budget	Existing, Ongoing
Fortify 1,100-ft gravity sewer and manholes in Laguna Beach below Lagunita to Blue Lagoon	Laguna Beach between Lagunita to Blue Lagoon	Coastal Hazards: Coastal Erosion	$1 Million	Operations	Short Term	Capital Budget or Grant	Existing, Ongoing
SCADA Security Improvements	Throughout service area	Human-Caused Hazards: Terrorism (Cyber Threat)	$550,000	Operations	Short Term	Capital Improvement or Budget	Existing, Ongoing
Establish Security Policies and Procedures Manual	District Wide	Human-Caused Hazards: Terrorism (MCI) and Terrorism (Cyber Threat)	$40,000	Admin	Short Term	Grant	Existing, Ongoing
MEDIUM PRIORITY							
Upgrade old pressure domestic water mains to increase reliability (remove and replace asbestos cement pipe)	Dana Point and Laguna Beach facilities	All Hazards	$28.5 Million	Operations	Long Term	Capital Budget or Grant	Existing, Ongoing
Lift Station 2 Repair/Replace	Lift Station 2	All Hazards	$40 Million	Engineering	Short Term	Capital Budget or Grant	In Progress

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Install backup generator for the Groundwater Recovery Facility (GRF)	Dana Point at the GRF	All Hazards	$750,000	Operations	Short Term	Capital Budget or Grant	Existing, Ongoing
Collect GIS data for all JRWSS pipes	Between CM10 and San Clemente	All Hazards	$500,000	GIS	Long Term	Budget	Existing, Ongoing
Palisades Dam Seismic Evaluation	JRWSS – Palisades Dam/ Bradt Reservoir	All Hazards	$400,000	Engineering	Short Term	Budget/Grant	Existing, Ongoing
Water main upgrades to increase fire flow in critical locations	Throughout Dana Point and Laguna Beach	Wildfire; Urban Fire	$1 Million	Operations	Long Term	Capital Budget or Grant	Existing, Ongoing
Fortify or relocate Lift Station 13	Dana Point	Coastal Hazards: Coastal Erosion	$1.5 Million	Operations/ Engineering	Long Term	Capital Budget or Grant	Existing, Ongoing
Evaluate and test the ability to implement security systems including video security technology.	District Wide	Human-Caused Hazards: Terrorism (MCI)	$100,000	Operations	Short Term	Budget	Existing, Ongoing
Complete seismic evaluation and implement seismic retrofits and improvements on district reservoirs	Reservoir 1A and 2C	Seismic Hazards: Seismic Shaking	$2.5 Million	Engineering	Short Term	Budget	Existing, Ongoing
Seismic Retrofit for all other critical infrastructure (water/wastewater)	Throughout service area	Seismic Hazards: Seismic Shaking	$2 Million	Engineering	Long Term		Existing, Ongoing
LOW PRIORITY							
Increase capacity of Lift Station 8 and relocate Lift Station and rebuild with more capacity. Reroute the sewer discharge from Lift Station 12 to treatment plant and elimination siphons.	Lift Stations 8 and 12	All Hazards	$1 Million	Engineering	Short Term	Capital Budget or Grant	Existing, Ongoing
Assessment and R&R of Coast Highway Transmission Main (Coast Supply Line)	Laguna Beach	All Hazards	$5.25 Million	Engineering	Short Term	Budget	Existing, Ongoing
Implement dual force mains where applicable.	Lift Station 6	Lift Station 6	$1.6 Million	Engineering	Long Term	Budget	Existing, Ongoing
Continue with improvement of site fencing and barrier.	Water reservoir sites 2C, 5A, and 5B	Human-Caused Hazards: Terrorism (MCI)	$20,000	Operations	Short Term	Budget	Existing, Ongoing

L.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Construct roof over chemical storage area at Aliso Creek Water Reclamation Facility.
  - **Status:** Completed.
- **Mitigation:** Improve reliability of communication throughout the district by installation of truck radios.
  - **Status:** Completed.
- **Mitigation:** Tunnel stabilization.
  - **Status:** Completed.

L.8 PLAN INTEGRATION

SCWD's Capital Improvement Project Budget, Strategic Plan, Water and Wastewater Master Plans, Emergency Operations Plan, Urban Water Management Plan and Infrastructure Master Plan, are used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, SCWD will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, SCWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform the Water and Wastewater Master Plans and Urban Water Management Plan.
- Mitigation actions identified in the Plan were prioritized in the Capital Budget to complete initiatives.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex M: Trabuco Canyon Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY

WEROC

Contents

Exhibits

TRABUCO CANYON WATER DISTRICT ANNEX

Trabuco Canyon Water District (TCWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, TCWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the MJHMP. The base plan, including the MJHMP procedural requirements and planning process apply to TCWD.

This annex details the hazard mitigation planning elements specific to TCWD and describes how TCWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the MJHMP, including the planning process and other procedural requirements, apply to and were met by TCWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to TCWD with a focus on the risk assessment and mitigation strategies.

M.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit M-1** lead the TCWD planning team, attended meetings, and coordinated the hazard mitigation planning efforts with TCWD staff and the consultant team supporting the effort.

Exhibit M-1. Planning Team Lead

Primary Point of Contact
Name: Michael Perea
Title: Assistant General Manager
Telephone: (949) 858-0277
Email: mperea@tcwd.ca.gov

TCWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as TCWD's internal hazard mitigation planning development team.

Exhibit M-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Lorrie Lausten	District Engineer
David Rodriguez	Engineering Support

Outreach to the public within TCWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, TCWD maintains a dedicated webpage to the MJHMP update on its official website with a link to the public input online survey. TCWD used its social media platform outlets (X, Facebook, and Instagram) to communicate to the public, and specifically, its customers, regarding the MJHMP update efforts and the need for public input by the online survey in September and October 2024. Additionally, District staff agendized the MJHMP update process for review with the District's Engineering/Operational Committee and the Board of Directors at public meetings held at the Administration Facility in October 2024.

M.2 JURISDICTION PROFILE

Service Population: 12,700

TCWD is a county water district organized and operating pursuant to Section 30,000 and following of the Water Code of the State of California. TCWD was organized on February 26, 1962, under Division XII of the California Water Code. TCWD is governed by a five-member Board of Directors elected to alternating four-year terms at elections held every two years.

TCWD is located in the southeastern portion of Orange County at the foothills of the Santa Ana Mountains and encompasses approximately 9,100 acres. The terrain within TCWD is generally steep hills and canyons throughout the central area. The east and west sides consist of more gentle terrain made primarily of rolling hills. Elevations within TCWD range from approximately 900 feet above mean sea level in the lower Aliso Creek area and the southern area of Dove Canyon, to nearly 2,400 feet in the northeasterly portion adjacent to the Cleveland National Forest. In addition, TCWD owns, operates and maintains water and sewer facilities outside of its service area and these vary in elevation from 575 feet (ARWTL) to 950 feet (El Toro Road Trunk Sewer) above mean sea level.

TCWD serves a 2015 estimated population of 12,700 in the Cities of Rancho Santa Margarita, Mission Viejo, and Lake Forest, and unincorporated areas of Orange County in Trabuco Canyon.

TCWD provides water, wastewater, and recycled water service to major communities within the service area. TCWD sources of water supply are imported treated water, imported surface water treated at the TCWD treatment plant, and treated local groundwater. To provide reliability and redundancy, TCWD system is interconnected with adjacent utilities including Santa Margarita Water District, El Toro Water District, and Irvine Ranch Water District.

M.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that TCWD faces, distinct from that of the county-wide planning area. The hazard profiles in the MJHMP discuss overall impacts to the planning area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3**.

TCWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the TCWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect TCWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit M-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit M-3. Trabuco Canyon Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to Trabuco Canyon
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	Low
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	High
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	High
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	High
Flood	Likely	Medium	Limited	Negligible	Medium	Medium
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	Low
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Medium
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	Low
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	Medium
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	Low
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Low
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	N/A

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to TCWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10 and 100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1 and 10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

The FEMA Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit M-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and TCWD.

M.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit M-4. Fire Hazard and TCWD Potable Water Infrastructure

