Commission Agenda Report

Planning Commission Meeting
03-02-26
Item 5.A.

To: Chair Riddick and Members of the Planning Commission

Prepared by: Allison Cook, AICP, Contract Planner

Reviewed by: Tyler Eaton, Assistant Community Development Director

Approved by: Yolanda Bundy, PE, MS, CBO, CBFO, Community Development Director

Date prepared: February 19, 2026 Meeting date: March 2, 2026

Subject: General Plan Amendment No. 24-002 – An amendment to the Malibu General Plan Safety Element

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RECOMMENDED ACTION: Adopt Planning Commission Resolution No. 26-12 (Attachment 1), recommending the City Council determine that the project is exempt from the California Environmental Quality Act (CEQA), incorporate the Las Virgenes Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan into the Safety Element Update of the City of Malibu General Plan by reference, and adopt General Plan Amendment (GPA) No. 24-002 adopting the Safety Element Update to the City of Malibu General Plan consistent with all applicable State Safety Element laws.

DISCUSSION:

Purpose/Background

Each city and county in California is required to prepare a General Plan, which is a comprehensive, long-term guide for a community's physical development. Government Code Section 65302 *et seq.* establishes requirements for General Plans, including the following mandatory "elements" that are applicable to the City of Malibu: land use, circulation, housing, conservation, open space, noise, and safety. The General Plan is a broad policy document, and its vision can be accomplished through a variety of more specific projects, programs, standards, and directives that follow its adoption.

The City of Malibu General Plan Safety and Health Element has not been updated since the original adoption of the General Plan in 1995 (Attachment 2). Since then, several changes to California Government Code Section 65302(g), which regulates Safety Elements, have been enacted that require the City to conduct an update.

The focus on Safety Element requirements in recent years is an attempt by the State Legislature to better align local land use planning with the changing landscape associated with natural and human-caused hazard risks. Catastrophic wildfires, severe flooding, extreme heat, and other climate-driven hazards have exposed gaps between local planning, emergency management, and infrastructure decision-making. To address these gaps, legislation like Senate Bill (SB) 1241(2012) (wildfire), SB 379 (2015) (climate adaptation and resiliency), SB 99 (2019) (residential evacuation routes), and Assembly Bills 747/1409 (2019/2021) (evacuation route assessment) have been adopted.

The state recently adopted AB 2684 (2024) which requires jurisdictions to address extreme heat impacts on their communities. Under this requirement, a community needs to identify areas most vulnerable to extreme heat, assess health and infrastructure risks, and include goals, policies, and implementation measures to reduce those risks. Addressing this issue can often overlap emergency management activities, especially during extreme heat events. This requirement does not go into effect until January 1, 2028, but the Safety Element Update incorporates objectives and policies to support compliance with these requirements.

The Safety Element Update has been spearheaded by the Public Safety and Community Development Departments, with the assistance of the planning consulting firm Atlas Planning Solutions. It has been prepared consistent with the above-noted legislative bills codified in Government Code Section 65302 *et seq.* and elsewhere in the Government Code, and the Governor's Office of Land Use and Climate Innovation's General Plan Guidelines.

State Requirements for Safety Elements

The Safety Element is required to provide for the protection of the community from unreasonable risks associated with the following:

- Seismically induced surface rupture, ground shaking, and ground failure
- Tsunami, seiche, and dam failure
- Slope instability leading to mudslides and landslides
- Subsidence
- Liquefaction
- Flooding
- Wildland and urban fires
- Climate change

The Safety Element must include maps of known seismic and other geologic hazards, and must address evacuation routes, peak load water supply requirements, and minimum road widths and clearances around structures as related to identified fire and geologic hazards. Policies associated with road widths and clearances were incorporated into the Fire

section to ensure compliance with CAL FIRE and California Board of Forestry and Fire Protection requirements.

The following required analyses informed preparation of the Safety Element Update.

Malibu Safety Element Update SB 99 Evacuation Discussion

Pursuant to SB 99 (2019), the Safety Element is required to identify residential developments in any hazard area that do not have at least two emergency evacuation routes (Government Code Section 65302(g)(5)). The *Malibu Safety Element Update SB 99 Evacuation Discussion* (Atlas Planning Solutions, November 2025) was prepared to identify locations in the City where single ingress/egress conditions are located and could affect future evacuations (Attachment 3).

Transportation Study for Malibu Safety Element Update

The *Transportation Study for Malibu Safety Element Update* (Evacuation Assessment) (Fehr & Peers for Atlas Planning Solutions, October 2025) (Attachment 4) builds on the City's *Transportation Plan for Wildfire and Tsunami Evacuation Study* (Minagar & Associates, 2020) and provides a qualitative assessment to meet AB 747/AB 1409 requirements (Government Code Section 65302.15). It identifies potential evacuation routes and evaluates their capacity, safety, and viability under a range of emergency scenarios. It considers potential hazards such as wildfire, flooding, and seismic events, as well as factors like roadway capacity, congestion, and accessibility for vulnerable populations.

City of Malibu Climate Vulnerability Assessment

Climate change can affect and potentially exacerbate the impact of other hazards (e.g., flooding). State law requires a city to prepare a climate vulnerability analysis (Government Code Section 65302(g)(4). The *City of Malibu Climate Vulnerability Assessment* (Atlas Planning Solutions, September 2025) (Attachment 5) was prepared to identify potential hazards impacted by climate change consistent with SB 379. The City's climate vulnerabilities were evaluated as part of the 2023 *Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan*, 2021 *Malibu Community Wildfire Protection Plan*, and the 2021 *Los Angeles County Climate Vulnerability Assessment*, and have been incorporated into the *Climate Vulnerability Assessment*. Collectively, the three documents evaluate climate focused and natural hazards that inform the overall vulnerability and adaptative capacity of the City. In addition, the City is currently preparing the Malibu Coastal Hazard Vulnerability Assessment. Since that assessment is ongoing, the results of the assessment are not yet available to include in the *Climate Vulnerability Assessment*.

Multi-Jurisdictional Hazard Mitigation Plan

The Las Virgenes Malibu Council of Governments' (LVMCOG) Multi-Jurisdictional Hazard Mitigation Plan (2023) is a Local Hazard Mitigation Plan that addresses hazards in the LVMCOG's member cities, including the City of Malibu. The Plan allows member cities to be eligible for federal mitigation funding after disasters and to apply for mitigation grants. It is incorporated into the Safety Element Update by reference, which allows the City to use available California Disaster Assistance Act funds to cover the local share of the 25 percent non-federal portion of grant funded post disaster projects.

Summary of Safety Element Update

The Safety Element Update meets the applicable state requirements by addressing the following topic areas and establishing related goals, objectives, policies, and implementation actions.

Emergency Preparedness

This section addresses natural and human-caused hazards and briefly describes the City's hazard prevention, response, and recovery strategies. This section references the City's *Emergency Operations Plan* (EOP) and the *LVMCOG Multi-Jurisdictional Hazard Mitigation Plan*. Goals, policies, objectives, and actions focus on identifying risks, planning and preparing for emergencies, minimizing evacuation impacts, and establishing post disaster/hazard recovery.

Seismic and Geologic Hazards

Topics in this section include surface rupture, seismic shaking, liquefaction, landslides, and mudflows. The goals, objectives, policies, and actions address both individual and collective risks from these hazards, as seismic and geologic events can have cascading effects. The section ensures seismic and geologic hazards are addressed to effectively protect structures and lives, as well as minimize risks.

Flood Hazards

Flooding by itself is a significant hazard, but flooding can often coincide with other hazards, such as landslides and mudslides, which are frequently exacerbated by wildfires. The intent of this section is to minimize flooding impacts by continuing to coordinate with other responsible agencies, requiring development to be consistent with federal standards (FEMA and the National Flood Insurance Program), and conducting public outreach efforts on flood hazards.

Fire Hazards

Topics related to fire hazards include wildfires, urban fires, and water supply. The majority of the City is located in the very high fire hazard severity zone (VHFHSZ), as mapped by the California Department of Forestry and Fire Protection (CAL FIRE). Goals, objectives, policies, and actions address multiple issues, including: continuing to work with the appropriate fire agencies (CAL FIRE, Los Angeles County Fire Department [LACFD] and others) to improve coordination, ensure adequate staffing, implement programs and standards, and ensure code enforcement; continuing to work with appropriate agencies to assure sufficient stored water, water capacity, and water delivery systems; and requiring development to be designed and sited to minimize fire risk, with new development and major redevelopment within a VHFHSZ providing a Fire Protection Plan to prevent fires (i.e., “home hardening”) and ensure safe evacuation. Another item is to consider developing and updating a community evacuation master plan.

Climate Adaptation

While climate change is not a hazard, variations in environmental conditions can impact some of the natural hazards affecting Malibu, particularly wildfires. This section describes climate change predictions and the potential effects of climate change on already existing hazards. Goals, objectives, policies, and implementation actions aim to prepare the community for potential climate-related impacts and minimize weather-related event hazards. These include water supply practices, measures to reduce the heat island effect, the use of cooling centers in neighborhoods, public outreach to inform residents of heat risk, and timely communication about power constraints and public safety power shutoff events. They also include collaborating with partners at various levels of government and local community organizations to address and evaluate the effectiveness of climate resilience and adaptation efforts. One measure is to develop a climate resiliency plan integrating and building on the strategies in the General Plan, Energy Action Plan (2018), and Draft Coastal Vulnerability Assessment.

Shoreline Protection

With projected sea-level rise, the City’s current vulnerabilities are expected to increase. This section addresses coastal erosion, sea-level rise, and tsunamis. Goals, objectives, policies, and implementation actions are identified to create a community resilient to changing coastal conditions, including the proper siting and design of coastal development; requiring development to provide for safety from coastal storm flooding, coastal erosion, surfacing septic effluent, sea level rise, and tsunami; and participating in a tsunami warning system. Other items include studying the effects of seawalls, groins, and revetments on beach erosion, completing coastal morphology studies, and establishing shoreline construction standards consistent with Malibu’s vision to protect the sensitive coastal environment and in line with policies established in the City’s Lcoal Coastal Program, an extension of the State Coastal Act. One of the actions is to

implement the recommendations of the City's Coastal Vulnerability Assessment regarding sea-level rise impacts.

Hazardous Materials and Wastes

While not a required component of a Safety Element, hazardous materials and wastes are addressed, as they are human-caused hazards often found throughout a community. This section addresses typical chemicals and hazardous materials found in the home and wider community, and the potential for hazardous materials to present a risk to public health and safety as well as the environment after a major fire or flood. The intent is to minimize the impact from hazardous materials and their accidental release. Policies and actions include continuing to provide for the proper collection and disposal of hazardous wastes, developing information campaigns about the safe use, handling, storage, and disposal of hazardous materials as well as alternatives to their use, and coordinating with other government resources to address potential hazardous materials sites.

1995 Safety and Health Element

The Safety Element Update is a complete replacement of the City's 1995 Safety and Health Element (Attachment. 2). The health-related topics of the 1995 Safety and Health Element include air quality, water quality, healthcare, overall community clean-up (e.g., litter and graffiti), and police protection. The Safety Element Update focuses on typical safety issues, such as those identified in Government Code Section 65302(g). While some goals, objectives, policies, and implementation measures from the prior element have been retained, many have been revised to be current and consistent with more recent state requirements. Outdated or no longer applicable ones have been removed. Attachment 6 is a table that lists the existing Safety and Health Element goals, policies, objectives, and implementation measures and their status in the proposed Safety Element Update. The Safety Element Update also includes new goals, objectives, policies, and implementation actions to meet the latest state requirements. From the list of policies removed from the original 1995 Safety and Health Element, the City can choose to keep some of these policies in other elements of the General Plan that may be more applicable. For example, policies regarding provisions for medical services can be placed in the City's Land Use Element, or policies related to the testing of waters near the shoreline for contaminations could be placed in the Conservation Element. The new Safety Element has been tailored to meet state law and focused more on safety related to the natural and built environment, while the public health policies by and large have been moved out but may be more suitable for other chapters of the General Plan if they are desired to be kept.

City Council Meeting

At its meeting on November 24, 2025, the City Council received a presentation by staff about the Safety Element. Staff explained the purpose of the Safety Element Update and the review by CAL FIRE to ensure the City is eligible for future wildfire prevention funding and other benefits to residents and businesses, as described below under, “State Board of Forestry and Fire Protection.” Comments of the City Council included concerns for improved communication with residents during an emergency event, especially when power is shut off.

State Board of Forestry and Fire Protection

As the City is within a VHFHSZ, the Draft Safety Element was provided to the State Board of Forestry and Fire Protection (Board) for review at its meeting on December 9, 2025, consistent with Government Code Section 65302.5(b)(1). The purpose of the review is to ensure wildfire risks are addressed in local planning. A city council must consider the recommendations of the Board prior to adopting the Safety Element. The Board found the Safety Element to comply with all state requirements, and no other recommendations were made.

The Board’s finding is a critical step that enables the City to be eligible for the State Board’s Fire Risk Reduction Community List (FRRCL) in 2026. The FRRCL is a list of cities, counties, and special districts in a state responsibility area or a VHFHSZ meeting best practices for local fire planning. There are significant advantages to being on the FRRCL, including priority for wildfire prevention grants from CAL FIRE and the potential for obtaining other state or federal resilience, hazard and community planning funds. It provides advantages to City homeowners and businesses when applying for insurance, as insurance companies are required to consider the FRRCL designation when calculating premiums for homes and businesses in the community, thereby potentially lowering insurance costs. To qualify for the FRRCL, the City must adopt the Safety Element and submit evidence of its adoption to CAL FIRE by April 30, 2026.

Public Safety Commission

At its meeting on January 14, 2026, the Public Safety Commission provided feedback on the Safety Element. This meeting notice was posted on January 2, 2026, and promoted through the City’s social media platforms. The Commission asked about the authority of the Safety Element, the requirement for more than one ingress/egress point for residences, minimum safe tsunami elevation, robust coordination with fire protection agencies regarding state lands properties, a central location for an evacuation shelter, status of signal synchronization efforts, communication with the public about evacuations, and consideration of incident impact time for evacuation, among other items.

City staff and its consultant responded to the comments. Upon adoption by the City Council, compliance with the Safety Element will be mandatory. The Safety Element is primarily a policy document that addresses issues on a broader level than the Malibu Municipal Code. The implementation actions of the Safety Element, to be accomplished in the future, may best be addressed through subsequent projects or programs (e.g., Develop, encourage, and support volunteer neighborhood watch and arson prevention programs, Action S-3.3.11) or through Code amendments (e.g., Design and ensure all private roads are maintained to permit unrestricted emergency equipment and personnel access in compliance with the California Fire Code, adopted local ordinances, and Fire Safe Regulations, Action S-1.3.2a). The City's consultant explained the state requirement for the need for more than one ingress/egress point for residences. This policy would need to be implemented during project development review. The City's consultant indicated that a minimum safe tsunami elevation cannot be effectively modeled, as tsunamis can occur from a variety of sources and their inundation may not be easily predicted. Modeling used by the state relies on best available science, but it is not at a level of detail to provide specific elevations. Rather, the community should be educated that the best evacuation route during a tsunami event would lead them to a safety location outside of potential inundation areas.

The Safety Element includes policies for continued coordination with CAL FIRE and the LACFD. State lands areas are not shown on the fire hazard maps in the Safety Element, as the Safety Element focuses on City fire responsibility areas. The City's consultant indicated that a policy to identify potential evacuation shelters would be appropriate, but that such specific shelter locations should not be identified in the Safety Element because they could vary depending on the emergency event and location. The City's consultant recommended that signal synchronization be addressed as part of specific evacuation plans. The Safety Element generally references evacuation routes. The *Transportation Study for Malibu Safety Element Update* (Attachment 4) identifies potential evacuation routes based on the largest roadways in a particular zone, however specific routes cannot be recommended in the Safety Element as evacuation scenarios are fluid with the direction and particular road changing. Communication with the public is addressed in multiple policies and implementation actions of the Safety Element. Regarding incident time of impact, the City's consultant indicated while a general policy to address this topic could be useful, specific information is not included in a Safety Element because incidents vary and some, such as earthquakes, do not have an effective notification time. There is often little to no advance notice of certain hazards, and the City takes this into consideration when planning and preparing for emergencies.

Staff has considered the Public Safety Commission comments, and modified the Safety Element to address some of the concerns expressed by the Commission members.

California Geological Survey

The Safety Element Update was prepared based on current seismic and other geologic hazard maps, including those available from the state. The Draft Safety Element was provided to the California Geological Survey of the Department of Conservation on February 5, 2026, to ensure that all known seismic and other geologic hazards are addressed, consistent with Government Code Section 65302.5(a).

California Office of Emergency Services

State Assembly Bill 2140 (2006) (Government Code Section 65302.6) requires a Local Hazard Mitigation Plan and the Safety Element of a General Plan to be consistent and requires a jurisdiction to adopt the Local Hazard Mitigation Plan in the Safety Element to be fully eligible for disaster relief funding under the California Disaster Assistance Act. The Draft Safety Element was provided to the California Office of Emergency Services (OES) on February 5, 2026, for review to ensure the Safety Element uses recognized hazard mitigation frameworks, considers emergency management and hazard mitigation coordination, and is consistent with the LVMCOG Multi-Jurisdictional Hazard Mitigation Plan (Local Hazard Mitigation Plan). OES indicated on February 9, 2026, that the Safety Element complies with these requirements. OES further indicated that it can issue a letter of compliance upon receipt of the City Council resolution adopting the Safety Element Update, as required by AB 2140.

General Plan Consistency

Government Code Section 65300.5 requires General Plan elements to be consistent, integrated, and compatible with one another. The Safety Element is consistent with all other elements of the City's General Plan. In particular, the Safety Element is consistent with the following related goals, objectives, policies and implementation measures in the Circulation and Infrastructure Element and Land Use Element.

CIRCULATION AND INFRASTRUCTURE ELEMENT

C GOAL 1. Safe, Environmentally Sensitive and Efficient Transportation for the City.

C OBJECTIVE 1.1: Safe, Efficient, and Convenient Traffic System with a Minimum of Impact or Cost.

Policy 1.1.2: The City shall utilize sound traffic engineering and enforcement principles to safety regulate traffic and improve traffic flow.

C Implementation Measure 7: Work with the fire and sheriff to minimize road closures due to accidents and disasters and to facilitate traffic flow on these occasions.

C OBJECTIVE 2.2: An Adequate Water Supply for Daily and Emergency Use by the Year 2000.

Policy 2.2.1: The City shall ensure adequate water storage for firefighting and other emergencies.

C Implementation Measure 37: Work with appropriate agencies such as Water District 29 and the Los Angeles County Fire Department to increase water storage at strategic locations throughout the City as required to assure a seven-day emergency water supply.

In addition to the Emergency Preparedness section of the Safety Element Update addressing multiple aspects of safe and effective evacuation, it addresses working with the LACFD and Los Angeles County Sheriff's Department to improve local access during emergencies and provide safe evacuation (S-1.3.3c, S-1.2.6, S-1.2.6a). The Fire Hazards section addresses water supply, storage and capacity to meet daily demand and fire flow requirements (S-3.3.1f, S-3.3.17, and S-33.18).

LAND USE ELEMENT

LU GOAL 1. The Natural and Environmental Resources of Malibu are Protected and Enhanced.

LU OBJECTIVE 1.3: Land Uses Consistent with Flood, Geologic and Fire Safety Requirements.

LU Policy 1.3.1: The City shall regulate development in floodways.

LU Policy 1.3.2: The City shall require proposed development to avoid geologic safety hazards created by development.

LU Policy 1.3.3: The City shall require fire protection measures for development.

To implement these policies the City shall:

LU Implementation Measure 18: Implement the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) program in Flood Hazard Overlay Areas.

LU Implementation Measure 19: Amend the Building Code to regulate development to respond to local conditions that require special consideration, such as impacts of septic systems on ancient and active landslides, unusual drainage problems, fire hazards and similar conditions.

LU Implementation Measure 20: Develop a system of incremental and progressive reviews of known or suspected geologic and liquefaction hazards in connection with development applications so that review is proportionate to the risk of such hazards.

LU Implementation Measure 21: Require study of potential soil creep, settling, mass movement and their attendant hazards as part of geologic review for proposed development in areas where appropriate due to known or suspected hazards.

LU Implementation Measure 22: Require applicants to execute release and assumption of risk from flood, geologic and fire hazards where appropriate.

LU Implementation Measure 23: Implement regulations, such as those of the Los Angeles County Consolidated Fire Protection District, to minimize the risk of loss of life and property as a result of fire.

LU Implementation Measure 24: In consultation with the appropriate park agency, all development within 200 feet of public park lands, [shall] require a fire vegetation clearance prescription analysis and require appropriate landscaping or vegetation clearance as a condition for development.

The Safety Element Update addresses development in floodways and geologic safety hazards as well as fire protection measures to be incorporated into development. Specifically, the Flood Hazards section requires development to be consistent with the FEMA guidelines for flood plain management (S-3.2.1), encourages residents to participate in the National Flood Insurance Program (NFIP)(S-3.2.4), and requires public outreach on flood hazards and the NFIP (S-3.2.4a). The Seismic and Geologic Hazards section addresses requirements for geologic/geotechnical studies for development projects (S-3.1.2, S-3.1.3, S-3.1.3b). The Fire Hazards section incorporates goals, objectives, policies, and actions to coordinate with the LACFD and other relevant agencies regarding minimizing risks from fires (S-3.3.1b through S-3.3.1e, S-3.3.1i, S-3.3.1k, S-3.3.1n, and S-3.3.2). Action S-3.3.13 specifically requires coordination with neighboring jurisdictions to create strategic fire plans for fuel management/modification balancing structure protection with native vegetation and sensitive habitat protection. Note that the requirement for applicants to execute release and assumption of risk from flood, geologic, and fire hazards in LU Implementation Measure 22 has already been implemented in the City.

Local Coastal Program

While a Local Coastal Program Amendment (LCPA) is not proposed for the Safety Element Update at this time, the following summary of the Safey Element Update's consistency with relevant provisions of the LCP Land Use Plan (LUP) and Local Implementation Program (LIP) is provided for reference.

Chapter 4 – Hazards & Shoreline/Bluff Development of the LUP contains policies to minimize development hazards and impacts to coastal resources. These include addressing sea level rise, siting and designing development to minimize risk from geologic and fire hazards and minimizing grading and vegetation clearance on steep slopes, addressing shoreline management, using adequate drainage and erosion control measures in development, and requiring development to minimize the impact of required fuel modification and brush clearance on native habitat and neighboring properties. The Safety Element Update addresses these policies in specific ways. Goals, objectives, policies, and actions protect the community by requiring that development be constructed in a safe manner through addressing geologic/geotechnical concerns and other hazards, requiring fuel modification near Environmentally Sensitive Habitat Areas to minimize

impacts to habitat, and protecting the shoreline through studies and development standards along the coastline.

The purpose of Chapter 9 – Hazards of the LIP is to ensure that new development minimizes risks to life and property in areas of high geologic, flood, and fire hazard. It contains a series of specific development standards similar to what is addressed more broadly in the Safety Element Update. These include, but are not limited to, the requirements of geologic/geotechnical studies prepared for development and measures to reduce geologic/geotechnical risks (e.g., landslides, unstable slopes, erosion). The Chapter provides standards for development in flood zones, and to minimize fire hazards, including fuel modification and brush clearance and ensuring emergency vehicle access and adequate fire flow water supply. The Safety Element Update is consistent with Chapter 9 of the LIP.

The draft Safety Element brings together principles long since established in the City's LCP and marries them with the City's General Plan. The Malibu LCP was adopted in 2002 while the existing Safety and Health Element had not been updated since 1995. The City's General Plan will now be better aligned with current state laws and policies including the Coastal Act which aims at protecting California's coastal environment by implementing safe development principles and guiding policy to protect and maintain the sensitive areas. Malibu is entirely within the coastal zone established by the Coastal Act.

ENVIRONMENTAL REVIEW:

The project is exempt from the CEQA. CEQA applies only to projects that have the potential for causing a significant effect on the environment. Pursuant to CEQA Guidelines Section 15061(b)(3), where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. Therefore, because the Safety Element Update would involve adoption of a policy document that does not, in and of itself, include any proposed development or land alteration, and would not require rezoning or facilitate development beyond what is currently allowed in the City's General Plan, it can therefore be seen with certainty that there is no possibility that adoption of the Safety Element Update would have a significant effect on the environment.

In addition, pursuant to CEQA Guidelines Section 15308, the project is exempt from CEQA, as it consists of an action taken by a regulatory agency, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment.

NEXT STEPS:

After the Planning Commission recommendation to the City Council, a public hearing will be conducted by the City Council to consider adoption of General Plan Amendment No. 24-002 for the Safety Element Update. Upon adoption of the Safety Element Update by the City Council, staff will submit evidence of adoption to CAL FIRE and apply for the City's inclusion on the FRRCL, and staff will submit the City Council resolution of adoption to OES.

At a later date to be determined, staff will prepare amendments to the LCP's LUP and LIP, as applicable, to ensure General Plan Amendment consistency. Amendments to the LCP will be considered by the Planning Commission for recommendation to the City Council, followed by City Council consideration for adoption. The Coastal Commission will then consider the LCP Amendments.

ATTACHMENTS:

1. Planning Commission Resolution No. 26-12 with Exhibit A (Safety Element Update)
2. City Safety and Health Element (1995): https://ecode360.com/44603800#44603800
3. Malibu Safety Element Update SB 99 Evacuation Discussion (November 2025)
4. Transportation Study for Malibu Safety Element Update (October 2025)
5. City of Malibu Climate Vulnerability Assessment (September 2025)
6. Summary of Safety Element Update Changes to the Existing Safety and Health Element
7. Public Hearing Notice

CITY OF MALIBU PLANNING COMMISSION
RESOLUTION NO. 26-12

A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF MALIBU RECOMMENDING THE CITY COUNCIL DETERMINE THAT THE PROJECT IS EXEMPT FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT, INCORPORATE THE LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN INTO THE SAFETY ELEMENT OF THE CITY OF MALIBU GENERAL PLAN BY REFERENCE, AND ADOPT GENERAL PLAN AMENDMENT NO. 24-002 ADOPTING THE SAFETY ELEMENT UPDATE TO THE CITY OF MALIBU GENERAL PLAN CONSISTENT WITH ALL APPLICABLE STATE SAFETY ELEMENT LAWS

The Planning Commission of the City of Malibu does hereby find, order and resolve as follows:

SECTION 1. Recitals.

A. The State of California requires each city and county to prepare a General Plan, which is a comprehensive, long-term guide for a community's physical development. California Government Code (Government Code) Section 65302 *et seq.* establishes requirements for General Plans, which includes a Safety Element.

B. Section 65302(g) of the Government Code establishes requirements for a Safety Element of a General Plan to provide for the protection of the community from unreasonable risks associated with seismically induced surface rupture, ground shaking, and ground failure; tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence, liquefaction, flooding, wildland and urban fires; and climate change. The Safety Element must include maps of known seismic and other geologic hazards, and must address evacuation routes, peak load water supply requirements, and minimum road widths and clearances around structures related to identified fire and geologic hazards.

C. The City of Malibu General Plan Safety and Health Element was last updated in 1995, and since then, several changes to Government Code Section 65302(g) have occurred, requiring the Safety and Health Element to be updated to meet current state requirements, including but not limited to, those related to wildfire, climate adaptation and resiliency, and evacuation routes.

D. The Safety Element Update (the "project") establishes goals, objectives, policies, and implementation actions that address emergency preparedness, seismic and geologic hazards, flood hazards, fire hazards, climate adaptation, shoreline protection, and hazardous materials and wastes in the Safety Element.

E. The state adopted Assembly Bill (AB) 2140 in 2006, which added provisions to the Government Code specifying what is to be included in a Local Hazard Mitigation Plan, requiring consistency between the Local Hazard Mitigation Plan and the Safety Element of a General Plan, and requiring a jurisdiction to adopt the Local Hazard Mitigation Plan into the Safety Element to be fully eligible for disaster relief funding under the California Disaster Assistance Act. Furthermore, AB 2140

can be met by either including the Local Hazard Mitigation Plan language specific to AB 2140 in the Safety Element or incorporating the Local Hazard Mitigation Plan by reference into the Safety Element.

F. The City of Malibu adopted the Las Virgenes Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan on August 26, 2024, which was approved by the Federal Emergency Management Agency (FEMA) Region IX officials on August 13, 2024, in accordance with the requirements of the Disaster Mitigation Act of 2000.

G. At its regularly scheduled meeting on November 24, 2025, the City of Malibu City Council received a presentation on the Safety Element by staff and provided feedback for consideration. Public notice of the meeting was posted at City Hall, on the City's website, and sent to interested parties.

F. On December 9, 2025, the California Board of Forestry and Fire Protection reviewed the Draft Safety Element, consistent with Government Code Section 65302.5(a), and found it to comply with all applicable state requirements.

G. On January 14, 2026, the City of Malibu Public Safety Commission received a presentation by staff on the Safety Element and provided feedback for consideration. Public notice of the meeting was provided to interested parties and posted on the City website.

H. On February 3, 2026, the Draft Safety Element was provided to the California Geological Survey of the Department of Conservation to ensure that all known seismic and other geologic hazards are addressed, in accordance with Government Code Section 65302.5(a).

I. On February 4, 2026, a draft Safety Element Update was made available for public review at City Hall. Public notice of the document's availability was provided to interested parties; regional, state and federal agencies; local libraries and media.