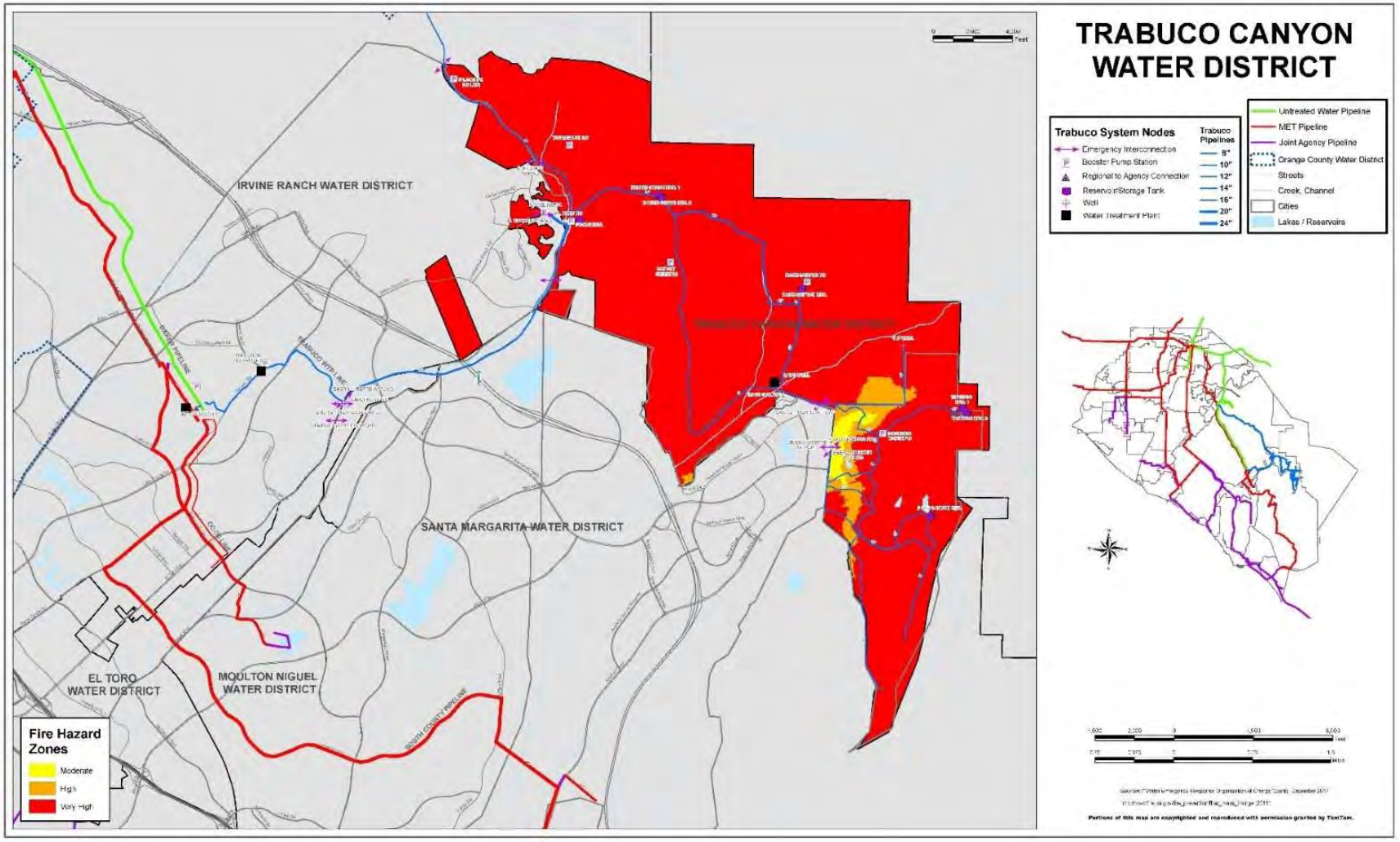


Exhibit M-5. Fire Hazard and TCWD Wastewater Infrastructure

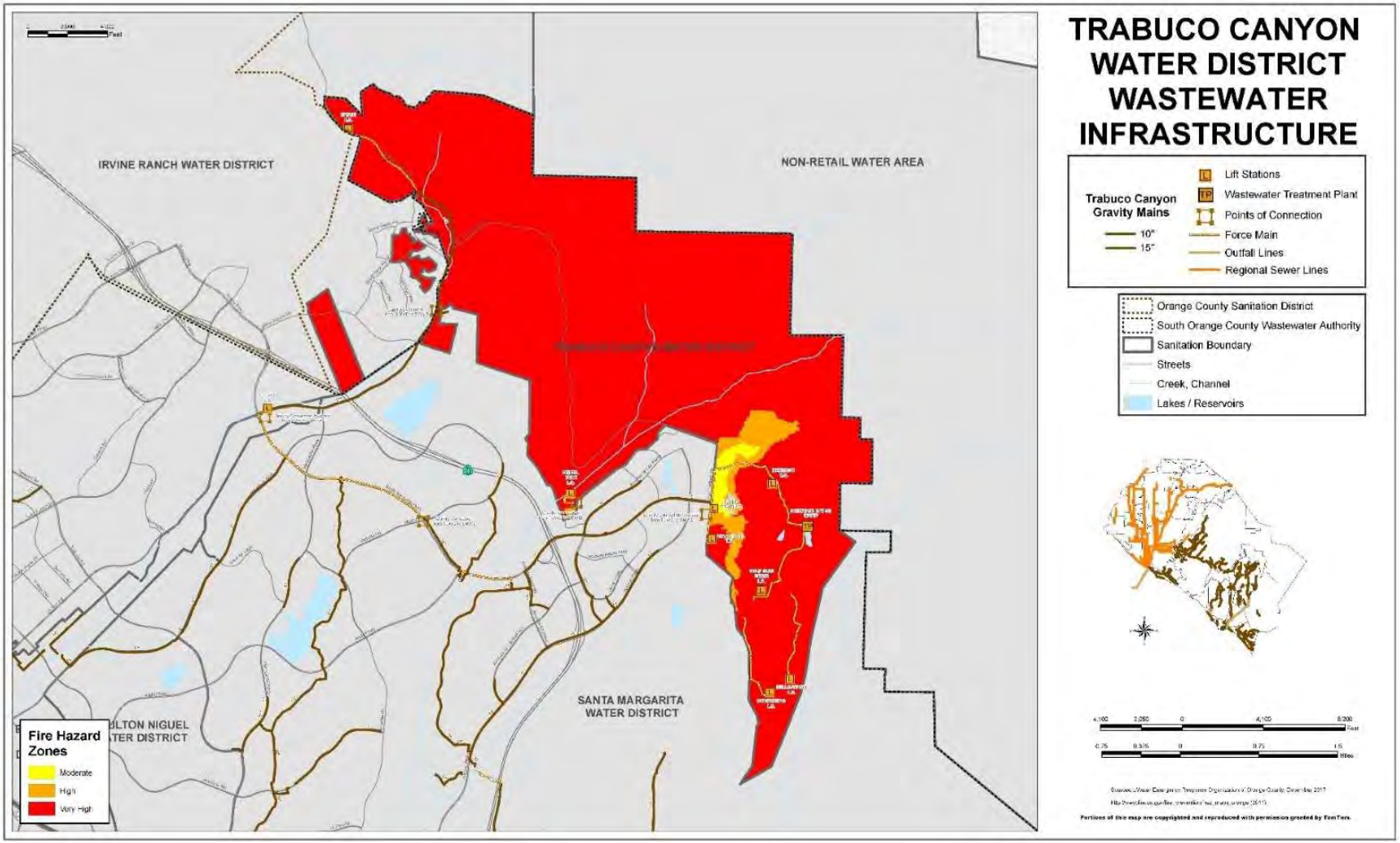


Exhibit M-6. Flood Hazard and TCWD Potable Water Infrastructure

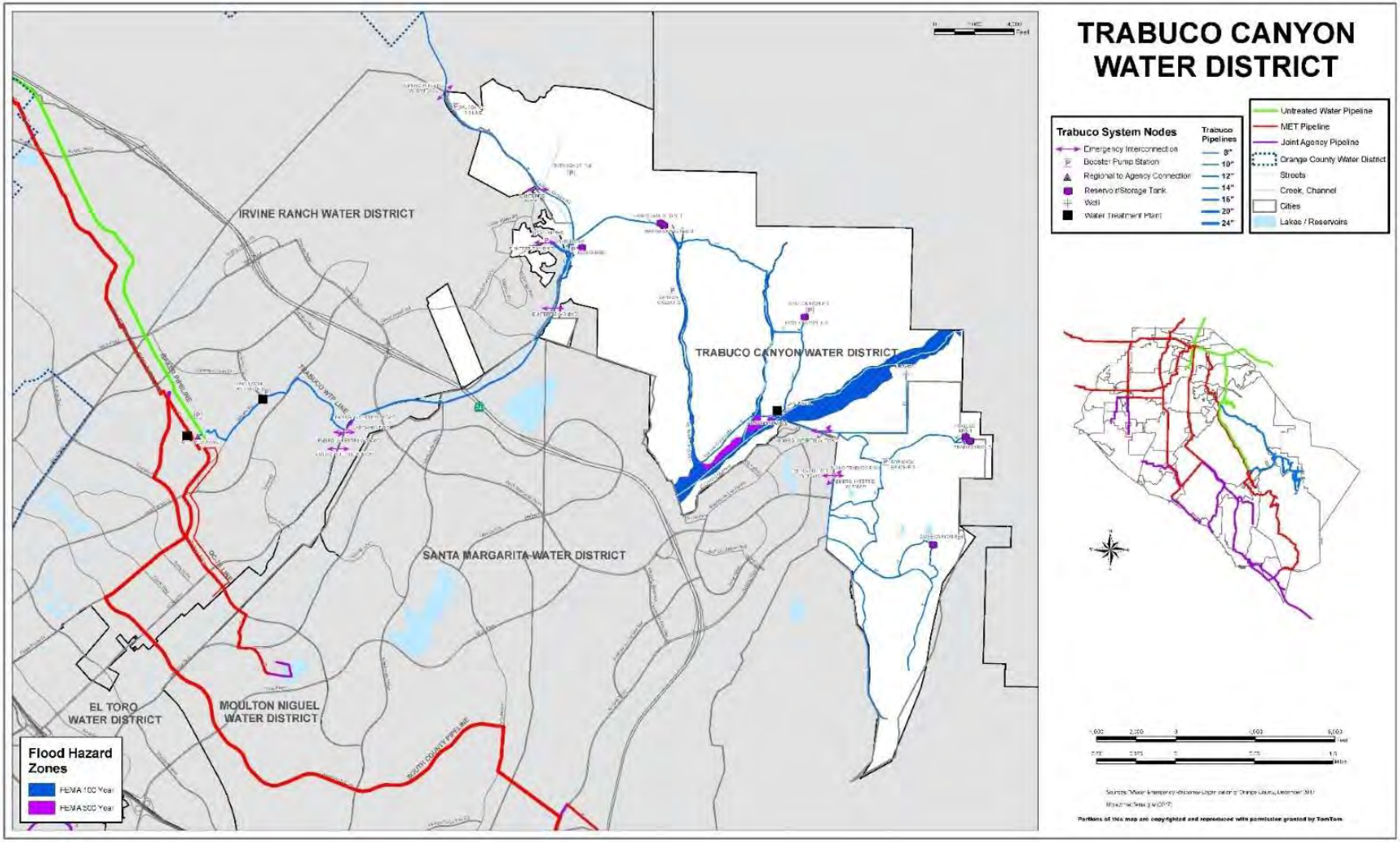


Exhibit M-7. Flood Hazard and TCWD Wastewater Infrastructure

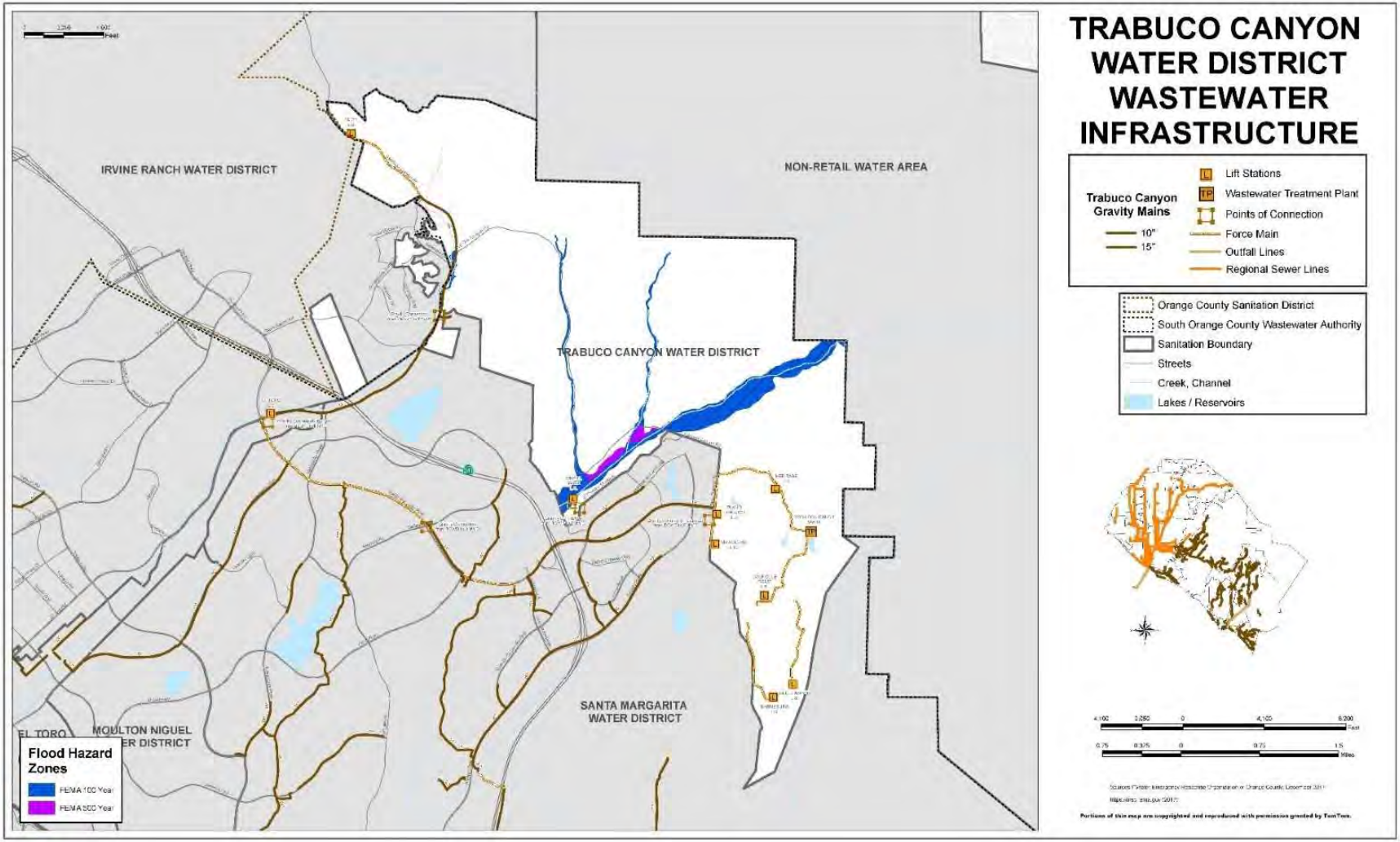


Exhibit M-8. Seismic Shaking Hazard and TCWD Potable Water Infrastructure

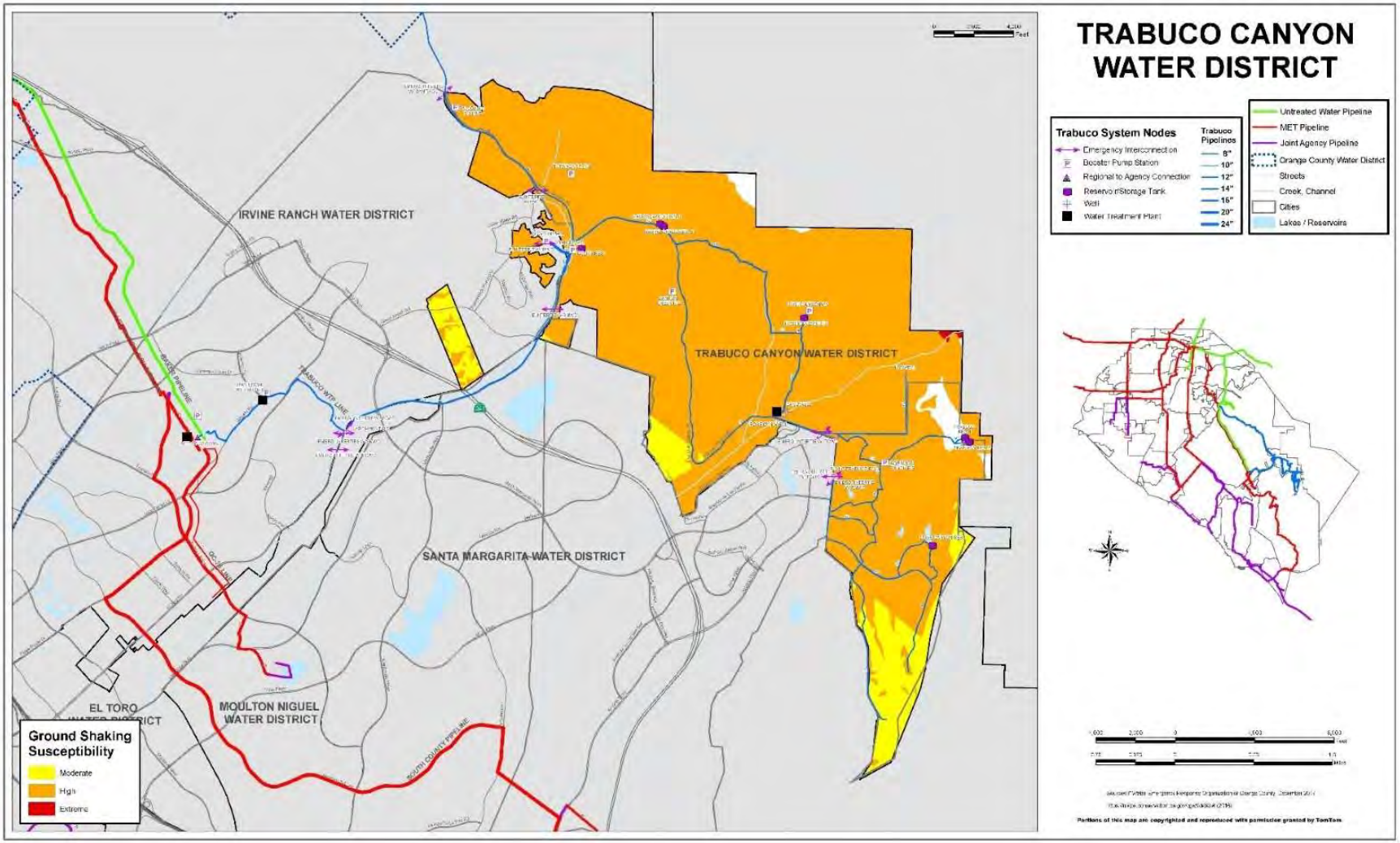


Exhibit M-9. Seismic Shaking and Trabuco Canyon Wastewater Infrastructure

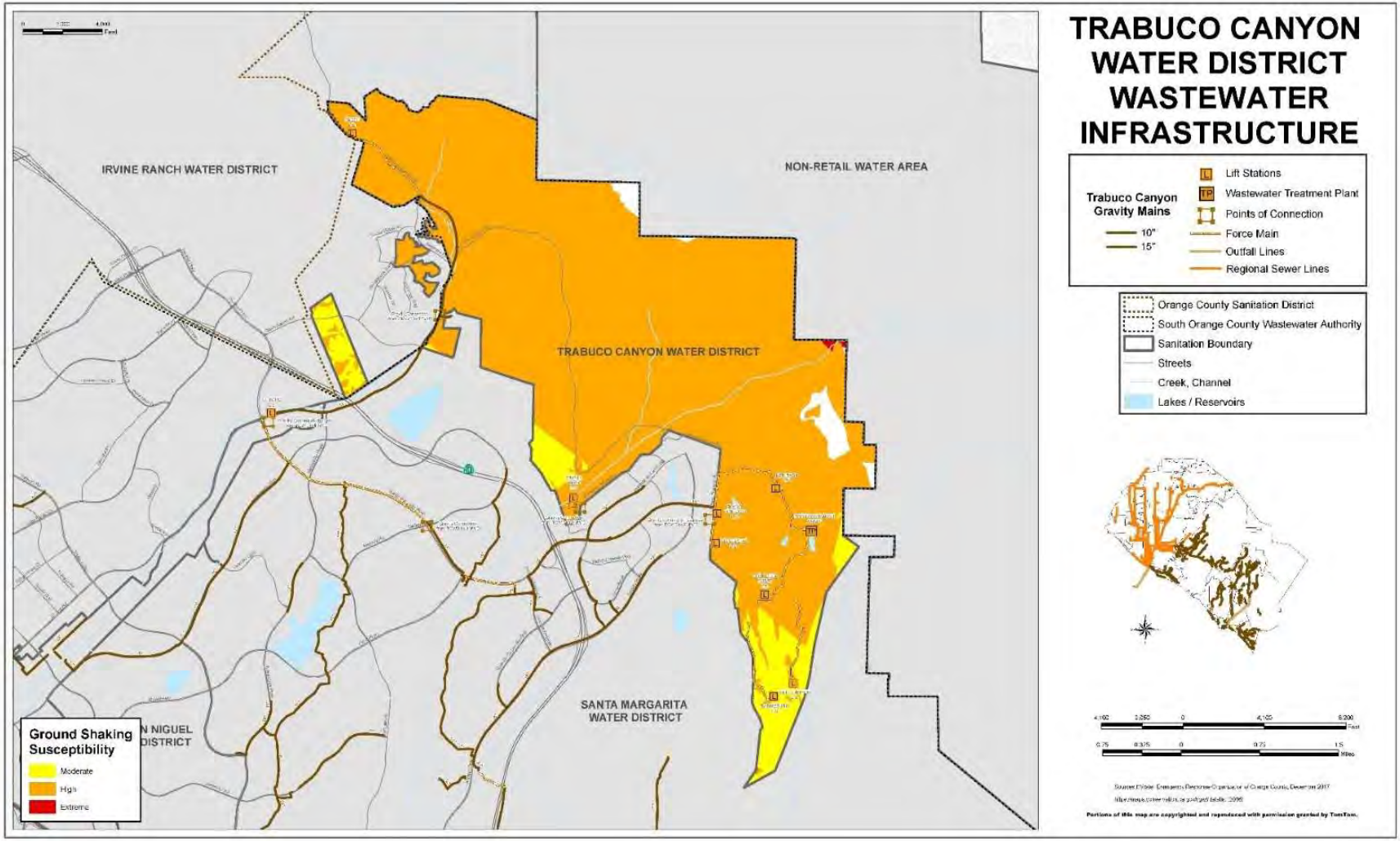


Exhibit M-10. Landslide Hazard and TCWD Potable Water Infrastructure

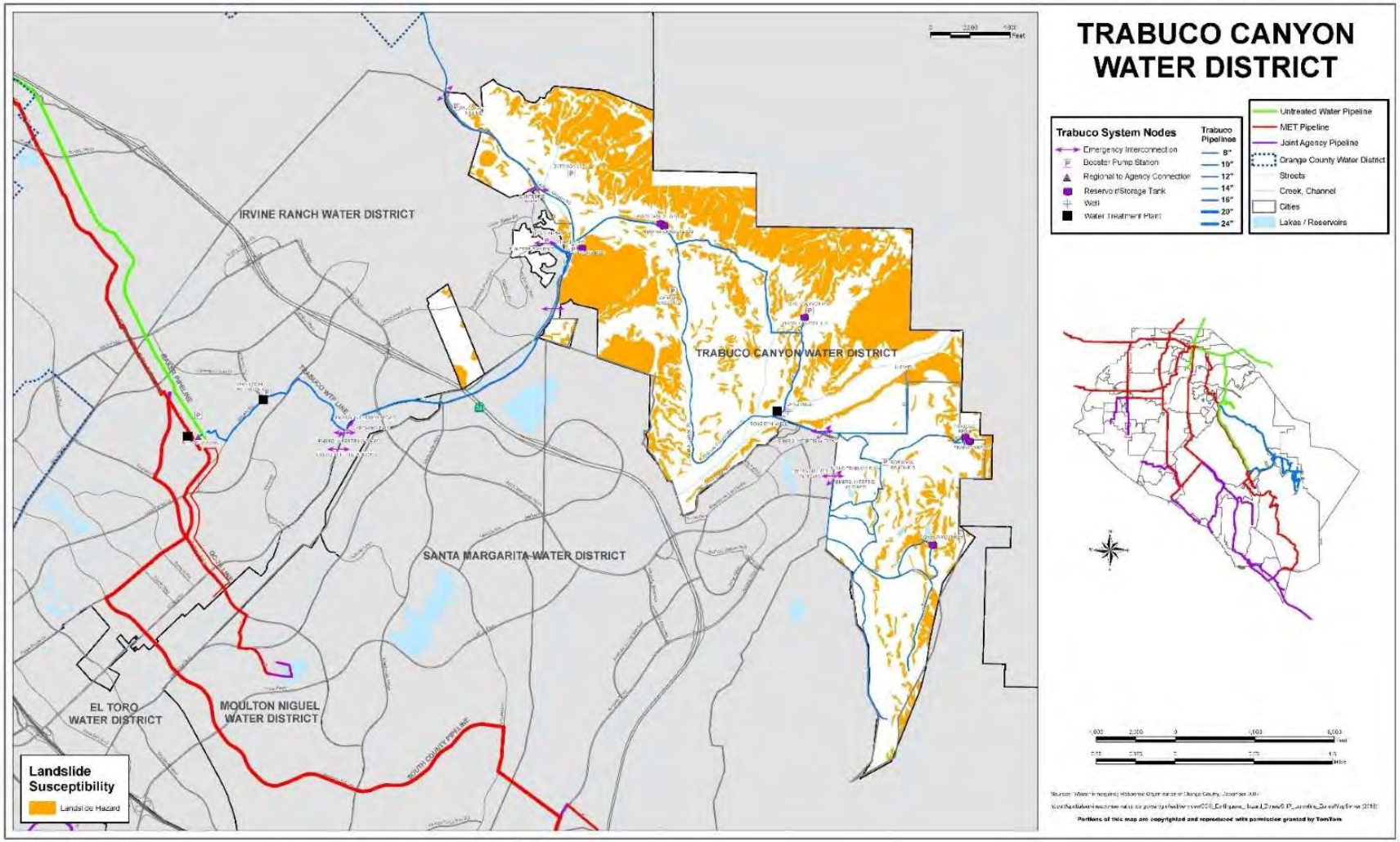


Exhibit M-11. Landslide Hazard and TCWD Wastewater Infrastructure

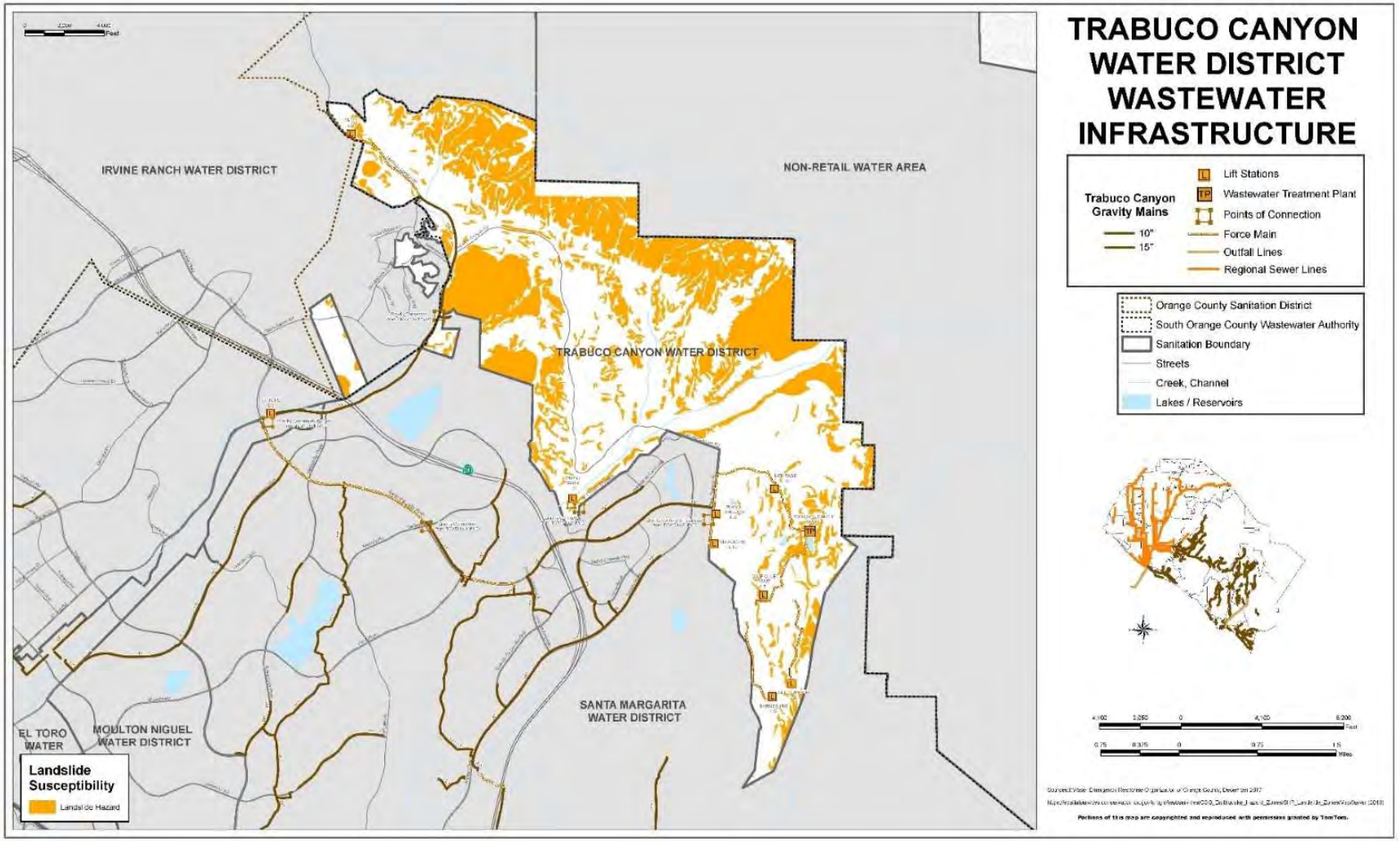


Exhibit M-12. Liquefaction Hazard and TCWD Potable Water Infrastructure

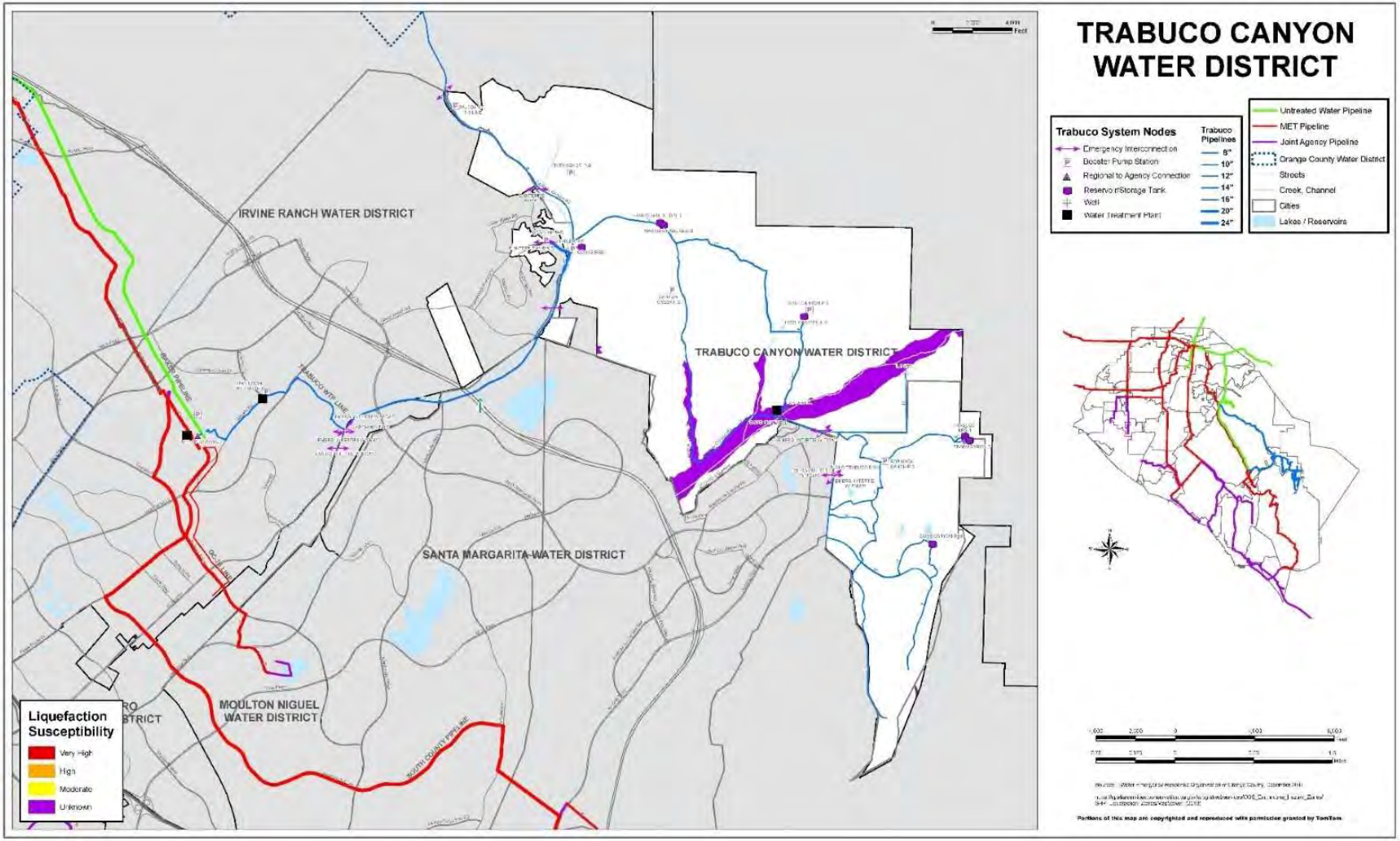
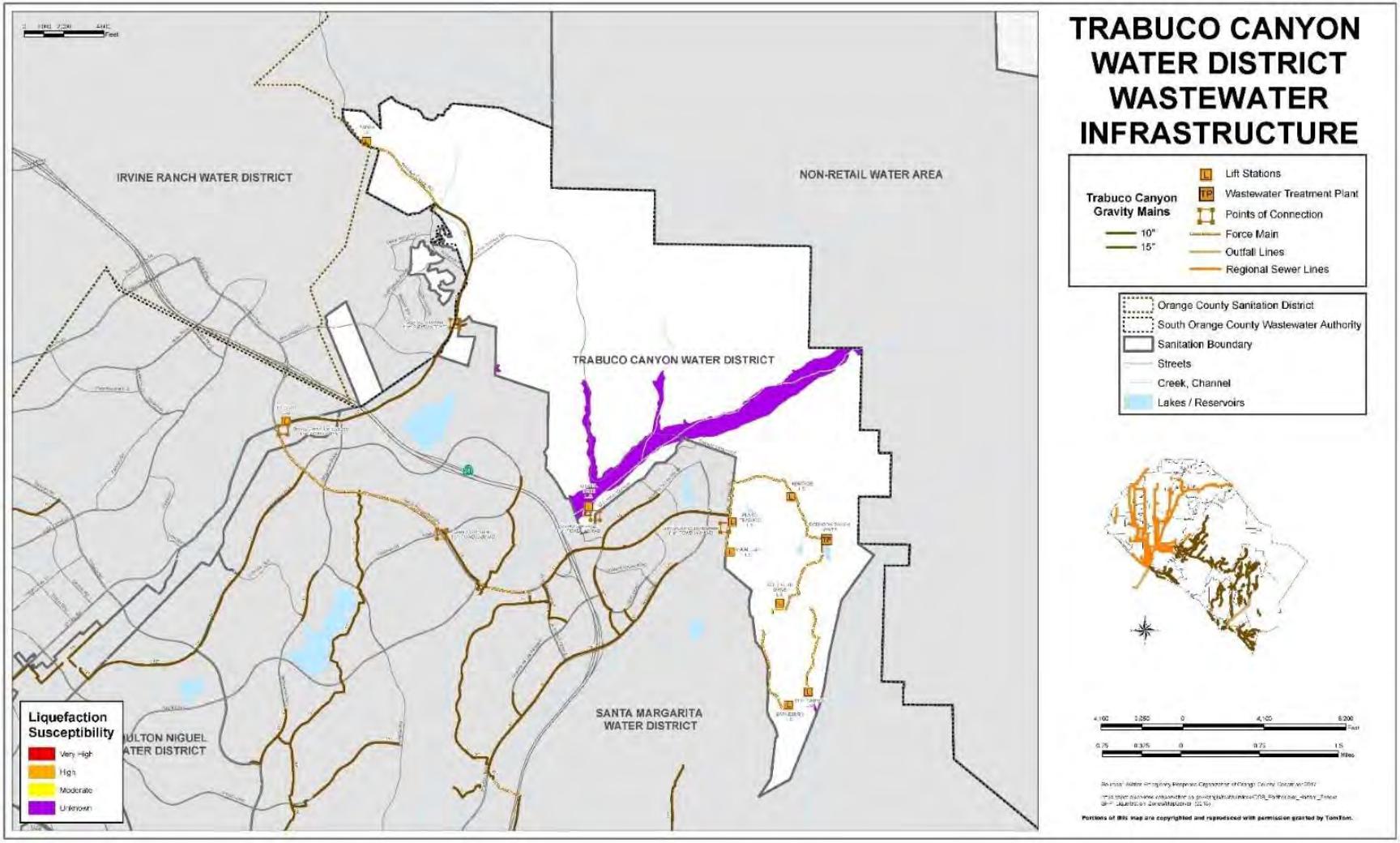


Exhibit M-13. Liquefaction Hazard and TCWD Wastewater Infrastructure



M.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within TCWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

TCWD's infrastructure is outlined in **Exhibit M-14**, which lists the number of TCWD's infrastructure assets are located within the mapped hazard zones identified above.

Exhibit M-14. TCWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type							
		Interties (#)	Pump Stations (#)	Reservoirs (#)	Wells (#)	Treatment Plants (#)	Lift Stations (#)	Potable Pipelines (miles)	Wastewater Pipelines (miles)
Fire Hazard Zone	Moderate	2	1	0	0	0	2	1.2	0
	High	0	0	0	0	1	0	2.8	0
	Very High	6	7	8	3	1	7	13.4	3.5
FEMA Flood Zone	100-Year	0	0	0	2	0	1	0.5	0.2
	500-Year	0	0	0	0	1	0	0	0
Alquist-Priolo Rupture Zone		0	0	0	0	0	0	0	0
Seismic Shaking	Moderate	0	0	0	0	0	2	0.6	0.1
	High	8	10	7	2	2	6	16.5	3.4
	Extreme	0	1	1	0	0	0	0	0
Liquefaction	Moderate	0	0	0	0	0	0	0	0
	High	0	0	0	0	0	0	0	0
	Very High	0	0	0	0	0	0	0	0
	Unknown	1	2	0	3	1	1	2.0	0.5
Landslide Zone		0	2	5	0	0	5	1.2	0.5
Tsunami Zone		0	1	1	0	0	0	0	0

Much of TCWD's service area and its associated infrastructure are located in very high fire hazard areas and high seismic shaking hazard areas. Several reservoirs and lift stations are located within landslide hazard areas. Additionally, TCWD does not contain infrastructure or pipelines in the Alquist-Priolo Rupture Zone nor in the tsunami zone except for the new Saddlecrest location.

Changes in Land Use and Development

TCWD serves eight communities across 7,000 plus acres that consist mostly of residential and open space land use. Approximately 56% of the service area is residential housing, with high, medium, and low-income families living in the communities. Within these communities, there are currently over 40 development projects that are anticipated to generate an additional 1.3 MGD of average daily demand by 2035. To ensure the ability to serve all customers, TCWD has a variety of projects ongoing and planned to increase service capacity. Projects on the potable water system

such as improvements at the Dimension Water Treatment Plant, upgrades to Plano Trabuco Pump Station, pipeline replacements, and the creation of a new 1.5 MG reservoir are anticipated to help meet the new drinking water demand. Within the wastewater system, TCWD is performing upgrades to lift stations across the service area and improvements to the Robinson Ranch Wastewater Treatment Plant.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Human-Caused Hazard: Power Outage	Climate change will likely increase TCWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact facilities located within areas such as the Dove Canyon and Bell Peak area.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within TCWD's service area.
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact TCWD as described in the base plan.
Severe Weather: Windstorm	The challenges to TCWD from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Wildfire	Climate change is expected to cause an increase in wildfires within TCWD's service area due to the high amount of urban-wildland interfaces and the proximity to the Trabuco Ranger District of the Cleveland National Forest.
Hazards of Medium Concern	
Flood	Climate change is expected to potentially cause some increased flooding within TCWD's service area, especially along the Tijeras Creek area.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides within TCWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact TCWD's service area as described in the base plan.
Hazards of Low Concern	
Geological Hazards: Expansive Soils	The impacts to expansive soils within TCWD's service area are anticipated to be as described in the base plan.
Geological Hazards: Land Subsidence	TCWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.

Hazard	Climate Change Vulnerabilities
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within Trabuco Canyon's service area as a result of climate change.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the TCWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.

M.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this MJHMP. TCWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits M-15a through M-15d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. TCWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit M-15a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	Local Cities, CA Division of Dams, OCFA, AQMD	TCWD complies with applicable building codes and works with public agencies in the service area. **Expansion and Improvement:** As retrofits and replacement projects are identified TCWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	County of Orange, City of Rancho Santa Margarita, City of Lake Forest, City of Mission Viejo	TCWD complies with applicable zoning ordinances and works with public agencies in the service area.