J. On February 5, 2026, a Notice of Planning Commission Public Hearing was published in a newspaper of general circulation within the City of Malibu and mailed to all interested parties, regional, state and federal agencies, local libraries and media.

K. On March 2, 2026, the Planning Commission held a duly noticed public hearing on the Draft Safety Element Update and at that hearing the Planning Commission reviewed and considered the Draft Safety Element Update, staff report, written reports, public testimony, and other information in the record.

SECTION 2. Environmental Review.

Pursuant to the authority and criteria contained in the California Environmental Quality Act (CEQA), the Planning Commission has analyzed the proposed project. The Planning Commission hereby recommends the City Council find that the proposed Safety Element Update is exempt from the California Environmental Quality Act (CEQA). CEQA applies only to projects that have the potential for causing a significant effect on the environment. Pursuant to CEQA Guidelines Section 15061(b)(3),

where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. Therefore, because the Safety Element Update would involve adoption of a policy document that does not, in and of itself, include any proposed development or land alteration, and would not require rezoning or facilitate development beyond what is currently allowed in the City's General Plan, it can therefore be seen with certainty that there is no possibility that adoption of the Safety Element Update would have a significant effect on the environment. In addition, pursuant to CEQA Guidelines Section 15308, the project is exempt from CEQA, as it consists of an action taken by a regulatory agency, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment.

SECTION 3. General Plan Amendment.

The Safety Element Update is provided in Exhibit A. General Plan Amendment (GPA) No. 24-002 constitutes a complete replacement of the existing text in the General Plan Safety and Health Element with new text and exhibits to be consistent with state law. The original General Plan Safety and Health Element has not been updated since its adoption in 1995 and has policies that are outdated with current state law and city goals and objectives.

SECTION 4. General Plan Amendment Findings.

A. The Safety Element is part of the City's General Plan, which sets forth guidance for physical development in the City. The requirement for each city to adopt a General Plan is contained in Government Code Section 65300 *et seq.*, which also lays out specific requirements for each element. Government Code Section 65302(g) requires a Safety Element to include maps of known seismic and other geologic hazards; address evacuation routes, peak load water supply requirements, and minimum road widths and clearances around structures related to identified fire and geologic hazards; and provide for the protection of the community from unreasonable risks associated with the following:

- Seismically induced surface rupture ground shaking, and ground failure;
- Tsunami, seiche, and dam failure ;
- Slope instability leading to mudslides and landslides;
- Subsidence;
- Liquefaction;
- Flooding;
- Wildland and urban fires; and
- Climate change.

The Safety Element Update meets each of the aforementioned requirements, therefore, is consistent with state law.

B. Government Code Section 65300.5 requires General Plan elements to be consistent, integrated, and compatible with one another. The Safety Element is consistent with the goals,

objectives, policies, and implementation measures of the General Plan and all its elements, specifically in the Conservation Element and Land Use Element, including C Implementation Measure 7 (Work with the fire and sheriff to minimize road closures due to accidents and disasters to facilitate traffic flow on these occasions); C Implementation Measure 37 (Work with appropriate agencies such as Water District 29 and the Los Angeles County Fire Department to increase water storage at strategic locations throughout the City as required to assure a seven-day emergency water supply); LU Goal 1 (Natural and environmental resources of Malibu are protected and enhanced); LU Objective 1.3 (Land uses consistent with flood, geologic and fire safety requirements); LU Policy 1.3.1 (City shall regulate development in floodways); LU Policy 1.3.2 (City shall require proposed development to avoid geologic safety hazards created by development); LU Policy 1.3.3 (City shall require fire protection measures for development); LU Implementation Measure 18 (Implement the FEMA Flood Insurance Rate Map program in flood hazard overlay areas); LU Implementation Measure 19 (Amend the Building Code to regulate development to respond to local conditions that require special consideration, such as impacts of septic systems on ancient and active landslides, unusual drainage problems, fire hazards and similar conditions); LU Implementation Measure 20 (Develop a system of incremental and progressive reviews of known or suspected geologic and liquefaction hazards in connection with development applications so that review is proportionate to the risk of such hazards); LU Implementation Measure 21 (Require study of potential soil creep, settling, mass movement and their attendant hazards as part of geologic review for proposed development in areas where appropriate due to known or suspected hazards); LU Implementation Measure 22 (Require applicants to execute release and assumption of risk from flood, geologic and fire hazards where appropriate); LU Implementation Measure 23 (Implement regulations, such as those of the Los Angeles County Consolidated Fire Protection District, to minimize the risk of loss of life and property as a result of fire); and LU Implementation Measure 24 (In consultation with the appropriate park agency, all development within 200 feet of public park lands, [shall] require a fire vegetation clearance prescription analysis and require appropriate landscaping or vegetation clearance as a condition for development).

The Safety Element addresses development in floodways and geologic safety hazards as well as fire protection measures to be incorporated into development. The Flood Hazards section of the Safety Element requires development to be consistent with the FEMA guidelines for flood plain management (S-3.2.1), encourages residents to participate in the National Flood Insurance Program (NFIP) (S-3.2.4), and requires public outreach on flood hazards and the NFIP (S-3.2.4a). The Seismic and Geologic Hazards section addresses requirements for geologic/geotechnical studies for development projects (S-3.1.2, S-3.1.3, S-3.1.3b). The Fire Hazards section incorporates goals, objectives, policies, and actions to coordinate with the Los Angeles County Fire Department and other relevant agencies regarding minimizing risks from fires (S-3.3.1b through S-3.3.1e, S-3.3.1i, S-3.3.1k, S-3.3.1n, and S-3.3.2). Action S-3.3.13 specifically requires coordination with neighboring jurisdictions to create strategic fire plans for fuel management/modification balancing structure protection with native vegetation and sensitive habitat protection.

SECTION 5. Adoption of General Plan Amendment.

Based on the foregoing findings and evidence contained in the record, the Planning Commission hereby adopts Resolution No. 26-12 recommending that the City Council:

A. Determine the project is exempt from CEQA pursuant to CEQA Guidelines Section 15061(b)(3);

B. Incorporate the Las Virgenes Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan by reference into the Safety Element Update of the General Plan in accordance with the requirements of AB 2140;

C. Adopt GPA No. 24-002 for the Safety Element Update to the General Plan (attached hereto as Exhibit A);

D. Direct City staff to submit a City Council resolution of adoption of the Safety Element Update to the California Office of Emergency Services to establish conformance with the requirements of AB 2140; and

E. Direct City staff to submit a City Council resolution of adoption of the Safety Element Update to the California Department of Forestry and Fire Protection for the City to be eligible for the California Board of Forestry's Fire Risk Reduction Community List (FRRCL).

PASSED, APPROVED, and ADOPTED this 2nd day of March 2026.

_____
ELIZABETH RIDDICK, Planning Commission Chair

ATTEST:

_____
REBECCA EVANS, Recording Secretary

Exhibit A: Safety Element Update

I CERTIFY THAT THE FOREGOING RESOLUTION NO. 26-12 was passed and adopted by the Planning Commission of the City of Malibu at the Regular meeting held on the 2nd day of March 2026 by the following vote:

AYES:
NOES:
ABSTAIN:
ABSENT:

_____
REBECCA EVANS, Recording Secretary

A

CITY OF MALIBU GENERAL PLAN

SAFETY ELEMENT

PUBLIC REVIEW DRAFT

EXHIBIT A

CITY OF MALIBU

SAFETY ELEMENT

ADOPTED BY CITY COUNCIL ON

CITY OF MALIBU

SAFETY ELEMENT

REVISED 2026

CITY COUNCIL

Marianne Riggins, Mayor
Bruce Silverstein, Mayor Pro Tem
Haylynn Conrad, Councilmember
Doug Stewart, Councilmember
Steve Uhring, Councilmember

PLANNING COMMISSION

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COMMUNITY DEVELOPMENT DEPARTMENT

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Tyler Eaton, Assistant Community Development Director

PUBLIC SAFETY DEPARTMENT

Susan Duenas, Public Safety Director

LOS ANGELES COUNTY SHERIFF'S DEPARTMENT

Dustin A. Carr, Captain,

LOS ANGELES COUNTY FIRE DEPARTMENT

Anthony Marrone, Fire Chief

CONSULTANTS

Atlas Planning Solutions (Lead)
Capstone City Planning

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I. EXECUTIVE SUMMARY

A. CONDITIONS IN MALIBU AND FOCUS OF THE SAFETY ELEMENT

Malibu is a coastal hillside community located along the Pacific Ocean, northwest of Los Angeles, surrounded by open space, including foothills and canyons. Its physical characteristics include prominent ridgelines, steep hillsides with gullies, rugged canyon bottoms, coastal bluffs, and low-lying coastal areas, creating a variety of hazardous conditions that can impact the community. Much of the City of Malibu remains undeveloped due to constraints posed by the natural environment and the coastline. Malibu faces serious risks that could detrimentally impact overall community safety, including, but not limited to wildfires and urban fires, earthquakes, instability from geologic conditions, and flooding from both stormwater runoff and tidal conditions. The City has experienced these specific events on several different occasions throughout the years, most recently the devastating Palisades Fire, which caused some $25 billion in damages in Malibu and the surrounding area. To compound matters, the impact of a changing climate is likely to intensify many of these risks. Drier, hotter weather will likely increase fire risk and potentially affect water supplies. Wetter and more intense winter storms could inundate parts of Malibu that have never experienced flooding or could exacerbate slope instability, causing landslides within the City's hillsides. This Safety Element focuses on identifying these safety risks and identifying policies, goals, and implementation actions to address and prepare for them. The Safety Element also strives to align with other general plan elements, as required by state law, including (1) Land Use, (2) Open Space and Recreation, (3) Conservation, (4) Circulation and Infrastructure, (5) Noise, and (6) Housing Elements. Malibu and several neighboring jurisdictions also updated the multijurisdictional Las Virgenes-Malibu Council of Governments Hazard Mitigation Plan (MJHMP), which was adopted in 2024, maintaining federal grant funding eligibility to mitigate many of the natural hazards identified in the City.

View of Malibu looking south.

B. PURPOSE OF SAFETY ELEMENT

The Safety Element is one of seven mandatory elements of the General Plan. Its primary purpose is to identify potential risks within the City that could endanger the community's public health, safety, and welfare. Periodic updates of the Safety Element ensure that goals and policies are relevant and responsive to community needs. California Government Code Section 65302(g)(1) identifies the following list of safety risks that, at a minimum, should be examined in each Safety Element:

- **seismically induced surface rupture***
- **ground shaking***
- **ground failure***
- **flooding***
- **tsunami***
- **seiche***
- **dam failure***
- **slope instability leading to mudslides and landslides***
- subsidence
- **liquefaction (areas with shallow groundwater [<50 feet]) ***
- other seismic hazards identified under Chapter 7.8 (commencing with Section 2690) of Division 2 of the Public Resources Code
- other geologic hazards known to the legislative body
- **wildland and urban fires***
- **climate change***

***potential hazards specific to the City of Malibu**

Each Safety Element must also geographically identify each safety risk's location and potential extent using maps, primarily for seismicity, flooding, and fire risks.

C. MOVING FORWARD

The City of Malibu reaffirms its commitment to protecting the community from potential natural hazard risks. The City's location and history with hazards make it likely that Malibu will experience risks from seismic, flooding, and wildfire events in the future. Malibu can also expect that some of these risks will worsen as climate change accelerates. With this in mind, the Safety Element, in conjunction with the MJHMP, is the best avenue for understanding and addressing natural hazard risks within the community.

II. INTRODUCTION

PURPOSE

The City of Malibu takes pride in its responsibility to safeguard the well-being of its community members. Among other things, this includes adequately anticipating potential emergencies caused by natural and human-made hazards and planning response strategies in an emergency. This element provides the necessary context to understand the hazards threatening the community and outlines policies and practices that take tangible steps to ensure the community's continued prosperity.

SCOPE

The Malibu Safety Element addresses the relevant planning hazards mandated by California Government Code Section 65302(g). Under state planning law, this element identifies and discusses the following hazards as they relate to the City:

- Seismic and geologic hazards such as seismic shaking, liquefaction, landslides, and mudslides caused by slope instability
- Fire hazards
- Flood hazards
- Climate adaptation and resiliency strategies
- Shoreline protection

The element also identifies and addresses the following safety issues, as permitted by law:

- Disaster and emergency preparedness, including evacuation
- Hazardous materials and waste

ELEMENT ORGANIZATION

This element is organized to be consistent with the other General Plan Elements. The goals, policies, and implementation actions/programs provide declarative statements setting forth the City's approach to safety-related issues. A definition of these key terms is provided below:

Goal: A general statement of the desired community outcome. It is denoted as Goal S-X in this element.

Objective: Objectives are the focused steps further streamlining the stated goals. These are denoted as Objective S-X.X in the element.

Policy: Policies are actions that a community will undertake to meet the goals. They are denoted as Policy S-X.X.X in this element.

Implementation Action/Programs: A list of recommended programs and future actions necessary to achieve element goals and policies; implementing actions are discussed within each section of this element.

Many of the previous Safety Element's policies have been incorporated into this element either as a new policy or an implementation action. Modifications to the previous text language occurred to ensure new goals, policies, and implementation actions meet City needs and best practice standards.

CONSISTENCY WITH OTHER ELEMENTS

Integrating safety considerations throughout the General Plan creates a consistent framework that prioritizes the community's well-being. The Malibu Safety Element is an essential component of the General Plan and works in tandem with the other elements in the General Plan to guide these efforts.

Land Use Element

The Land Use Element is considered the key element of any general plan because of its broad scope. This element plays a central role in synthesizing all General Plan issues, constraints, and opportunities. It was prepared to ensure consistency with the information, policies, and programs contained in the Circulation and Infrastructure, Housing, Open Space and Recreation, Conservation, Safety, and Noise elements of the General Plan and the Local Coastal Plan. The Land Use Element is particularly responsive to natural hazards. Understanding the natural and human-caused hazards that threaten a community can help reduce the possibility of disaster by avoiding the designation of sensitive land uses in hazard-prone areas.

Open Space and Recreation Element

The purpose of the Open Space and Recreation Element is to improve the overall quality of life for Malibu residents and visitors by managing the natural resources and open space areas. The Open Space and Recreation Element deals with open space and recreation issues, including outdoor recreation facilities and trails. The issues addressed in this element include various aspects of the natural environment that contribute to ecological balance. The Malibu Open Space and Recreation Element is to be used as a guide for the maintenance of existing parkland, the acquisition and development of additional parks and recreational facilities, and the management of vacant open land. The Open Space and Recreation Element works with the Conservation Element to help protect open space and provide ecosystem services to reduce flood risk and preserve habitat.

Conservation Element

The purpose of the Conservation Element is to serve as a guide for the conservation, protection, restoration, management, development, and appropriate and responsible utilization of the City's existing natural resources. Substantial areas of land within the City of Malibu and north of the City within the Malibu Coastal Zone (MCZ) are undeveloped or contain an abundance of natural resources. To protect these resources, the City has established policies that promote intelligent management. These policies address a variety of natural resources issues, including water quality, coastal and slope erosion, maintenance of unique plant communities, habitat protection, viable populations of plants and wildlife, and preservation of visual resources.

Circulation and Infrastructure Element

The Circulation and Infrastructure Element sets forth policies and standards for the rational and cost-efficient provision and extension of public services to support planned development and protect natural resources. It addresses present conditions and concerns and sets measures for improvement. It is structured to accommodate future growth and development patterns. The purposes and goals of the other elements align with those of the Circulation and Infrastructure Element. Together, they serve as a guide for decision-making by public and private investors and for the future expenditure of public funds. Coordination with the Safety Element can influence public health and safety by addressing traffic congestion on roads designated as evacuation routes during emergencies and by redefining truck routes to avoid residential and other heavily populated areas.

Noise Element

The purpose of the Noise Element is to guide comprehensive local programs to control and abate excessive noise and to protect residents from adverse noise impacts. The element provides information on the existing and projected noise environment and includes goals, objectives, policies, and implementation programs to ensure an acceptable noise environment. The element also identifies criteria for decision-makers to evaluate the noise implications of proposed projects.

Housing Element

The Housing Element is more closely associated with land use and incorporates many safety considerations into its goals and objectives. Building practices and codes addressed in the Housing Element contribute to community safety by improving the built environment's resiliency to natural and human-caused hazards. Additionally, the Housing Element can help identify vulnerable populations and inform the Safety Element to ensure that proper protections are in place.

MULTIJURISDICTIONAL LAS VIRGENES-MALIBU COUNCIL OF GOVERNMENTS HAZARD MITIGATION PLAN (LVMCOG HMP) CONSISTENCY

The multijurisdictional Las Virgenes-Malibu Council of Governments Hazard Mitigation Plan (LVMCOG HMP), was adopted by the City in 2024 and serves three primary purposes: 1) it provides a comprehensive analysis of the natural and human-caused hazards that threaten the City, with a focus on mitigation; 2) it keeps the City of Malibu eligible to receive additional federal and state funding to assist with emergency response and recovery, as permitted by the federal Disaster Mitigation Act (DMA) of 2000 and California Government Code § 8685.9 and 65302.6; and 3) it complements the efforts undertaken by the Safety Element. The LVMCOG HMP complies with all requirements set forth under the federal Disaster Mitigation Act of 2000 and received approval from the Federal Emergency Management Agency (FEMA) in 2024. Sections of the Safety Element are supplemented by the LHMP, incorporated by reference in this element, as allowed by California Government Code § 65302.6. To

access, visit the City's website dedicated to emergency plans at: (https://www.malibucity.org/1159/Emergency-Plans).

CONSISTENCY WITH THE LOCAL COASTAL PROGRAM

The Malibu Local Coastal Program (LCP) was certified in 2002 by the California Coastal Commission. Since the entire City is located within the coastal zone, the Local Coastal Program regulates all development activities (except activities considered exempt). Malibu's LCP functions similarly to the City's General Plan and Zoning Code (Title 17 of the Municipal Code), as it too regulates zoning and land use. The main difference between the LCP and the General Plan/Zoning code is the LCP is an extension of State law (i.e., California Coastal Act) implemented at the local level. As a result, the policies and regulations of the LCP supersede any policy or regulation of the City's General Plan or Zoning Code in the event there is a conflict between the documents. Zoning is administered through the LCP Local Implementation Plan (LIP), and land use is administered through the LCP Land Use Plan (LUP).

REGULATORY ENVIRONMENT

California Government Code § 65302(g)(1)

California Government Code § 65302(g)(1) establishes the legislative framework for California's safety elements. This framework consolidates requirements from relevant federal and state agencies, ensuring that all cities comply with numerous statutory mandates. These mandates include:

- Protecting against significant risks related to earthquakes, tsunamis, seiches, dam failure, landslides, subsidence, flooding, and fires as applicable.
- Including maps of known seismic and other geologic hazards.
- Addressing evacuation routes, military installations, peak-load water supply requirements, and minimum road widths and clearances around structures as related to fire and geologic hazards, where applicable.
- Identifying areas subject to flooding and wildfires.
- Avoiding locating critical facilities within areas of high risk.
- Assessing the community's vulnerability to climate change.
- Including adaptation and resilience goals, policies, objectives, and implementation measures.

California Government Code § 8685.9 and 65302.6

California Government Code § 8685.9 (also known as Assembly Bill 2140, or AB 2140) limits California's share of disaster relief funds paid to local governments to 75 percent of the funds not covered by federal disaster relief efforts. However, if the jurisdiction has adopted a valid hazard mitigation plan consistent with DMA 2000 and has incorporated the Hazard Mitigation Plan into the jurisdiction's General Plan, the State may cover more than 75 percent of the remaining disaster relief costs. All cities and counties in California must prepare a General Plan, including a Safety Element that addresses various hazard conditions and other public safety issues. The Safety Element may be a standalone chapter or incorporated into another section as the community wishes. California Government Code § 65302.6 allows a community to adopt an LHMP into its Safety Element, provided the LHMP meets applicable state requirements. This enables communities to use the LHMP to meet state Safety Element requirements. As the General Plan is an overarching long-term plan for community growth and development, incorporating the LHMP into it creates a stronger mechanism for implementing the LHMP.

California Government Code § 65302(g)(3) adopted through SB 1241 (2012)

California Government Code § 65302(g)(3) requires the Safety Element to identify and update mapping, information, and goals and policies to address wildfire hazards. As part of this requirement, any jurisdiction that includes State Responsibility Areas or Very High Fire Hazard Severity Zones in the Local Responsibility Areas (LRA), as defined by the California Board of Forestry and Fire Protection (Board), is required to transmit the updated element to the Board for review and approval.

California Government Code § 65302(g)(4) adopted through SB 379 (2015)

California Government Code § 65302(g)(4) requires the Safety Element to address potential impacts of climate change and develop potential strategies to adapt/mitigate these hazards. Analysis of these potential effects should rely on a jurisdiction's Local Hazard Mitigation Plan or an analysis that includes data and analysis from the State of California's Cal-Adapt website. The City prepared a Climate Vulnerability Assessment to comply with SB 379 requirements, which can be accessed here.

California Government Code § 65302(g)(5) adopted through SB 99 (2019)

California Government Code § 65302(g)(5) requires the Safety Element to identify evacuation constraints associated with residential developments, specifically focused on areas served by a single roadway. Refer to the Malibu Safety Element Update SB 99 Evacuation Discussion memo for additional detail.

California Government Code 65302.15(a) adopted through AB 747 (2020) and AB 1409 (2021)

California Government Code 65302.15(a) requires the Safety Element to be reviewed and updated as necessary to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios. The bill would authorize a city or county that has adopted an LHMP, emergency operations plan, or other document that fulfills commensurate goals and objectives to use that information in the Safety Element to comply with this requirement by summarizing and incorporating by reference that other plan or document in the Safety Element. The City has completed a Transportation Study for Malibu Safety Element that relies on an existing plan “Transportation Plan for Wildfire and Tsunami Evacuation Study” completed in 2020. This study complies with AB 747/1409 requirements and can be accessed here.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) was created in 1968 to help communities adopt more effective floodplain management programs and regulations. The Federal Emergency Management Agency (FEMA) is responsible for implementing the NFIP and approves the floodplain management plans for participating cities and counties. Malibu participates in the NFIP and uses Title 15, Chapter 15.20 of the Malibu Municipal Code to administer flood management regulations throughout the City.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code [PRC], Chapter 7.5, § 2621-2699.6) was intended to reduce the risks associated with surface faults and requires the designated State Geologist to identify and map "Earthquake Fault Zones" around known active faults. Per PRC § 2623(a), cities and counties shall require a geologic report defining and delineating any hazard of surface fault rupture before the approval of a project. If the jurisdiction finds no undue hazard of that kind exists, the geologic report on the hazard may be waived, with the State Geologist's approval. For a list of project types, please refer to PRC § 2621.6. There are no Alquist-Priolo Earthquake Fault Zones in Malibu; therefore, this topic is not addressed in this document. It should be noted that there are several identified Alquist-Priolo Earthquake Fault Zones located within 20 miles of the City.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (California Public Resources Code, Chapter 7.8, § 2690-2699.6) created a statewide seismic hazard mapping and technical advisory program in 1990 to help cities and counties more effectively address the effects of geologic and seismic hazards caused by earthquakes. Under PRC § 2697, cities and counties shall require a geotechnical report that defines and delineates any seismic hazard before approving a project located in a seismic hazard zone. If the jurisdiction finds that no undue hazard of this kind exists based on information resulting from studies conducted on sites near the project and of similar soil composition to the project site, the geotechnical report may be waived. After a report has been approved or a waiver granted, subsequent geotechnical reports shall not be required, provided that no new geologic datum or data warranting further investigation is recorded. Each jurisdiction shall submit one copy of each approved geotechnical report, including the mitigation measures to be taken, if any, to the State Geologist within 30 days of its approval of the report. For a list of project types, please refer to PRC § 2693.

Cortese List

Government Code § 65962.5 (typically referred to as the "Cortese List") identifies sites that require additional oversight during the local permitting process as well as compliance with the California Environmental Quality Act (CEQA). The list generally comprises properties and businesses that generate, store, or have been impacted by hazardous materials/wastes. Many properties identified on this list may be undergoing corrective action, cleanup, or abandoned and in need of these activities. The City of Malibu does not have any properties or businesses identified on this list as of October 2025.

III. HAZARDS / TRENDS

A. EMERGENCY PREPAREDNESS

The ability to anticipate, evaluate, and mitigate potential risks posed by natural and human-caused hazards is paramount to a city's longevity. In some cases, hazard events may occur with little to no notice. These types of events can make emergency management activities more difficult. To better prepare for these occurrences, the City considers various hazard events that have different warning times as part of their planning and preparation to ensure better response in the future. Although this element specifically addresses natural and human-caused hazards, emergency preparedness involves many more considerations beyond identifying the hazards themselves. The Emergency Preparedness section consolidates and briefly describes the City of Malibu's hazard prevention and response strategies.

Emergency Operations Plan

The Emergency Operations Plan (EOP), managed by the Public Safety Department, is primarily responsible for informing the City of Malibu's emergency management strategies. These strategies are typically organized under four categories: mitigation, preparedness, response, and recovery.

Mitigation

The EOP, in conjunction with the MJHMP, identifies and assesses the natural and human-caused hazards that threaten the City and recommends proactive policy and procedural actions that reduce the risks associated with these hazards. This preemptive planning is intended to decrease the probability of emergency situations and minimize the effects should one occur. Examples of hazard mitigation and prevention can be found in many city policies, but they are most prominently displayed in the numerous codes regulating construction and development. A key strategy for many fire prone communities is the relocation of overhead powerlines underground.

Example of overhead powerlines

Preparedness

Emergency preparedness focuses on activities that equip a community to respond to a disaster. These activities typically involve preparing plans addressing life safety, emergency response, and evacuation; purchasing and storing emergency supplies; and conducting training and exercises to practice response activities. As part of the City's preparedness initiatives, an Evacuation Analysis has been prepared that identifies potential evacuation routes and Genasys evacuation zones. These potential constraints may affect evacuation activities and inform future improvements to evacuation efforts. As part of this analysis, single ingress/egress locations have been mapped and locations within the City that have impaired access roadways. These locations may require earlier evacuation notifications during an emergency incident.

Response

Emergency response activities typically focus on actions necessary to save lives and prevent further property damage during an emergency/disaster. Many of these activities are conducted in tandem with the Los Angeles County Sheriff's Department and the Los Angeles County Fire Department's standard emergency response procedures. To guide response activities, the City relies on implementing the EOP and working closely with volunteer organizations such as the Community Emergency Response Team (CERT). If City resources become overwhelmed, the City will request support through the Operational Area (which consists of a county and all political subdivisions within that county, including incorporated cities and special districts) and mutual aid agreements currently in place. However, the City recognizes that mutual aid resources are dependent on availability and may be limited during a large regional incident. Therefore, consideration for strengthening self-sufficiency should be a priority.

Recovery

Recovery activities typically occur after an emergency/disaster event. These activities focus on reestablishing services to impacted areas, repairing and/or reconstructing damaged buildings and infrastructure, and assisting residents and businesses with permitting and approvals of building plans. Depending on the scale and type of incident, recovery could occur in specific community locations and/or require specialized expertise to address the issues created. Cleanup of hazardous wastes shall be considered part of the recovery from a major disaster event.

GOAL S-1: A COMMUNITY BETTER PREPARED FOR FUTURE EMERGENCIES.

Objective / Policy / *Action*

S-1.1	**Ensure residents, employees, and visitors understand the risks within the community**
S-1.1.1	Communicate existing and emerging risks to residents, businesses, and visitors from hazardous areas, where practicable.
S-1.1.2	Improve understanding of community risks by residents, businesses, and visitors through signage and educational materials.
Action S-1.1.2a	Develop and maintain a development geo-hazard and coastal vulnerability database to incorporate findings from site specific and area hazard-related studies.
Action S-1.1.2b	Develop and maintain an up-to-date list of appropriate media outlets to relay emergency information, such as early warnings and notification of threats to the community.
Action S-1.1.2c	Educate and encourage both residents and local businesses to carry adequate insurance or maintain adequate resources to meet most emergencies.
Action S-1.1.2d	Establish community health-education and safety-education programs, to include the need to prepare well ahead of time for emergency response and recovery.
Action S-1.1.2e	Create and maintain an all-hazards outreach and education program prioritizing at-risk populations (could include children, older adults, pregnant women, people with disabilities, chronic health conditions, limited English proficiency, or limited financial/transportation access). Priority issues addressed should include: a) Emergency Preparedness and Evacuation; b) Seismic and Geologic Hazards; c) Flood and Dam Failure Hazards; d) Wildfire Hazards; e) Severe Weather f) Human-Caused Hazards; and g) Climate Adaptation As part of outreach and education programs, share updated maps and information with residents and businesses throughout the City.
S-1.2	**Ensure City staff are able to plan, prepare, and respond to emergency situations efficiently and effectively.**
S-1.2.1	Maintain and update as needed a comprehensive Emergency Operations Plan for response to all levels of emergency situations affecting the City.
Action S-1.2.1a	Conduct annual trainings, exercises, and/or simulations to ensure that staff are properly prepared to support emergency management functions during an incident.
Action S-1.2.1b	Conduct emergency-response drills on a regular basis and periodically participate in Operational Area trainings and exercises and include city staff and stakeholders when appropriate.
S-1.2.2	The City shall cooperate with local first responders to achieve efficient and prompt response by local agencies to those emergencies which do not require mutual aid support.
Action S-1.2.2a	Support and encourage sufficient local staffing and equipment levels for first responder agencies and city services to ensure timely and well-coordinated responses to calls for service and most emergency situations.