Subdivision Ordinance or Regulations	Local cities, County of Orange	TCWD complies with applicable subdivision ordinances or regulations and works with public agencies in the service area.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Special Purpose Ordinance	County of Orange, Army Corps of Engineers, USFWS/CDFG	TCWD complies with applicable special purpose ordinances and works with the cities within the service area.
Growth Management Ordinances	Local cities, County of Orange, Foothill Specific Plan, LAFCO	TCWD complies with applicable growth management ordinances and works with the public agencies in the service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, SCWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	Local Cities, County of Orange, Orange County Fire Authority, CA Legislative Bills and Propositions	TCWD complies with applicable site plan review requirements and works with public agencies within the service area. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plans	TCWD Master Plan	TCWD Master Plan outlines the current and future conditions and complies with applicable General Plans for cities within the service area.
Capital Improvements Plan	TCWD CIP	TCWD develops a 10-year CIP for water, wastewater, and recycled water. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	CDHP, SEMS, NIMS, WEROC, MET	The district works with local agencies and WEROC for emergency response. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure TCW is better prepared for future incidents and can anticipate their communities' needs.
Disaster Recovery Plan	County of Orange	Adhere to County plan.
Post-Disaster Recovery Ordinance	Local cities, County of Orange, State of California, FEMA	Works with County on Post-Disaster Recovery Ordinance.
Water Discharge Requirements	RWQCB, SOCWA, EPA, County of Orange State Water Resources Control Board	Adhere to all Federal and State regulations.
Vulnerability Assessment	EPA, CA State Water Resources Control Board, Division of Drinking Water	The district works with State, local agencies to determine vulnerabilities.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Urban Water Management Plan	TCWD	The UWMP has been prepared consistent with the requirements under Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act and is due to the California Department of Water Resources (DWR) by July 1, 2021. **Expansion and Improvement:** Integration of future projects from UWMPs into Local Hazard Mitigation Plans can ensure both plans are supporting the necessary improvements needed to ensure future water supplies and minimize risks to hazards and disasters.

How can these capabilities be expanded and improved to reduce risk?
▪ Update the risk and resilience assessment (RRA) and corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply.

Exhibit M-15b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Outside consultants in coordination with the Engineering Department	District staff utilizes an outside consultant with input from staff.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Outside consultants in coordination with the Engineering Department	District staff utilizes an outside consultant with input from staff.
Planners or Engineer(s) with an Understanding of Natural and/or Human - Caused Hazards	Outside consultants in coordination with the Engineering Department	District staff utilizes an outside consultant with input from staff.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	County of Orange, Emergency Response Plan, Sheriff's Dept., OCFA	Work with the County and local agencies to assess vulnerabilities.
Personnel Skilled in GIS and/or HAZUS	MWDOC, Center for Demographics Research, Outside Consultant	Work with MWDOC and outside consultant.
Emergency Manager	MWDOC, WEROC, Emergency Coordinator	Coordinate with WEROC and the County.
Lab Specialist	Contract Laboratories, Neighboring Water Districts	Coordinates with other agencies and outsider consultant.
Floodplain manager	County of Orange, Sheriff's Department	

Scientists Familiar with the Hazards of the Community	County, Orange County Fire Authority, Outside Consultants, Local University and Non-Profit Research Centers	Work with the County and local agencies who are familiar with community hazards.
Mutual aid agreements	WEROC	As an MA of MWDOC/WEROC, TCWD has utilized mutual aid requests for disaster response efforts.

Exhibit M-15c. Financial Capabilities Summary

Fees for Water, Sewer, Gas, or Electric Service	Administrative Services Department	TCWD is able to charge customers fees for water and sewer services. **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Incur Debt Through Special Tax And Revenue Bonds	Administrative Services Department	TCWD may incur special tax or revenue bonds as needed through the appropriate legal process.

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy.

Exhibit M-15d. Education and Outreach Capability Summary

Resource/ Programs	Agency or Department	Description/Comments
AlertOC	County of Orange	Residents are encouraged to sign up for emergency alerts with the City.
Emergency Preparedness Information	Municipal Water District of Orange County, Federal, State	TCWD directs the public the website for emergency preparedness resources.
Public Awareness and Education	District website & Social Media platforms	TCWD uses its official website as the primary source of public awareness and education. Social media platforms are a secondary source of public awareness and education.
Local News	Orange County Register	The newspaper is used for the publication of required notices or public outreach purposes.
Community Newsletter	TCWD On Tap Newsletter	TCWD publishes a monthly newsletter that is included with customer utility bills.

How can these capabilities be expanded and improved to reduce risk?
▪ Participation in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the Access, Disability, and Functional Needs community specific to TCWD.