S-1.2.3	The City shall coordinate efficient utilization of emergency assistance provided by neighboring communities and county agencies under mutual-aid response.
S-1.2.4	The City shall create, maintain, and coordinate with local volunteer agencies to enhance emergency assistance and response.
Action S-1.2.4a	Continue to organize, train, and support the City of Malibu Community Emergency Response Team (CERT), to maintain trained and organized volunteers from the community capable of providing intelligence, communications, medical and logistic support to the professional health and safety organizations in emergency situations.
Action S-1.2.4b	Continue to improve the area-wide, volunteer-manned emergency communication system.
Action S-1.2.4c	Work with the Red Cross, other private agencies, and local, state and federal government agencies on disaster-preparedness education and training.
S-1.2.5	Ensure information about hazards or concerns, critical facilities, and vulnerable populations is periodically updated by the City.
Action 1.2.5a	Map all existing and planned critical facilities in the City and categorize them based on function.
Action 1.2.5b	In coordination of updates to planning documents (Emergency Operations Plan and Hazard Mitigation Plan, etc.), adopt and update as appropriate maps of existing and emerging hazards of concern.
S-1.2.6	The City shall provide effective and efficient law enforcement protection services to ensure effective emergency response.
Action S-1.2.6a	Periodically evaluate Los Angeles County Sheriff's services and service criteria to ensure that the City continues to receive adequate law enforcement services.
S-1.2.7	Ensure communications capabilities meet current and future community needs and incorporate newer more effective technologies.
S-1.3	**Minimize the impact to the emergency evacuation capability of the City.**
S-1.3.1	Ensure new development, redevelopment, and major remodels do not diminish roadway capacity and evacuation capabilities and support future evacuations during emergencies.
S-1.3.2	Require all new developments and redevelopments within Fire Hazard Severity Zones provide a minimum of two points of access by means of public roads that can be used for emergency vehicle response and evacuation purposes, where practicable.
Action S-1.3.2a	Ensure all private roads are designed and maintained to permit unrestricted emergency equipment and personnel access in compliance with the California Fire Code, adopted local ordinances, and California Fire Safe Regulations.
Action S-1.3.2b	Identify the feasibility of constructing additional emergency access improvements for existing developments that do not meet minimum road standards for emergency equipment, such as: a) Additional vehicle pullouts at key hillside locations. b) Limiting or restricting on-street parking at key hillside locations and areas with inadequate road widths. c) Potential for construction of new or improved emergency access routes. d) Roadside clearance improvements.
S-1.3.3	Maintain functionality, make improvements, and expand the capacity, where feasible, of the existing emergency evacuation routes within the City, taking into account current and future natural and human-caused hazards.

Action S-1.3.3a	Conduct public outreach and educational activities associated with emergency evacuation routes and procedures, prioritizing efforts towards vulnerable populations.
Action S-1.3.3b	Prepare evacuation routes and disaster response plans for known hazards within the city.
Action S-1.3.3c	Work with law enforcement agencies to develop techniques to improve local access during times of emergency.
Action S-1.3.3d	Work with the appropriate jurisdictions to ensure that highways, roads, bike paths, foot paths, and trails are free of avoidable hazards.
S-1.3.4	In areas with inadequate access or without at least two evacuation routes, provide adequate mitigation actions to address the deficiencies required by the Fire Code and State law.
S-1.3.5	For residential developments in hazard areas that do not have at least two emergency evacuation routes, identify alternate evacuation options, implement earlier evacuation notifications, and develop protocols for future evacuations that consider the constraints associated with these areas.

GOAL S-2: A COMMUNITY THAT CAN QUICKLY RECOVER AFTER A HAZARD EVENT

Objective / Policy / *Action*

S-2.1	**Establish a coordinated post-disaster/ hazard event recovery framework.**
S-2.1.1	Develop and maintain a post disaster/ hazard event recovery framework that guides short- and long-term recovery across housing, infrastructure, public health, and environmental restoration.
Action S-2.1.1a	Adopt a local post disaster/hazard event (i.e. wildfire) Recovery Plan as an appendix to the Emergency Operations Plan (EOP), consistent with the Local Hazard Mitigation Plan (LHMP).
Action S-2.1.1b	Designate a Recovery Coordinator or assign a local recovery team responsible for interagency coordination and communication during hazard event (i.e. wildfire) recovery.
S-2.2	**Promote resilient and safe rebuilding in post hazard event (i.e. wildfire) areas.**
S-2.2.1	Support rebuilding efforts that meet or exceed current wildfire resilience standards and reduce future hazard exposure.
Action S-2.2.1a	Develop a "Resilient Rebuilding Checklist" with requirements for fire-resistant materials, compliance with Wildland Urban Interface (WUI) standards, and enhanced defensible space regulations.
Action S-2.2.1b	Establish a streamlined permit process for rebuilding hazard (i.e. wildfire) damaged structures that meet enhanced resilience criteria.
Action S-2.2.1c	Discourage rebuilding in the most hazardous areas identified in the Community Wildfire Protection Plan (CWPP) or Hazard Mitigation Plan unless risk reduction measures are in place.
S-2.3	**Provide access to temporary and permanent housing after hazard/disaster events (i.e. wildfires).**
S-2.3.1	Facilitate rapid deployment of interim housing and the long-term replacement of lost housing, with a focus on vulnerable populations.
Action S-2.3.1a	Pre-identify sites suitable for temporary housing in coordination with the Housing Element and disaster recovery agencies.

Action S-2.3.1b	Encourage use of Accessory Dwelling Units (ADUs) and SB 9 lot-splits as flexible housing recovery tools.
Action S-2.3.1c	Work with nonprofit and regional partners to provide wraparound services, rental assistance, and housing counseling for displaced residents.
S-2.4	**Restore and protect public health and the environment during recovery.**
S-2.4.1	Ensure that post disaster/hazard event (i.e. wildfire) recovery addresses air and water quality, soil stability, debris, and hazardous waste management.
Action S-2.4.1a	Coordinate with CalRecycle, CalEPA, and County Public Health to manage debris and hazardous materials after disaster/hazard event (i.e. wildfires).
Action S-2.4.1b	Implement erosion control, slope stabilization, and/ or replanting of native vegetation as deemed appropriate by the Fire Chief and Public Works Director in burned areas within 6-12 months of a wildfire.
Action S-2.4.1c	Monitor and report post disaster/hazard event (i.e. wildfire) environmental impacts, including air quality and surface water contamination, and incorporate findings into future planning efforts.
S-2.5	**Prioritize equity and community engagement during the recovery process.**
S-2.5.1	Ensure post disaster/hazard event (i.e. wildfire) recovery services are inclusive and accessible, especially for low-income households, renters, seniors, and persons with disabilities.
Action S-2.5.1a	Develop a post disaster/hazard event (i.e. wildfire) recovery assistance program offering case management, translation services, and rebuilding resources for underrepresented communities.
Action S-2.5.1b	Host community recovery meetings with language translation services responsive to the population and distribute recovery information in accessible formats within 30 days of a disaster/hazard event (i.e. wildfire) disaster declaration.
S-2.6	**Leverage funding and partnerships to support recovery.**
S-2.6.1	Actively pursue local, state, federal, and private funding to support post disaster/hazard event (i.e. wildfire) recovery and resilience infrastructure.
Action S-2.6.1a	Maintain eligibility for FEMA and California Governor's Office of Emergency Services (Cal OES) funding by keeping the Safety Element, Hazard Mitigation Plan, and Emergency Operations Plan updated and aligned.
Action S-2.6.1b	Develop pre-approved applications and templates for commonly used post-disaster grant programs to accelerate access to recovery funding.

B. SEISMIC AND GEOLOGIC HAZARDS

Seismic and geologic hazards are traditionally addressed together because they both involve the movement of the Earth's surface. Although some geologic events (landslides, subsidence, erosion, etc.) can and do occur independently, the primary catalyst for their occurrence is often a seismic event, commonly called an earthquake. This section identifies four common seismic and geologic hazards that threaten Malibu and establishes policies and procedures to protect the community in the event of a geologic event. A key consideration for seismic and geologic hazards is the potential for cascading effects resulting from an event. When an earthquake occurs, seismic shaking can rupture natural gas and water/sewer pipelines, leading to additional impacts such as flooding, erosion, or fires. The goals, policies, and actions throughout this element are designed to work together to reduce both the individual and collective risk of these hazards.

Seismic Hazards

Southern California is prone to earthquakes, and their frequent occurrence is widely accepted as a fact of life. Malibu is prone to seismic hazards due to its location in a seismically active region. These hazards can be divided into three categories, each with unique characteristics and implications for planning.

Surface Rupture

The Earth's crust is composed of large tectonic plates that are in constant motion, moving toward, away from, or past one another. This constant movement means that where two plates grind past each other, friction can cause them to become "stuck". As the plates continue to push, immense energy builds up at the point of friction. Eventually, this stress overcomes the friction, causing the plates to suddenly shift and release the stored energy as an earthquake. This abrupt release can sometimes cause the ground itself to break and displace, a phenomenon known as surface fault rupture. Structures built over a surface rupture are especially vulnerable to damage from ground displacement, which can sever pipelines and destroy roads and bridges. To address this risk, California identifies areas with known surface rupture hazards as Alquist-Priolo Special Study Zones. Malibu does not have any faults that currently fall within one of these zones. Moreover, many earthquakes may only cause seismic shaking and do not produce a surface rupture event.

Seismic Shaking

Seismic shaking is the recognizable movement caused by the energy released from an earthquake. The same mechanism that creates a surface rupture is also responsible for seismic shaking and can produce an equally devastating effect. Buildings and other structures may be destroyed because of violent shaking. Infrastructure such as roads, pipelines, and power lines is also susceptible to damage and poses additional safety concerns. Unlike surface rupture, the consequences of seismic shaking are not restricted to the area immediately surrounding the fault. Energy resonating through the ground can travel hundreds of miles and cause damage in many locations simultaneously. The closer to the earthquake's source (epicenter), the stronger the shaking will be. Seismic shaking is of particular concern to the City of Malibu due to its proximity to active faults capable of generating significant earthquakes. Numerous faults surround and traverse the Malibu area, including the Malibu Coast Fault, the Santa Monica Fault, the Las Flores Reverse Fault, and the Anacapa Fault. These faults are not well-defined because they are generally not visible on the surface. According to the MJHMP, there is a 93% probability of a magnitude 6.7 or greater event occurring within the Los Angeles Region in the next 30 years. There is a 30-40% chance that the Las Virgenes-Malibu Region will experience a magnitude 6.5 or greater event within the next 25 years. **Figure S-1** depicts the Seismic Shaking anticipated from a strong earthquake in the City. The darker colors on the map indicate stronger shaking is expected in those areas.

Liquefaction

Liquefaction is a phenomenon that occurs when intense earthquake vibrations cause saturated soil to lose stability and behave more like a liquid than a solid. This poses significant problems for buildings and other structures in areas where liquefaction can occur, as the ground may give way under the weight of the structure and its foundation. In addition, underground structures are vulnerable to liquefaction. Few areas of significant liquefaction susceptibility exist in the City of Malibu. These areas are located along beaches and in the floodplains of major streams, such as Malibu Creek. The soils in these areas are sandy or loose sediment washed down the canyons by floods and creeks, and such material is prone to liquefaction. Areas of liquefaction potential in the City occur along stream beds and in some canyon areas. Malibu's coastline, particularly areas near Malibu Creek and the Malibu Coastal Fault Zone, has been identified as having liquefaction potential during earthquakes. **Figure S-2** depicts the areas of the City susceptible to liquefaction.

Figure S-1 Anticipated Seismic Shaking in Malibu

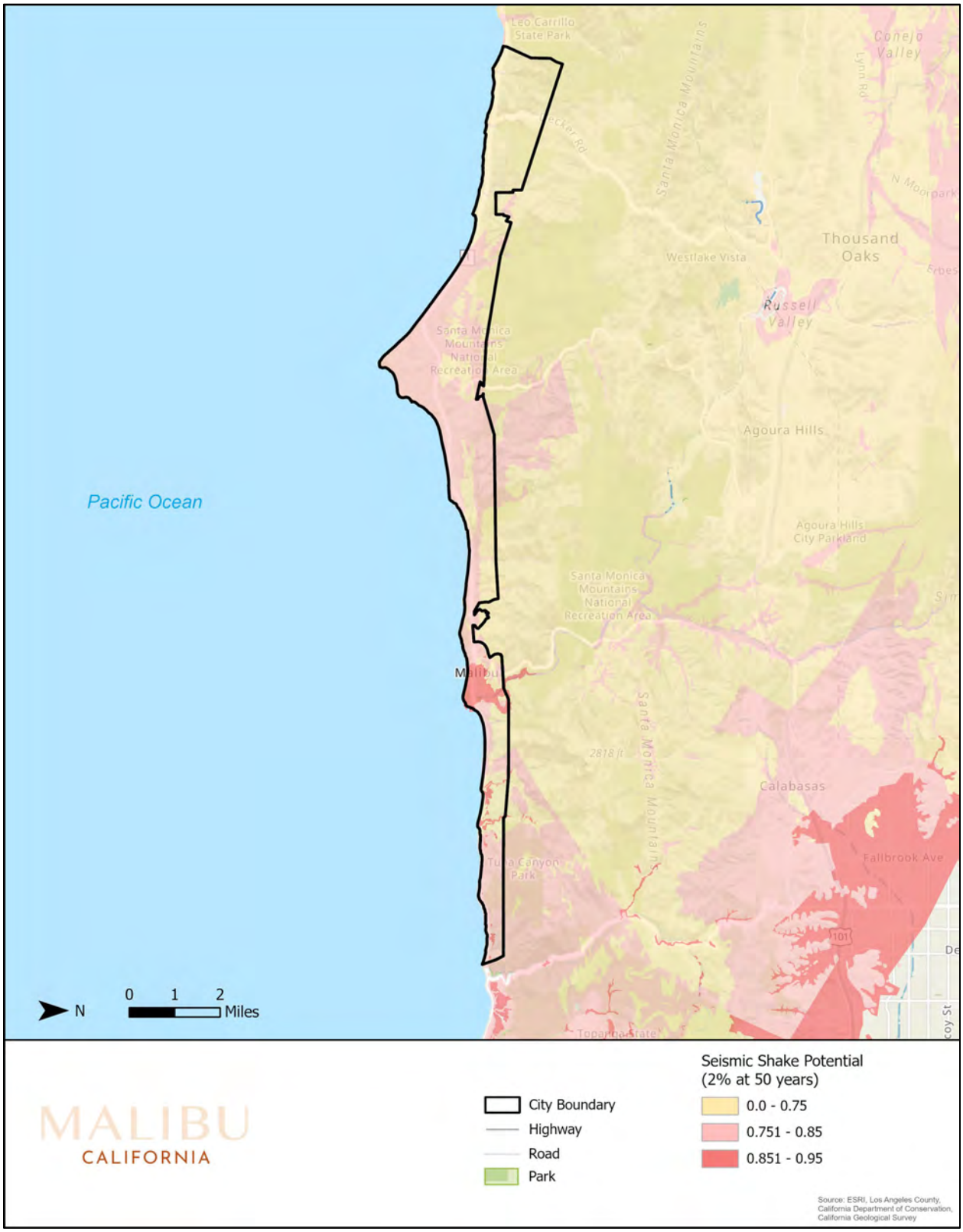


Figure S-2 Liquefaction Susceptibility Locations in Malibu

Geologic Hazards

Although seismic events, such as earthquakes, often trigger geologic hazards, this is not always the case. Therefore, understanding and preparing for these hazards as standalone events is equally important.

Landslides and Mudflows

Dirt and boulders covering Malibu Canyon Road.

A landslide is the movement of earth materials down slopes and areas of steep topography. Although earthquakes often trigger them, landslides can occur when a sloped surface can no longer support the material contained within or above it. This instability can be caused by the sheer weight of the loose material or exacerbated by other events, such as heavy rain. When rain causes a slope to fail, the movement of earth materials is typically called a mudslide. The many canyons that drain the Santa Monica Mountains and cross through Malibu to empty into the ocean provide avenues for future debris/mud flow events during wet winters and intense rainstorms. Debris flow events have been experienced in Topanga Canyon, Las Flores Canyon, and other areas, and will occur again in the future. Malibu's landscape is prone to wildfires. The heat from fires makes the soil hydrophobic (water-repellent), while the loss of vegetation and root systems leaves slopes unstable and unable to absorb rainfall. This dramatically increases the risk of destructive debris flows and mudslides in subsequent rain events. Both landslides and mudslides move with great force and pose a significant danger to buildings and other structures. In some circumstances, these events may cause bodily harm if bystanders cannot move out of its path in time. Anticipating the risk of landslides in the areas identified by **Figure S-3** will be essential for protecting the community members who reside there. The parts of Malibu most at risk of landslides are the bottom of canyons and canyon slopes.

A Los Angeles Fire Department SUV is swept into the ocean by a mudslide along Big Rock Road in Malibu.

The generally recognized landslide areas in Malibu include (listed from east to west):

- Las Tunas Beach Slides
- Eagle Pass-Las Flores Slide
- Calle Del Barco
- Carbon Canyon Slide
- Puerco Beach Slides
- Latigo Shore Slide
- Malibu Cove Colony Slides
- LaChusa Highlands Slide
- Big Rock Mesa
- Rambla Pacifico
- Carbon Mesa Slides
- Amarillo Beach Slides
- RV Park Slide
- Latigo Canyon Slide
- Lower Encinal Canyon Slides

Figure S-3 Earthquake Induced Landslide Zone in Malibu

GOAL S-3: A COMMUNITY BETTER PREPARED TO ADDRESS THE RISKS FROM NATURAL HAZARDS.

Objective / Policy / *Action*

S-3.1	**Ensure seismic and geologic hazards are addressed to effectively protect structures and lives.**
S-3.1.1	The City shall minimize the risks from landslides and debris flows.
Action S-3.1.1a	Work with the residents of neighborhoods affected by landslides and debris flows to develop appropriate risk abatement programs.
S-3.1.2	Require new development/ redevelopment, and major remodels to provide for analyses of site safety related to potential hazards of fault rupture, seismic shaking, liquefaction, subsidence, soil erosion, seepage, and rockfalls.
S-3.1.3	Reduce the risk of impacts from geologic and seismic hazards by applying proper development engineering, building construction, and retrofitting requirements on new developments and major redevelopments.
Action S-3.1.3a	Apply all restrictions and investigation requirements mandated by the State under the Alquist-Priolo Special Studies Zones Act for faults classified as "active" to development on properties crossed by or adjacent to the Malibu Coast Fault.
Action S-3.1.3b	Require that soils, geologic and structural evaluation reports with appropriate mitigation measures be prepared by registered soils engineers, engineering geologists, and/or structural engineers and that all recommended mitigation measures be implemented.
Action S-3.1.3c	To protect slope stability, restrict grading or development related vegetation clearance where the slope exceeds 2:1, except as required for fire safety, driveways and utilities and where there is no reasonable alternative.
Action S-3.1.3d	Ensure water efficient landscaping plans in areas of landslide susceptibility minimize deep percolation and enhance slope stability.
Action S-3.1.3e	Encourage research to study the effects of excessive ground water on surface erosion, earth movement, and groundwater "daylighting." Seek funding opportunities and resources to support this project including but not limited to: the Environmental Protection Agency (EPA) Water Research Grants Program, The U.S. Geological Survey (USGS) Water Resources Research Act Program, or the U.S Department of Agriculture (USDA) Conservation Innovation Grants.
S-3.1.4	Require that all City-owned and private critical facilities (hospitals/urgent care clinics, police and fire stations) be earthquake resistant designed for the effects of a maximum credible earthquake.

C. FLOOD HAZARDS

Floodwaters surge at the Pacific Coast Highway and Las Flores Canyon Road in Malibu

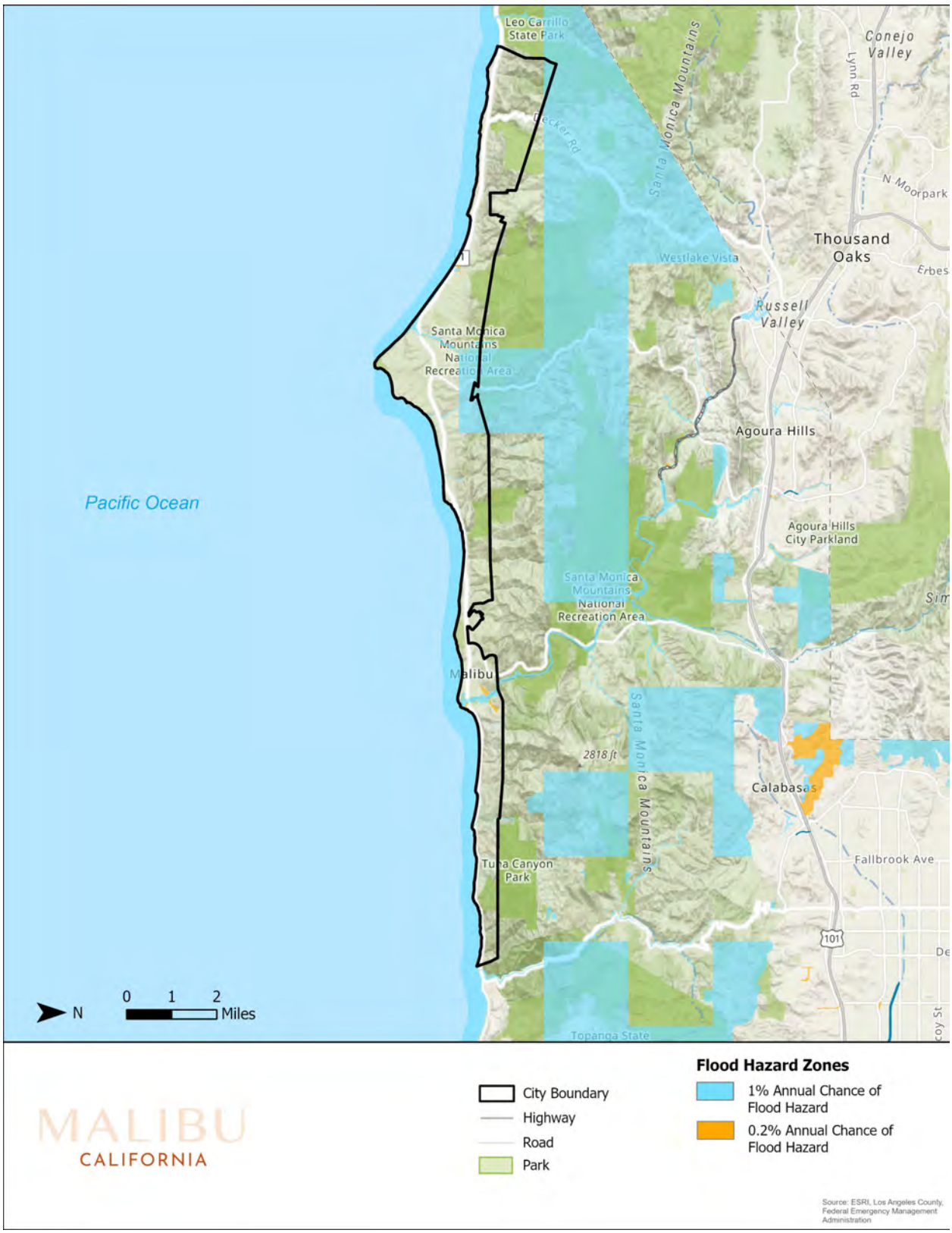
The accumulation of water on the ground surface leads to flooding, which can occur after heavy rainfall or from failures in water delivery infrastructure. The effects of flooding may be intensified by climate change-driven droughts, as parched ground becomes less permeable. Flooding presents significant hazards to both individuals and property. Risks range from drowning in deep standing water to extensive property damage caused by even shallow water. Fast-moving water is particularly perilous, capable of sweeping away people and causing severe structural damage. In Malibu, where flooding is a persistent threat, current flood control and drainage systems are inadequate to consistently meet community needs. Malibu's combination of steep clay slopes and numerous canyons, such as Las Flores Canyon and Malibu Canyon, make it especially vulnerable to rapidly moving water and debris. The Pacific Coast Highway (PCH), which runs through several canyons, is frequently closed due to these hazards. Coastal areas of Malibu are increasingly vulnerable to flooding from rising sea levels, high tides, and storm surges. This threatens low-lying areas and critical infrastructure like the PCH and beachfront properties, especially during major storms. Malibu's flood infrastructure is only moderately effective and faces significant vulnerabilities from post-wildfire debris flows and sea-level rise. While the city works with Los Angeles County to manage stormwater runoff, recent intense weather has frequently overwhelmed the system, causing flash floods and mudslides. To help address these issues, the City is actively engaged in several ongoing initiatives with Los Angeles County Public Works and the Flood Control District to improve the effectiveness of flood control, such as the Enhanced Watershed Management Program, stormwater capture and retention, and continued sediment dredging and maintenance of flood-prone areas. **Figure S-4** illustrates the FEMA flood zones within Malibu. While flooding by itself is a significant hazard, often flooding can coincide with other hazards like landslides and mudslides, which are often exacerbated by wildfires.

GOAL S-3: A COMMUNITY BETTER PREPARED TO ADDRESS THE RISKS FROM NATURAL HAZARDS.

Objective / Policy / *Action*

S-3.2	**A community where impacts of flooding are minimized.**
S-3.2.1	Require development to be consistent with minimum Federal Emergency Management Agency (FEMA) guidelines for flood plain management.
S-3.2.2	Collaborate with local/regional agencies to ensure that risks of flooding caused by upstream development are minimized.
S-3.2.3	Coordinate with the dam owners/operators and responsible jurisdictions to ensure that all dams in the Malibu watershed areas have regular safety inspections.
S-3.2.4	Encourage area residents to participate in the National Flood Insurance Program (NFIP).
Action S-3.2.4a	Create and hold public educational workshops providing information on flood hazards in the City and participation in the National Flood Insurance Program.

Figure S-4 Flood Zones in Malibu



D. FIRE HAZARDS

Wildfires

Steep hillside areas of Malibu with natural vegetation

The most common type of natural hazard in California is wildfire, which can burn large areas of undeveloped or natural land in a short amount of time. They often begin as smaller fires caused by lightning strikes, downed power lines, or unattended campfires, but may rapidly expand in size if conditions are dry and/or windy. Southern California experiences Santa Ana Wind events annually, usually before the winter rainy season. Santa Anas are hot, dry desert winds, usually of relatively high velocity. These events typically occur when humidity is low and temperatures are high. The combination of these two conditions can create extreme fire danger during late summer through early winter. These winds can quickly exacerbate wildfires, intensifying their burning and spreading, potentially increasing the range of embers and feeding oxygen to the flames. Powerful Santa Ana winds made the recent 2025 Palisades fire significantly worse by rapidly increasing its speed and spread. The winds, which gusted up to 80 mph or more, fueled the fire, causing it to explode in size, destroy thousands of structures, and force widespread evacuations

The recent trend toward more extended drought periods increases the likelihood of wildfires. Typically, wildfires pose minimal threat to people and buildings in urban areas, but increasing human encroachment into natural areas raises the threat of damage/destruction. This encroachment occurs in areas called the wildland-urban interface (WUI), which are within the High and Very High Fire Hazard Severity Zones, as defined by the California Department of Forestry and Fire Protection (CAL FIRE). Significant wildfires have occurred in Malibu and the Santa Monica Mountains in the past and posed a significant threat to people and property. Natural, undeveloped hillsides border the community, and the developed areas are very narrow. Much of the community is very close to these hillsides. All of the City is located within a mapped Very High Fire Hazard Severity Zone (VHFHSZ), which is the highest wildfire risk classification designated by CAL FIRE. **Figure S-5** depicts the VHFHSZs mapped throughout Malibu, which covers nearly 100% of the City. **Figure S-6** also identifies areas where historic fires have occurred within the City as well as areas identified within the WUI. In addition, the Los Angeles County Fire Department conducts strategic planning regularly to ensure fire response capabilities and personnel can adequately address current service needs throughout the City and identify potential issues to be addressed. The latest version of the Los Angeles County Fire Department 2017-2021 Strategic Plan is available here.

Urban Fires

The possibility of an urban fire confronts every city. Many urban fires begin as isolated incidents caused by a faulty electrical appliance, an absentminded cooking mishap, or an industrial malfunction, but can spread to other buildings if conditions permit. Many factors contribute to the severity and extent of urban fires, but modern building codes and practices have helped reduce their impact. Despite these improvements, it is essential to acknowledge the risks associated with fires in urban areas. No matter its size, any fire can cause severe harm to people and damage buildings and other structures. The larger concern for Malibu is the ability for a structure fire to ignite surrounding brush and/or structures, which could increase the size of the incident as well as the necessary response.