M.7 MITIGATION STRATEGY

M.7.1 Mitigation Goals

TCWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

M.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the MJHMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit N-16,** TCWD Mitigation Actions, identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit M-16. TCWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Dove and Trabuco Dam Outlet Gate Structure Repair/Replacement.	Trabuco Dam	Dam/Reservoir Failure	$2,500,000	Engineering	Immediate	Grants, General Fund	New
Implement erosion control and slope stabilization measures at existing Transmission Mains. Install new structural supports and reinforce or replace unstable foundations and soils and bridge crossings.	System Wide, including 16-inch water main bridge crossings on old El Toro Road.	Geological Hazards: Landslide and Mudflow	>$5 Million	Operations	Short to Long Term	Grants, General Fund	Existing, On Going
Conduct structural, geotechnical, and/or erosion control studies to determine site specific mitigation measures to protect existing transmission mains. Mitigation measures may include rip-rap, drainage structures/pipes, asphalt paving, and re-compaction/fill of slopes and unpaved areas at or above existing transmission mains. If more feasible, relocate sections of piping and valves.	System Wide, including Rose Canyon water mains in unpaved areas, various treated water mains at and near Trabuco Creek, adjacent hill sides, and unpaved areas on Plano Trabuco Road	Geological Hazards: Landslide and Mudflow	>$10 Million	Engineering	Short to Long Term	Grants, General Fund	Existing, On Going
MEDIUM PRIORITY							
Evaluate water tanks for structural stability and seismic activity and install flexible coupling and seismic valves where recommended.	Water storage tanks	Seismic Hazards: Seismic Shaking	$5 Million	Engineering	Immediate	General Fund	Existing, On Going
Implement erosion control and slope stabilization measures at Wastewater Treatment Plant and service roads to the facility.	Wastewater treatment plant and service road	Geological Hazards: Landslide and Mudflow	>$1 Million	Operations	Long Term	Grants, General Fund	Existing, On Going
Construct a new storage tank with a capacity of 1.5 MG	New water storage tank	All Hazards	$7 Million	Operations	Short Term	Grants /Developer	Existing, On Going

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Install emergency standby generators	Water treatment plant, high altitude pressure zones (Robinson Ranch Pump Station, Canyon Creek, Rose Reservoir)	Human-Caused Hazards: Power Outage; Severe Weather: Windstorm; Wildfire	$4 Million	Operations	Short Term	Grant, General Fund	Existing, On Going
Fire Flow Availability Improvements	Sections of service area with less-than-optimal fire flow availability.	Wildfire, Urban Fire	$1,540,000	Engineering	Long Term	General Fund	New
LOW PRIORITY							
Install surveillance and lighting equipment.	Water Treatment Plants and System Storage Tanks	Human-Caused Hazards: Terrorism (MCI)	$250,000	Operations	Long Term	Grants	Existing, On Going
Expand SCADA system monitoring.	Water and Wastewater Facilities	Human-Caused Hazards: Terrorism (Cyber Threat)	$3 Million	Information Technology and Operations	Short Term	General Fund, Restricted Reserves	Existing, On Going
Add laboratory sampling and analyses for unregulated compounds related to potential terrorist threat or vandalism.	Water Treatment Plants and System Storage Tanks	Human-Caused Hazards: Contamination/ Saltwater Intrusion	No cost estimate available	Water Quality	Long Term	Grants, General Fund	Existing, On Going

M.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Construct new Saddlecrest storage tank.
  - **Status:** Complete in 2023.

M.8 PLAN INTEGRATION

TCWD's capital budget, Water, Reclaimed Water, and Wastewater Master Plan are all used to implement mitigation initiatives identified in this annex. After adoption of the MJHMP, TCWD will continue to integrate mitigation priorities into these documents.

Since the previous Plan Update, TCWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform the City's Water Master Plan and Urban Water management Plan.
- Mitigation actions were incorporated into the Capital Budget to prioritize and complete initiatives.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex N: Yorba Linda Water District

Contents

Exhibits

YORBA LINDA WATER DISTRICT ANNEX

Yorba Linda Water District (YLWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (HMP). As a participant MA, YLWD representatives were part of the HMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the HMP. The base plan, including the HMP procedural requirements and planning process apply to YLWD.

This annex details the hazard mitigation planning elements specific to YLWD and describes how YLWD's risks vary from the planning area. This annex is not intended to be a standalone document but supplements the information contained in the base plan. All sections of the HMP, including the planning process and other procedural requirements, apply to and were met by YLWD. The base plan treats the entire county as the planning area and identifies which MAs are subject to a profiled hazard. The purpose of this annex is to provide additional information specific to YLWD with a focus on the risk assessment and mitigation strategies.

N.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representatives listed in **Exhibit N-1** lead the YLWD planning team, attended meetings on behalf of YLWD, and coordinated the hazard mitigation planning efforts with YLWD staff and the consultant team supporting the effort.

Exhibit N-1. Planning Team Lead

Primary Point of Contact
Name: Alex Ramirez
Title: Safety Officer
Telephone: 714.701.3036
Email: aramirez@ylwd.com

YLWD followed the planning process detailed in **Section 2** of the base plan and formed an internal team to support and provide information for the plan update. The following staff served as YLWD's internal hazard mitigation planning development team.

Exhibit N-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Rosanne Weston	Engineering Manager
John DeCriscio	Operations Manager
Ariel Bacani	Assistant Engineer III

Outreach to the public within YLWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, YLWD published a webpage with information on the MJHMP process and a link to the MJHMP survey. The MJHMP survey was also promoted on YLWD's Instagram. A statement was released on August 26, 2024 on their website regarding the survey to increase engagement.

N.2 JURISDICTION PROFILE

Service Population: 80,000

YLWD is an independent special district that provides water and sewer service to residents and businesses within its service area. YLWD's history dates to 1909, when local farmers and ranchers formed the Yorba Linda Water Company. In 1959, the voters elected to create a public utility with the assets of the Water Company, and the Yorba Linda Water District was formed under the California Water District Law, Division 13 of the Water Code of the State of California.

YLWD is governed by a publicly elected Board of Directors comprised of five directors who serve four-year terms. The directors set YLWD's policies and programs, provide general oversight of activities, set water and sewer rates, and employ the general manager to direct the activities of YLWD.

N.3 HAZARDS

This section is intended to profile the hazards and assess the vulnerabilities that YLWD faces, distinct from that of the county-wide planning area. The hazard profiles in the HMP discuss overall impacts to the planning area and describe the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events, and the likelihood of future occurrences. For more information on risk assessment methodologies, see **Section 3** of the base plan.

YLWD's service area is subject to most of the other hazards identified for the planning area. Many of these hazards are dispersed and may affect the entire region, including power outages, drought, seismic shaking, and windstorms. Based on the risk assessment, the YLWD development team discussed which hazards should or should not be profiled in the base plan. This discussion resulted in the identification of the following hazards that affect YLWD and summarized their probability of future occurrence, level of impact and significance as outlined in **Exhibit N-3.** Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

Exhibit N-3. YLWD Hazard Identification

Hazard Type	Occurrence Probability*	Affected Area*	Primary Impact*	Secondary Impact*	Hazard Planning Consideration*	Significance to YLWD
Human-Caused Hazards: Power Outage	Highly Likely	Medium	Catastrophic	High	High	High
Wildfire	Highly Likely	Medium	Critical	High	High	High
Human-Caused Hazards: Terrorism (Cyber Threat)	Highly Likely	Medium	Critical	Limited	High	High
Seismic Hazards: Seismic Shaking	Likely	Medium	Catastrophic	High	High	High
Seismic Hazards: Seismic Liquefaction	Likely	Medium	Catastrophic	High	High	High
Severe Weather: Windstorm	Highly Likely	Large	Limited	Negligible	Medium	Medium
Severe Weather: Extreme Heat	Likely	Medium	Critical	Moderate	Medium	Medium
Severe Weather: Drought	Highly Likely	Large	Negligible	Negligible	Medium	Low
Dam/Reservoir Failure	Somewhat Likely	Medium	Catastrophic	High	Medium	Medium
Flood	Likely	Medium	Limited	Negligible	Medium	Low
Coastal Hazards: Coastal Storms	Likely	Small	Limited	Limited	Medium	N/A
Coastal Hazards: Coastal Erosion	Likely	Isolated	Limited	Limited	Medium	N/A
Seismic Hazards: Fault Rupture	Somewhat Likely	Isolated	Catastrophic	Limited	Medium	High
Geological Hazards: Landslide and Mudflow	Somewhat Likely	Small	Limited	Moderate	Medium	Medium
Coastal Hazards: Sea Level Rise	Likely	Isolated	Limited	Negligible	Medium	N/A
Human-Caused Hazards: Contamination/Saltwater Intrusion	Unlikely	Small	Critical	High	Low	Low
Human-Caused Hazards: Terrorism (MCI)	Unlikely	Isolated	Critical	Moderate	Low	High
Human-Caused Hazards: Hazardous Materials	Unlikely	Isolated	Limited	Moderate	Low	High
Urban Fire	Unlikely	Isolated	Limited	Negligible	Low	High
Geological Hazards: Land Subsidence	Unlikely	Isolated	Negligible	Limited	Low	Low
Geological Hazards: Expansive Soils	Unlikely	Isolated	Negligible	Limited	Low	Medium
Coastal Hazards: Tsunami	Unlikely	Isolated	Negligible	Negligible	Low	N/A

**The values within these columns are representative of the entire planning area of Orange County and are not narrowed down to YLWD's service area.*

Geographic Affected Area	Significance
▪ Isolated: Less than 10% of planning area ▪ Small: 10-30% of planning area ▪ Medium: 30-60% of planning area ▪ Large: 60-100% of planning area	▪ Low: Minimal potential impact ▪ Medium: Moderate potential impact ▪ High: Widespread potential impact
Probability of Future Occurrences	**Magnitude/Severity**
▪ Highly Likely: Near 100% chance of occurrence in next year or happens every year. ▪ Likely: Between 10-100% chance of occurrence in next year or has a recurrence interval of 10 years or less. ▪ Occasional: Between 1-10% chance of occurrence in the next year or has a recurrence interval of 11 to 100 years. ▪ Unlikely: Less than 1% chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.	▪ Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths. ▪ Critical: 25-50% of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability. ▪ Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable; does not result in permanent disability. ▪ Negligible: Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid.

The Federal Emergency Management Agency (FEMA) Local Mitigation Planning Handbook requires each agency to identify the magnitude/severity of each hazard to their infrastructure. The identification of hazards provided in **Exhibit N-3** is highly dependent on the location of facilities within each agency's jurisdiction and takes into consideration the history of the hazard and associated damage (if any), information provided by agencies specializing in a specific hazard (e.g., FEMA, California Geological Survey), and relies upon each agency's expertise and knowledge. The table was created with input from the Water Emergency Response Organization of Orange County (WEROC), consultant staff, and YLWD.

N.4 HAZARD MAPS

The following maps show the location of hazard zones within the jurisdiction relative to potable water systems, as applicable.

Exhibit N-4. Fire Hazard and YLWD Potable Water Infrastructure

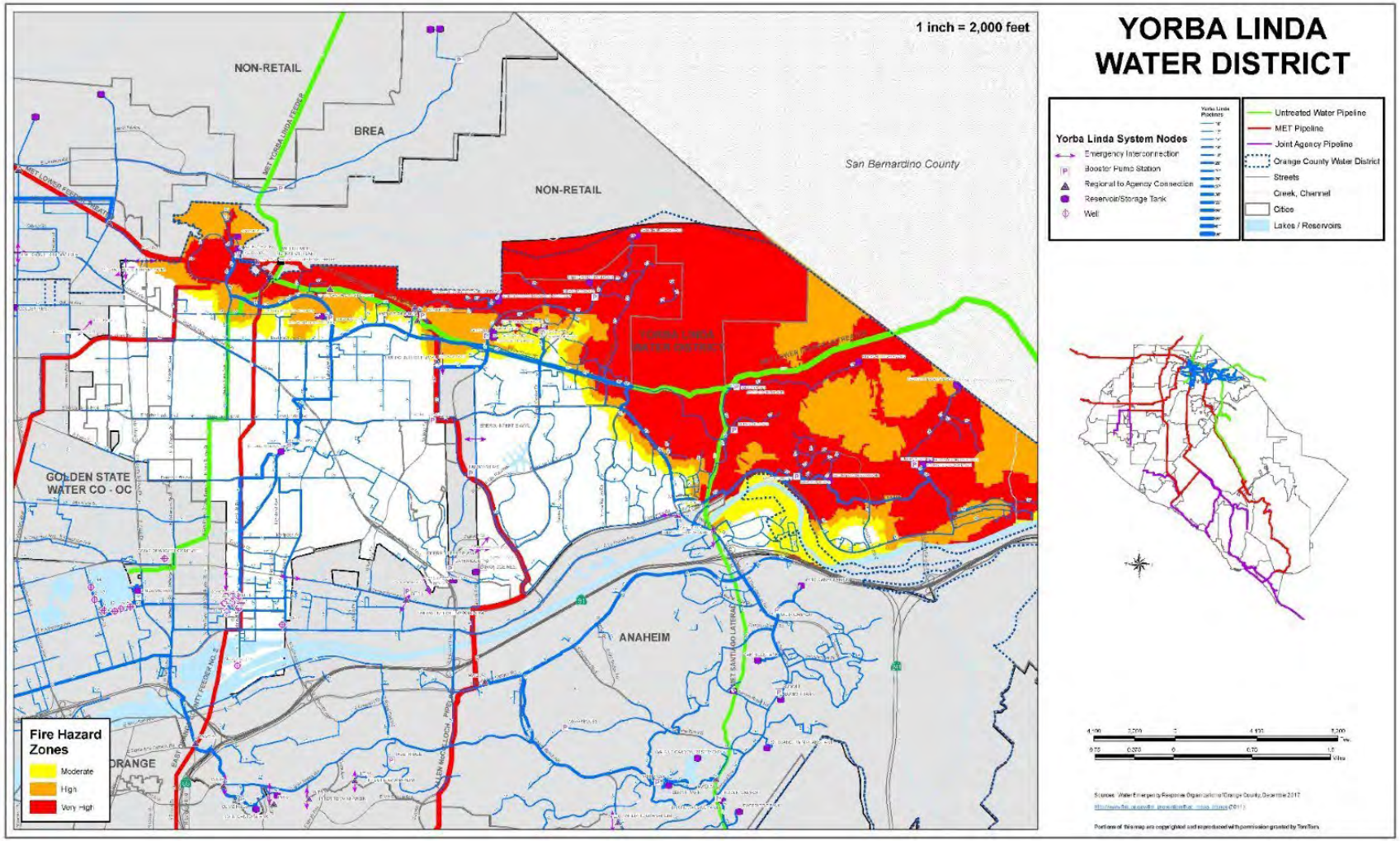


Exhibit N-5. Fire Hazard and YLWD Wastewater Infrastructure

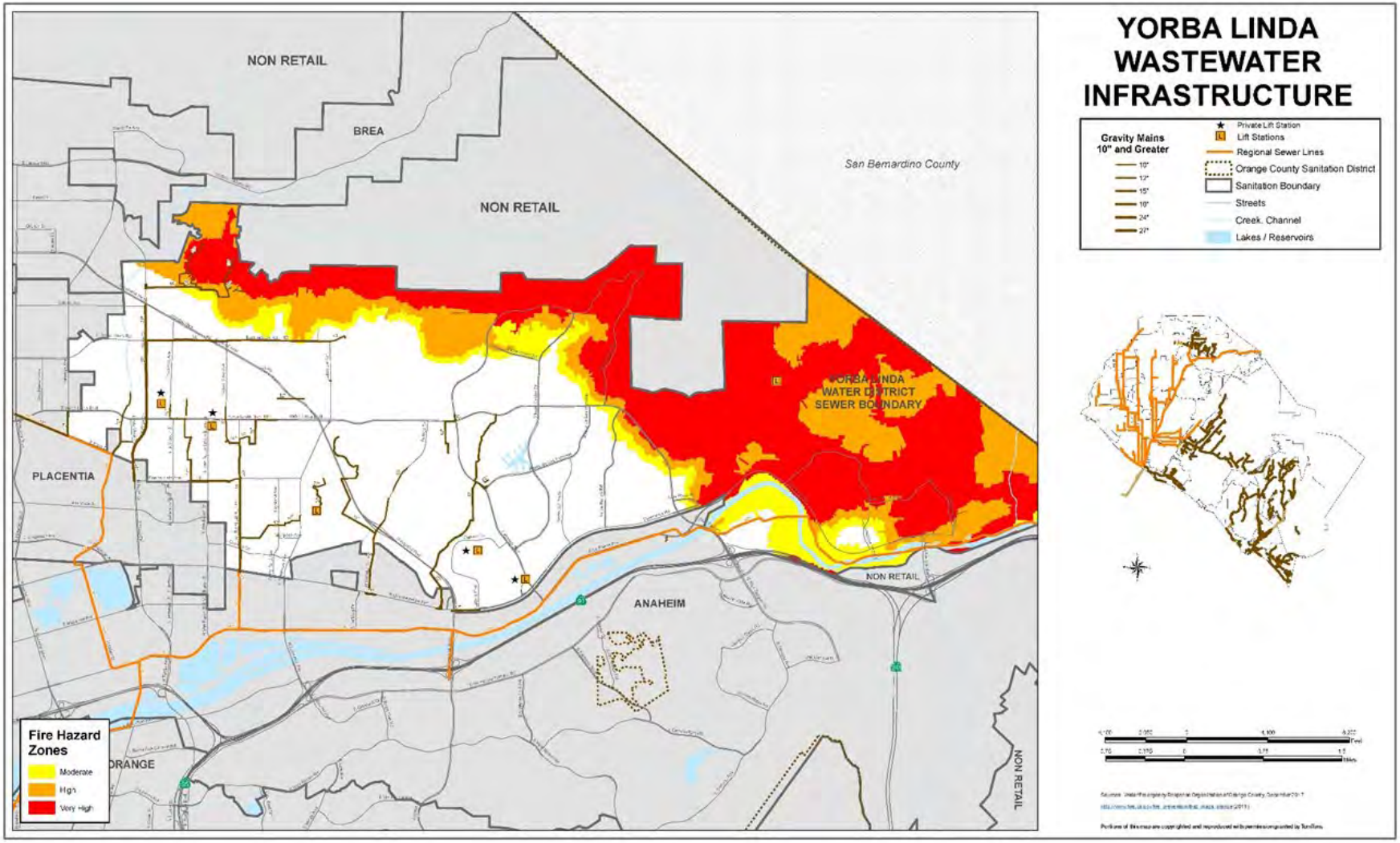


Exhibit N-6. Flood Hazard and YLWD Potable Water Infrastructure

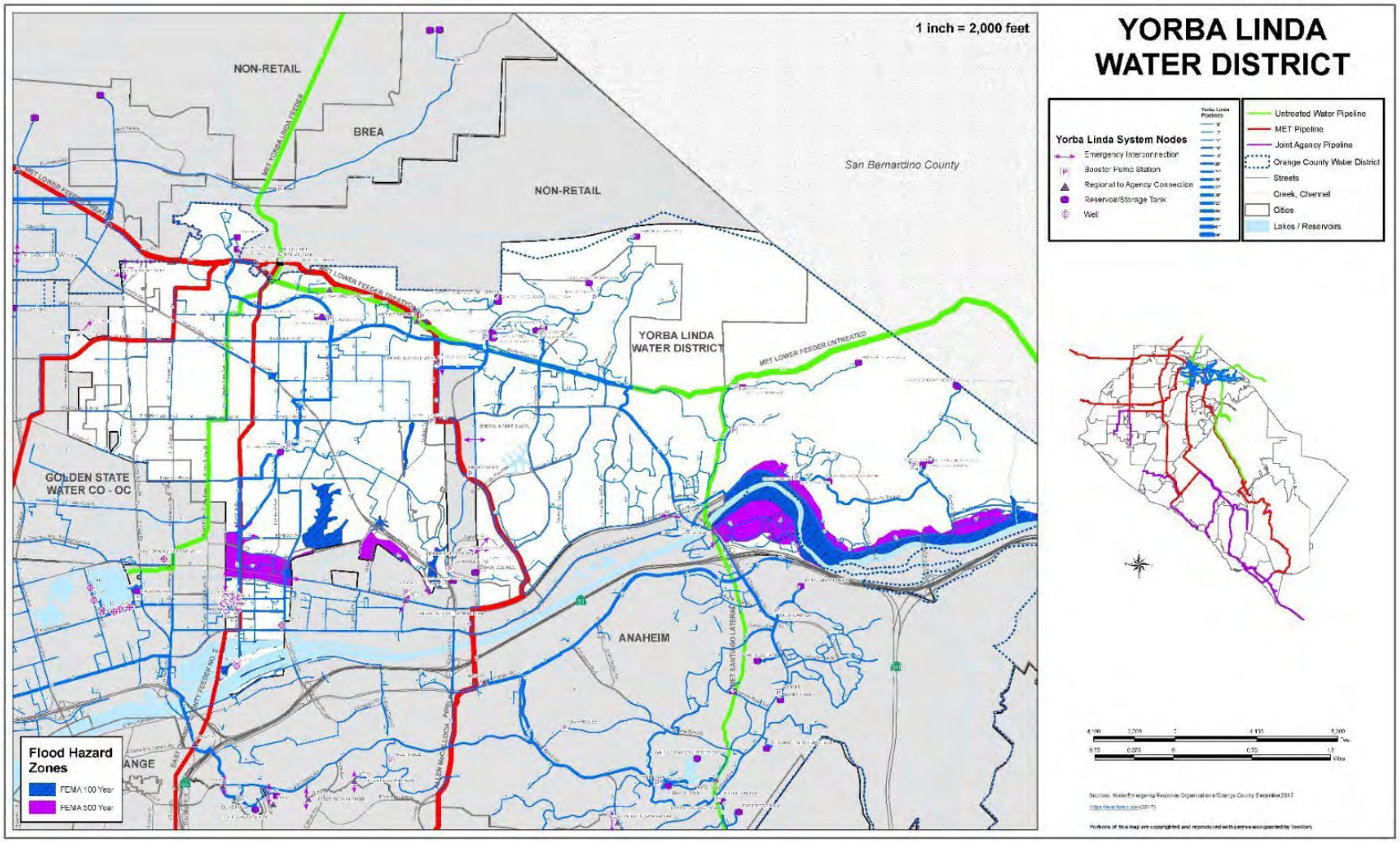


Exhibit N-7. Flood Hazard and YLWD Wastewater Infrastructure

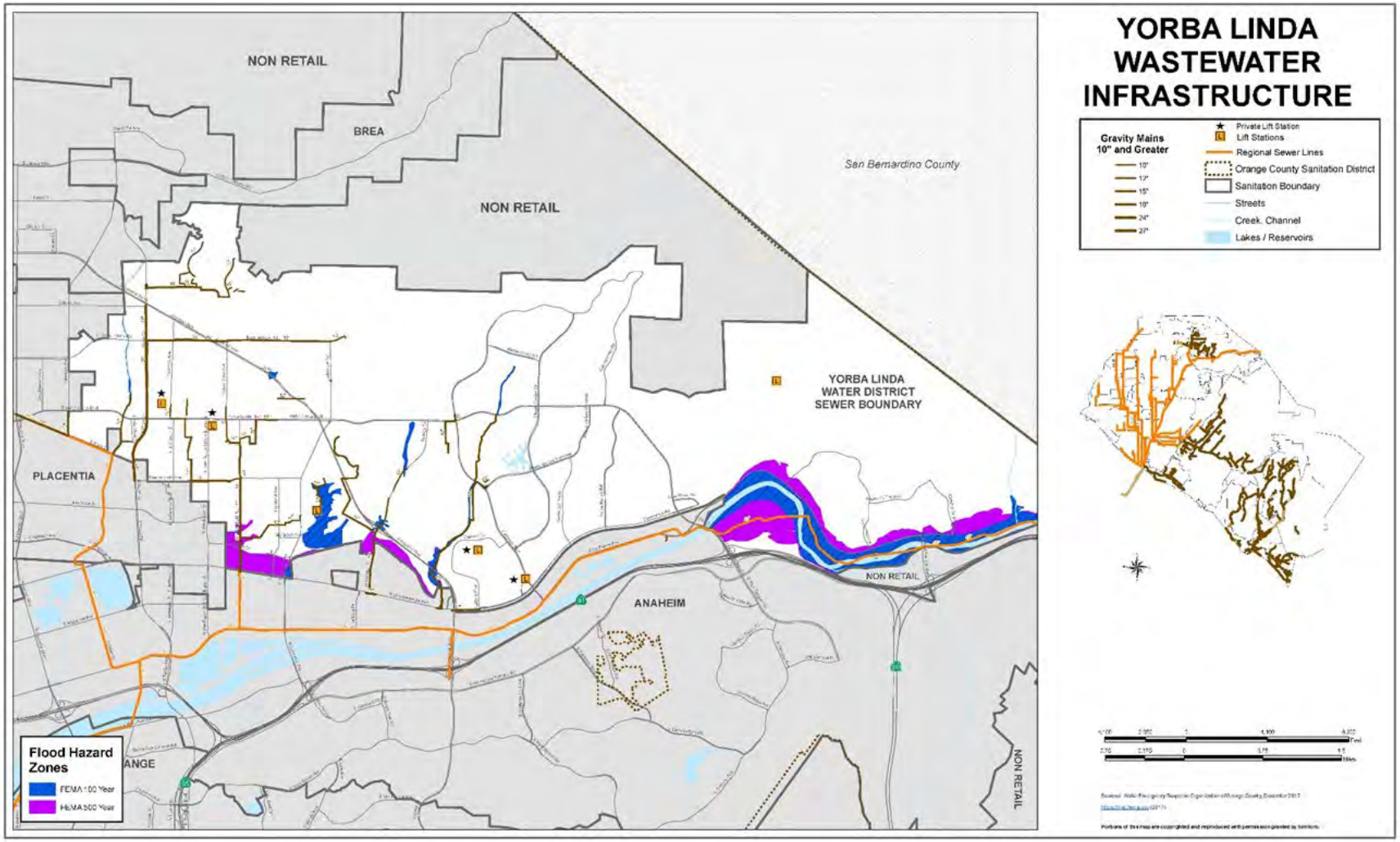


Exhibit N-8. Seismic Shaking Hazard and YLWD Potable Water Infrastructure

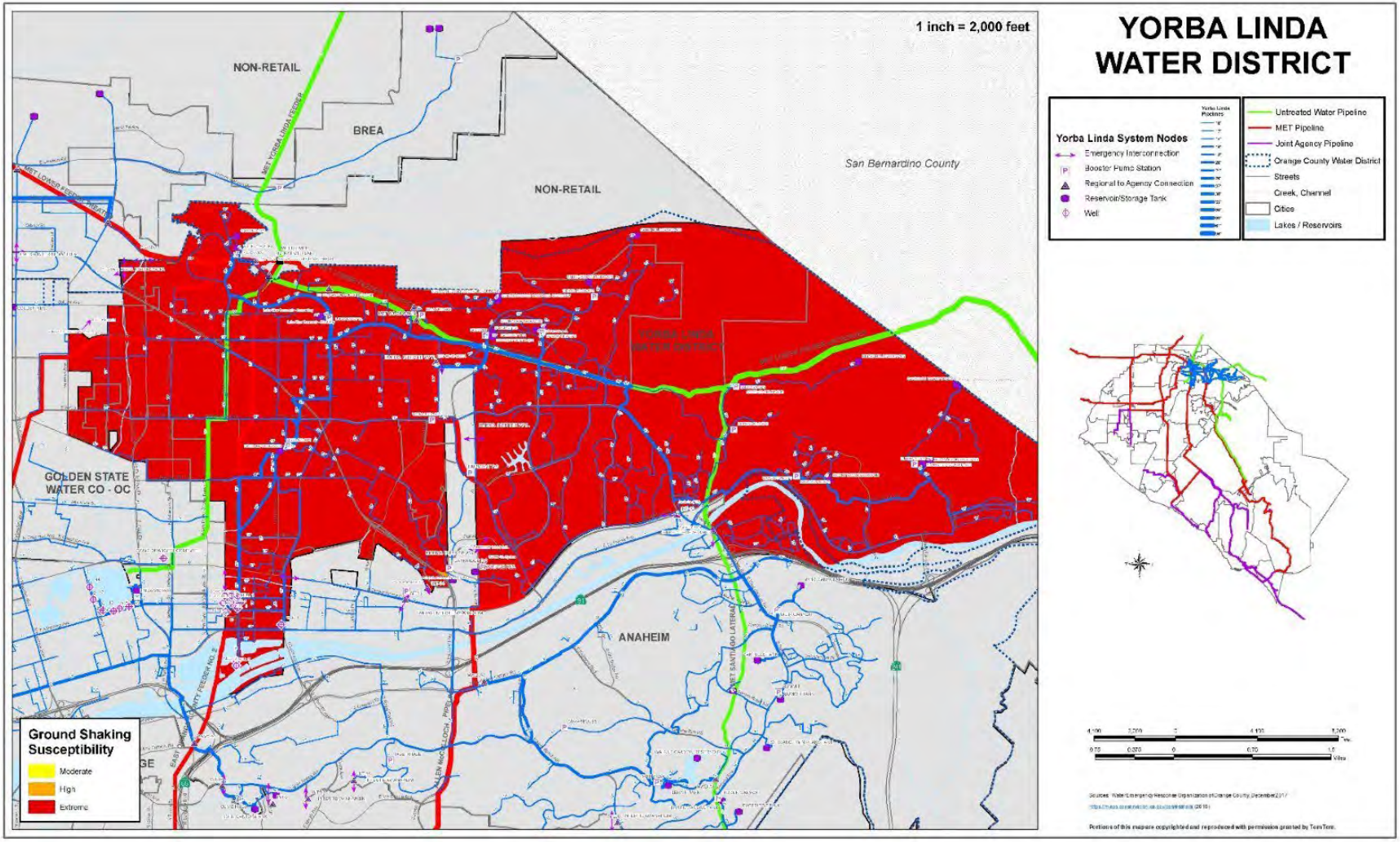


Exhibit N-9. Seismic Shaking and YLWD Wastewater Infrastructure

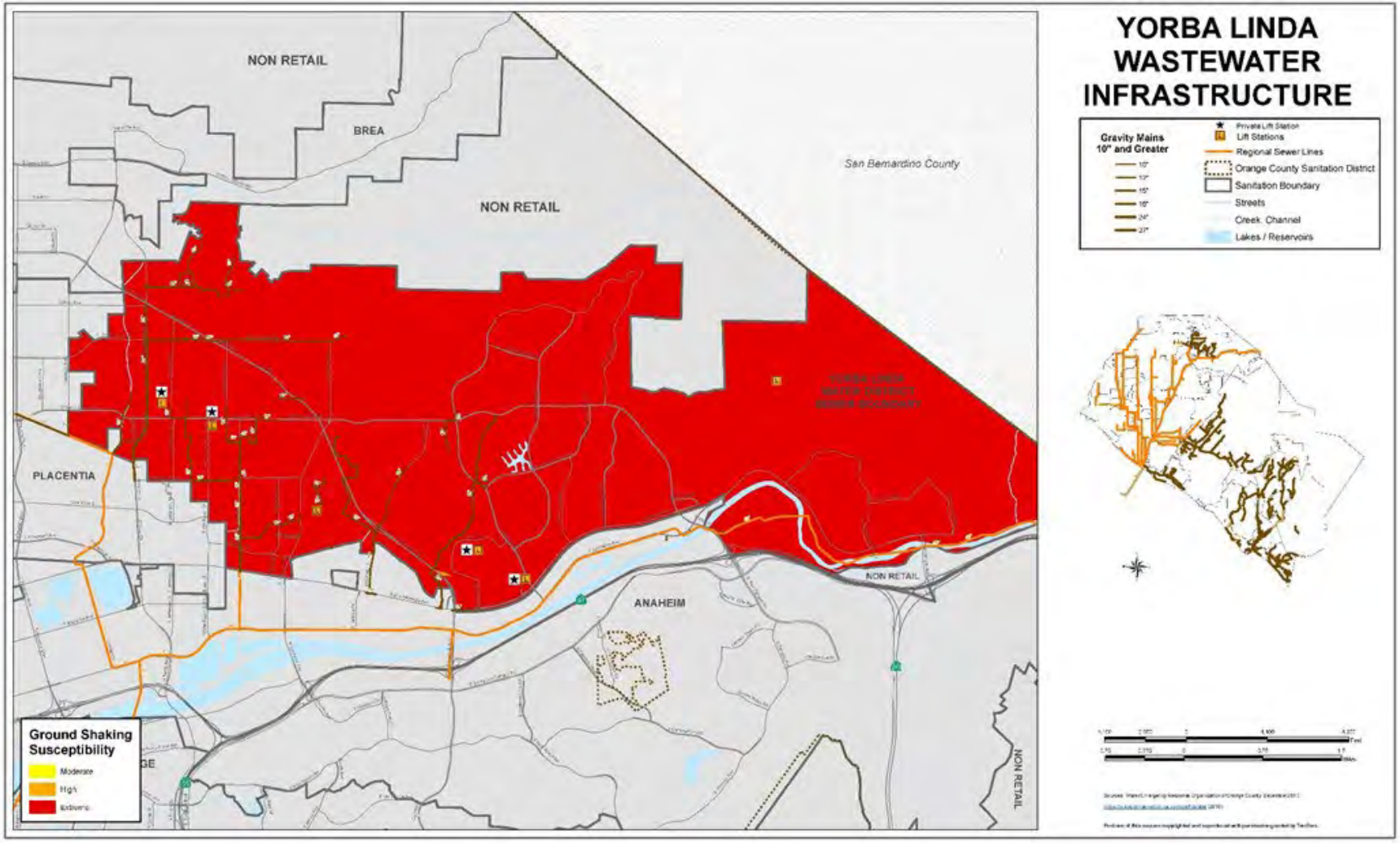


Exhibit N-10. Liquefaction Hazard and YLWD Potable Water Infrastructure

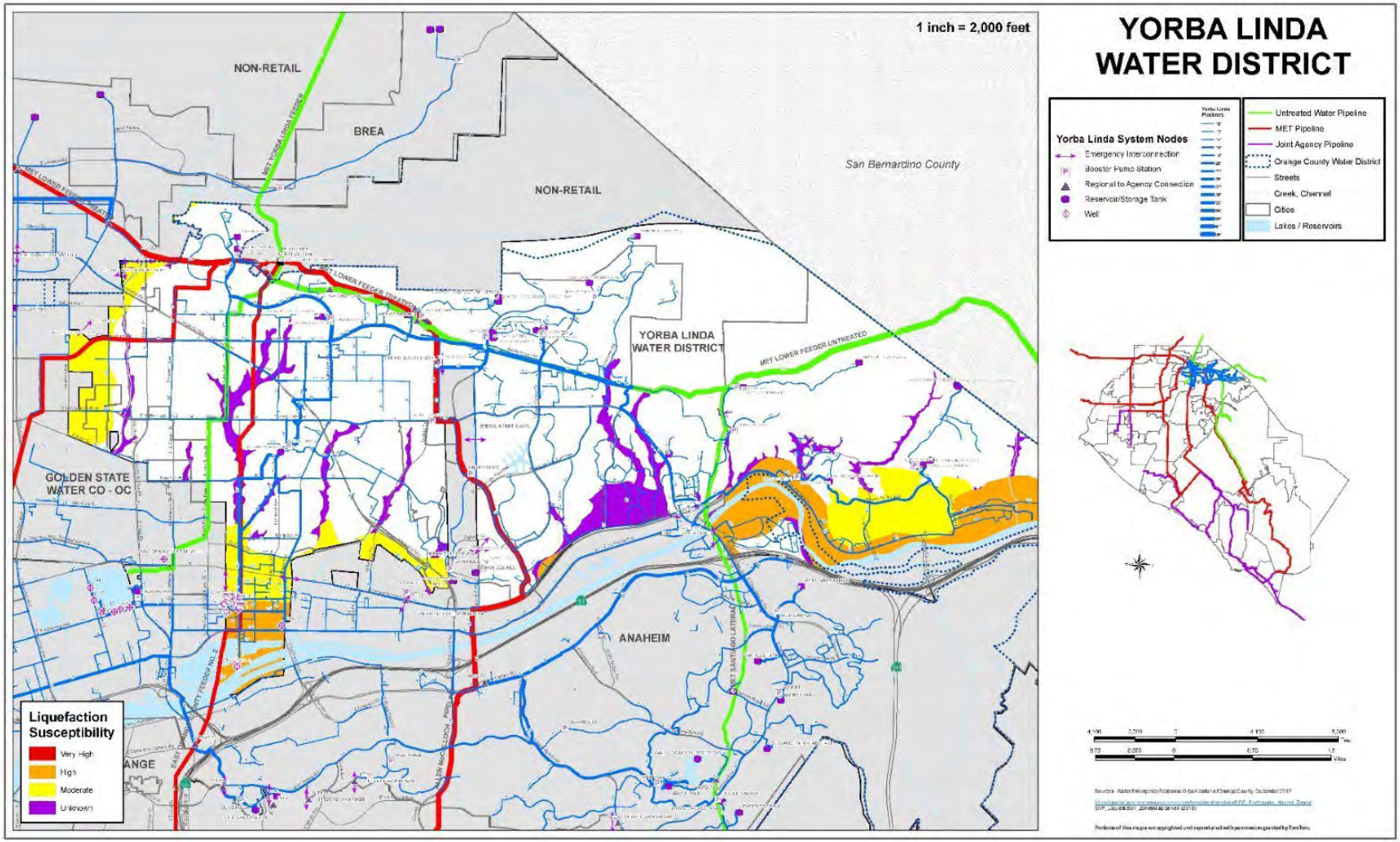


Exhibit N-11. Liquefaction Hazard and YLWD Wastewater Infrastructure

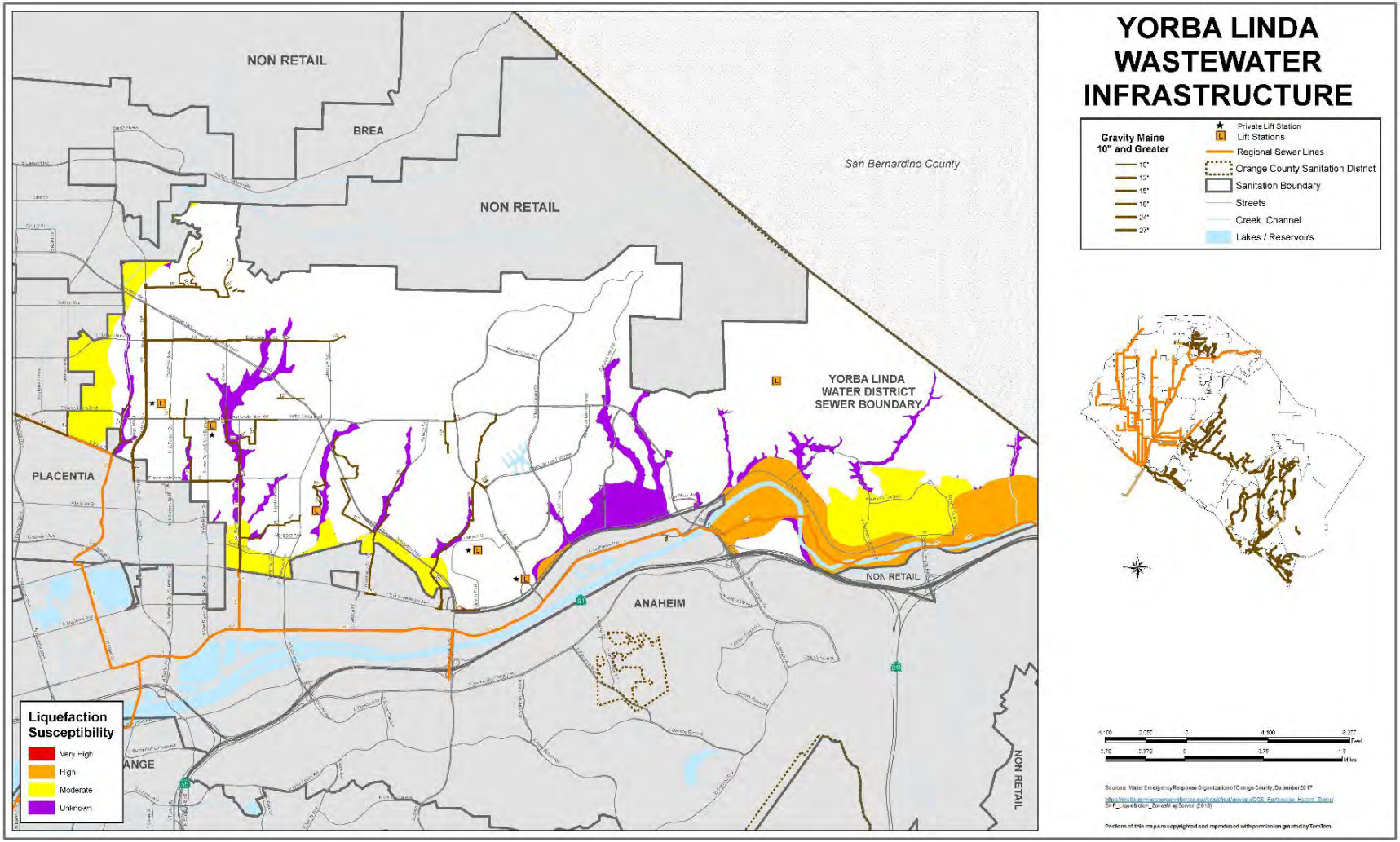


Exhibit N-12. Landslide Hazard and YLWD Potable Water Infrastructure

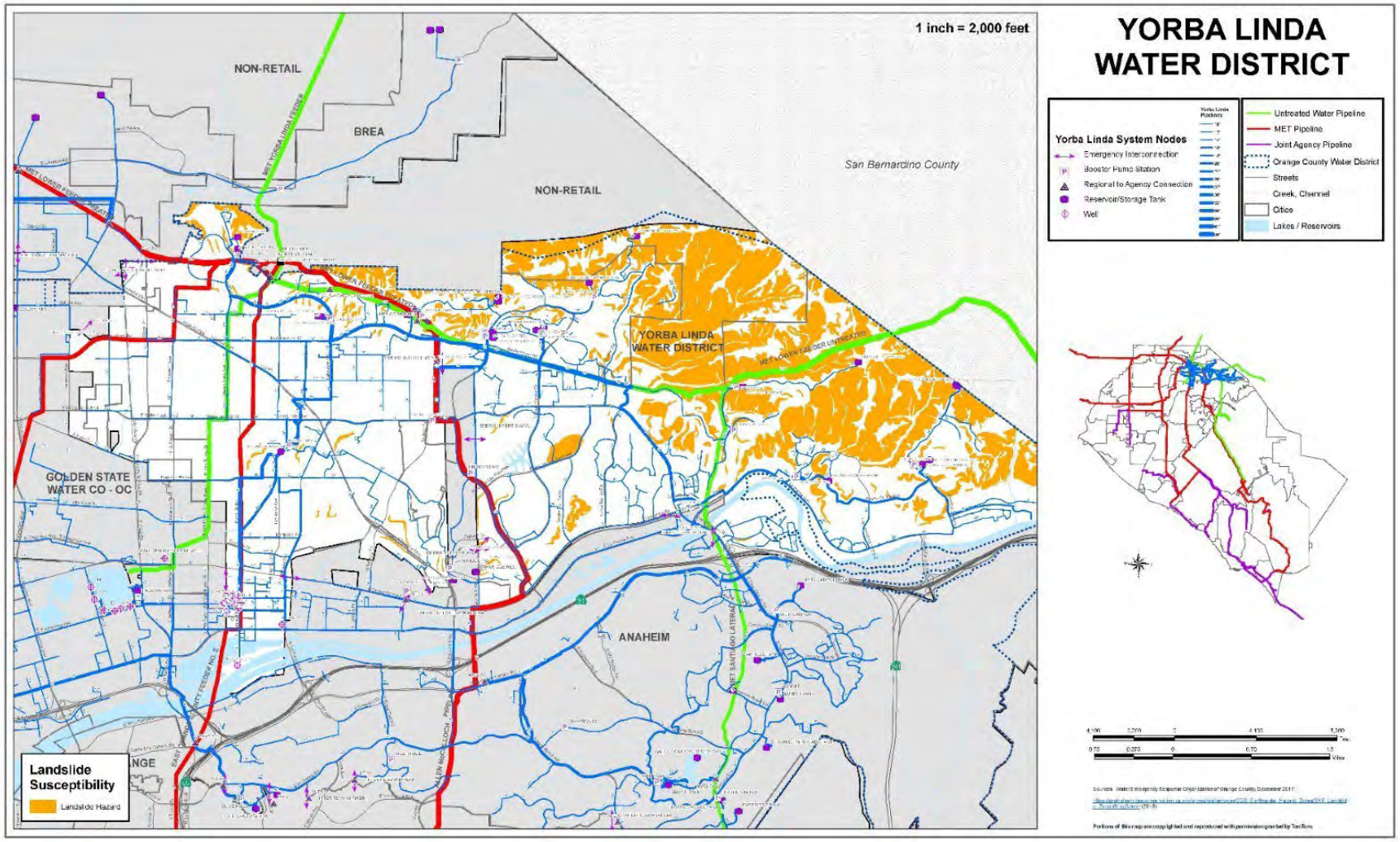


Exhibit N-13. Landslide Hazard and YLWD Wastewater Infrastructure

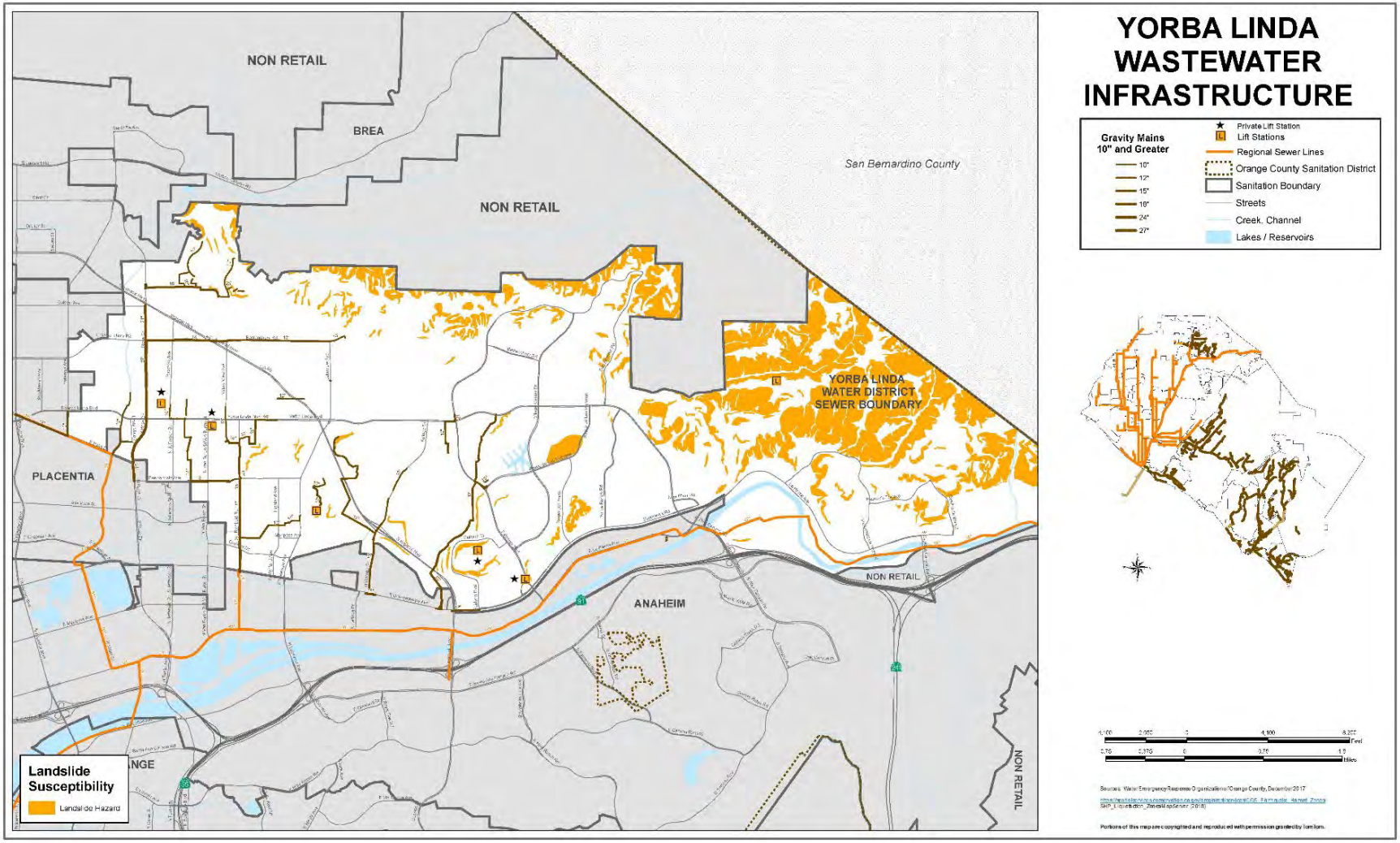
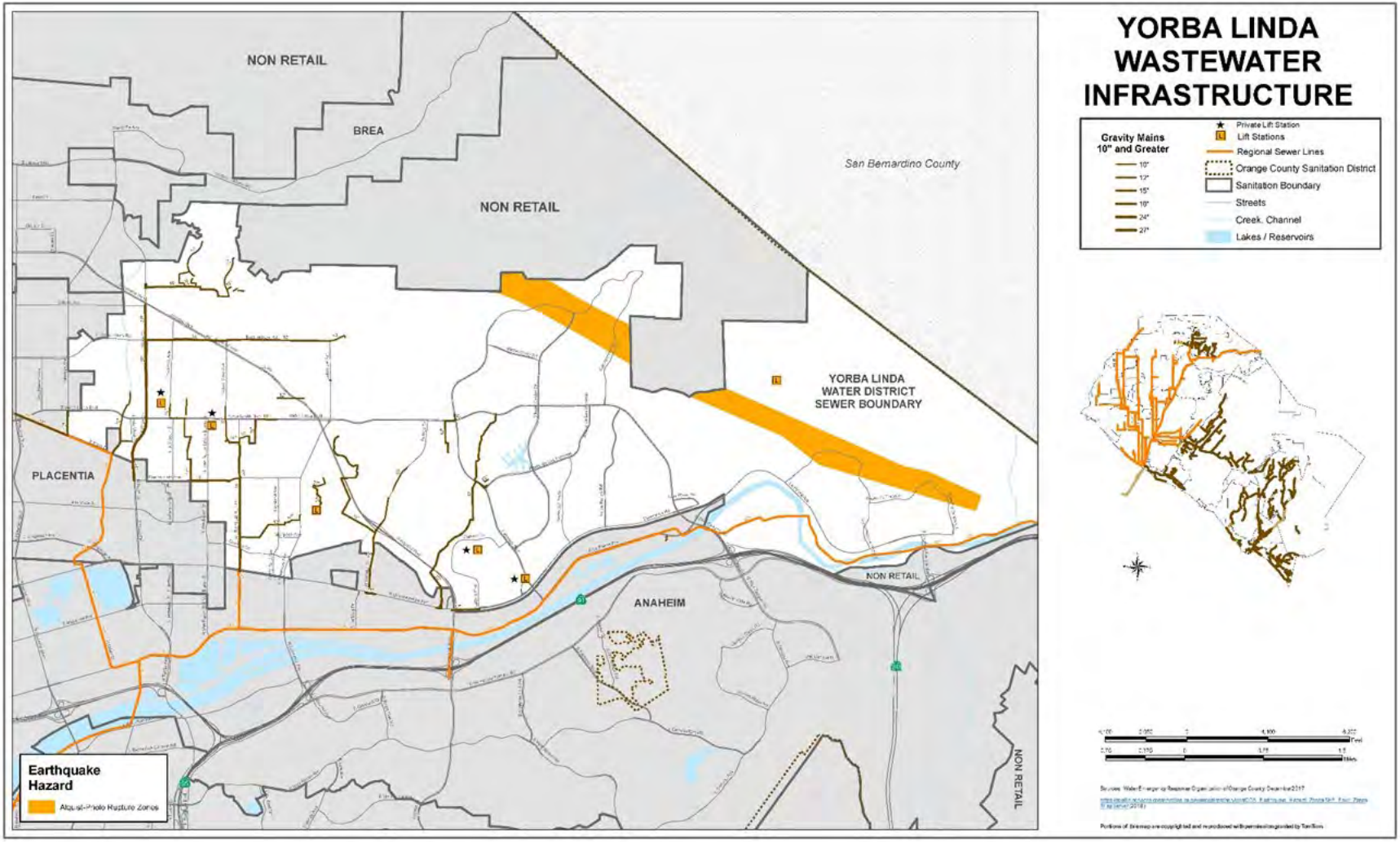


Exhibit N-14. Fault Rupture Hazard and YLWD Wastewater Infrastructure



N.5 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within YLWD's service area that are vulnerable to specific hazard events. The vulnerability assessment considered unique local knowledge of hazards and impacts and a GIS overlaying method for examining such vulnerabilities more in depth. Using these methods, vulnerable populations, infrastructure, and potential losses from hazards can be estimated.

Assets Susceptible to Hazard Events

YLWD's infrastructure is outlined in **Exhibit N-15**, which lists the number of YLWD's water and wastewater infrastructure assets are located within the mapped hazard zones identified above.