Structure fire that occurred in Malibu

Water Supply

Water service in Malibu is provided by the Los Angeles County Waterworks Districts (LACWD) specifically District 29. According to LACWD's District 29 Urban Water Management Plan, adequate water supplies are available to meet customer demands within the City, as the District receives its water from West Basin Municipal Water District, which imports its primary source from the Metropolitan District of Southern California. This is especially important for ensuring adequate supplies are available for fire suppression needs within the City. While adequate water supplies are available, parts of the City continue to experience challenges with water pressure and flow, particularly during major infrastructure work and emergencies such as wildfires. These issues have been reported to cause service disruptions throughout the City. As standard practice, new developments and major remodels are required to conduct water pressure/flow testing and to mitigate issues if they are inadequate. The 2025 Palisades Fire highlighted some key challenges associated with water infrastructure used for wildfire fighting purposes. Most water systems are designed to support structure fire response, however when a large wildfire, such as during the Palisades Fire, overwhelms a communities' infrastructure, reductions in water pressure and pumping capacity can occur.

Figure S-5 Very High Fire Hazard Severity Zones in Malibu

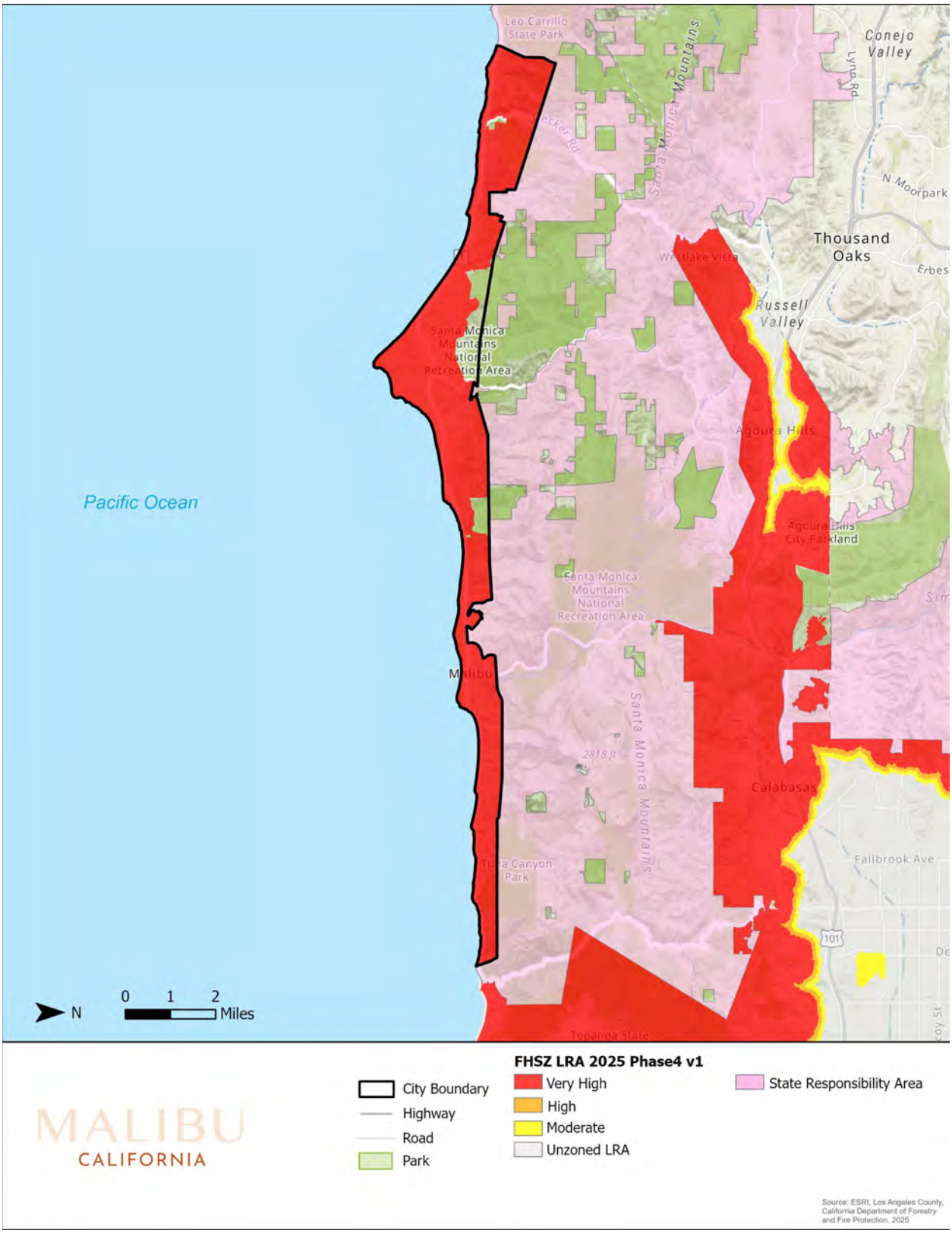
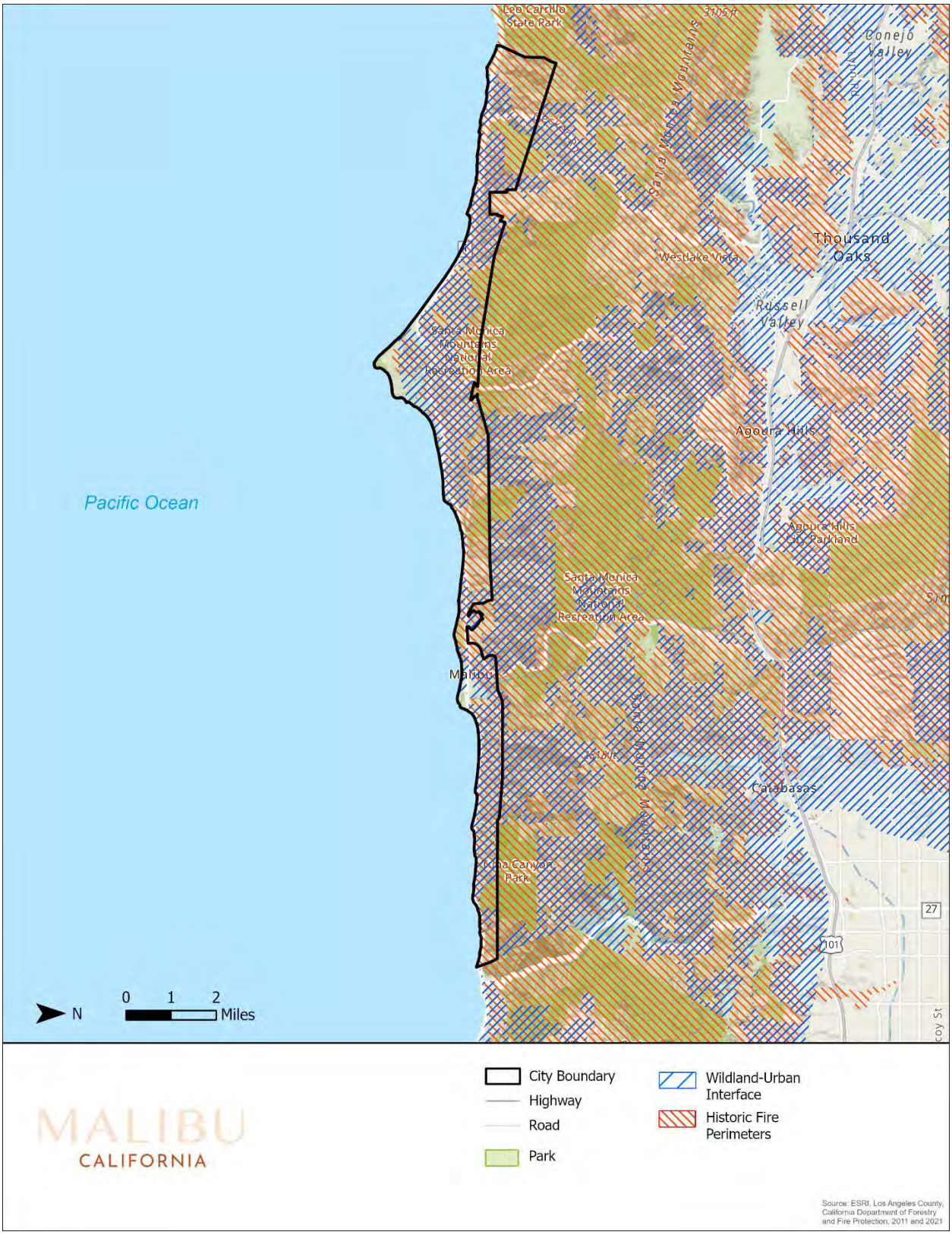


Figure S-6 Historic Fire Perimeters and WUI Areas in Malibu



GOAL S-3: A COMMUNITY BETTER PREPARED TO ADDRESS THE RISKS FROM NATURAL HAZARDS.

Objective / Policy / *Action*

S-3.3	**A community adapted to wildfire risks and hazards .**
S-3.3.1	The City shall minimize the risk of loss to life and property from wildfire by reducing wildfire vulnerability where possible.
Action S-3.3.1a	Continue to monitor and update the Malibu Community Wildfire Protection Plan, including the identification of fire hazards, assessing acceptable levels of cost and risk, and determining appropriate fire protection programs.
Action S-3.3.1b	Work with other agencies including but not limited to Los Angeles County Fire Department, Ventura County Fire Department, and California Department of Forestry and Fire Protection (CAL FIRE), to ensure effective and efficient fire suppression, prevention and rescue services.
Action S-3.3.1c	Coordinate with Los Angeles County Fire Department and CAL FIRE to establish programs and guidelines for fire-safe landscaping including buffers comprised of fire adapted/ resistant vegetation between residential areas and open space areas and encourage use of fire-safe landscaping principles which emphasize plant species with low fuel volumes.
Action S-3.3.1d	Work with the Los Angeles County Fire Department to adopt a program for controlled burning of combustible vegetation, based on the recommendations of the responsible forestry and fire-protection official.
Action S-3.3.1e	Work with the Los Angeles County Fire Department to enforce code requirements for flammable brush clearance, and reduction of flammable vegetation, including both native plants and ornamental landscaping.
Action S-3.3.1f	Work with appropriate agencies to ensure sufficient stored water and consider non-monetary incentives for on-site or area-wide shared storage water suitable to meet effective firefighting standards and requirements .
Action S-3.3.1g	Work with Los Angeles County Fire Department to establish standards for fire-fighting equipment access suitable for Malibu.
Action S-3.3.1h	Develop and update as necessary an Evacuation Plan for the City which identifies streets available to serve as wildfire escape routes, potential hazard incidents, and criteria regarding capacity, safety, and viability.
Action S-3.3.1i	Coordinate with Los Angeles County Fire Department and CAL FIRE to develop guidelines and standards for all new construction and remodel structures to utilize fire-resistant building materials and designs, and, if feasible, to be sited to minimize fire hazards.
Action S-3.3.1j	Provide South Coast Air Quality Management District regional wind patterns maps to homeowners, architects and contractors to help them plan development siting and design that minimizes fire hazards.
Action S-3.3.1k	Provide on-site fire safety home inspections (using Fire Safety Liaisons), when requested by resident or property owner, and advise homeowners on the most current programs/policies within the City and County, to help minimize fire hazards while maintaining slope stability and appropriate vegetation.
Action S-3.3.1l	Develop, encourage, and support volunteer neighborhood watch and arson prevention programs.

Action S-3.3.1m	Develop a permanent, ongoing homeowner watershed area management plan to reduce fire hazards while maintaining appropriate vegetation that will stabilize the watershed and control the flow of water from it. Application of such plan in Resource Protection Areas shall be subject to review and approval for compliance with resource protection requirements.
Action S-3.3.1n	Work with water service providers and Los Angeles County Fire Department, to identify neighborhoods with inadequate flow from fire hydrants, and to upgrade deteriorated and undersized water-distribution systems.
Action S-3.3.1o	Work with jurisdictions within the city and surrounding region to ensure that all public water storage facilities have an emergency power supply for their pumps, or gravity-driven water distribution systems.
Action S-3.3.1p	Require smoke detectors, carbon monoxide alarms, and fire sprinkler systems in all new residential developments.
Action S-3.3.1fq	Reassess fire hazards after wildfire events to adjust short- and long-term fire prevention and suppression needs.
S-3.3.2	Work with the Los Angeles County Fire Department to ensure that communities address the following wildfire risk within Fire Hazard Severity Zones: a) Identify building and site design methods or other methods to minimize damage in fire prone areas on undeveloped land and when rebuilding after a fire. b) Require ongoing brush management to minimize the risk of structural damage or loss due to wildfires. c) Provide and maintain water supply systems to for adequate structural fire suppression. d) Provide adequate fire protection.
Action S-3.3.2a	Assess site constraints when considering land use designations near wildlands to avoid or minimize wildfire hazards as part of land use update or amendment.
Action S-3.3.2b	Establish ongoing maintenance and funding for vegetation management and brush clearance along City-maintained roads, open space areas, and fire breaks.
Action S-3.3.2c	Implement brush management along City maintained roads in Fire Hazard Severity Zones adjacent to open space and canyon areas.
Action S-3.3.2d	Maintain up-to-date maps depicting Fire Hazard Severity Zones and historical wildfire data and ensure that information is readily accessible to the public.
Action S-3.3.2e	Maintain access (ingress and egress) for fire apparatus vehicles along public streets in Fire Hazard Severity Zones for emergency equipment and evacuation.
S-3.3.3	All proposed development shall incorporate fire safe design and adhere to the latest fire safe regulations adopted by the State and City.
S-3.3.4	Require development to be located, designed, and constructed to provide adequate fire defensibility and minimize the risk of structural loss and life safety.
S-3.3.5	Require development located near ridgelines, top of slopes, saddles, or topography prone to wildfire hazards to be located and designed to account for the increased risk.
Action S-3.3.5a	Require new developments and major redevelopments to be designed to minimize pockets, peninsulas, or islands of flammable vegetation to reduce fire susceptibility.
S-3.3.6	Require new developments and major redevelopments to conform to contemporary fire safe standards related to road standards and vegetative hazards.
Action S-3.3.6a	Develop, implement, and maintain a public outreach program educating the community about contemporary fire safe standards, and wildland fire preparedness.

S-3.3.7	Require all new development and redevelopment after a fire to meet current Fire Code requirements. Incorporate fire safe design into all new development within the City, which should include but not be limited to: a) Require that development is located, designed and constructed to provide adequate defensibility and minimize the risk of structural and human loss from wildland fires. b) Require development on hillsides and canyons to be designed to reduce the increased risk of fires from topography features (i.e., steep slopes, bluffs, and ridge slopes). c) Administer state vegetation management requirements for new and existing developments. d) Design and maintain public and private streets for adequate fire apparatus vehicle access (ingress and egress). e) Install and maintain visible street signs, and necessary water supply for structural fire suppression. f) Require that development provide and maintain adequate fire breaks where feasible or identify other methods to slow the movement of a wildfire in very high Fire Hazard Severity Zones. g) Ensure long-term maintenance of vegetation management activities is accounted for in budgeting and planning throughout the City. h) Fire prone areas shall require construction standards to reduce structural susceptibility and increase protection. In addition, require onsite detection and suppression, including automatic sprinkler systems. i) Encourage owners of non-sprinklered properties to retrofit their buildings and include internal fire sprinklers. j) As appropriate, require site and design new development to avoid the need to extend fuel modification zones into sensitive habitat, where feasible. k) Adopt, amend or maintain the Fire Hazard Severity Zone Map and applicable Wildland Urban Interface Code Standards through periodic updates and ensure alignment with City documents such as but not limited to; the Community Wildfire Protection Plan, General Plan Safety Element, and the Local Hazard Mitigation Plan. l) Incorporate all of the previous requirements into any new or updated Fire Protection Plans (see Policy S-3.3.11) to maintain consistency.
S-3.3.8	Require development to provide additional access roads when necessary to provide for safe access of emergency equipment and civilian evacuation concurrently.
S-3.3.9	Require all new, remodeled, or rebuilt structures to meet current ignition resistance construction codes and establish and enforce reasonable and prudent standards that support retrofitting of existing structures in High Fire Hazard Severity Zones.
S-3.3.10	Require all new essential public facilities to adhere to the latest construction requirements and best management practices within fire prone areas to minimize risk to these facilities.
S-3.3.11	All new development and major redevelopment shall provide a Fire Protection Plan which meets the minimum standards as required by the State of California, County of Los Angeles, and the Los Angeles County Fire Department.
S-3.3.12	Require brush clearance around structures consistent with the City of Malibu and Los Angeles County Fire Department Fire Code and California Fire Safe Regulations.

Action S-3.3.12a	Provide information for and encourage the removal of dead, dying, and diseased trees on developed properties.
S-3.3.13	New development near or within environmentally sensitive habitat areas and habitat buffers shall be sized, sited, and designed to minimize the impacts of fuel modification and brush clearance activities to the extent feasible
Action S-3.3.13a	Coordinate with neighboring jurisdictions to develop strategic fire plans focusing on fuel management/ modification within established defensible spaces, balancing structure protection with native vegetation, and sensitive habitat preservation.
S-3.3.14	Advocate and support regional coordination among fire and protection service providers to improve fire protection and maximize service levels in a fair, efficient, and cost-effective manner.
Action S-3.3.14a	Coordinate with local, state, and federal fire protection agencies with respect to fire suppression, rescue, mitigation, training, and education.
Action S-3.3.14b	Coordinate with local, state, and federal agencies to update emergency, evacuation, and hazard mitigation plans, as necessary.
Action S-3.3.14c	Coordinate with local, state, and federal agencies to develop emergency services training and education goals, policies, and standards
Action S-3.3.14d	Coordinate with local, state, and federal agencies to ensure adequate training is provided to first responders and emergency services personnel
Action S-3.3.14e	Coordinate with fire services providers to improve fire protection services for multi-story construction.
S-3.3.15	Require and maintain adequate setbacks, easements, and accesses to development, to ensure that emergency services can function.
S-3.3.16	Require all planned development and major redevelopment has adequate fire and emergency services.
Action S-3.3.16a	Analyze new development impacts on emergency services funding and develop new funding sources, if needed
Action S-3.3.16b	Coordinate with the Los Angeles County Fire Department to ensure adequate emergency services staffing, facilities, and equipment is available to serve existing and future development.
Action S-3.3.16c	Coordinate with Los Angeles County Fire Department to develop and periodically update an Emergency Services Master Plan that details staffing, facilities, and equipment needs. Updates should periodically assess future emergency services needs for the City.
S-3.3.17	Require adequate water supplies and infrastructure are available for current and future development.
S-3.3.18	Ensure that adequate water storage and capacity are available to meet daily demand and fire flow requirements.
S-3.3.19	Coordinate with appropriate providers/agencies to ensure adequate infrastructure and conditions for new development related to: a. Water supply and fire flow. b. Location of anticipated water supply. c. Maintenance and long-term integrity of water supplies. d. Evacuation and emergency vehicle access. e. Fuel modification and defensible space. f. Vegetation clearance maintenance on public and private roads. g. Visible home and street addressing and signage.

E. CLIMATE ADAPTATION

Although climate change is not a hazard, variations in environmental conditions can impact some of the natural hazards affecting Malibu. Projections of future conditions include increased temperatures, increased extreme heat days, changes in precipitation, more prolonged droughts, and changes in the size and frequency of wildfire incidents. **Table S-1** identifies the current/historical conditions and end of the century projected conditions within Malibu projected from climate change.

Increasing temperatures associated with climate change can act as a hazard multiplier. By the end of the century, annual mean temperatures are projected to increase between two and ten degrees, impacting City residents and businesses. These increases are also anticipated to increase the number of extreme heat days, from 3 days per year to between 8 and 37 days. These potential temperature increases may impact residents living in poorly insulated structures or structures that do not meet current code requirements.

TABLE S-1 – POTENTIAL CLIMATE CHANGE EFFECTS FOR MALIBU

CATEGORY	Historic (1961-1990) /Current	Future/End of the Century (2070-2099)
ANNUAL MEAN TEMPERATURE	71.3° F	73.9 – 81.4 °F
EXTREME HEAT DAYS (90.1° F)	3 days per year	8 to 37 days per year
ANNUAL MEAN PRECIPITATION	17.0 inches	13.2 to 26.0 inches
ANNUAL AVERAGE AREA BURNED	379.6 acres	490.3 – 531.8 acres

SOURCE: **HTTPS://CAL-ADAPT.ORG/**

Climate change projections suggest that while temperatures will increase in the coming decades, annual mean precipitation could decrease. However, future rainfall events are expected to be more intense, potentially increasing the risk of flooding. These shifts in precipitation patterns may also lead to changes in local vegetation, impacting drainages and changing wildfire management needs.

Increased rainfall could intensify flooding in the community and extend into areas that have not experienced such events before. In addition, more intense precipitation can destabilize local hillsides and drainages, potentially resulting in an increase of landslides, mudslides, and erosion along stream courses, which would threaten adjacent properties and structures.

With future temperature increases and unpredictable precipitation events compared to those experienced today, wildfire impacts are projected to increase by the end of the century. This projection is based on the overall reduction in small and moderate precipitation events in place of large or extreme events, suggesting that vegetation could also experience fluctuating growth patterns. A reduction in vegetation (during dry years) could reduce future wildfire vulnerability, while an increase in vegetation (during wet years) could increase wildfire vulnerability. The City currently experiences an average of 379.6 acres burned annually, projected to increase to 490.3–531.8 acres by the end of the century. Based on these projections the City could experience a 40% increase in acreage burned during a wildfire.

While climate change is projected to exacerbate many of the hazards already affecting the City, many of these hazards may interact with each other. Increased temperatures coupled with less precipitation (a prolonged drought) can reduce water supplies and vegetation growth. Under these drier conditions lower vegetation growth may reduce fire risk, however during a prolonged drought, the existing vegetation will be drier than normal and

could become diseased due to the added stress. Under these conditions, the remaining vegetation would be extremely vulnerable to wildfire conditions.

GOAL S-3: A COMMUNITY BETTER PREPARED TO ADDRESS THE RISKS FROM NATURAL HAZARDS.

Objective / Policy / *Action*

S-3.4	**A community where hazards from weather related events are minimized.**
S-3.4.1	Require buildings and developments exposed to high wind conditions to incorporate design elements and features that minimize or reduce damage to people, structures, and the community.
S-3.4.2	Ensure city operations and the community are informed about heat risk during extreme heat events.
Action S-3.4.2a	Maintain a heat vulnerability index and use it in prioritizing capital projects and neighborhood investments.
Action S-3.4.2b	Operate and maintain cooling centers in underserved neighborhoods during heat emergencies and publicize their locations widely
Action S-3.4.2c	Conduct public outreach to inform residents of heat risks each summer and collaborate with local health agencies to support vulnerable populations.
S-3.4.3	Ensure new multi-family development, non-residential, and single-family residential subdivision developments shall plant street trees at appropriate intervals to increase shade and canopy cover.
S-3.4.4	Promote the use of increased shading, light colored-paving, and pervious surfaces.
S-3.4.5	Require heat mitigation plans as part of project review for all new developments, showing shading, ventilation, and surface treatment strategies
Action S-3.4.5a	Implementation of heat mitigation measures shall prioritize nature based solutions to improve tree cover, cooling resources, and infrastructure capacity to address extreme heat impacts.
S-3.4.6	Coordinate with utility providers to reduce blackouts and public safety power shutoff events.
Action S-3.4.6a	Provide timely communication regarding power constraints and public safety power shutoff events to residents and businesses.
Action S-3.4.6b	Explore and encourage alternative power sources and power infrastructure including micro-grids and battery backup systems.
S-3.5	**A community prepared for future climate related impacts.**
S-3.5.1	Support regional and subregional efforts to adapt current water supply practices in anticipation of reduced water availability due to the effects of climate change.
S-3.5.2	Collaborate with local, regional, state, and/or federal jurisdictions and agencies on climate resiliency and adaptation strategies in the City.
Action S-3.5.2a	Develop a climate resiliency plan that integrates and builds upon the strategies identified in the General Plan, Energy Action Plan, and Coastal Vulnerability Assessment.
S-3.5.3	Monitor climate change-related effects with local, regional, state, and/or federal partners to provide information about the effectiveness of existing infrastructure and programs within the City.

Action S-3.5.3a	Establish a collaborative framework with partners at various levels of government and local community to share goals, collect localized data, and regularly evaluate the effectiveness of resilience and adaptation efforts. Potential partners could include but not be limited to: • Local Community-Based Organizations (CBOs), • Research and Academic Institutions, • Local Cities and Counties, • Regional Planning Organizations Like Southern California Association Of Governments (SCAG), • Governor's Office Of Land Use And Climate Innovation (LCI), • California Department Of Public Health, • National Oceanic And Atmospheric Administration (NOAA), And • Environmental Protection Agency (EPA).
S-3.5.4	Coordinate with regional, state, and federal agencies to monitor the indicators and impacts of climate change as they relate to the City.
Action S-3.5.4a	Monitor and periodically update the following City plans and mapping as required to include the most up to date climate adaptation resiliency strategies and information within the City: a) Las Virgenes-Malibu Council of Governments MJHMP - to incorporate new information related to climate change, as necessary. b) The City of Malibu Energy Action Plan - focuses on climate mitigation and generally addresses climate adaptation. c) The City of Malibu Vulnerability Assessment - integrates climate adaptation and hazard mitigation information and analysis.

F. SHORELINE PROTECTION

Coastal Erosion

Coastal erosion is the gradual or sudden wearing away of coastal bluffs and beaches by wind, rain, high surf, tides, and other events. If buildings and facilities on a beach or bluff have poor drainage, it can exacerbate erosion. Bluff erosion weakens the edges of the coastal terraces and causes parks or yards built on top of the bluffs to shrink over time. Erosion also weakens or hollows out areas beneath structures, leading to partial or complete collapse if the erosion progresses far enough. If the risk of collapse is high enough, the structure may be closed to prevent a potential disaster. Beach erosion narrows beaches, reducing recreational use or limiting coastal access. A narrower beach is also less able to act as a buffer from wave action and coastal flooding, so beach erosion can increase the risk to beachfront properties or increase the rate of bluff erosion when the beach is at the cliff's base. The entire shoreline of Malibu—both beach and bluffs—is subject to coastal erosion. Depending on the orientation of the shoreline and composition of the coastal geology, erosion occurs at different rates in different locations along the coast. Erosion is often worse during the rainy season when severe storms can cause substantial erosion.

Eroded embankment on PCH near Coastline Drive in Malibu.

Sea-Level Rise

Sea-level rise is the increase in the ocean's height and is driven by changes in the Earth's climate. Global temperatures are increasing and causing land ice (i.e., glaciers) to melt. Meltwater runs into the oceans, raising sea levels. Warmer temperatures also cause the water in the oceans to expand (as many other materials do when heated), further raising sea levels. Although it occurs globally, various factors and changes in ocean composition cause sea-level rise at different rates in different locations. Sea-level rise can happen naturally at the end of an ice age, although current sea-level rise is very likely (at least a 90 percent chance) due to human-caused climate change. Sea-level rise is not a direct threat, but it exacerbates various coastal flooding hazards, such as storms, high surf, or exceptionally high tides. Sea-level rise makes beaches narrower and less effective as buffers between the ocean and waterfront development. As a result, when coastal flooding occurs, floodwaters can advance farther inland. Higher ocean levels can also increase the rate of erosion of beaches and bluffs. In the long term, ocean levels may rise high enough to permanently or semi-permanently flood low-lying coastal areas. All beaches in Malibu are at risk of sea-level rise. Areas particularly vulnerable to sea-level rise include low-lying coastal communities, such as the Malibu Lagoon area, as well as specific beaches, such as Zuma Beach, Malibu Surfrider, and Topanga Beach. Critical infrastructure, such as PCH and wastewater treatment facilities, is also at risk, as are beachfront properties, including those on Carbon Beach.

The City prepared a Coastal Vulnerability Assessment (Coastal VA) in 2023 to plan for measures to reduce future vulnerabilities of the City's built and natural coastal resources to projected sea-level rise. The assessment analyzed coastal hazards including tidal inundation, shoreline and bluff erosion, and extreme coastal storm flooding associated with sea-level rise through the end of the century.

SEA-LEVEL RISE VULNERABILITY SUMMARIES

According to the Coastal VA, Malibu's vulnerabilities to coastal flooding and erosion are projected to increase with projected sea-level rise. Many of the City's assets are currently exposed to flooding and erosion hazards in the coastal zone, which are projected to experience greater impacts if no actions are taken. In addition, many assets are not currently subject to coastal hazards but may become exposed under projected future conditions. The following summarizes key sea level rise vulnerabilities of concern for Malibu:

Critical Facilities and Infrastructure

Critical infrastructure in Malibu includes Lifeguard Towers and the Station at Zuma Beach, which may need modification/relocation to avoid erosion and flooding impacts with sea-level rise. Several stretches of PCH are vulnerable to hazards by the end of this century, including bluff erosion or coastal storm flooding and wave run-up (along Zuma Beach, Dan Blocker County Beach, Puerco Beach and Carbon Beach). Several fire hydrants may be exposed to coastal flooding and erosion with sea-level rise. Other important infrastructure includes a sewer pump station that may be exposed to coastal erosion with sea-level rise. In addition, beachfront parcels may also experience issues with onsite septic systems due to rising groundwater levels from sea-level rise. Failure of septic systems may result in discharge of untreated wastewater, poor local water quality and adverse impacts to human health and the environment.

Development

Vulnerable development in Malibu includes beachfront and blufftop homes and businesses, much of which are currently armored and/or elevated. With sea level rise, development on the beaches or lower bluffs may be subjected to coastal erosion and flooding more frequently, leading to property damage and degradation of existing coastal armoring structures. Some oceanfront property and buildings may become impacted by tidal inundation depending on floor elevation and configuration of utilities beneath structures. Shore and bluff erosion may impact upland property and structures. By end of the century, much of the commercial area west of Malibu Creek and lagoon is vulnerable to coastal storm flooding and regular inundation by spring tides.

Access roads to beachfront development may become exposed to erosion with sea-level rise, while Malibu Colony Road may also be subject to tidal inundation and coastal storm flooding.

Beaches

Many of the narrow beaches along the Malibu coast may disappear with sea-level rise, impacting shore ecology and recreation. Beaches in Malibu mostly exist as narrow stretches along beachfront homes, coastal bluffs and PCH, with wider beaches at Zuma/Westward Beach, Point Dume State Beach, and Malibu Surfrider Beach. Today, approximately one quarter of beaches in Malibu may disappear annually from seasonal fluctuations alone and nearly two thirds may disappear annually by middle of this century. In addition, beaches may cease to recover along coastal armoring and other hardened shorelines without action. The disappearance of beaches in Malibu would adversely impact ecological functions along the coastline as well as recreation opportunities for Malibu residents and visitors.

With projected sea-level rise, Malibu's current vulnerabilities to coastal flooding and erosion are projected to increase. There are many assets currently exposed to flooding and erosion hazards in the coastal zone that will experience greater impacts without action. There are also many assets that are not currently subject to coastal hazards but may become exposed under projected future conditions. **Table S-2** (Table 4-22 from the Coastal VA) summarizes the grades for each asset category's exposure, sensitivity, adaptive capacity, and overall vulnerability to sea-level rise. For additional information refer to the Draft Coastal Hazard Vulnerability Assessment.

Table S-2 Coastal VA Results for Malibu

Asset Category	Asset	Hazard Exposure	Asset Sensitivity	Adaptive Capacity	Vulnerability
Communication	Communication Towers	Med	Med	Low	Med-High
Critical Facilities	Fire Stations	Med	High	Low	High
	Fire Hydrants	Med	High	Low	High
	Emergency Shelter	Med	High	Low	High
	Legal Facilities	Med	Med	Low	Med-High
	Lifeguard Towers	Med-High	Low	High	Med
	Lifeguard Stations and Headquarters	Med	High	Med	Med-High
Development	Coastal Armoring Structures	High	Med	Low	Med-High
	Commercial Buildings	Med	Med	Low	Med-High
	Government Buildings	Med	Med	Low	Med-High
	Industrial Buildings	Med	Med	Low	Med-High
	Recreational Buildings	Med-High	Med	Low	Med-High
	Single Family Homes	Med-High	Med	Med	Med-High
	Multi-Family Buildings	High	Med	Low	Med-High
	Mobile Homes	Med-High	Med	High	Med
	Parking Lots	Med	Med	Med	Med
	Other Buildings	Med-High	Med	Med	Med-High
	Malibu Parcels	Med-High	Med	Med	Med-High
Ecology	Wetlands	High	Med	Med	Med-High
	Beaches	Med-High	High	Low	High
	Environmentally Sensitive Habitat Areas (ESHA)	Med-High	Med	Med	Med-High
Energy	Electrical Meters	Med-Low	Med	Med	Med
Recreation	Parks and Open Space	Med-High	Low	High	Med
	Hiking Trails	Med-High	Med	High	Med
	Coastal Access Points	Med-High	Med	Med	Med-High
	Paradise Cove and Malibu Piers	Med	Med	Med	Med
Transportation	Bridges	Med	Low	Low	Med
	Local Roads	Med	Med	Med	Med
	Pacific Coast Highway	Med	High	Low	Med
	Fueling Stations	Med-Low	High	Low	Med-High
Water	Sewer Mains	n/a*	High	Med	n/a*
	Sewer Pipes	Med-Low	High	Med	Med
	Sewer Treatment	n/a**	High	Low	n/a*
	Sewer Pump Stations	n/a*	High	Low	n/a*
	Storm Drain Lines	Med	Med	Med	Med
	Storm Drain Blocks	Med	Med	Med	Med

**n/a – vulnerability grading not applicable; assets are not exposed to hazards by late century*
*** septic systems are not evaluated in this study but have the potential for high vulnerability*

Tsunami

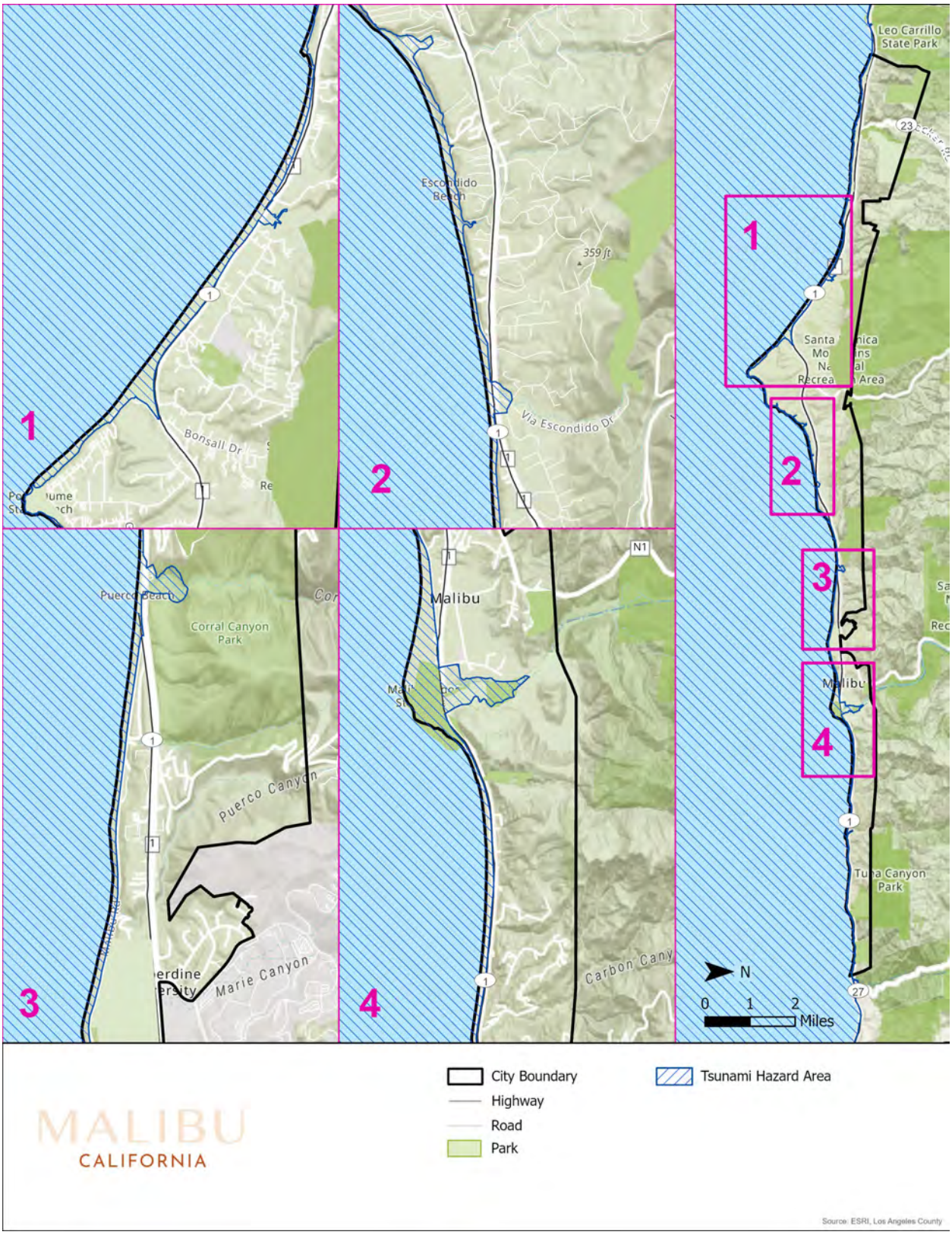
A tsunami is a type of sea wave typically generated by an underwater or coastal geologic event. Earthquakes are the most common cause of tsunamis, but they may also be triggered by landslides, volcanic eruptions, and —in rare instances—meteor strikes. A large and sudden change in atmospheric pressure can also trigger a rare tsunami-type called a meteotsunami. Tsunamis can inundate low-lying coastal areas, causing widespread flooding, and the force of the water can cause significant damage. A typical tsunami event involves multiple waves of varying heights, and the initial wave is not always the tallest. Part of the danger of tsunamis is that they can cause damage far away from the event that triggers them. Although tsunamis weaken as they travel and typically do the most significant damage near the displacement event, large ones can retain enough energy to be destructive hundreds or thousands of miles away. While Malibu is not considered high-risk for tsunamis (due to coastal orientation and geographic location) compared to other coastal areas in California, its low-lying areas and beaches are vulnerable to inundation during a tsunami event. This includes areas surrounding the Malibu Lagoon and much of the coast near Pacific Coast Highway. **Figure S-7** depicts key locations of concern for tsunami inundation based on the latest tsunami hazard mapping prepared by the State of California.

GOAL S-3: A COMMUNITY BETTER PREPARED TO ADDRESS THE RISKS FROM NATURAL HAZARDS.

Objective / Policy / *Action*

S-3.6	**A community resilient to changing coastal conditions.**
S-3.6.1	Require development to provide for safety from coastal storm flooding, coastal erosion, surfacing septic effluent, sea level rise, and tsunami.
Action S-3.6.1a	Require coastal development, except supporting structure, to be above the wave uprush level for storms within the past 100 years, above the 100-year flood plain, and consistent with the latest state and federal guidance and regulations regarding sea level rise.
Action S-3.6.1b	Complete coastal morphology studies and establish shoreline construction standards.
Action S-3.6.1c	Study the effects of seawalls, groins and revetments on beach erosion, consistent with the latest state and federal guidance and regulations regarding sea level rise.
Action S-3.6.1d	Require that proposed coastal development exposed to ocean waters, including but not limited to potentially heavy tidal or wave action, be sited landward of state-owned tidelands and be further sited so as not to cause a potential nuisance, hazard to navigation, public safety problem, or interference with the public's right in the navigable waters.
Action S-3.6.1e	Continue to require a coastal engineering report for all proposed revetments, seawalls, cliff retaining walls and other such construction proposed to protect existing structures to ensure that the structure is constructed utilizing the least environmentally damaging method.
S-3.6.2	Ensure the latest state and federal guidance and regulations regarding sea level rise impacts are considered during planning and development.
Action S-3.6.2a	Implement the recommended actions identified in the Coastal Vulnerability Assessment to address sea-level rise impacts.
S-3.6.3	Participate in a tsunami warning system.

Figure S-7 Tsunami Inundation Hazard Areas in Malibu



G. HAZARDOUS MATERIALS AND WASTES

Natural hazards are not the only threat to a community's safety. Human-caused hazards associated with hazardous materials and waste, are often found throughout a community and can pose significant risks. Generally, hazardous materials are identified as being toxic, flammable, explosive, corrosive, infectious, radioactive, or a combination of these characteristics. Hazardous waste is categorized similarly but is identified separately from materials because they no longer serve a meaningful use.

In the Community

Although common household chemicals pose little threat to the community at large, hazardous materials and waste used by business and industry present a greater risk. Mechanical dealerships, repair shops, gasoline, diesel fuel stations, and dry cleaners are examples of businesses that regularly use and store chemicals or other hazardous materials. Pipelines and tanks within the City also transport and store chemicals that could pose a risk if failure occurs. These releases are anticipated to be isolated to properties where storage occurs. Releases also tend to involve the transportation of raw materials and their byproducts either by pipeline or truck. Regulation of the use, storage, and transportation of hazardous materials and wastes rests on state and federal agencies; however, cities play a significant role in minimizing the risks and impacts of exposure through careful planning and preparation. The City's only truck route is PCH, which has restrictions on the size of vehicles (four or more axles) between Topanga Canyon Blvd (State Route 27) and Decker Road. In addition, California’s Department of Transportation and the Los Angeles County Department of Public Works impose limits on trucks on the main roads in and around the City.

In the Home

Exposure to hazardous materials is not uncommon, as many household cleaning products contain chemicals that can harm both humans and the environment. Through proper use, however, the health risks associated with these hazardous materials can largely be avoided. The proper storage of household cleaning products and other common hazardous materials, such as those used in automotive and home repair, is also an important component of responsible management. Following the manufacturer's instructions on the packaging and keeping products out of the reach of children are two simple steps that can help reduce the risk of exposure.

Post Emergency/Disaster Concern

Following a major wildfire or flood, hazardous materials can pose significant risks to public health, safety, and the environment due to the release of toxic substances from damaged structures, vehicles, industrial sites, and household products. Contaminants such as heavy metals, asbestos, hydrocarbons, and volatile organic compounds can infiltrate soil, air, and water systems, creating long-term cleanup and exposure challenges. Effective recovery efforts require coordinated hazardous materials management, debris removal, and water quality protection consistent with state and federal regulations to safeguard community health and environmental quality.

GOAL S-4: A COMMUNITY BETTER PROTECTED AGAINST HUMAN-CAUSED HAZARDS (HAZARDOUS MATERIALS RELEASE).

Objective / Policy / *Action*

S.4.1	**Minimize the impact from hazardous materials and accidental release in the City.**
S-4.1.1	Ensure hazardous materials release programs are up to date and effectively implemented by the City.
Action S-4.1.1a	Work with trash haulers and Los Angeles County Fire Department to provide for the proper collection and disposal of hazardous wastes.
Action S-4.1.1b	Work with Los Angeles County Fire Department to ensure compliance with the Hazardous Materials Disclosure Law.
S-4.1.2	Continue to maintain and hold the bi-monthly Malibu Roundups, a household hazardous waste (HHW) and electronic waste (E-Waste) disposal program, which enables residents to bring material to a centralized collection facility (City Hall) for proper disposal.
Action S-4.2.1a	Develop an informative campaign promoting Malibu Roundups and hold educational workshops/events teaching residents and businesses of the City about the safe handling, storage, use, disposal, and alternatives to use of hazardous materials.
Action S-4.2.1b	Coordinate with federal, state and county resources on potential hazardous materials sites to support identification, analysis, and cleanup if needed.

The City Safety and Health Element (1995) can be found online at: https://ecode360.com/44603800#44603800

ATTACHMENT 2

Malibu Safety Element Update SB 99 Evacuation Discussion

DATE: 11/4/2025

TO: City of Malibu

FROM: Aaron Pfannenstiel, Principal
Atlas Planning Solutions

As a key component of the Malibu Safety Element update, the City is required to address evacuation hazards and constraints. Since evacuation involves many City Departments and resources to ensure residents and businesses can get to safe locations, it is essential to understand evacuation issues. Compliance with recently adopted state requirements (Senate Bill 99, Assembly Bills 747 and 1409) is intended to assist jurisdictions with understanding constraints and opportunities associated with evacuation routes. This memo provides an overview of the updated requirements for evacuation hazards, current information in the existing element, and the results of the analysis prepared by Atlas Planning Solutions (APS). The scope of this memo is to ensure compliance with SB99 requirements; however, some portions can contribute to AB 747/1409 compliance which will be completed under a separate study.

Why evacuation is being addressed within the Safety Element

Evacuation legislation signed by the Governor in the past six years requires an update to the general plan safety element, to address the following:

GC 65302.15 adopted through AB 747 (2019) **and AB 1409 (2021)**: Upon the next revision of the LHMP on or after January 1, 2022, or if a local jurisdiction has not adopted an LHMP, beginning on or before January 1, 2022, this section requires the Safety Element to be reviewed and updated as necessary to identify evacuation routes and their capacity, safety, and viability and evacuation locations under a range of emergency scenarios.

65302 (g) (5) adopted through SB 99 (2019): Upon the next revision of the housing element on or after January 1, 2020, the safety element shall be reviewed and updated as necessary to identify residential developments in any hazard area identified in the safety element that does not have at least two emergency evacuation routes.

Identifying residential developments that may be constrained during an evacuation will be important for the City. It is also important to understand the current review practices to ensure new subdivision requirements prevent the creation of developments with limited ingress/egress access conditions that could impact evacuation.

Current Evacuation Routes Identified

For the purposes of this analysis, we have listed the primary potential evacuation routes as identified by the City which are recommended for use during an evacuation, depending on incident circumstances. These routes are chosen for their location (generally bisecting the city), capacity, and connectivity to locations outside of the city. The City and Los Angeles County use Genasys evacuation zones to inform residents and identify evacuation routes for use during

emergencies. The City adopted the current mapping in 2020, and created a dedicated page identifying evacuation zones(located here). The evacuation zones mapping organizes the City into four evacuation zones, MAL-C111 through MAL-C114. Each of these zones includes specific mapping to help guide residents towards primary evacuation routes and safely evacuate during an emergency. Malibu recommends that residents understand which of these evacuation routes should be used to evacuate out of their neighborhood and have emergency supplies ready should evacuation become necessary. **Table 1** identifies primary potential evacuation routes, which are depicted in **Figures 1A – 1D**.

Table 1: Primary Potential Evacuation Routes by Zone

Zone	Potential Evacuation Routes
MAL-C111	• Pacific Coast Highway – SR 1 • Carbon Canyon Rd. • Rambla Pacifico St. • Big Rock Dr. • Tuna Canyon Rd.
MAL-C112	• Pacific Coast Highway - SR 1 • Puerco Canyon Rd. • Malibu Canyon Rd. • Civic Center Way • Webb Way • Cross Creek Rd. • Carbon Beach Ter.
MAL-C113	• Pacific Coast Highway – SR 1 • Phillip Ave. • Morning View Dr. • Busch Dr. • Kanan Dume Rd. • Latigo Canyon Rd.
MAL-C114	• Pacific Coast Highway – SR 1 • Decker Rd. • Encinal Canyon Rd. • Trancas Canyon Rd.

Figure 1A: Genasys Evacuation Routes for Malibu: MAL-C111

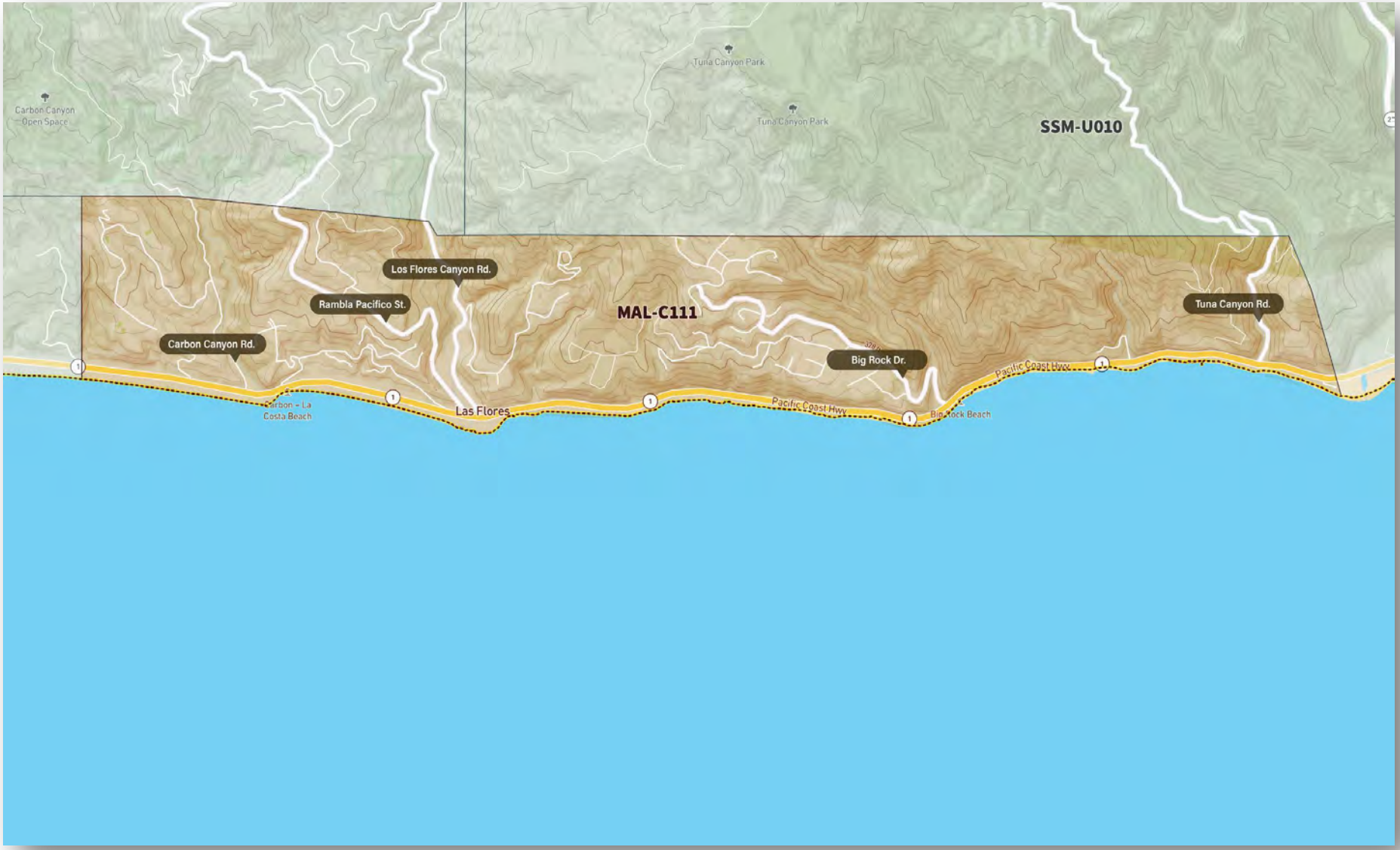


Figure 1B: Genasys Evacuation Routes for Malibu: MAL-C112

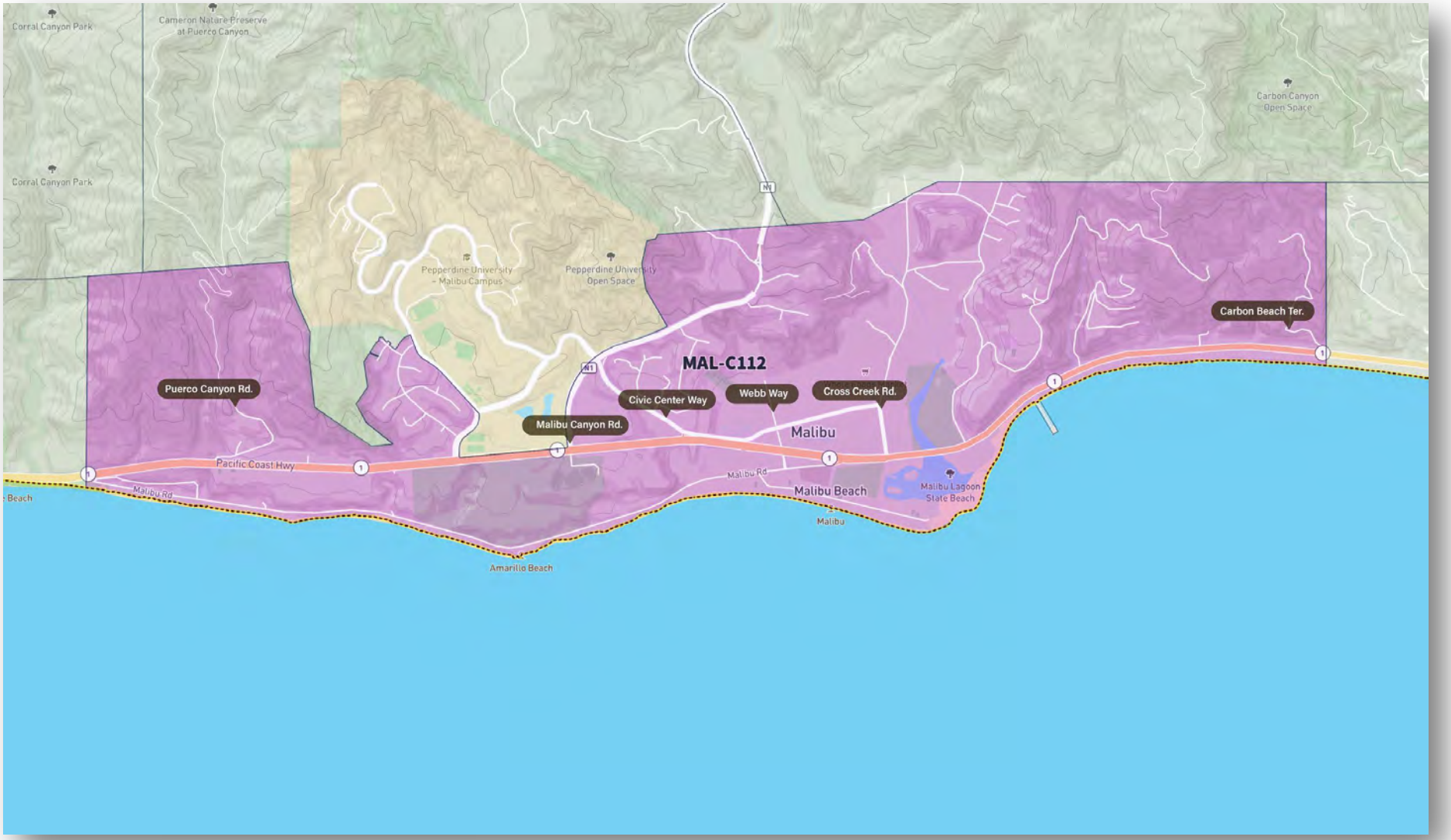


Figure 1C: Genasys Evacuation Routes for Malibu: MAL-C113

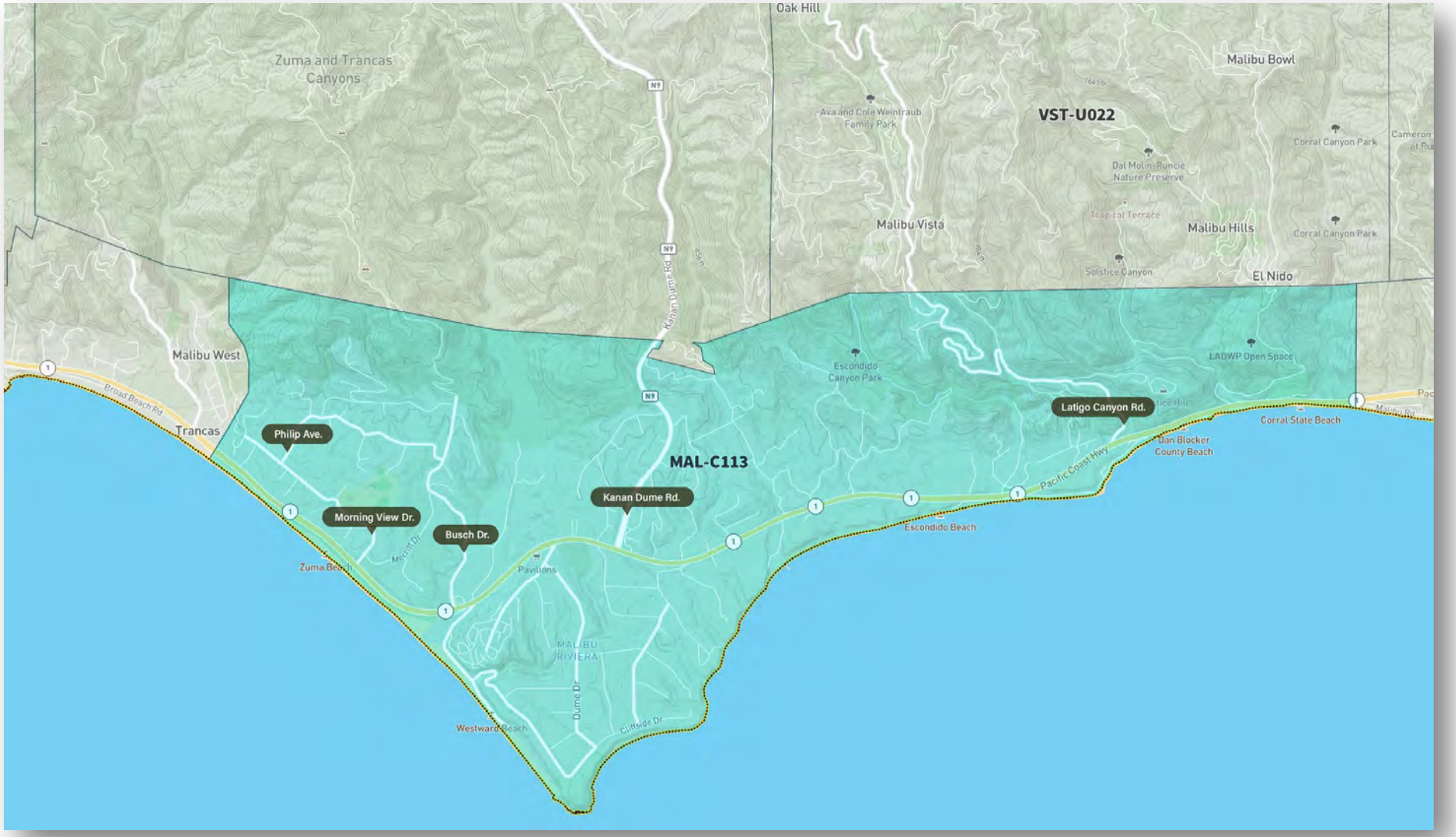
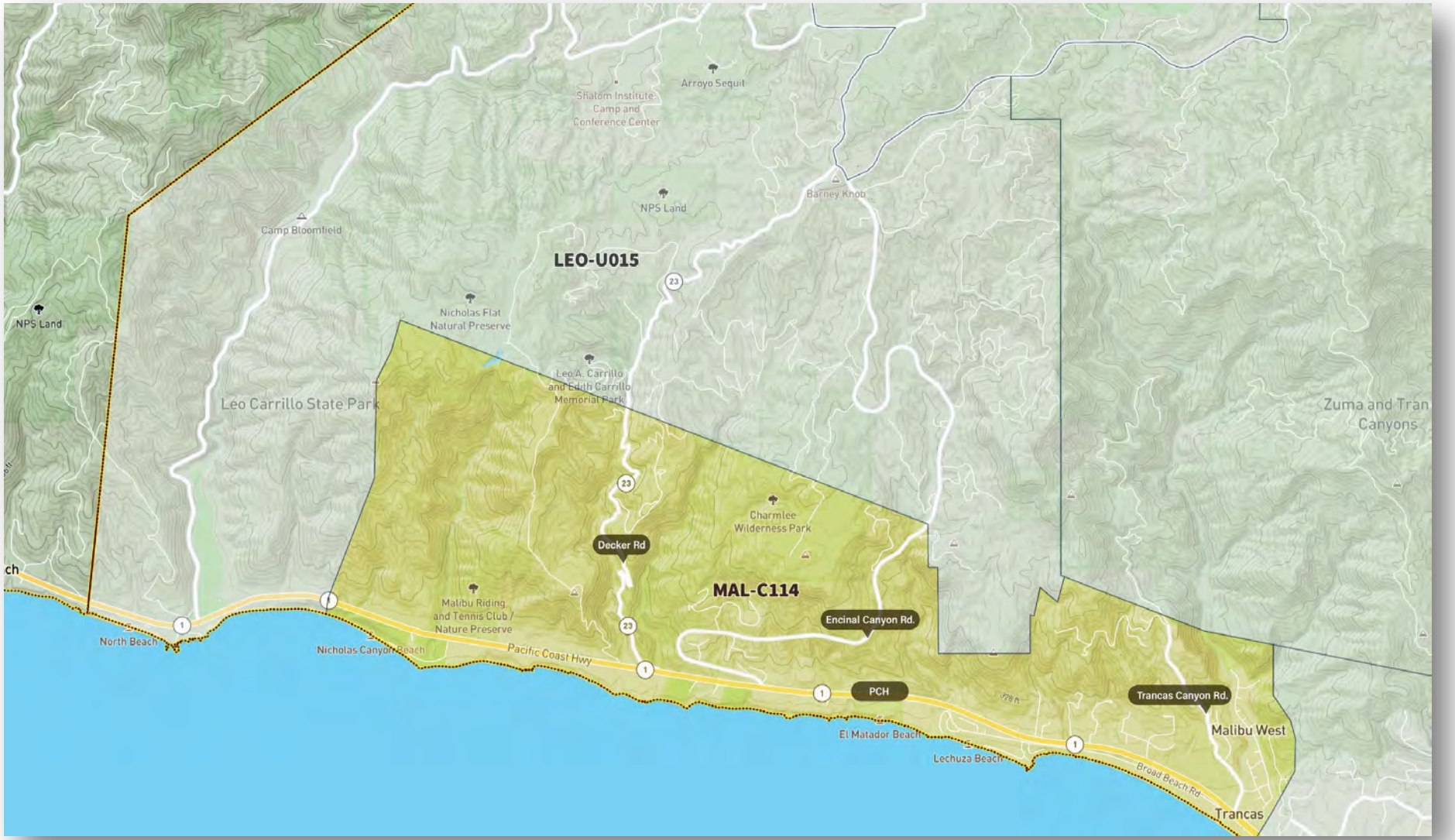


Figure 1D: Genasys Evacuation Routes for Malibu: MAL-C114



Existing Non-Conforming Developments

To perform the SB 99 analysis, GIS mapping of the following conditions was conducted and illustrated in **Figure 2.** Due to the scale and orientation of the city **Figures 2A-2B were created** which roughly bisect the city allowing for greater detail and illustration of the following conditions:

Single Ingress/Egress Roadways – identified as red linework on the following map, these roadways include cul-de-sacs, roadways with a single connection to the roadway network, and roadways that may have secondary connections that are not publicly accessible due to a gate or other constraint.