Exhibit N-15. YLWD Infrastructure and Exposure to Hazards

Hazard		Infrastructure Type					
		Interties (#)	Pump Stations (#)	Reservoirs (#)	Wells (#)	Potable Pipelines (miles)	Wastewater Pipelines
Fire Hazard Zone	Moderate	1	3	2	0	3.8	0.4
	High	0	0	5	0	6.6	1
	Very High	0	6	5	1	21.6	0.7
FEMA Flood Zone	100-Year	1	0	0	0	1.6	1.8
	500-Year	1	0	0	0	4.8	1.7
Alquist-Priolo Rupture Zone		0	0	0	0	3.8	0
Seismic Shaking	Moderate	0	0	0	0	0	0
	High	0	0	0	0	0	0
	Extreme	9	11	13	9	71	17.1
Liquefaction	Moderate	5	0	0	0	6.2	2.4
	High	2	1	0	9	9.1	0.3
	Very High	0	0	0	0	0	0
	Unknown	0	0	0	0	4.9	2.9
Landslide Zone		0	1	6	0	2.2	0.1
Tsunami Zone		0	0	0	0	0	0.2

Much of YLWD's potable water and wastewater pipeline systems are located in very high fire hazard areas and extreme seismic shaking hazard areas. Additionally, YLWD does not contain infrastructure or pipelines in the tsunami zone.

Changes in Land Use and Development

YLWD service area is comprised mostly of the City of Yorba Linda, which has undergone various changes in the past five years. These changes include more than 400 planned moderate to above moderate-income housing units, approximately 100 residential homes currently under construction, and multiple facilities including churches and commercial properties that would require water and wastewater service. Additionally, the City of Yorba Linda is required to zone more than 2,400 housing units for the 2021-2029 Housing Element Cycle, with most units in the low to moderate-income ranges.

To ensure service to new developments, YLWD has been updating their system with various projects to increase capacity. These include a new pump station built in 2024 and new pipeline that is currently being laid throughout the system.