Single Ingress/Egress SB 99 Parcels – these parcels are identified in orange and include areas where at least 30 parcels are located along a single ingress/egress condition. These areas will be referred to as constrained access parcel (CAP) locations.

Single Ingress/Egress Parcels of Concern – these parcels are identified in green and include areas where 20 - 29 parcels are located along a single ingress/egress condition. As development in the City intensifies (accessory dwelling units, lot splits, etc.), these locations have been identified because they represent areas where evacuation can potentially become a concern in the future. These areas will be referred to as parcels of concern (POC) locations.

While there is no formal guidance, the California Department of Forestry and Fire Protection (Cal FIRE) and Public Resources Code Section 4290.5 identify a threshold of 30 dwellings per single access roadway within the very high fire hazard severity zone (VHFHSZ). For this analysis we applied this threshold across the entire city regardless of location. A total of 21 CAP locations have been identified within the City that have limited ingress/egress conditions. It should be noted that Paradise Cove, which includes several large parcels, is identified as a CAP location, since approximately 276 homes are located within the development and only one ingress/egress location is not fenced off and/or locked.

In total there are approximately 1,950 single family residences located on 1,676 parcels, all of which have constrained access for emergency ingress/egress. In addition, there are 12 additional locations identified as POC locations, totaling approximately 281 parcels. It also noted that throughout the City there are many other locations that have limited ingress/egress. Many of these locations are single parcels or subdivisions of less than 19 parcels. While these do not meet the threshold used for this analysis, cumulatively there are many more home sites in Malibu that experience limited ingress/egress conditions. These smaller parcel groupings should also be considered when planning for emergency evacuations throughout the city.

As depicted in **Figures 1A-1D and Figures 2A-2H**, the city's current roadway network, recommended evacuation routes, constrained roadways, and SB 99 CAP and POC locations suggest that many areas may find evacuation challenging due to a lack of capacity or connectivity to the roadway network.

Figure 2A: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

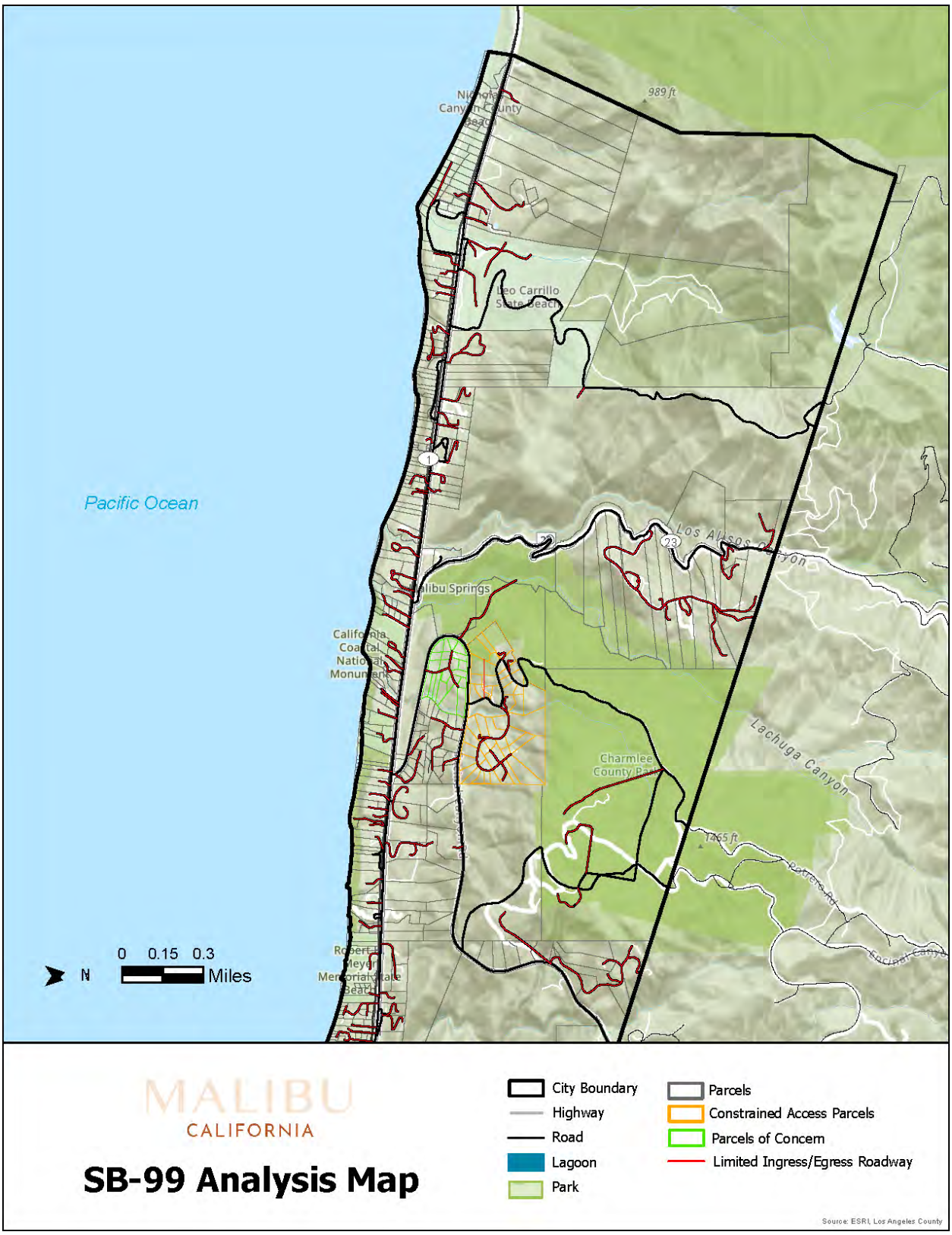


Figure 2B: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

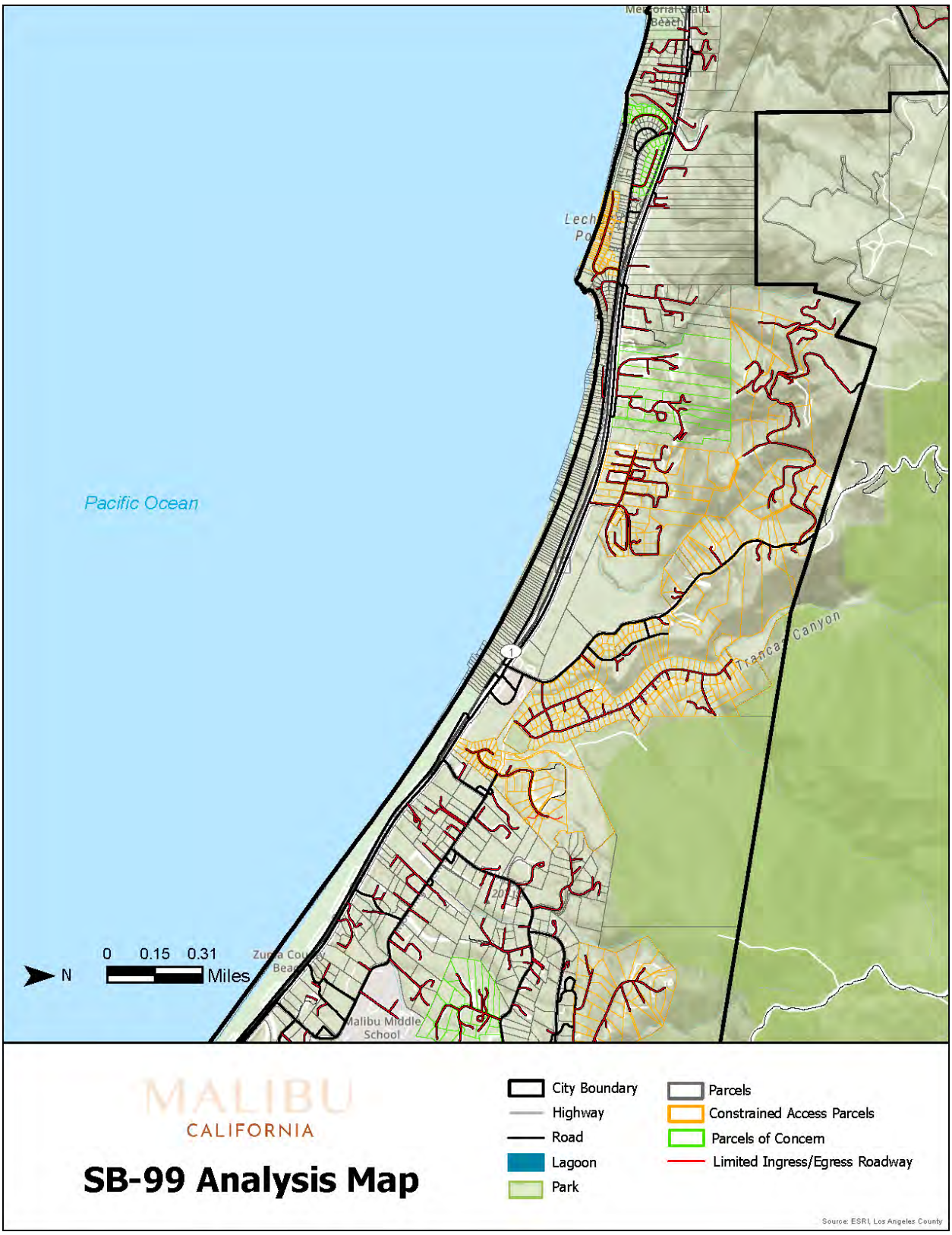


Figure 2C: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

Figure 2D: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

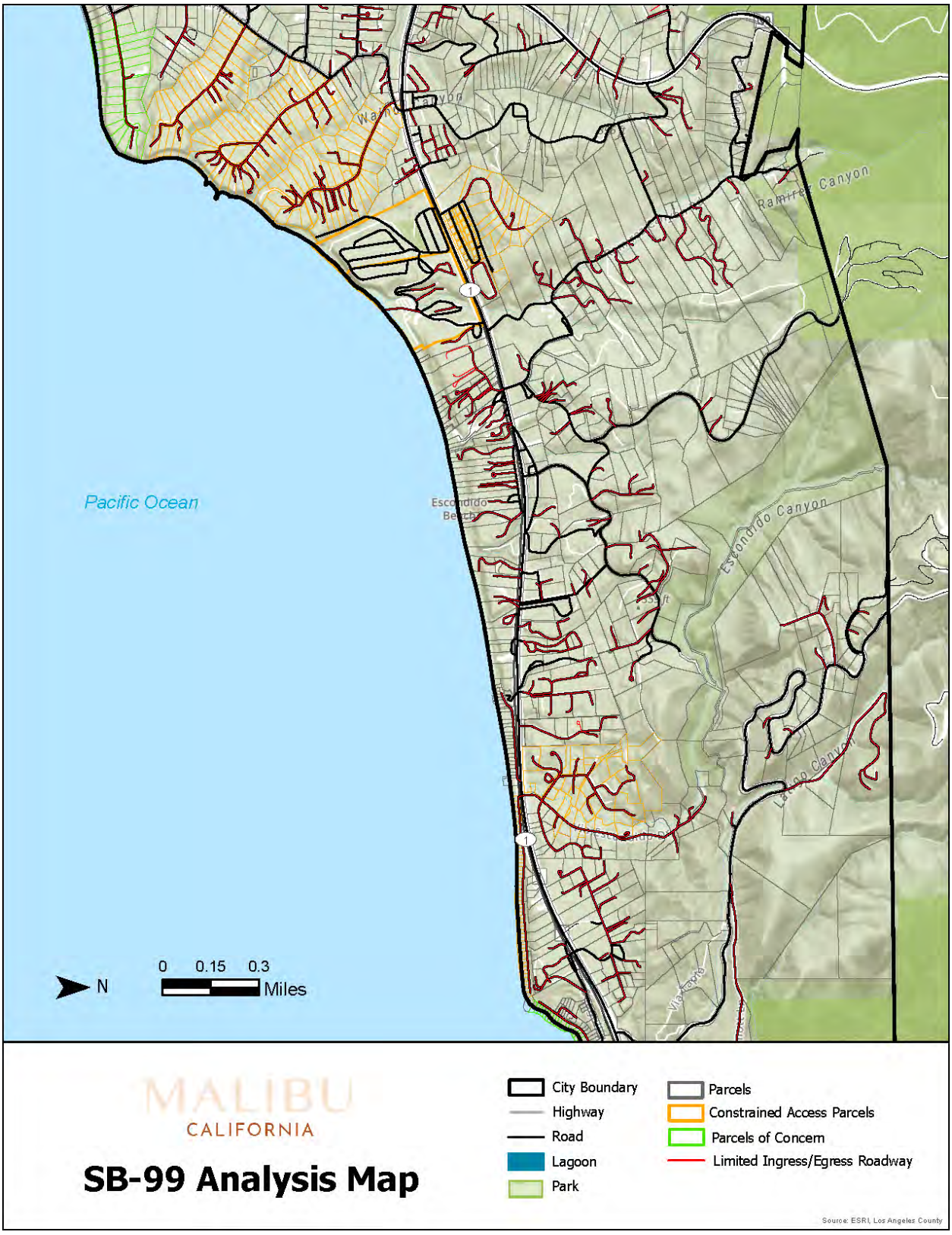


Figure 2E: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

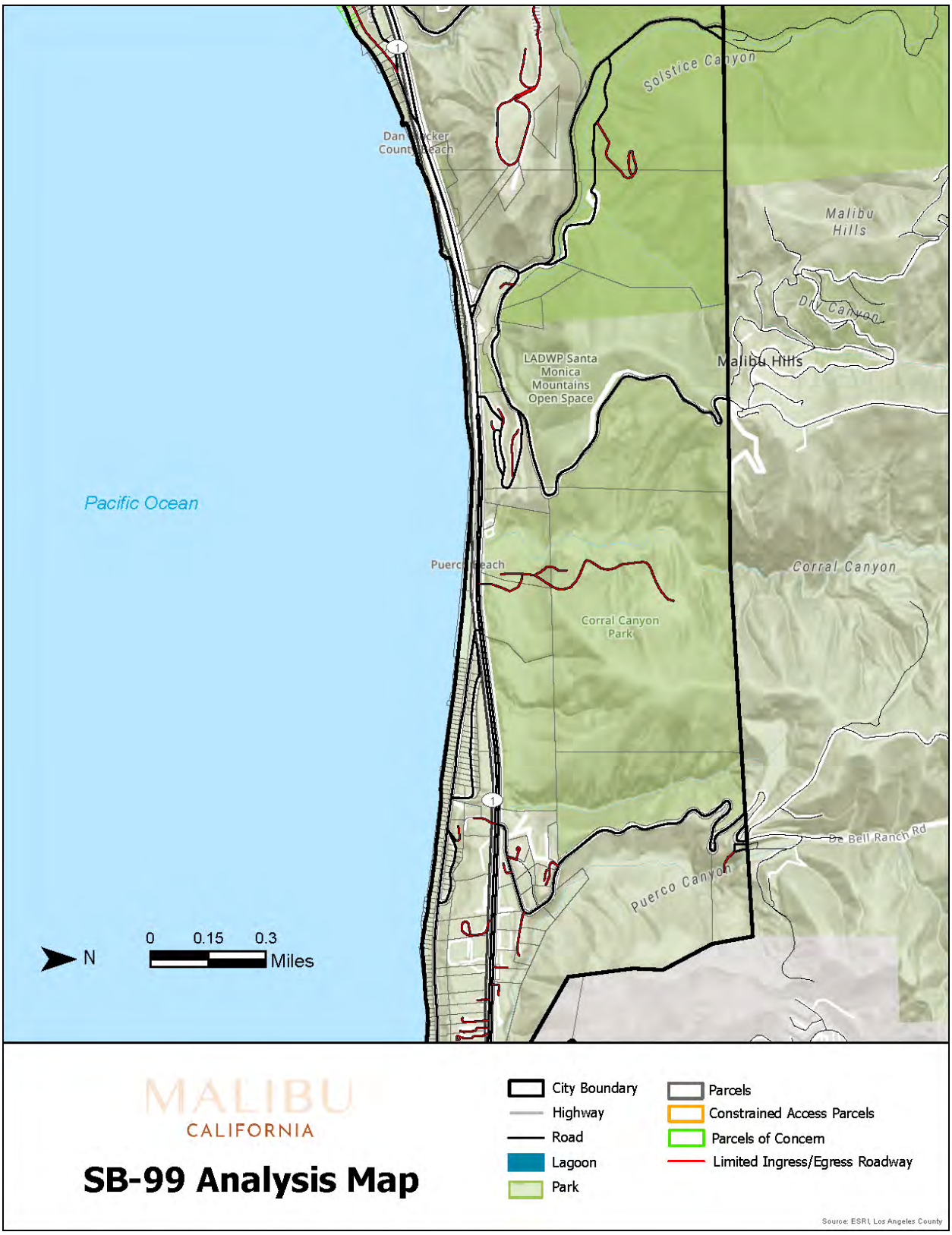


Figure 2F: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

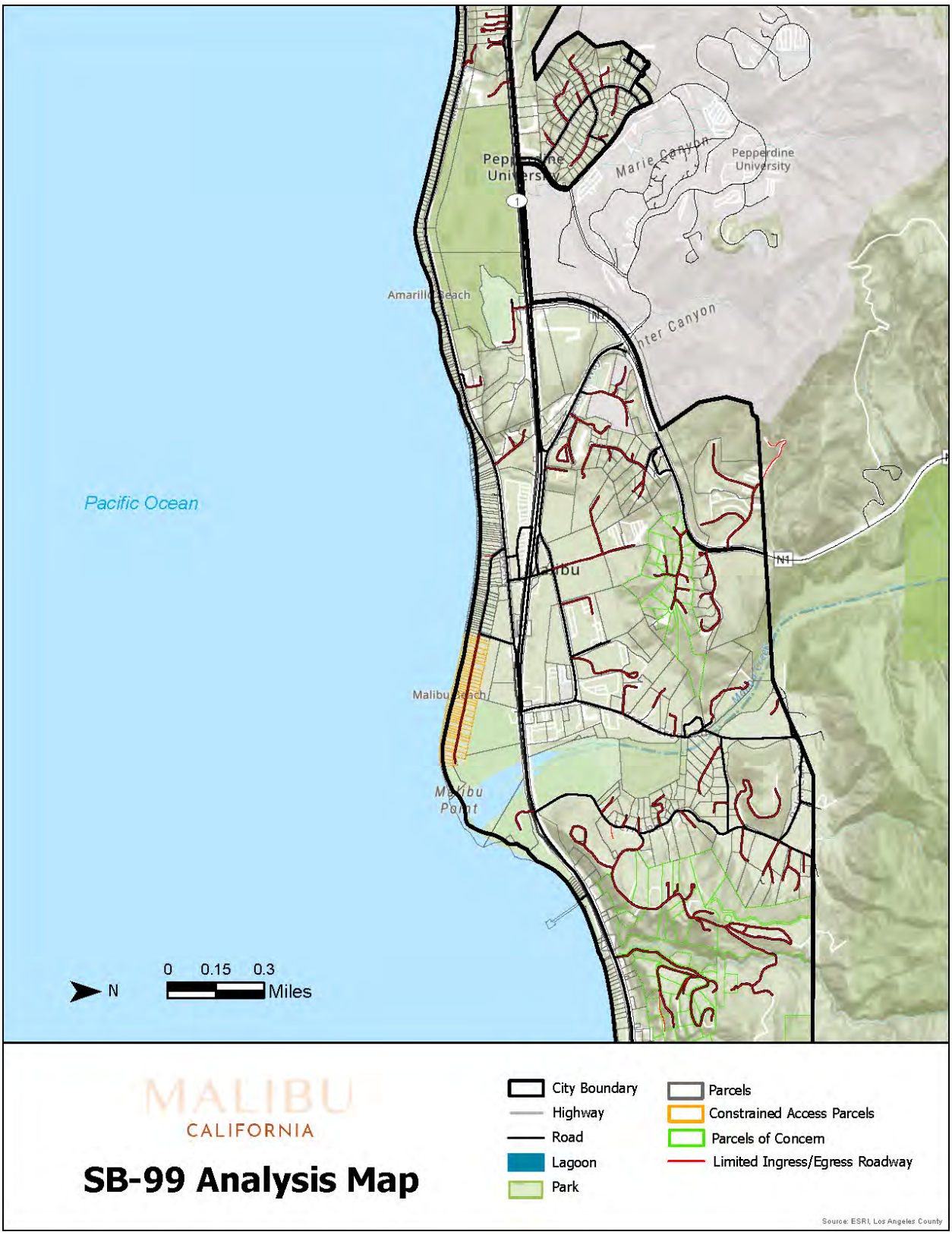


Figure 2G: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

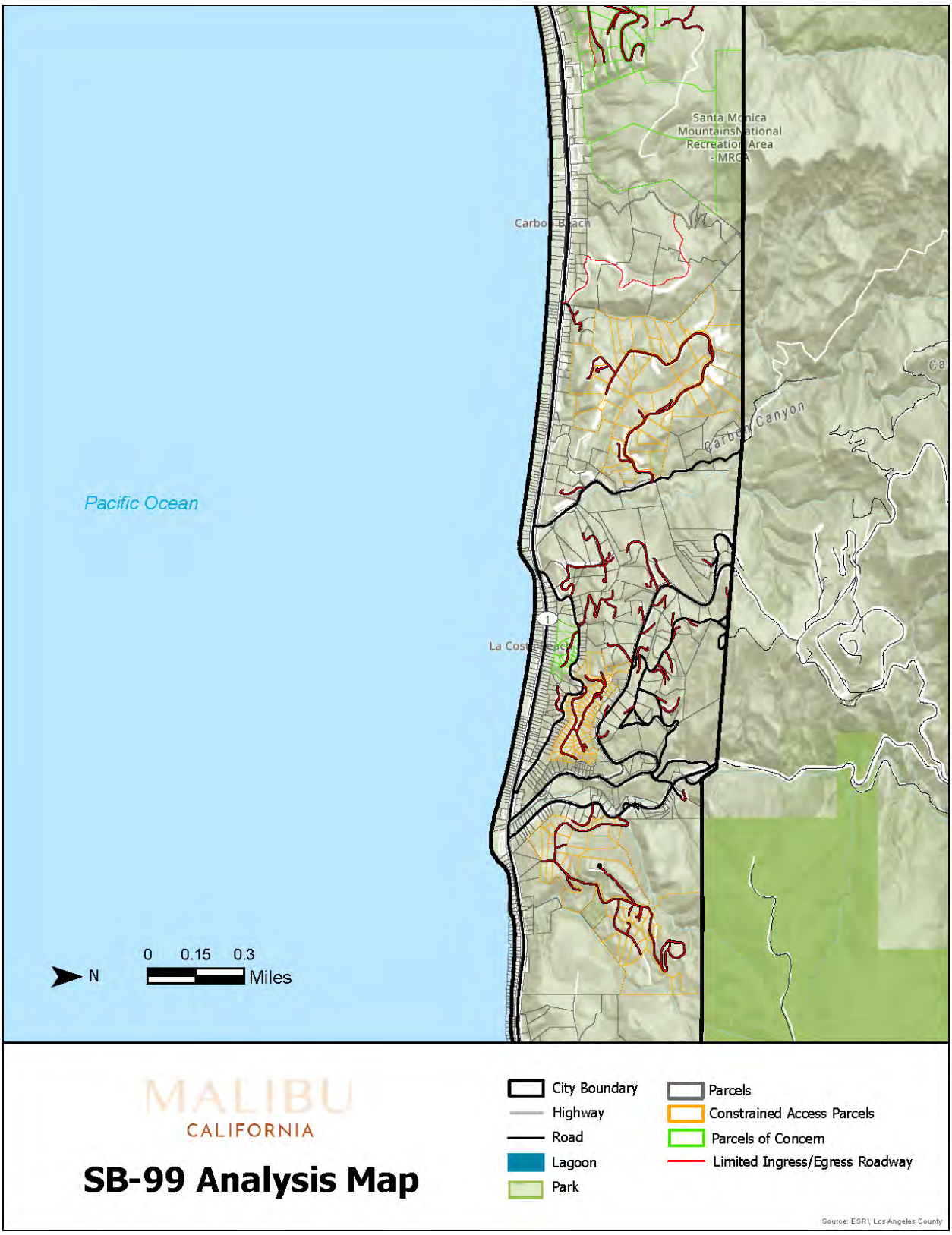


Figure 2H: SB 99 CAP and POC Locations, Single Ingress/Egress Roadways

Evacuation Concerns/Data

Based on the analysis conducted above, the following summarizes evacuation concerns within the City:

Mapped Evacuation Routes

Figures 1A-1D identify the evacuation zones and potential evacuation routes for the City. The major routes identified are recommended due to their location and connectivity within and outside of the city. Upon approval of the Safety Element, these routes should be incorporated into the Emergency Operations Plan, preferably within an updated Evacuation Annex that can be used for trainings and exercises. This coupled with evacuation scenarios that meet AB 747 requirements can help test and refine the City's emergency management and preparedness capabilities.

Past Evacuations

Malibu is located within a portion of the region susceptible to various hazards. Wildfires are especially concerning and recent events have required the issuance of evacuation orders.

Special Areas of Concern Within the City

Fire Hazard Severity Zones

One of the primary concerns, specifically addressed in SB 99 requirements, is the city's development patterns that rely on single ingress/egress roadway conditions. Due to the topography of the city (many canyons and bluffs along the ocean),vegetation and fuels throughout the community, and the development regulations in place when many homes were constructed, fire risk is a significant issue for residents and businesses. Based on the latest mapping prepared by Cal Fire, the entire City is located in a VHFHSZ. This condition requires new development to adhere to the State's Fire Safe Regulations as well as promote retrofitting of existing properties that are susceptible to fire risk.

All 21 CAP and 12 POC locations are located in an identified VHFHSZ. Within those 33 identified locations, 1,957 parcels and approximately 2,231 residences are located along constrained access roadways.

FEMA 100-Year and 500-Year Flood Zones, Dam Inundation Zones, and Tsunami Zones

Flood zones within the City are generally confined to the eastern border and along several canyons (Zuma Canyon, Ramirez Canyon, Las Flores Canyon and Malibu Canyon). Flooding can affect some parts of the city but is generally not a major hazard of concern. There are only sixty parcels located in two CAP locations within identified flood zones. While normal rainfall events do not typically cause significant flooding, major storms can if stormwater cannot be absorbed or transported effectively. During these conditions, excessive stormflow can cause ponding, overwhelm storm drains, and erode natural drainage channels, which can exacerbate other hazards (landslide/mudslides). Depending on the location of flooding, roadways can become inundated and/or damaged, affecting transportation access.

There are several dams and reservoirs that could potentially affect the city in the event of failure. These include Lake Sherwood (Potrero Dam), the Westlake Reservoir (Main Dam and Saddle Dam), Malibu Lake Club Dam, Lake Lindero, and Century Lake. Due to the topography of the City and the region, all of these inundation zones are funneled along Malibu Creek Canyon into the Malibu Lagoon State Beach area. These inundation zones spread east and west once they hit this relatively flat area, where they have the potential to threaten approximately 78 parcels

located in one CAP location along the coast. The Pacific Coast Highway (SR-1) could become inundated in this area creating a barrier affecting access to this major evacuation route.

As a coastal city, the potential for tsunami inundation is always present, especially along beaches and any low-lying areas. Fortunately, the risk for the City is low according to the 2022 tsunami hazard mapping prepared by the California Geological Survey.

Seismic Hazards/Alquist Priolo Special Study Zones

Located within a seismically active region of southern California, the potential for seismic shaking exists throughout the city, so all CAP and POC locations are vulnerable during a significant seismic event.

The Malibu Coast Fault, considered potentially active, is located near Malibu and has active segments mapped within Alquist-Priolo Special Study zones. This type of zone delineates area of additional study required by California along active fault lines. Their purpose is to protect structures intended for human occupancy from the hazard of surface fault rupture during earthquakes. No CAP or POC locations are sited within an identified Alquist Priolo Special Study zone.

Liquefaction/Landslide

Liquefaction - Areas of liquefaction potential in the City exist along stream beds and in some of the canyon areas. Malibu's coastline, particularly areas near Malibu Creek and the Malibu Coastal Fault Zone, have been identified as having liquefaction potential during earthquakes. Liquefaction occurs when water-saturated sediments lose strength when vibrated, behaving like a liquid. While not all areas in Malibu are susceptible, those with shallow groundwater and unconsolidated sediments are at higher risk.

9 CAP locations containing 337 parcels and 2 POC locations containing 29 parcels are located within or immediately adjacent to mapped liquefaction zones.

Landslide - A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. According to the analysis, there are 18 CAP locations containing 913 parcels within earthquake induced landslide hazard zones. In addition, 9 POC locations containing 154 parcels are also located within these zones. According to USGS mapping, the vast majority of Malibu, including all 21 CAP and 12 POC locations, are located within or immediately adjacent to areas of medium to high deep seated landslide susceptibility.

New Evacuation Policies/Implementation Programs

To better support evacuations in the future, new policies and implementation programs should prioritize the following initiatives:

- Improved mapping of constrained roadways
- Sub-area evacuation plans for key CAP locations
- Thresholds for additional evacuation analysis
- Retrofitting strategies to increase roadways capacities and connectivity

For additional detail, please refer to the General Plan Safety Element for key policy and implementation actions.

Fehr & Peers

Transportation Study for Malibu Safety Element Update

Prepared for:

Atlas Planning Solutions

October 2025

ATTACHMENT 4

LA 3622

Table of Contents

List of Figures

1. Introduction

This report provides a qualitative assessment of transportation conditions and evacuation planning in Malibu, based on a review of an existing plan *Transportation Plan for Wildfire and Tsunami Evacuation Study* and input from City of Malibu ("City") and public safety agencies. Fehr & Peers reviewed the *Transportation Plan for Wildfire and Tsunami Evacuation Study* prepared for the City of Malibu by Minagar & Associates (2020) (the "2020 Transportation Study"), gathered feedback from City staff as well as the Los Angeles County Fire Department and Sheriff's Department, and developed additional policy recommendations to supplement and complement the City's ongoing efforts as part of the Safety Element Update process.

This report is divided into four chapters, including this introduction. Chapter 2 summarizes key findings and recommendations from the 2020 Transportation Study. Chapter 3 describes experiences and challenges that first responders faced related to transportation and mobility in the previous wildfire evacuation conditions. Chapter 4 presents policy recommendations for improving emergency access evacuation for residents, workers, and visitors, based on the findings from the previous chapters.

2. Existing Document Review Summary

In 2020, Minagar & Associates, Inc. prepared the *Transportation Plan for Wildfire and Tsunami Evacuation* (the "2020 Transportation Study") for the City. Initiated by the Public Safety Department, this effort aimed to address gaps identified during the Woolsey Fire evacuation in November 2018 by focusing on the primary transportation needs of evacuating residents and the services required to support them. The study analyzed seven key intersections along the City's primary evacuation routes, evaluated transportation operations under seven different evacuation scenarios, and provided a range of short-, mid-, and long-term strategies. This section summarizes the key findings and recommendations from the 2020 Transportation Study.

2.1 Evacuation Map Overview

The 2020 Transportation Study developed a "Master Map" that presents key locations and traffic flow in the event of an emergency (Figure 1). The study identified seven study intersections marked with a large black asterisk in the Master Map:

- Decker Road (State Route 23, maintained by Caltrans)
- Encinal Canyon Road (city maintained)
- Kanan Dume Road (city maintained)
- Latigo Canyon Road (city maintained)
- Malibu Canyon Road (city maintained)
- Las Flores Canyon Road (city maintained)
- Topanga Canyon Road (State Route 27, maintained by Caltrans)

On the Master Map, large red arrows indicate the primary direction of traffic flow along evacuation routes and the Pacific Coast Highway (PCH) during a wildfire event. At intersections along evacuation routes, permitted movements are shown with smaller red arrows. For tsunami scenarios, large blue arrows represent the main direction of traffic, while smaller blue arrows indicate permitted intersection movements.

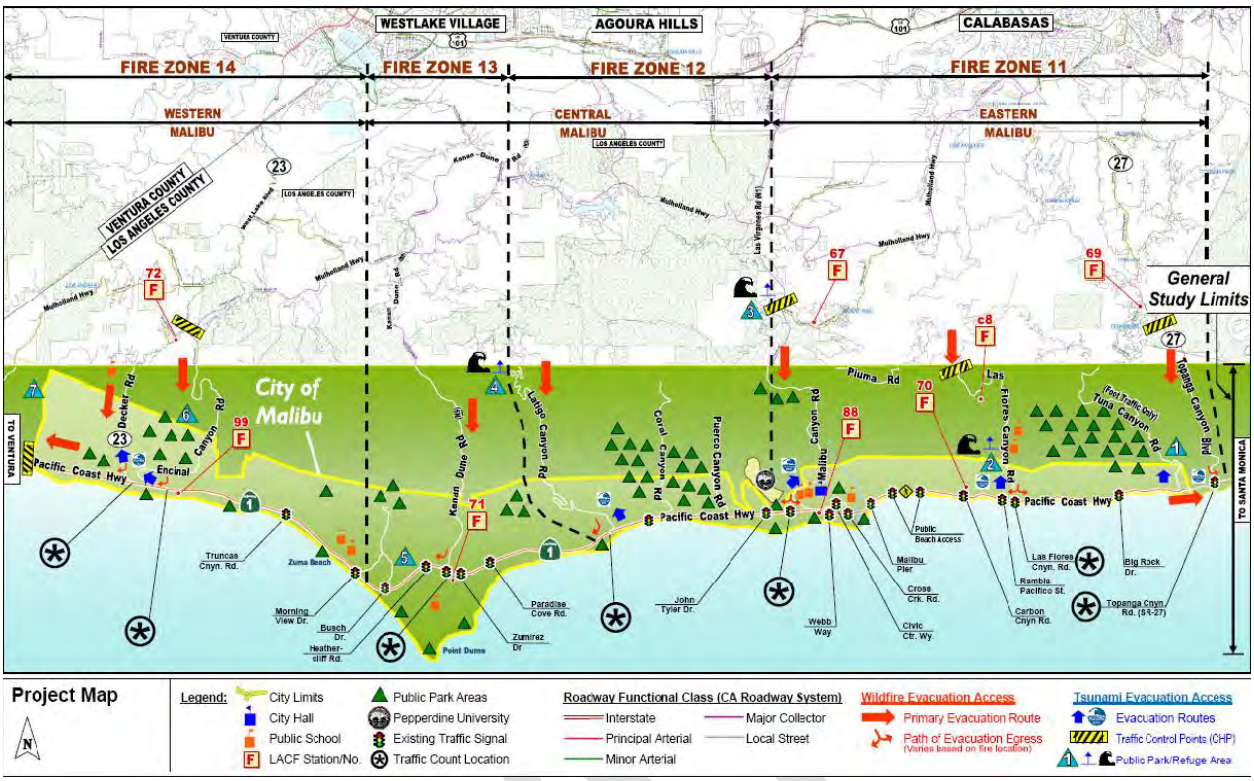


Figure 1: City of Malibu Evacuation Plan

2.2 Evacuation Scenarios

The 2020 Transportation Study analyzed traffic operations under seven scenarios, including five wildfire events and one tsunami scenario.

1. Existing Maximized Conditions[1]
2. Wildfire within Western & Central Malibu (Fire Zones 14, 12 & 13)
3. Wildfire within Western Malibu (Fire Zone 14) Excluding Central Malibu (Fire Zones 12 & 13)
4. Wildfire within Eastern (Fire Zone 11) Including Central Malibu (Fire Zones 12 & 13)
5. Wildfire within Eastern (Fire Zone 11) Excluding Central Malibu (Fire Zones 12 & 13)
6. Wildfire Citywide (Fire Zones 11, 12, 13, & 14)
7. Tsunami Citywide (Within Los Angeles County & CGS Tsunami Inundation Areas 2-24 and Fire Zones 11, 12, 13 & 14)

The study evaluated intersection Level of Service (LOS) and delay for key evacuation routes. Results showed that LOS at intersections along Malibu Canyon Road, Kanan Dume Road, and Topanga Canyon Boulevard frequently reached unacceptable levels (LOS D or worse) under various wildfire

[1] Existing Maximized Conditions assume existing conditions of no wildfire or tsunami where traffic proceeds as per usual. There would be no restrictions placed on intersection turning movements and vehicles would be travelling in all possible directions. This scenario assumes maximized existing hourly traffic volumes for each possible movement at each intersection.

scenarios. In the tsunami scenario, most intersections experienced LOS D or worse, with average delays exceeding seven minutes. Detailed LOS findings are summarized in Appendix A.

2.3 Recommended Evacuation Strategies

The following are the strategies recommended by the 2020 Transportation Plan:

Short-Term Strategies

- Depending upon the location of wildfire or tsunami, utilize the recommended Transportation Plan Evacuation Scenarios #2 through #6 or Scenario #7 respectively.
- Utilize the 2019 14th Edition of the Work Area Traffic Control Handbook (WATCHBOOK) and 2016 Field Guide for Temporary Traffic Control.
- Purchase Additional Changeable/Dynamic Message Signs (CMS/DMS), Trailblazers and Traffic Incident Management Area Signs

Mid-Range Strategies

- Depending upon the location of wildfire or tsunami, utilize the recommended Transportation Plan Evacuation Scenarios #2 through #6 or Scenario #7 respectively.
- Harden or Implement Protection Systems for the Critical Infrastructure to prevent Roadway Debris.
- Re-analyze and re-optimize the Traffic Signals along Pacific Coast Highway.

Long-Term Strategies

- Widen Pacific Coast Highway via more reversible directional lanes with overhead changeable directional signals
- Widen Evacuation Route Approach to Pacific Coast Highway, such as temporarily converting one of the left-turn lanes to a right-turn lane at Kanan Dume Road and/or Malibu Canyon Road under certain scenarios.

3. Experienced Evacuation Conditions

Fehr & Peers participated in an outreach meeting with the project team, including City of Malibu Community Development Department (Planning), Public Safety Department, and Atlas Planning Solutions, along with the Los Angeles County Fire Department and Sheriff's Departments in City Hall on August 31, 2025. During this meeting, Fehr & Peers presented key findings and recommendations from the 2020 Transportation Study and facilitated a discussion about first responders' experiences during previous evacuations, including the Franklin Fire (December 2024) and Palisades Fire (January 2025). The meeting provided valuable insights into the challenges faced by first responders in areas such as traffic control, evacuation management, cross-jurisdictional coordination, and public awareness, as well as their perspectives on the feasibility of implementing specific features and evacuation strategies. This section summarizes the experiences and challenges related to transportation and mobility that first responders encountered during past evacuation events.

3.1 Traffic and Roadway Challenges

Evacuation Route Blockages and Congestion

The primary evacuation route through Malibu consists of the Caltrans-maintained Pacific Coast Highway (PCH) and several north-south routes that originate at PCH and connect to the US 101 Highway corridor to the north. During previous wildfire evacuations in Malibu, PCH was essential as both an evacuation route and for emergency vehicle access. The two-way center turn lane, where available, provided critical flexibility and served as a contraflow lane for emergency vehicles.

Before the Franklin Fire (December 2024) and Palisades Fire (January 2025) occurred, Caltrans developed the PCH Master Plan Feasibility Study (Feasibility Study)[2]. The purpose of the Feasibility Study was to identify potential transportation improvements to improve safety and connectivity for all PCH users. The Study proposed strategies specifically to address evacuation and emergency access needs, such as the emergency access medians. These strategies included options for mountable rubber curbing and ramps that would allow emergency vehicles to traverse concrete-curbed medians. However, some proposed improvements, such as reducing the number of travel lanes or converting two-way left turn lanes into landscaped medians, could limit emergency response flexibility during future incidents. Following the recent fires, Caltrans has acknowledged that the Feasibility Study's recommendations may need to be revisited or modified as the community recovers. This process creates an opportunity for the City to coordinate closely with Caltrans and provide feedback to ensure that evacuation and emergency access needs are fully addressed in future planning.

During the previous fire evacuations, traffic congestion became a significant issue, particularly due to vehicles breaking down or being abandoned by drivers during evacuation. This resulted in major road blockages that slowed down or completely halted the movement of evacuees and emergency responders. Many of Malibu's evacuation routes, such as Big Rock Drive, Corral Canyon Road, and Las Flores Canyon Road, are narrow, private, and situated on steep terrain, making them particularly

[2] Caltrans District 7, Pacific Coast Highway Master Plan Feasibility Study, April 2025

vulnerable to gridlock during emergencies. Additionally, falling debris, such as rocks dislodged by fire and weather conditions, further impeded evacuation routes, as was also seen during the Woolsey Fire. These road hazards highlighted the need for better road maintenance and pre-disaster preparation.

Traffic Control and Limitations

Several traffic management tools have been effective during previous evacuation incidents. The use of traffic cones in high-risk areas, such as Topanga Canyon, proved effective in controlling access and ensuring smoother traffic flow. By pre-positioning cones during Red Flag conditions and restricting roads to residents only, early traffic control helped prevent worse congestion. This effort was supported by pre-evacuation coordination with Caltrans, which successfully delivered cones in advance on PCH.

Contraflow strategies also present a valuable tool for enhancing evacuation flow when roadway capacity and staffing levels permit. This involves temporarily reversing lanes to direct all traffic in one direction and transporting evacuees out of the evacuation zone. For example, Topanga Canyon Road implements a well-established contraflow procedure in which two southbound lanes are used for outbound traffic during evacuations. This strategy is effective largely because residents are familiar with their evacuation zones and the traffic management procedures in place. However, contraflow requires at least three total lanes and sufficient personnel to safely manage intersections and transitions. Roads like Malibu Canyon Road, which serve fewer residents and have limited lane capacity, may not benefit as significantly from this approach.

Limited personnel availability to manage traffic was a challenge during large-scale evacuations. Malibu relies primarily on Sheriff's deputies, who must be stationed at each intersection to provide traffic direction. This approach is labor-intensive and not always feasible given staffing constraints. Compounding the issue, PCH is a Caltrans-maintained facility, so the Los Angeles County Sheriff's Department does not have direct control over traffic signals. Although they can activate flashing modes using signal keys, this solution is not practical for widespread use during citywide evacuations.

The 2020 Transportation Study recommended the City purchase additional Changeable or Dynamic Message Signs (CMS/DMS), which were confirmed as a useful tool by the Sheriff's representatives. These signs can provide real-time evacuation instructions, route changes, and hazard alerts to drivers, thereby reducing confusion and improving evacuation efficiency.

Power Outages and PSPS Impacts

Public Safety Power Shutoffs (PSPS), initiated to reduce wildfire risk, caused widespread power outages that had cascading effects on evacuation efforts. Without power, traffic signals and communication systems were disrupted, leading to confusion and panic among residents. This sometimes triggered gridlock on key evacuation routes. These power outages also raised important questions about accountability, with uncertainty around whether Caltrans, Southern California Edison, or the City of Malibu is responsible for ensuring traffic and infrastructure stability during PSPS events.

Utility and Roadside Hazards

Another critical issue was the presence of utility infrastructure vulnerable to fire damage. If they are not secured, power poles and electrical lines can become a fire hazard and can cause interrupted service during emergencies if they fail. Furthermore, the buildup of debris can become hazardous when dislodged during wildfires. These environmental factors pose significant threats to both evacuating residents and first responders and require targeted infrastructure improvements.

3.2 Coordination and Communication

Cross-Jurisdictional Coordination

Mass evacuations cause a surge of evacuees to cross jurisdictional boundaries, during which a coordinated/regional response can be impeded by unexpected traffic congestion and evacuees' confusion. This occurred during the Palisades Fire evacuation between City of Malibu and other adjacent jurisdictions. Uncoordinated cross-jurisdictional movements place undue pressure on Malibu's limited infrastructure and emergency personnel and highlight the need for improved communication and joint evacuation planning across jurisdiction boundaries.

Public Communication

Although the City has developed a Mass Evacuation Plan[3], evacuation decisions depend on a complex and changing set of factors, including risk levels, road conditions, radar coverage, and required travel distances. Therefore, it was challenging for Sheriff and Fire staff to provide answers when they were asked what the evacuation plan was during the Palisades Fire evacuation. This dynamic nature makes it difficult to establish a one-size-fits-all evacuation plan and underscores the importance of adaptive planning and real-time communication. In addition, real-time communication can be even more effective when supported by pre-established and well-publicized expectations on where the public can find real-time information during an emergency.

3.3 Evacuation Zones and Public Education

Evacuation Zone Awareness

The City's Public Safety Department has launched several public education initiatives and workshops to increase public awareness of City's evacuation zone system. While these efforts succeeded in neighborhoods near Topanga Canyon Road, participation in the workshops has been limited elsewhere, resulting in many residents either being unaware of their designated evacuation zone or unable to recall it during high-stress situations. This highlights the need for more innovative and accessible education tools. Furthermore, the absence of wildfire-specific signage in public rights-of-way may contribute to this lack of awareness. For example, while tsunami evacuation signage exists throughout Malibu, no equivalent signage is available for wildfire evacuation since the areas most at

[3] City of Malibu, Mass Evacuation Plan, August 2020. Accessed in September 2025 on https://www.malibucity.org/DocumentCenter/View/26832/FINAL-Evacuation-Plan-8192020

risk can change rapidly depending on weather and ignition conditions, which can lead to confusion and uncertainty during emergencies.

Evacuation Orders and Shelter-in-Place Strategy

Pepperdine University's decision to shelter in place during Palisades Fire was considered the appropriate response given the circumstances. The campus was sufficiently prepared to house its community safely and effectively. However, outside the university, some residents who were not subject to shelter-in-place directives chose to disregard official evacuation orders and remain at home to protect their property. This behavior is often rooted in a false sense of security, reinforced by favorable outcomes from previous wildfires despite risky decision-making. This normalization of risky behavior makes it hard to shift public attitudes toward safe and proactive evacuation practices. Overall, this persistent gap in effective public education and behavioral change continues to undermine the City's evacuation preparedness.

In addition, limited evacuation resources may also influence individual's decision to shelter in place. Factors include a lack of awareness of designated evacuation zone, insufficient understanding of the information channels through which evacuation orders are communicated and mobility constraints (described in the subsequent section).

3.4 Vulnerable Populations Support

Vulnerable groups - including individuals with mobility limitations, those with large animals, residents in group living quarters, and individuals without access to personal transportation – require targeted support during evacuations. While City and County staff noted that relatively few residents in Malibu own large animals, there are notable populations lacking personal transportation, such as individuals in rehabilitation centers and those who rely on buses for commuting.

Discussions have explored the creation of a community-led "neighborhood help" program to provide localized support during emergencies. Such program would enhance community resilience and ensure that no individuals are left behind during evacuations.

4. Study Recommendations

Based on the review of the 2020 Transportation Plan, and feedback from the discussion with Los Angeles County Fire Department and Sheriff's Departments, this section outlines additional strategies that the City can implement to improve the preparedness and efficiency of evacuation operations. These strategies can be organized into three categories:

Demand-side: when, how, and where people evacuate in an emergency.
Supply-side: the physical and operational infrastructure that facilitate an emergency evacuation.
Information-side: how information is shared and received before and during an emergency.

4.1 Demand-Side Recommendations

Encourage households (including those who must evacuate livestock) to evacuate using the fewest number of vehicles possible. Public messaging should emphasize the importance of planning ahead and carpooling within households to minimize traffic volume during emergencies.

Promote early evacuation on Red Flag days. Alerts should notify residents of high-risk fire conditions and encourage proactive departure to reduce last-minute congestion, especially if evacuating with livestock/large animals.

Consider the needs of vulnerable populations, such as individuals with mobility limitations, those in group living quarters, K-12 students, and others without access to a personal vehicle in City evacuation plans. Explore community-led "neighborhood help" programs to offer localized support.

To the extent possible, use high-capacity public transit vehicles to reduce the use of single occupancy vehicles and increase the number of evacuees while reducing congestion. Publicize this option, including pick-up points, anticipated operations, and expectations around returning as part of ongoing education and communication campaigns.

4.2 Supply-Side Recommendations

Continue coordination with Caltrans on the PCH Master Feasibility Study and all other PCH planning efforts to make sure evacuation and emergency considerations are integrated into all planning, design, and review processes for PCH improvements.

- Establish a standing working group between the City and Caltrans to review all transportation improvement projects on PCH for emergency and evacuation implications, and to provide regular feedback during recovery and planning phases.
- Require all PCH modification proposals to include a formal assessment of their impact on evacuation routes and emergency response times, with input from local fire, law enforcement, and emergency management agencies.
- Require that all decisions regarding lane reductions, median conversions, or other major changes be documented with clear justifications for how emergency access will be preserved or improved.

- Explore “win-win” design options that can preserve capacity for emergency vehicles during emergencies while meeting the day-to-day goals of serving all users of PCH with safer, more comfortable multi-modal facilities.

Invest in additional CMS units to enable real-time traffic and evacuation messaging across key corridors.

Expand investment in resilient communication infrastructure that operates independently of commercial power utilities (e.g., Southern California Edison) and traditional telecommunication networks, such as satellite-based systems (e.g., Starlink), radio-based alerting platforms (e.g., AlertFM), to ensure uninterrupted emergency communications during power outages or Public Safety Power Shutoff (PSPS) events.

Establish formal protocols for pre-positioning traffic management tools in CONEX or similar storage units, such as cones, signage, and CMS units, in high-risk areas ahead of wildfire events.

Establish joint evacuation protocols and responsibilities with neighboring cities, counties, and agencies on traffic signal timing control on PCH during wildfire evacuations to ensure smooth operations.

Explore the feasibility of a curbside management system to help enforce parking restrictions on Red Flag Warning days. A curbside management system would provide a coordinated or technology-assisted method to monitor and enforce temporary parking restrictions, ensuring curb areas remain clear for emergency access and evacuation during Red Flag Warning days.

Coordinate with owners of private/unmapped roads (including gated communities) to maintain them as viable egress routes and allow for their use during an evacuation. Identify locations with fewer than two egress points and develop specific evacuation strategies for those areas.

Provide City staff with officially marked vehicles or temporary signage/stickers to ensure access to critical areas during emergencies.

4.3 Information-Side Recommendations

Implement a multi-channel, recipient-specific education and training program to enhance wildfire evacuation preparedness across Malibu’s diverse community sectors.

- Launch a citywide campaign while the memory of the Palisades Fire remains fresh. Include community workshops, door-to-door outreach, and school-based programs with take-home materials to engage entire households.
- Offer emergency preparedness training to businesses, potentially linking it to the permitting process.
- Provide targeted training to Homeowners Associations (HOAs), Chamber of Commerce, and other community and stakeholder groups to strengthen neighborhood-level coordination.
- Continue to support the formation of Firewise communities throughout the City.

Initiate a pilot project to install wildfire-specific signage at City-maintained facilities located at key entry points to fire-prone areas. Signage should include clear messaging such as "You Are Entering a High Fire Risk / Evacuation Zone" to raise public awareness and promote preparedness.

As part of this pilot project, display evacuation zone numbers on streetlight poles at major intersections and neighborhood entry points, as well as street name signs within each zone. This numbering system will help residents easily identify the zone they live in and understand when to evacuate quickly during emergencies.

- Coordinate with the Public Works Department to identify appropriate pilot locations and oversee installation logistics.
- Launch a concurrent public education campaign to explain the purpose, design, and importance of the signage and numbering system, emphasizing the need for residents to know their evacuation zone.
- Explore and evaluate the trade-offs between static signage (durable but limited in adaptability) and CMS which offer dynamic messaging capabilities but are dependent on battery life and maintenance.
- Collect community feedback during the pilot phase through surveys, public meetings, or digital platforms to assess effectiveness and public support.
- Based on community input and operational review, refine the signage system and consider permanent citywide implementation if broadly supported.

Evaluate whether emergency alert platforms can be integrated into the evacuation planning process with the goal of improving real-time, user-friendly communication and addressing existing gaps in public awareness.

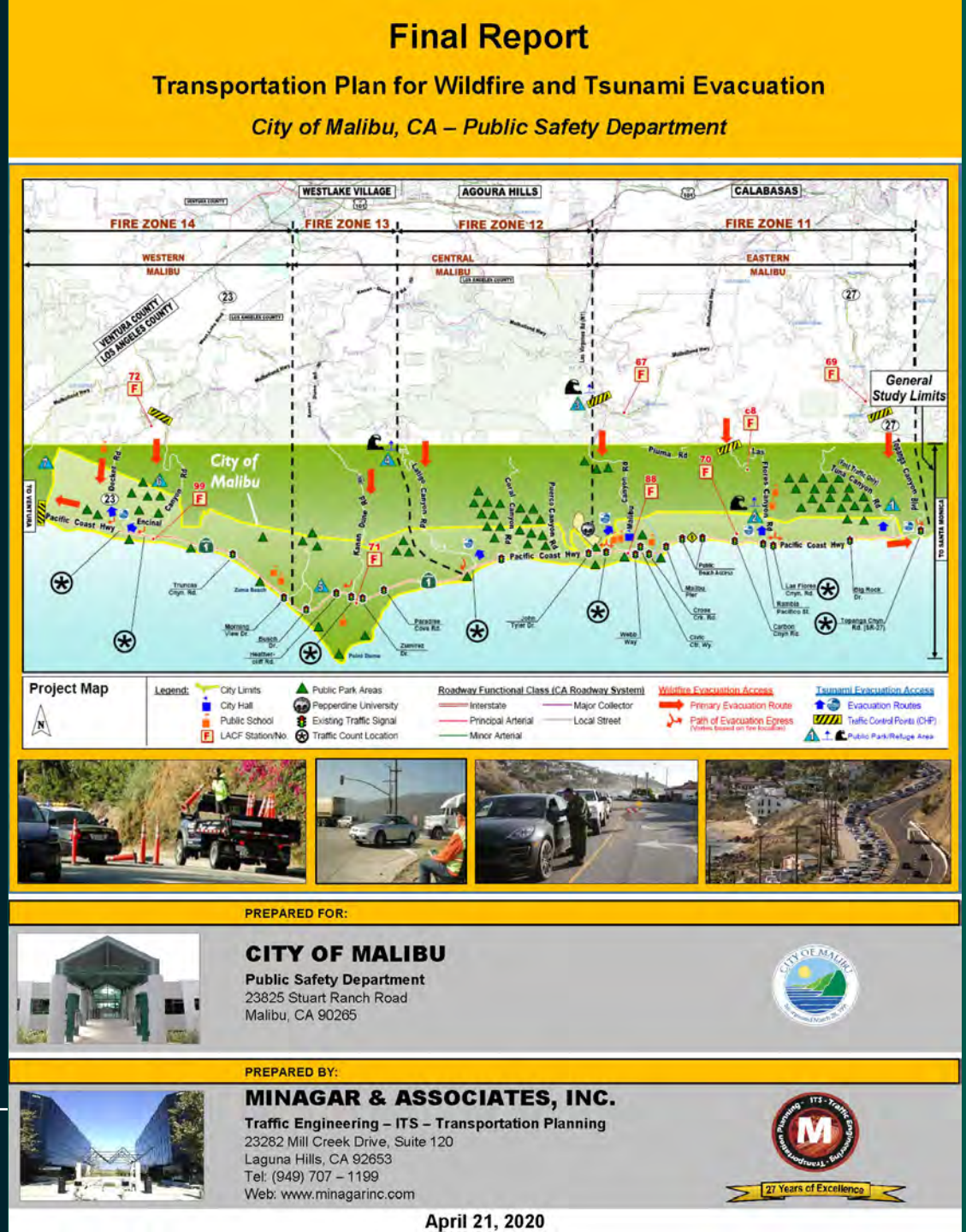
Appendix A: Review of Transportation Plan for Wildfire and Tsunami Evacuation

Fehr & Peers

Review of *Transportation Plan for Wildfire and Tsunami Evacuation*

City of Malibu

July 2025



Agenda

01 Background

02 Evacuation Map Overview

03 Study Intersections

04 Evacuation Scenarios

05 Strategies & Implementation

Background

Project initiated by **Malibu Public Safety Department** to develop citywide comprehensive mass evacuation plan for disasters, emergencies, and significant events.