Vulnerabilities Associated with Climate Change

Hazard	Climate Change Vulnerabilities
Hazards of High Concern	
Human-Caused Hazards: Hazardous Materials	Climate change has the potential of increasing hazardous materials releases resulting from transportation crashes or damage to storage vessels.
Human-Caused Hazard: Power Outage	Climate change will likely increase YLWD's vulnerability to power outages as local electric companies implement protocols such as rolling blackouts or targeted shutoffs that may impact facilities.
Human-Caused Hazards: Terrorism (Cyber Threat)	Connections between climate change and cyber based terrorism have not been identified.
Human-Caused Hazards: Terrorism (MCI)	Climate change has no direct link to human-caused hazards and is expected to follow the impacts described in the base plan.
Seismic Hazards: Fault Rupture	There are no expected changes to the frequency or intensity of fault ruptures occurring within YLWD's service area as a result of climate change.
Seismic Hazards: Seismic Liquefaction	Climate change is anticipated to impact liquefaction potential within the YLWD service area as periods of both intense rain and drought could potentially increase or decrease groundwater elevations affecting the risk of liquefaction, depending on the circumstances.
Seismic Hazards: Seismic Shaking	Climate change is not expected to cause any changes to the frequency or intensity of seismic shaking occurring within YLWD's service area.
Urban Fire	There is no anticipated impact to how climate change could influence the ignition or behavior of urban fires.
Wildfire	Climate change is expected to cause an increase in wildfire frequency within YLWD's eastern service area where the Chino Hills State Park and Fremont Canyon Nature Preserve are located with vast acreage of wildland.
Hazards of Medium Concern	
Dam/Reservoir Failure	There are no expected climate change impacts on dam/reservoir failure. However, fluctuations in the amount of precipitation and intensity of events could cause stress on dam/reservoir facilities not previously anticipated during initial design. These types of issues could increase the vulnerability of these facilities, which is described in the base plan.
Geological Hazards: Expansive Soils	Climate change is not expected to impact expansive soils within YLWD. The vulnerability follows that described in the Base Plan.
Geological Hazards: Landslide and Mudflow	Climate change could indirectly affect the conditions for landslides across YLWD's service area as increased precipitation and storm intensities may cause more moisture-induced landslides.
Severe Weather: Extreme Heat	Temperatures are expected to increase due to climate change and impact YLWD's service area similarly to the impacts described in the base plan.
Severe Weather: Windstorm	The challenges to YLWD from climate change's impacts on windstorms is expected to follow the impacts described in the base plan.
Hazards of Low Concern	
Flood	Climate change is expected to cause some higher-level flood waters within YLWD along the Santa Ana River where the 100-year flooding event may expand into the 500-year flood zones on a more frequent basis.

Hazard	Climate Change Vulnerabilities
Severe Weather: Drought	Droughts are expected to increase in length and frequency due to climate change and impact YLWD as described in the base plan.
Geological Hazards: Land Subsidence	YLWD's vulnerability to land subsidence is not expected to change due to climate change and is anticipated to be similar to those described in the base plan.
Human-Caused Hazards: Contamination/ Saltwater Intrusion	Changes in contamination and saltwater intrusion vulnerability due to climate change are expected to follow the changes outlined in the base plan.

N.6 CAPABILITIES ASSESSMENT

The capabilities assessment is designed to identify existing local agencies, personnel, planning tools, public policy and programs, technology, and funds that have the capability to support hazard mitigation activities and strategies outlined in this HMP. YLWD's internal development team revised the capabilities identified in the 2019 plan and collaborated to identify current local capabilities and mechanisms available to the MA for reducing damage from future hazard events. **Exhibits N-16a through N-16d** assess the authorities, policies, programs, and resources that the jurisdiction has in place that are available to help with the long-term reduction of risk through mitigation. These capabilities include planning and regulatory tools, administrative and technical resources, financial resources, and education and outreach programs. YLWD has the ability to expand on and improve existing emergency management policies and programs to implement mitigation programs. In some instances, methods of expansion and improvement have been identified within a specific capability, while a majority of these capabilities are anticipated to be expanded and improved upon through additional projects/initiatives underway by the Agency. These have been included at the bottom of each table.

Exhibit N-16a. Planning and Regulatory Capabilities Summary

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Building Code	City of Yorba Linda, City of Placentia, City of Anaheim, and Orange County Fire Authority (OCFA)	Standards for constructed facilities such as buildings and non-building structures. **Expansion and Improvement:** As retrofits and replacement projects are identified YLWD will anticipate meeting or exceeding the latest building codes to ensure greater resilience is incorporated into their infrastructure.
Zoning Ordinance	City of Yorba Linda, City of Placentia, City of Anaheim, and Orange County	Requirements for constructed (structures) and non-constructed properties (agricultural, etc.).
Special Purpose Ordinance	Floodplain Management: Santa Ana Watershed Project Authority, Orange County Flood Control District (OCFCD) Stormwater Management: City of Yorba Linda and OCFCD Slope Ordinances: City of Yorba Linda Wildfire Ordinances: OCFA State Fire	Standards for constructed facilities such as buildings and non-building structures.

Ordinance, Plan, Policy, Program	Responsible Agency or Department	Description/Comments
Growth Management Ordinances	City of Yorba Linda, City of Placentia, City of Anaheim, and Orange County	YLWD complies with applicable growth management ordinances and works within the service area. **Expansion and Improvement:** Growth management ordinances need to take into account water needs and available supplies for existing and future populations. Working closely with the Cities and County in the region, YLWD can help better understand how growth management ordinances could impact these resources.
Site Plan Review Requirements	City of Yorba Linda, City of Placentia, City of Anaheim, and Orange County	Standards for properties. **Expansion and Improvement:** Developing better methods and techniques to support site plan reviews within Orange County can help ensure adequate planning, design, and engineering analysis is available to Cities and the County when new subdivisions are proposed.
General Plans	City of Yorba Linda, City of Placentia, City of Anaheim, and Orange County	YLWD complies with applicable General Plans and works with the cities within the service area.
Capital Improvements Plan	City of Yorba Linda, City of Placentia, City of Anaheim, YLWD	Standards for infrastructure. **Expansion and Improvement:** Incorporation of mitigation strategies into the CIP can help support future funding of improvements necessary to enhance water/wastewater systems.
Emergency Response Plan	City of Yorba Linda, City of Placentia, City of Anaheim, Orange County and YLWD	Emergency management resource. **Expansion and Improvement:** Continued improvement and enhancement of emergency response plans can help ensure YLWD is prepared for future incidents and can anticipate their communities' needs.
Economic Development Plan	City of Yorba Linda, City of Placentia, City of Anaheim and Orange County	YLWD complies with applicable Economic Development Plans and works with the cities within the service area.
Post-Disaster Recovery Plan	City of Yorba Linda, City of Placentia, City of Anaheim, Orange County and YLWD	Emergency management resource.
Air Quality Emissions	Air Quality Management District	Emission standards and permit requirements.
Pressure Vessels	City of Yorba Linda, City of Placentia, City of Anaheim, Orange County, and YLWD	Standards set by jurisdictional agency. For non-occupied structures, YLWD may be sole agency.

How can these capabilities be expanded and improved to reduce risk?
▪ Conduct a Risk and Resilience Assessment (RRA) and create corresponding Emergency Response Plan (ERP) per the America's Water Infrastructure Act of 2018 (AWIA). Consider this plan as a resource to meet the AWIA requirements. ▪ Conduct disaster response fuel analysis and contingency planning with WEROC as a component of the Southern California Catastrophic Plan. ▪ Evaluate ability to contract with local fuel distributors and gas stations for emergency backup supply. ▪ Work with State Water Resources Control Board regarding water quality planning and response. ▪ Work with the State Sanitary Sewer Overflow (SSO) Plans and incorporate mitigation actions as appropriate. ▪ Incorporate hazard information into the next generator plan and Capital Improvement Plan (CIP) update.

Exhibit N-16b. Administrative and Technical Capabilities Summary

Staff/Personnel or Type of Resource	Responsible Agency or Department	Description/Comments
Planner(s) or Engineer(s) with Knowledge of Land Development and Land Management Practices	Hunsaker & Associates, Planning, Engineering, Surveying	Planners with expertise in land development practices.
Engineer(s) or Professional(s) Trained in Construction Practices Related to Buildings and/or Infrastructure	Various consulting civil engineers	Licensed civil engineers and certified building evaluators (Safety Assessment Program [SAP] certified by the California Governor's Office of Emergency Services [Cal OES]).
Planners or Engineer(s) with an Understanding of Natural and/or Human – Caused Hazards	Carollo Engineers and other consulting civil engineers	Outside contractor.
Floodplain Manager	Orange County, Storm Water Department	Work with the county floodplain manager.
Surveyors	On-call geotechnical survey consultant: Hushmand Associates, Inc.	Certified surveyor on staff.
Staff with Education or Expertise to Assess the Community's Vulnerability to Hazards	City of Yorba Linda Engineering Department staff; Assistant City Engineer; YLWD staff; City of Yorba Safety Officer	Work with engineers and WEROC to assess vulnerabilities.
Personnel Skilled in GIS and/or Hazards United States (HAZUS)	YLWD analyst for GIS; DCSE consulting for HAZUS	Works with outside consultant for this service.
Emergency Manager	Orange County Fire Authority; WEROC coordinator; YLWD general manager	Work with the county and WEROC for this expertise.
Grant Writers	Townsend Public Affairs	Search for available grants when applicable.

How can these capabilities be expanded and improved to reduce risk?
▪ Evaluate participation in Metropolitan Water District of Orange County (MWDOC) Water Loss Control Program, including meter testing and leak detection through training of internal staff or through MWDOC's Choice Program. ▪ Have all agency-registered engineers and other qualified individuals attend Cal OES SAP training for building inspections. ▪ Coordinate with department managers to review the HMP and progress towards implementation. ▪ Identify information that should be included in future HMP updates. ▪ Tabulate HMP actions in MS Outlook.

Exhibit N-16c. Financial Capabilities Summary

Financial Resources	Agency or Department	Description/Comments
Capital Improvements Project Funding	Finance Department, YLWD	YLWD Capital Budget 5 Year Plan **Expansion and Improvement:** During annual budgeting YLWD can highlight HMP strategies that support funding needs for the CIP.
Authority to Levy Taxes for Specific Purposes	Finance Department, YLWD	Special Assessment Areas
Fees for Water, Sewer, Gas, or Electric Service	Finance Department, YLWD	For Reimbursement of Water **Expansion and Improvement:** Analysis of future fees for services should analyze potential mitigation funding support opportunities to capture funding for these projects.
Impact Fees for Homebuyers or Developers for New Developments/Homes	Finance Department, YLWD	Water Development Fees
Incur Debt Through General Obligation Bonds	Finance Department, YLWD	For Capital Projects
Incur Debt Through Special Tax and Revenue Bonds	Finance Department, YLWD	For Capital Projects

How can these capabilities be expanded and improved to reduce risk?
▪ Learn about how to utilize post-disaster mitigation grants (Section 406) and incorporate it into the utility's disaster recovery strategy. ▪ Work with Southern California Electric (SCE) and Southern California Gas Company on energy reduction programs and rebates for resiliency. ▪ Work with FEMA on grant funding to enhance physical and cyber security (upgrades to facilities).

Exhibit N-16d. Education and Outreach Capability Summary

Resource/Programs	Agency or Department	Description/Comments
Public Awareness and Education	Public Affairs Department, YLWD	Public Outreach and Public Information **Expansion and Improvement:** Incorporate mitigation information and analysis into outreach to continue sharing information with customers.
Training Opportunities	All Departments	YLWD trains with WEROC and the County for various ICS and Emergency Management

Resource/Programs	Agency or Department	Description/Comments
		trainings. YLWD staff take FEMA IS training online.
Social media	Public Affairs Department, YLWD	YLWD utilizes social media and Youtube to share information to customers.

How can these capabilities be expanded and improved to reduce risk?
▪ Participate in WEROC-led efforts to develop standardized messaging for water outages, dam events, and general disaster response. Ensure that messaging will work for the general community, as well as the access, disability, and functional needs communities specific to YLWD. ▪ Develop outreach materials on mitigation to include on the district website, in social media, and in water bills.

N.7 MITIGATION STRATEGY

N.7.1 Mitigation Goals

YLWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4.2** of the base plan.

N.7.2 Mitigation Actions

The internal development team reviewed the mitigation actions identified in the 2019 plan and the updated 2024 risk assessment to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the HMP update. New mitigation actions to address the updated risk assessment and capabilities identified above were also considered and added. **Exhibit N-17, YLWD Mitigation Actions,** identifies the mitigation actions, including the priority, hazard addressed, risk, timeframe, and potential funding sources.

Exhibit N-17. YLWD Mitigation Actions

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
HIGH PRIORITY							
Increase ground water to provide a redundant water supply during natural hazard events.	Drill and equip new Well 23 along with new transmission main	All Hazards	$3M	Engineering	Long Term	Capital Improvement Plan	Existing, Ongoing
Install flexible piping, seismic monitors, earthquake valves, and flow meters on nine reservoirs in high-risk zones.	Fairmont, Springview, Little Canyon, Chino Hills, Santiago, Elk Mountain, Bryant Ranch, Camino de Bryant & Hidden Hills Reservoirs	Seismic Hazards – Seismic Shaking	$1.8M	Engineering	Long Term	Capital Improvement Plan	Existing, Ongoing
Perform a Cathodic Protection Survey on the District's Oldest Critical Transmission Mains.	39" Zone 4 Transmission Main from MET OC-66 Turnout to Fairmont	Seismic Hazards – Seismic Shaking	$25K	Engineering	Immediate	Dept. Budget	Existing, Ongoing
Provide a list of all new District facilities to local, county, fire, and MWDOC agencies.	Well Nos. 21 & 22 sites	Wildfire; Urban Fire	$1K	Emergency Management	Immediate	Dept. Budget	Existing, Ongoing
Harden facilities as required. Clear vegetation.	Facilities within fire hazard zones	Wildfire; Urban Fire	TBD	Emergency Management/ Operations	Immediate	Grants and Budget	Modified and Ongoing
MEDIUM PRIORITY							
Develop Evacuation Plan to relocate all Richfield mobile equipment.	913 S. Richfield Rd., Placentia, CA	All Hazards	$2K	Operations	Immediate	Dept. Budget	Existing, Ongoing
Update the existing ERP to include all-natural hazards in the service area.	Replace the current ERP	All Hazards	$35K	Emergency Management	Immediate	Dept. Budget	Existing, Ongoing

Action/Task/Project Description	Location/ Facility	Hazard	Cost	Responsible	Timeframe	Possible Funding Sources	Status
Provide training for in-house staff for visually identifying structural defects of critical facilities.	14 reservoirs, transmission mains over 30" dia., 11 production wells, 42 PR stations & 12 Pump Stations.	Seismic Hazards – Seismic Shaking	$10K	Engineering	Immediate	Dept. Budget	In Progress
Develop a policy and protocol for evaluating any structural damage of critical structures and facilities.	For all reservoirs, operations and administration buildings and pump stations structures	Seismic Hazards – Seismic Shaking	$3K	Engineering	Immediate	Dept. Budget	Existing, Ongoing
Obtain a structural evaluation for the oldest reservoir.	Fairmont Reservoir and Pump Station built in 1972.	Seismic Hazards – Seismic Shaking	$5K	Engineering	Immediate	Dept. Budget	Existing, Ongoing
Identify YLWD facilities currently within the high-risk landslide or mudslide areas.	12 Reservoirs except Highland and Lakeview Reservoir	Geological Hazards – Landslide and Mudflow	$10K	Emergency Management	Short Term	Capital Improvement Plan	Existing, Ongoing
Protect YLWD assets with a high relative vulnerability to the effect of landslide or mudslide.	12 Reservoirs except Highland and Lakeview	Geological Hazards – Landslide and Mudflow	$10K	Operations	Long Term	Dept. Budget	Modified, Ongoing
Identify YLWD facilities that need redundant communication systems.	Reservoir/pump stations in high fire zone	Wildfire; Urban Fire	$2K	Emergency Management/ Operations	Immediate	Dept. Budget	Existing, Ongoing
LOW PRIORITY							
Participate in City of Yorba Linda and OCFA mutual aid response teams training exercises.	City of Yorba Linda Emergency Team and OCFA Station #10	Wildfire; Urban Fire	$1K	Emergency Management	Immediate	Dept. Budget	In Progress
Provide a list to OCFA of YLWD facilities in High Fire Threat Zone.	14 out of 14 Reservoir/Pump Stations	Wildfire; Urban Fire	$2K	Emergency Management	Immediate	Dept. Budget	In Progress
Provide ongoing training for YLWD employees to identify danger signs of any systems failures.	All Maintenance and Operations personnel	Wildfire; Urban Fire	$1K	Emergency Management	Immediate	Dept. Budget	Existing, Ongoing

N.7.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2019 plan have been completed or are in progress and therefore are removed from this plan update.

- **Mitigation:** Develop wildfire fighting system.
  - **Status:** Complete. YLWD has installed Heli Hydrants at two locations in the urban wildland interface zones, Camino de Bryant Reservoir, and Santiago Reservoir. Backup power generators have been installed at key pumping facilities.
- **Mitigation:** Boost Operations by adding a remote Emergency Operations Center in the Fairmont Booster Pump Station.
  - **Status:** Complete.
- **Mitigation:** Construct a Redundant Data/Supervisory Control and Data Acquisition (SCADA) communications site.
  - **Status:** Complete. Backup power generators have been added to the Main Campus and SCADA System can be accessed remotely from any location. All operators have access through their issued laptops.
- **Mitigation:** Reinforce existing communications structures to withstand high wind or microburst conditions.
  - **Status:** Complete. An additional backup radio system for CCTV security was installed.
- **Mitigation:** Identify alternate sites for relocation of Richfield's mobile equipment during flood event.
  - **Status:** Complete. Highland Reservoir and Fairmont Reservoir have been identified as locations.
- **Mitigation:** Identify required physical security at all YLWD facilities (fencing, lighting, alarm, landscaping, etc.). Incorporate cyber security and surveillance (live cameras, cyberlocks, etc.)
  - **Status:** Complete. A lot of this work has been completed throughout YLWD's assets.

N.8 PLAN INTEGRATION

YLWD's capital budget, Water Master Plan, Wastewater Master Plan, and Annual Operating Budget are used to implement mitigation initiatives identified in this annex. YLWD also works with the City of Yorba Linda through its General Plan, CIP, Municipal Code, Emergency Operations Plan, and annual budget process to identify other opportunities to implement mitigation initiatives identified in this annex. After adoption of the HMP, YLWD will continue to integrate mitigation priorities into these documents.

Since the 2019 MJHMP, YLWD incorporated information from the MJHMP in its CIP, in addition to the following planning mechanisms:

- The risk assessment and mitigation actions were used to inform the City's Water and Wastewater Master Plans and Urban Water Management Plan.

- Mitigation actions were identified and incorporated into the Capital Budget for completion.

2024

Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan

Annex O: Irvine Ranch Water District

WATER EMERGENCY RESPONSE ORGANIZATION OF ORANGE COUNTY
WEROC

Contents

Exhibits

IRVINE RANCH WATER DISTRICT ANNEX

Irvine Ranch Water District (IRWD) is a participant (Member Agency [MA]) in the Orange County Water and Wastewater Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). As a participant MA, IRWD representatives were part of the MJHMP planning process and served on the planning team responsible for the plan update; refer to **Section 2** of the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). The base plan, including the HMP procedural requirements and planning process apply to IRWD.

To comply with DMA 2000 requirements IRWD recently completed a single-jurisdiction Local Hazard Mitigation Plan (LHMP) that was adopted in 2021. Instead of updating this plan, IRWD opted to join the MJHMP update process established by MWDOC.

Information contained within IRWDs LHMP was reviewed and discussed as part of the update process. The following summarizes that process and any relevant changes to their plan as a result.

O.1 HAZARD MITIGATION PLAN POINT OF CONTACT AND DEVELOPMENT TEAM

The representative listed in **Exhibit O-1** lead the IRWD Planning Team, attended meetings, and coordinated the hazard mitigation planning efforts with IRWD staff.

Exhibit O-1. Planning Team Attendance

Primary Point of Contact
Steve Choi
Director of Safety and Security
Telephone: (949) 453-5712
Email: choi@irwd.com

IRWD followed the planning process detailed in **Section 2** and formed an internal team to support and provide information for the plan update. The following staff served as IRWD's internal hazard mitigation planning development team.

Exhibit O-2. Internal Hazard Mitigation Planning Development Team

Name	Title
Eric AKiyoshi	Engineering Manager
Bryan Clinton	Operations Manager
Robert Meripol	Safety & Security Supervisor
Mitch Robinson	Senior Engineer

O.2 OUTREACH

Outreach to the public within IRWD's service area was performed to ensure residents could access information on this planning effort. To reach the largest number of people possible, IRWD published a webpage/ blogpost with information on the MJHMP process. Posts to social media platforms Facebook, X (formerly known as Twitter), LinkedIn, and Nextdoor were made on August 21, 2024 regarding the MJHMP to increase exposure.

IRWD has been diligent in continuing to distribute information using their in-person board meetings, social media and web-based platforms to ensure their customers are aware of the project and have an opportunity to share their feedback.

O.3 HAZARDS

A review of the hazards of concern within both the MWDOC MJHMP and IRWD LHMP verified that both plans were generally consistent with one another regarding hazards of concern. Based on the discussion conducted by the planning partners, the only changes to hazards of concern in the MWDOC MJHMP Update were hazards that were not deemed hazards of concern for IRWD at this time. These hazards are categorized as human-caused hazards and were included to better align with IRWD's American Water Infrastructure Act (AWIA) Risk and Resilience Assessment process. Detailed hazard profiles for the planning area are provided in **Section 3** of the base plan.

During the review of the Hazards of Concern, IRWD did update some of the hazard priorities based on discussion with the planning team. The following changes were incorporated:

Seismic Hazards – Ground Shaking: Changed from Medium to High based on the growing concern surrounding earthquakes and more frequent seismic activity being experienced.

Coastal Storms/Erosion: Changed from Medium to Low priority given the proximity to the coast and lack of infrastructure susceptible to these types of hazards.

Sea Level Rise: This hazard was originally identified as a low priority, however during Planning Team discussions it was determined that IRWD does not have any assets located in close proximity to the coast where sea level rise impacts would most likely occur. As a result this hazard was de-prioritized.

O.4 VULNERABILITY AND RISK ASSESSMENT

Assessing vulnerabilities shows the unique characteristics of individual hazards and begins the process of narrowing down locations within IRWD's service area that are vulnerable to specific hazard events. The existing vulnerability assessment in the 2021 LHMP considered unique local knowledge of hazards and impacts and a Geographic Information Systems (GIS) overlaying method for examining such vulnerabilities more in depth. Using these methods, vulnerable populations, infrastructure, and potential losses from hazards were estimated.

During the planning process, the IRWD Planning Team verified the asset inventory used in their 2021 LHMP analysis. No new assets have been constructed since that analysis, therefore the existing risk and vulnerability assessment is still relevant to the MWDOC MJHMP Update. In addition, changes to the priorities of hazards listed above did not change the outcomes of the risk and vulnerability assessment, requiring additional analysis.

O.5 CAPABILITIES ASSESSMENT

IRWDs existing capabilities assessment identifies the various plans, programs, staffing, and resources necessary to conduct mitigation activities within the District. To better comply with the latest requirements the following updates to their capabilities assessment have been provided as part of the plan update process (**Exhibit O-3**).

Exhibit O-3. Changes to Capabilities Assessment

Resource	Description and Ability to Support Mitigation
Planning and Regulatory	
Emergency Operations Plan	
Responsible Department: IRWD Safety & Security, Automation, and Information Technology Departments	The IRWD Emergency Operations Plan (EOP) outlines responsibility and resource deployment during and following emergencies or disasters. The EOP was updated in 2020 as part of the AWIA requirements and then again in 2023 to clarify activation levels and other concept of operations. The EOP outlines the emergency organization, activation, and Emergency Operations Center (EOC) operations. The EOP includes a Continuity of Operations Plan, outlining a clear chain of command, line of succession, and plans for backup or alternate emergency facilities in the case of an extreme emergency or disaster. Additionally, the EOP includes references to a Disaster Recovery Plan and Cyber Incident Response Plan maintained by Automation and Information Technology Departments. Together, the EOP and LHMP provide a mitigation and response strategy to hazard events.
Urban Water Management Plan	
Responsible Department: IRWD Water Resources Department and Environmental Compliance Department	The Urban Water Management Plan (UWMP) is prepared every five years, to support IRWD's long-term resource planning and ensure adequate water supplies are available to meet existing and future water supply needs. The UWMP also addresses drought conditions, and the ability of IRWD to continue supplying water to customers. The latest UWMP was adopted in June 2021, along with the IRWD Water Shortage Contingency Plan. The Water Shortage Contingency Plan provides a series of response actions that IRWD may implement in the event of a water shortage due to drought or emergency. The UWMP and Water Shortage Contingency Plan can be used in coordination with the LHMP to implement mitigation actions associated with drought and water supply reliability (redundancy). IRWD will update the UWMP in 2025 to be adopted in 2026.
Baker Water Treatment Plant Emergency Action Plan	
Responsible Department: IRWD Safety & Security Department	The Baker Water Treatment Plant (BWTP) Emergency Action Plan (EAP) provides guidance for IRWD employees in the case of emergencies as outlined by California Code of Regulations (CCR) Title 8. The BWTP EAP identifies potential hazards associated with specific natural/manmade hazards, including some pre-hazard mitigation actions. Together, the LHMP and EAP provide a mitigation and response strategy for hazards at BWTP.
Water System Risk and Resilience Assessment	
Responsible Department: IRWD Safety & Security, Engineering, and Operations Departments	The Water System Risk and Resilience Assessment (RRA) develops a risk baseline for IRWD critical assets, as well as an analysis of potable water system resilience and recommendations for enhancement. The RRA was prepared in 2020 in accordance with the American Water Infrastructure Act. The RRA identified vulnerabilities similar to the LHMP and includes recommendations for mitigation actions to increase resilience and reduce risk.
Dam Safety Program	
Responsible Department: Engineering Department	The Dam Safety Program ensures continual monitoring, inspection, and maintenance for IRWD dams and reservoirs. The Dam Safety Program exceeds current state standards and establishes a Risk-Informed Decision-Making process to identify and reduce risk. The program outlines

Resource	Description and Ability to Support Mitigation
	safe operation and management, design, regulation and oversight, and commitment to community conversation. IRWD has implemented the Dam Safety Program that addresses risk identified in dam portfolio assessment. The Dam Safety Program works with the LHMP to provide a foundation for infrastructure and safety protocols at IRWD's five "extremely high" hazard dams.
Sewage Treatment Master Plan & Potable Reuse Program	
Responsible Department: Water Resources, Capital Projects	The Sewage Treatment Master Plan outlines IRWD's long-term vision for a potable reuse program. Sewage treated at LAWRP could be treated to advanced purified water, conveyed to Baker Water Treatment Plant (WTP), and treated again for domestic purposes. This would offset the need for import water and improve IRWD's drought resiliency. This program can be utilized in coordination with the LHMP to identify and mitigate risks related to drought resiliency.
Administrative and Technical	
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Four Engineering groups are staffed within the Engineering Department: Treatment & Conveyance, Dams & Storage, Operations Support & Pipelines, and Infrastructure Planning. Each group employs engineers trained in construction practices related to buildings and infrastructure, and staff has the capability to implement mitigation actions.
Engineers with an understanding of natural hazards and/or infrastructure	Four Engineering groups are staffed within the Engineering Department: Treatment & Conveyance, Dams & Storage, Operations Support & Pipelines, and Infrastructure Planning. Each group employs engineers trained in construction practices related to buildings and infrastructure, and staff has the capability to implement mitigation actions.
Safety & Security Department	The Safety & Security Department writes and implements related plans, provides training, manages exercise projects, and/or develops and facilitates safety exercises. The Director of Safety & Security and Safety & Security Specialists support the LHMP and has the capability to implement mitigation actions.
Emergency Operations Team	The IRWD Emergency Operations Team (EOT) is comprised of managers and supervisors across various departments.
Personnel skilled in Geographic Information Systems	The Infrastructure Planning Group within Engineering employs a full-time GIS group to maintain internal databases and assist with mapping and infrastructure planning.
Financial	
Development Connection Fees	IRWD collects developer connection fees during the plan check and permitting process to fund existing infrastructure and to offset future infrastructure improvements, and increased water/wastewater service demand related to new developments within the service area.
Education and Outreach	
IRWD Alert	IRWD Alert is IRWD's mass notification system used to communicate with employees and the public within IRWD's service area. Coordination with Water Emergency Response Organization of Orange County (WEROC) would occur before sending any broad messages so as to not overlap or conflict with County or City messaging.
IRWD Website, E-Newsletter, Social Media, Brochures and Pamphlets	The IRWD Communications Department maintains the IRWD website, writes the monthly e- newsletter, and posts regularly though IRWD social media channels. These various forms of communication provide an opportunity to convey information and implement mitigation actions

Resource	Description and Ability to Support Mitigation
	specific to educating and informing the community regarding all hazards and ways to reduce impacts from the hazards.

How can these capabilities be expanded upon and improved to reduce risk?
Multiple mitigation measures are priority projects to expand on IRWD capabilities. Examples of opportunities to expand capabilities include the following mitigation actions:
Planning/Regulatory: Technical Communications Plan (Mitigation Action #4), Specific Hazard Response Plans (Mitigation Action #8), Energy and Greenhouse Gas Master Plan (Mitigation Action #12), Recycled Water Shortage Contingency Plan (Mitigation Action #16), Inflow and Infiltration Study (Mitigation Action #19), Cybersecurity Plan (Mitigation Action #28), SCE Communications Plan (Mitigation Action #40).
Admin/Technical: Back-up communications system (Mitigation Action #3 and #4), WEROC membership (Mitigation Action #9), phone system enhancements (Mitigation Action #10), communication resilience in canyon areas (Mitigation Action #34), extend battery life for the Supervisory Control and Data Acquisition (SCADA) (Mitigation Action #43), improve canyon facility access for staff (Mitigation Action #53).
Financial: Seek funding opportunities for potable reuse program (Mitigation Action #14), funding for seismic vulnerability evaluation (Mitigation Action #47).
Education/Outreach: Annual communication system training (Mitigation Action #3), annual alert/warning system training (Mitigation Action #5), Specific Hazard Response Plans regular training and exercise programs (Mitigation Action #8), WEROC membership for communication and collaboration (Mitigation Action #9), coordination with police for IRWD-preferred response in localized flooding incidents (Mitigation Action #23), support customer cities in community outreach regarding hazardous materials (Mitigation Action #26), coordination with public safety agencies after wildfires (Mitigation Action #30), collaboration with CDFW & CAL FIRE regarding defensible space strategy (Mitigation Action #50), continue existing outreach programs (Mitigation Action #54), and explore opportunities for additional outreach programs (Mitigation Action #55).

O.6 MITIGATION STRATEGY

O.6.1 Mitigation Goals

IRWD adopts the hazard mitigation goals developed by the planning team; refer to **Section 4**.

O.6.2 Mitigation Actions

IRWD reviewed the mitigation actions identified in the 2021 plan and to determine if the mitigation actions were completed, required modification, should be removed because they are no longer relevant, and/or should remain in the HMP update. The following are updates to mitigation actions within the 2021 LHMP.

Mitigation: Implement and maintain information sharing mechanisms/platforms for involved departments to utilize during a disaster response. Ensure the platform can be viewed on network devices and mobile devices, while maintaining data security.

– **Update Status:** Enterprise Master GIS plan in the works with opportunities to include disaster response tools.

Mitigation: Conduct an update of the IRWD Energy and Greenhouse Gas Master Plan.

– **Status:** Modified to: Conduct an update of the IRWD Climate Adaptation and Energy Management Plan, formerly known as the Energy & Greenhouse Gas Master Plan.

Mitigation: Develop a Cybersecurity Plan in coordination with a consultant and include an IS/Network focused Business Continuity Plan (BCP).

– **Status:** Update action to: Develop a Cybersecurity Plan in coordination with a consultant to include a disaster recovery (DR) plan. Cybersecurity Plan completed with a consultant.

Mitigation: Coordinate with Southern California Edison prior to any planned power outage to ensure generator capacity and provide time to pre- position supplies as applicable

– **Status:** Modify. Coordinate with SCE prior to any planned power outage to ensure generator capacity and time to pre-position supplies as needed. Maintain communications with SCE for duration of power outage.

O.6.3 Completed or Removed Mitigation Initiatives

The following mitigation actions from the 2021 plan have been completed or are in progress and therefore are removed from this plan update.

Mitigation: Coordinate with the County of Orange for opportunities to allow shared communication space on cell towers for IRWD. Shared space would allow for IRWD Supervisory Control and Data Acquisition (SCADA) radio communication only.

– **Status:** Completed.

Mitigation: Identify additional back-up communication systems (such as satellite phones or radio) for purchase, to utilize if primary communication systems become unavailable. Ensure that coverage includes the entirety of the IRWD service area. Include annual training opportunities.

– **Status:** Completed.

Mitigation: Implement and maintain both internal and external alert/warning systems to effectively communicate hazard threats to staff and customers. Include utilization of the alert/warning system in a regular training program.

– **Status:** Completed.

Mitigation: Enhance phone system to support phone connectivity when people are working offsite through Voice over Internet Protocol (VoIP).

– **Status:** Completed.

Mitigation: Prepare a Recycled Water Shortage Contingency Plan

– **Status:** Completed.

Mitigation: Assess permanently elevating water-sensitive equipment and anchoring fuel tanks in flood-prone locations.

– **Status:** Completed.

Mitigation: Regularly check and maintain radar flood level gauges located in San Diego Creek.

- **Status:** Remove - his is part of preventative maintenance and does not need to be included here

Mitigation: Designate alternative locations for residual dirt and fill storage, away from the Michelson Yard

- **Status:** Complete in 2024. Expected to be completed in 2024 with alternative road access being developed into and out of MWRP for use in the event of major flooding. Flood gates have also been implemented. This allows IRWD vehicles and equipment to continue to be staged at its normal location without having to be re-staged.

Mitigation: Continue to monitor and track regulatory requirements and updates as they relate to hazardous materials storage and response actions.

- **Status:** Completed. Regulatory compliance team and legislative team that tracks all regulatory requirement.

Mitigation: Consider development of a project utilizing the recent hyper-local landslide study and resulting report (2021 WERT report) in combination with assessment of canyon facilities to determine potential for additional mitigation projects protecting against debris flow.

- **Status:** Remove.

Mitigation: Assess the communications resilience in canyon areas; address capacity of canyon facilities to communicate with each other (some are linked and dependent), as well as sending communications back to IRWD staff in other locations monitoring facility status.

- **Status:** Completed.

Mitigation: Perform monthly maintenance checks on permanent and portable back-up generators, and check fuel supply

- **Status:** Remove. This is part of preventative maintenance and does not need to be included here

Mitigation: Seek funding opportunities to rehabilitate or replace aging generators in order to maintain critical water and wastewater operations during power outages.

- **Status:** Complete. No funding found. Construction is underway for increasing fuel storage to 72 hours and replacing several generators.

Mitigation: Establish a communication plan with Southern California Edison for use during an unplanned power outage to assess the potential duration and extent of the power outage, and associated need for generators and supplies.

- **Status:** Completed.

Mitigation: The necessity for fire agency escorts into fire-affected areas has complicated physical access to facilities for refueling. Increase the capacity of current portable fueling equipment to allow better access to affected facilities with fewer trips during active fire activity. This project will also increase efficiency during power outages that do not involve wildfires.

- **Status:** Complete. All fuel tanks in the canyons are in construction for supporting 72 hours of operation.

Mitigation: Extend battery life for the SCADA system by purchasing long runtime or extended long runtime uninterruptible power supply (UPS) to prevent outages in canyon facilities. Evaluate which locations would benefit from the upgraded UPS.

– **Status:** Complete. A new UPS was installed at Modjeska Reservoir to allow longer runtime during power outages. Manning, Williams, Fleming, Shaw, and Read pump stations all have generators. Shaw Reservoir is getting a new PLC panel & UPS as part of the current projects so that will help that site.

Mitigation: Collaborate with the California Department of Fish and Wildlife (CDFW), CAL FIRE, and local firefighting agencies to establish a defensible space strategy in compliance with existing plans and environmental policies that provides IRWD the ability to maintain/remove vegetation around critical facilities in the wildfire hazard zone.

– **Status:** Complete. Now part of the annual maintenance program.

Mitigation: Develop measures to improve access to canyon facilities for fueling and maintenance during wildfires. Collaboration with fire agencies and pre-planning with WEROC are two possibilities.

– **Status:** Complete. Now part of a standard operating procedure

Mitigation: Continue existing community and customer outreach programs/modules, including landscaping, irrigation, water quality, water efficiency, leak detection, and other relevant topics as needed.

– **Status:** Complete.

O.7 PLAN INTEGRATION

IRWD's capital budget, Capital Improvements Program, Infrastructure Master Planning, and other planning and response documentation are all used to implement mitigation initiatives identified in this annex. IRWD will update its Emergency Response Plan (also referred to the Emergency Operations Plan) that will establish protocol and incorporate applicable areas of the MJHMP. After adoption of the MJHMP, the District will continue to integrate mitigation priorities into these documents.

Since the pervious Plan Update, IRWD incorporated information from the HMP in its Capital Investment Plan (CIP), updated various plans, and procedures and conducted the following activities to support plan integration:

- The risk assessment and mitigation actions were used to inform IRWD's updates to Master Plans and Urban Water Management Plan.
- The Capital Budget was used to implement mitigation initiatives identified in the previous Plan.
- The risk assessment informed the need for additional studies focused on risk reduction and mitigation implementation.