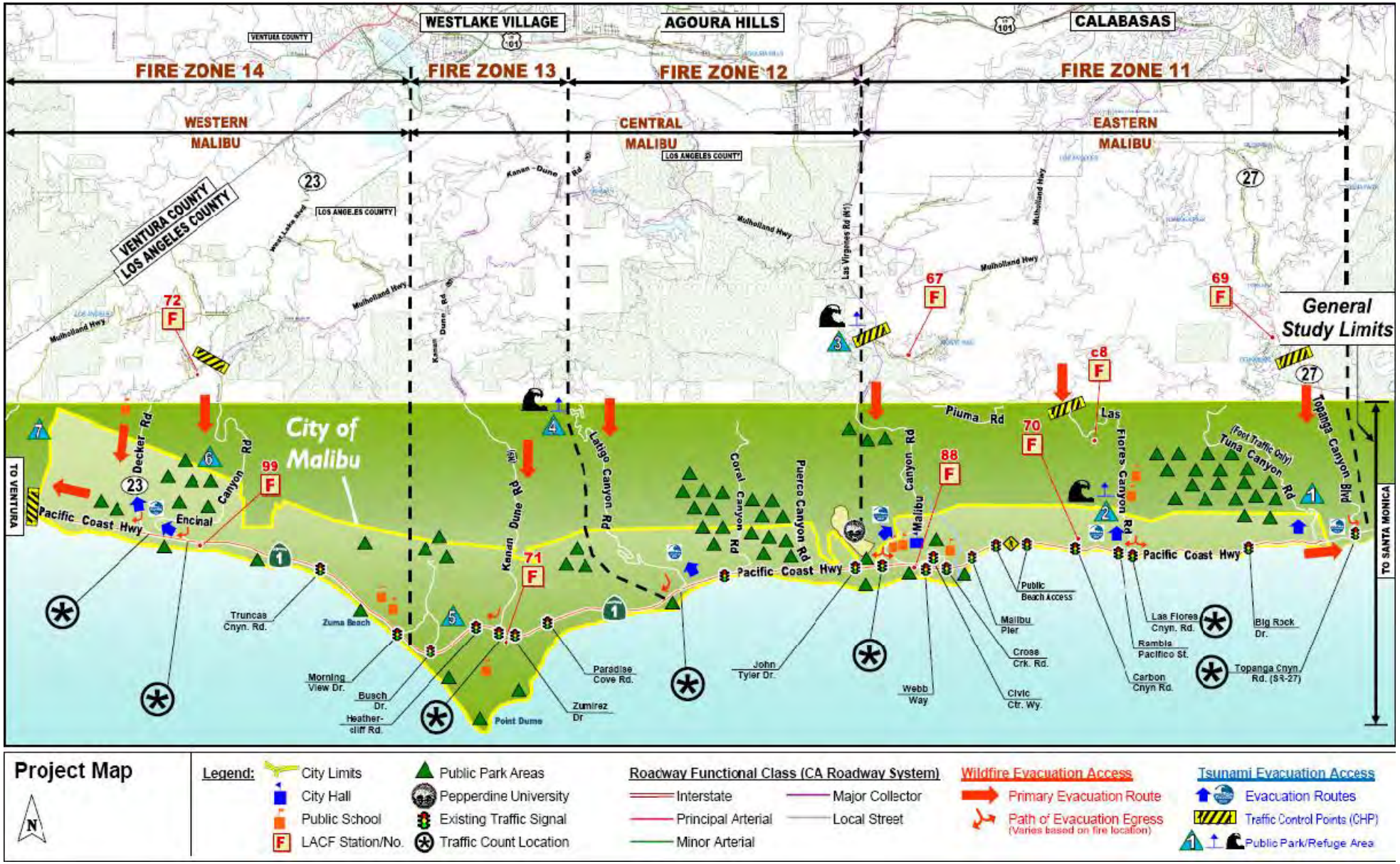
Project limits: City of Malibu

- 27 miles along south facing shore
- Approximately 13,000 residents

Prepared by Minagar & Associates, Inc. April 2020.

SECTION 02

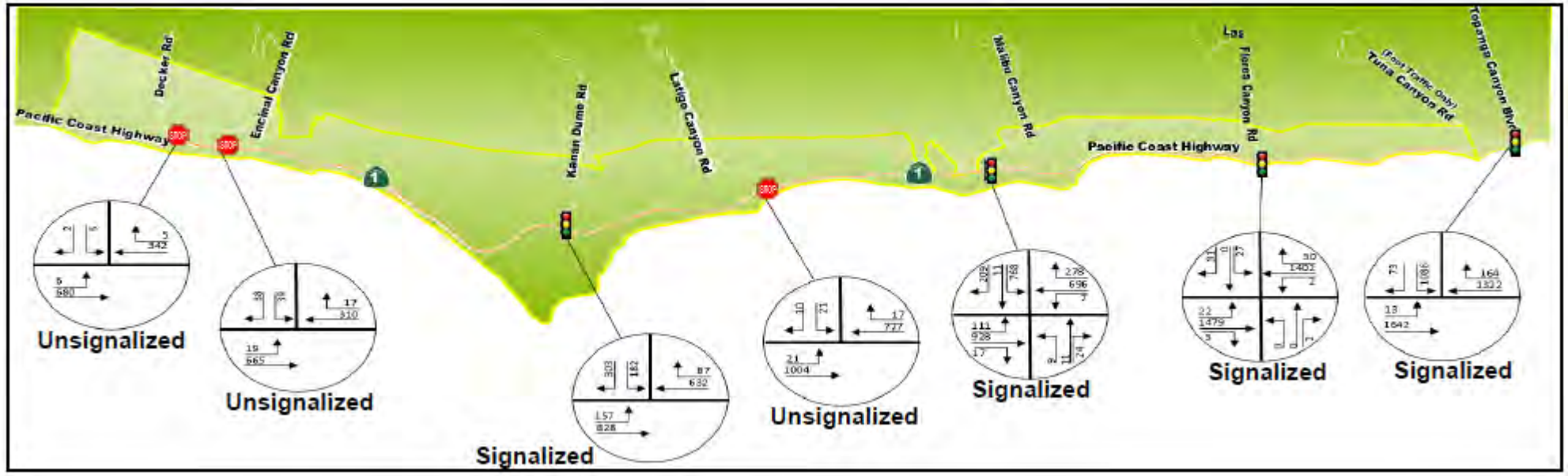
Evacuation Map Overview



Study Intersections

Primary evacuation routes: (via Pacific Coast Highway):

- Decker Road (SR 23, maintained by Caltrans)
- Encinal Canyon Road (city maintained)
- Kanan Dume Road (city maintained)
- Latigo Canyon Road (city maintained)
- Malibu Canyon Road (city maintained)
- Las Flores Canyon Road (city maintained)
- Topanga Canyon Road (SR 27, maintained by Caltrans)



SECTION 04

Evacuation Scenarios

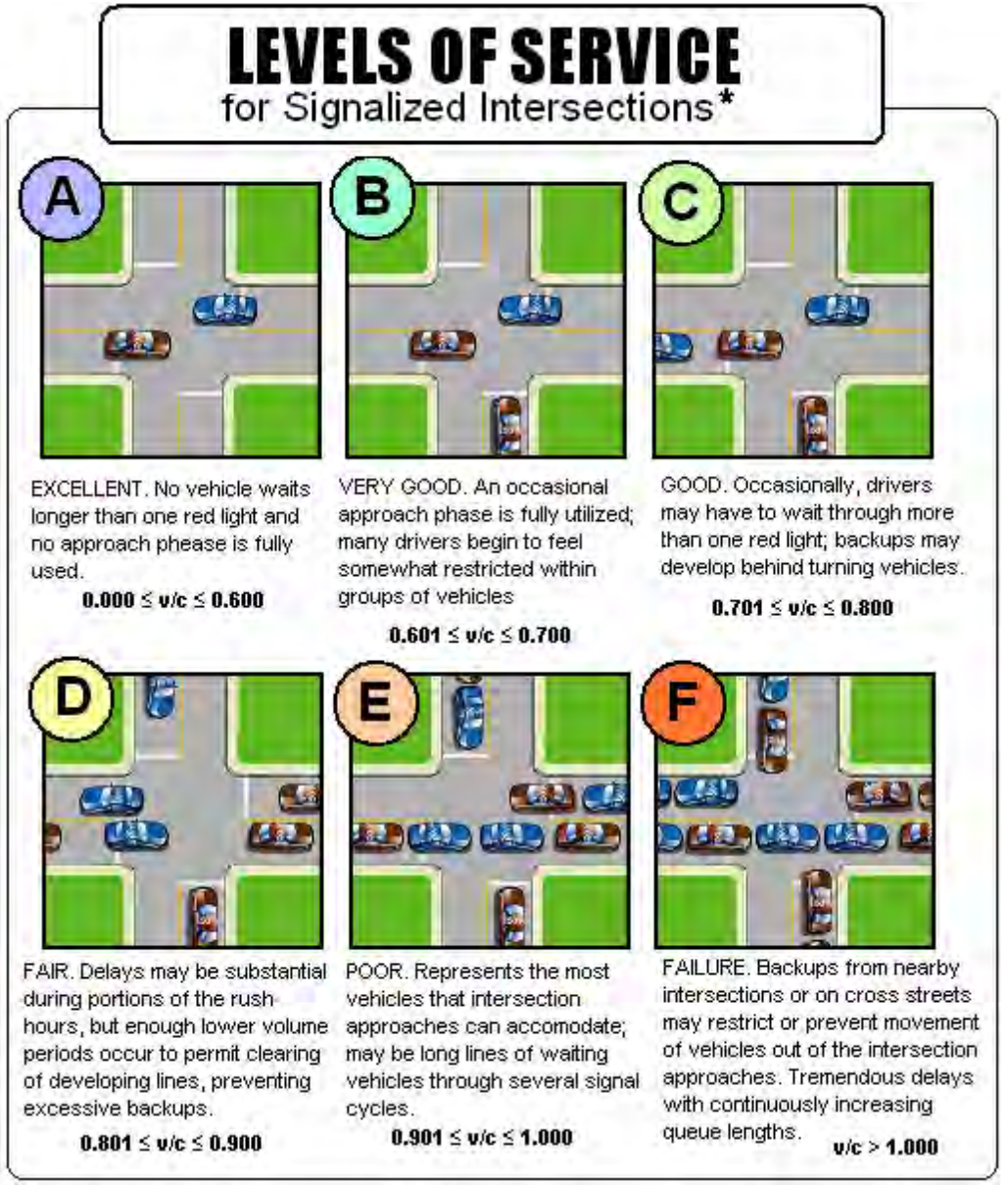
Evacuation Scenarios

Scenario #	Scenario
0	Existing Normal Conditions
1	Existing Maximized Conditions
2	Wildfire within Western & Central Malibu (Fire Zones 14, 12 & 13)
3	Wildfire within Western Malibu (Fire Zone 14) Excluding Central Malibu (Fire Zones 12 & 13)
4	Wildfire within Eastern (Fire Zone 11) including Central Malibu (Fire Zones 12 & 13)
5	Wildfire within Eastern (Fire Zone 11) Excluding Central Malibu (Fire Zones 12 & 13)
6	Wildfire Citywide (Fire Zones 11, 12, 13, & 14)
7	Tsunami Citywide (Within Los Angeles County & CGS Tsunami Inundation Areas 2-24 and Fire Zones 11, 12, 13 & 14)

Methodology: LOS and Delay (Synchro)

For the City of Malibu, **an unacceptable LOS is considered LOS D or worse**, however this would only apply to the analysis of existing conditions.

LOS	Average Delay (seconds per vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	> 50	> 80



Scenario 0: Existing Normal Conditions

LOS Summary for Existing Normal AM Peak Hour at Each Evacuation Route Intersection

Street Name Intersecting PCH		Intersection LOS	Delay Value (sec/veh)	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)
Las Flores Canyon Rd		A	6.6	N/A*	N/A
Malibu Canyon Rd		D	43.2	N/A	N/A
Latigo Canyon Rd		A	0.7	D	33.5
Kanan Dume Rd		C	23.2	N/A	N/A
Encinal Canyon Rd A		A	0.9	B	11.3
Decker Canyon Rd		A	0.1	B	11.1
Topanga Canyon Blvd		E	74.2	N/A	N/A

 Signalized Intersection

 Stop Controlled Approach/Intersection

*N/A: Not Applicable

Scenario 0: Existing Normal Conditions

LOS Summary for Existing Normal MD Peak Hour at Each Evacuation Route Intersection

Street Name Intersecting PCH		Intersection LOS	Delay Value (sec/veh)	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)
Las Flores Canyon Rd		A	9.9	N/A*	N/A
Malibu Canyon Rd		C	27.2	N/A	N/A
Latigo Canyon Rd		A	2.4	F	94
Kanan Dume Rd		C	25.1	N/A	N/A
Encinal Canyon Rd A		A	1.1	B	14.3
Decker Canyon Rd		A	0.3	B	13.1
Topanga Canyon Blvd		C	27.3	N/A	N/A

 Signalized Intersection

 Stop Controlled Approach/Intersection

*N/A: Not Applicable

Scenario 0: Existing Normal Conditions

LOS Summary for Existing Normal PM Peak Hour at Each Evacuation Route Intersection

Street Name Intersecting PCH		Intersection LOS	Delay Value (sec/veh)	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)
Las Flores Canyon Rd		B	11.8	N/A*	N/A
Malibu Canyon Rd		C	31	N/A	N/A
Latigo Canyon Rd		A	1.8	F	104.8
Kanan Dume Rd		D	39.5	N/A	N/A
Encinal Canyon Rd A		A	1	C	17.6
Decker Canyon Rd		A	0.3	C	18.9
Topanga Canyon Blvd		D	39.2	N/A	N/A

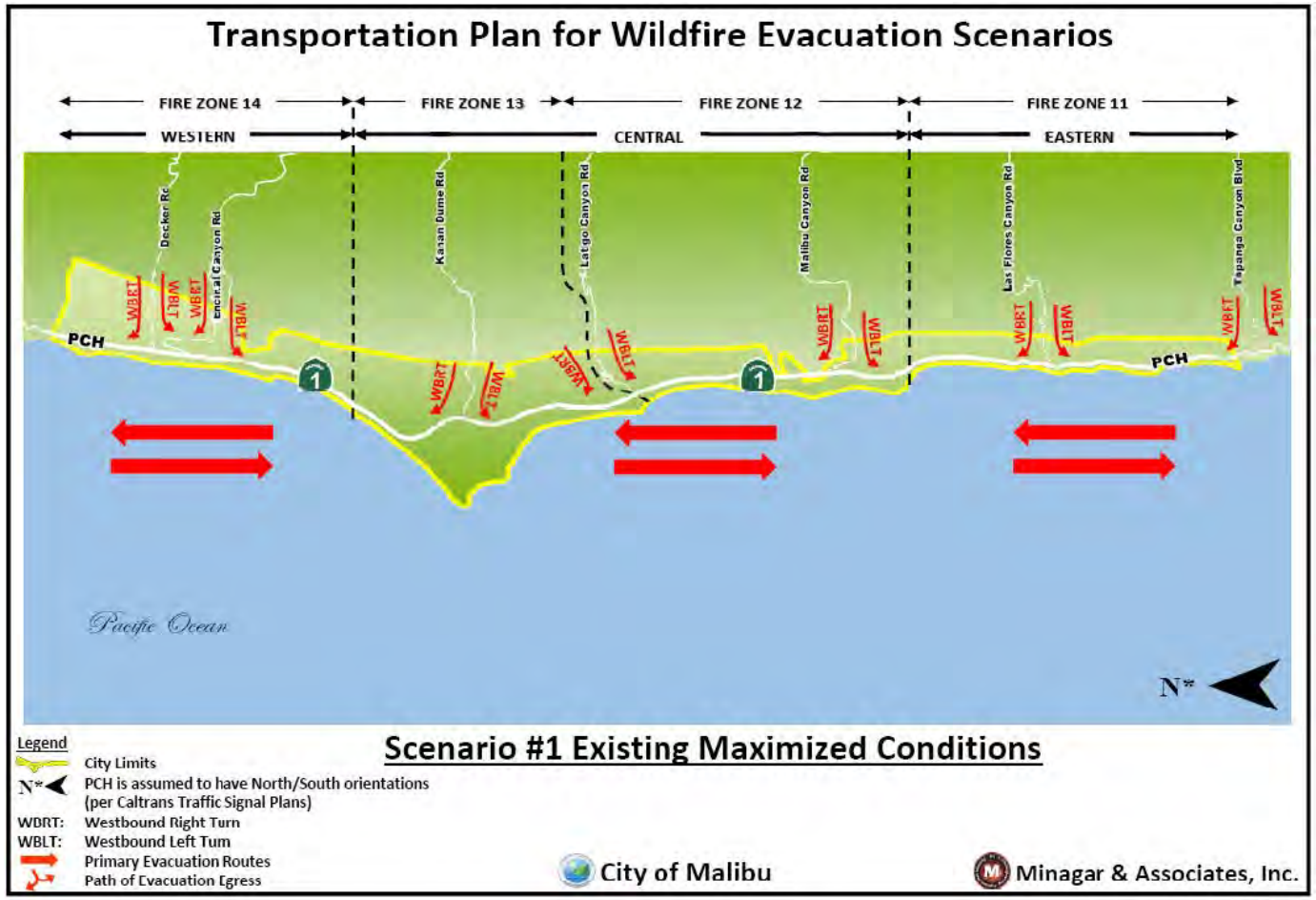
 Signalized Intersection

 Stop Controlled Approach/Intersection

*N/A: Not Applicable

Scenario 1: Existing Maximized Conditions

Based on existing counts, maximized Hourly Traffic Volume at each turning movement.



1- PCH at Decker Canyon (unsignalized) PCH (E/W)

Segment	TOD	Analysis Direction	Segment Limits		Cycle Length	Volumes											
			North -South	East-West		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	AM	NB,SB,WB	PCH	Decker Canyon	-	0	0	0	5	0	2	0	342	5	6	680	0
1	MD	NB,SB,WB	PCH	Decker Canyon	-	0	0	0	11	0	8	0	566	9	5	558	0
1	PM	NB,SB,WB	PCH	Decker Canyon	-	0	0	0	12	0	4	0	958	12	14	448	0
1	EVAC	NB,SB,WB	PCH	Decker Canyon	-	-	-	-	12	-	8	-	958	12	14	680	-

Scenario 1: Existing Maximized Conditions

LOS Summary for Existing Maximized Conditions at Each Evacuation Route Intersection

Street Name Intersecting PCH		Intersection LOS	Delay Value (sec/veh)	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)
Las Flores Canyon Rd		B	12.4	N/A*	N/A
Malibu Canyon Rd		D	45.1	N/A	N/A
Latigo Canyon Rd		A	4.4	F	196.9
Kanan Dume Rd		D	36.8	N/A	N/A
Encinal Canyon Rd A		A	1.1	C	20.1
Decker Canyon Rd		A	0.4	B	11.9
Topanga Canyon Blvd		F	140.1	N/A	N/A

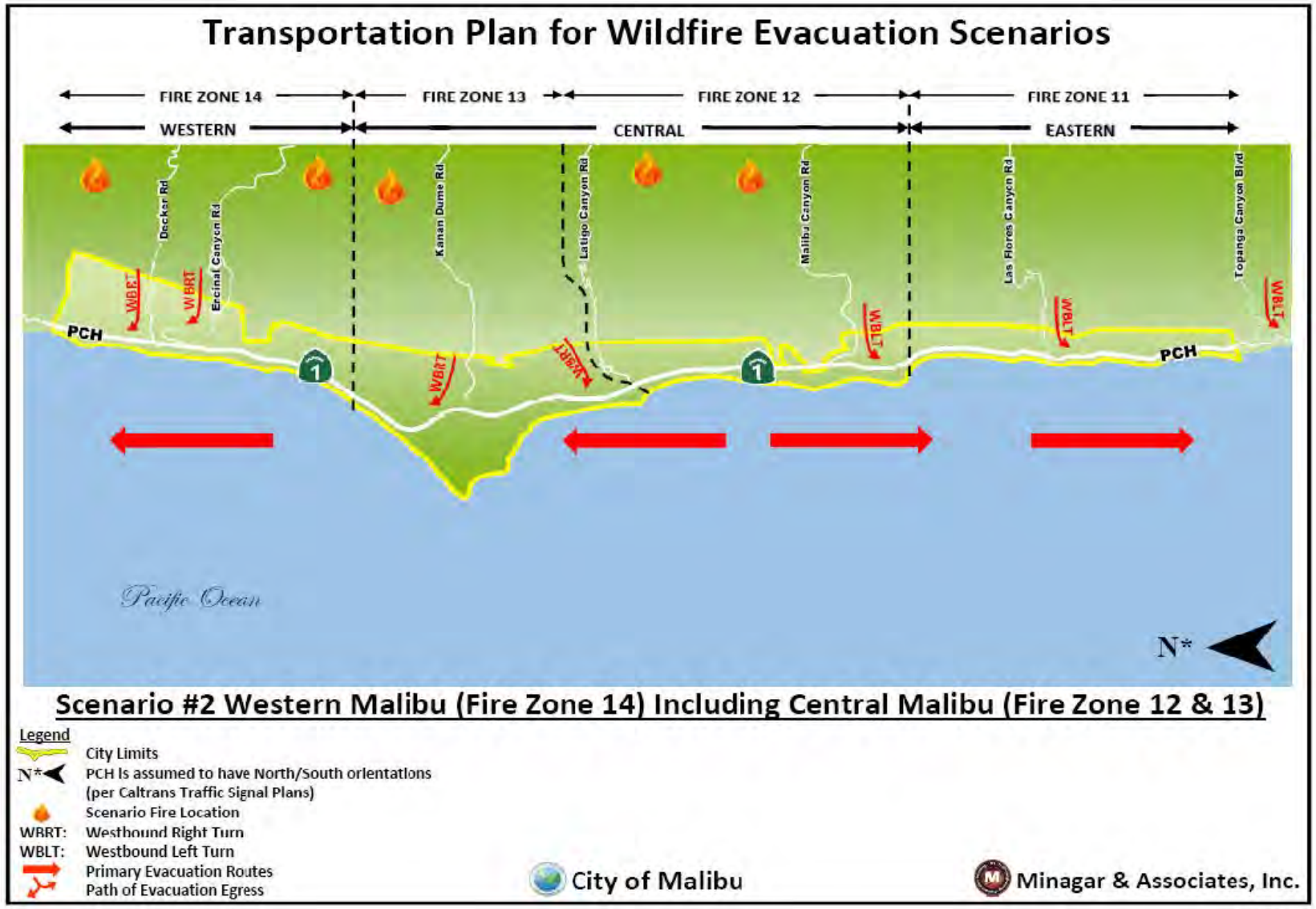
 Signalized Intersection

 Stop Controlled Approach/Intersection

*N/A: Not Applicable

Scenario 2: Wildfire within Western & Central Malibu (Fire Zones 14, 12 & 13)

Red arrow – Permitted movement:
4 intersections right turn only;
3 left turn only.



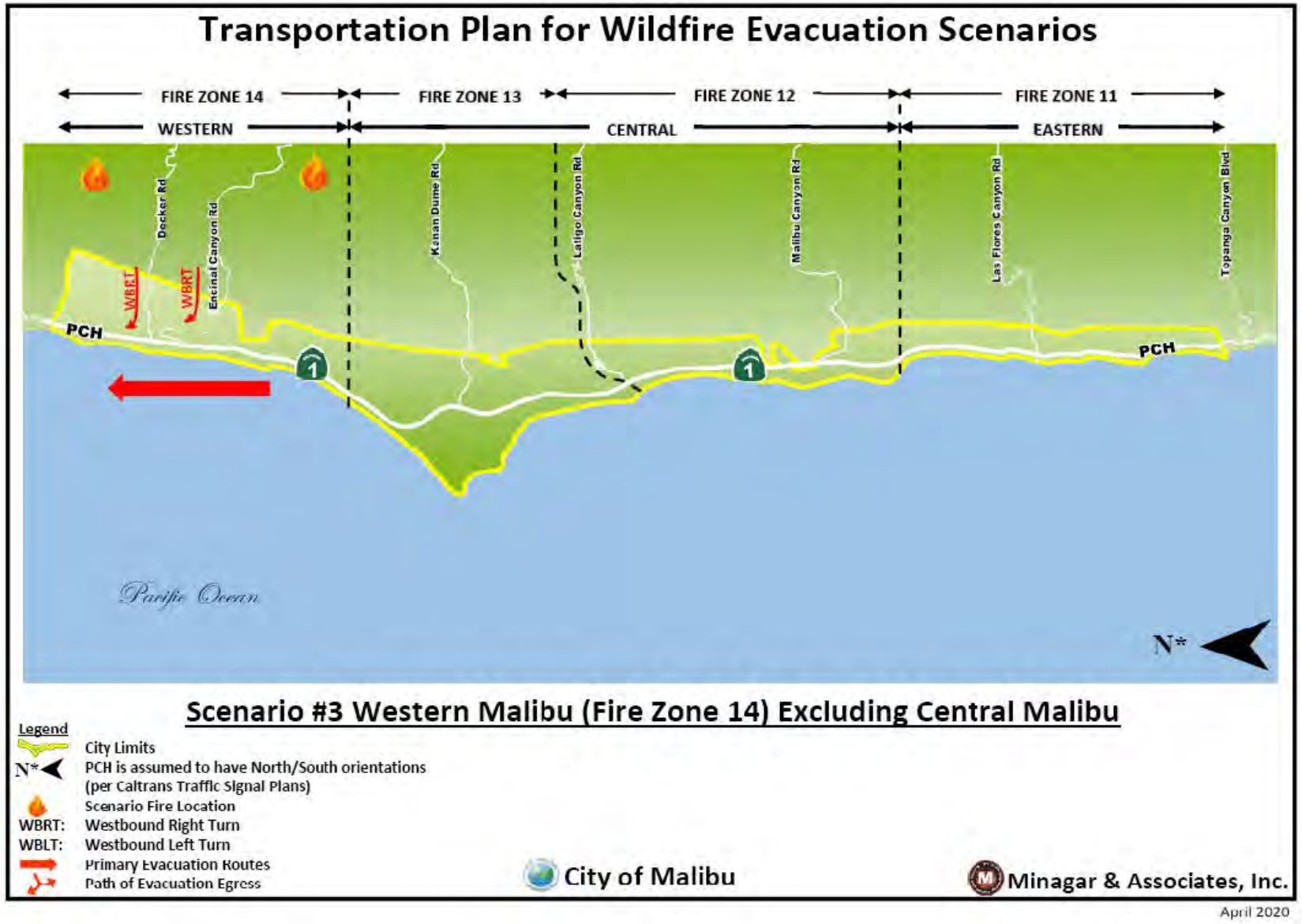
Scenario 2: Wildfire within Western & Central Malibu (Fire Zones 14, 12 & 13)

LOS Summary at Each Evacuation Route Intersection *(& compared with Scenario 1)*

Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	*Delay Value Change (sec/veh)*	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)	*Delay Value Change (sec/veh)*
Las Flores Canyon Rd	A	6.1	*-6.3*	N/A*	N/A	*N/A*
Malibu Canyon Rd	F	94.7	*+49.6*	N/A	N/A	*N/A*
Latigo Canyon Rd	A	0.4	*-4*	C	17.7	*-179.2*
Kanan Dume Rd	E	59.6	*+22.8*	N/A	N/A	*N/A*
Encinal Canyon Rd	A	0.7	*+0.4*	B	13.6	*-6.5*
Decker Canyon Rd	A	0.2	*-0.2*	A	9.5	*-2.4*
Topanga Canyon Blvd	F	603.9	*+463.8*	N/A	N/A	*N/A*

Signalized Intersection Stop Controlled Approach/Intersection *N/A: Not Applicable

Scenario 3: Wildfire within Western Malibu (Fire Zone 14) Excluding Central Malibu (Fire Zones 12 & 13)



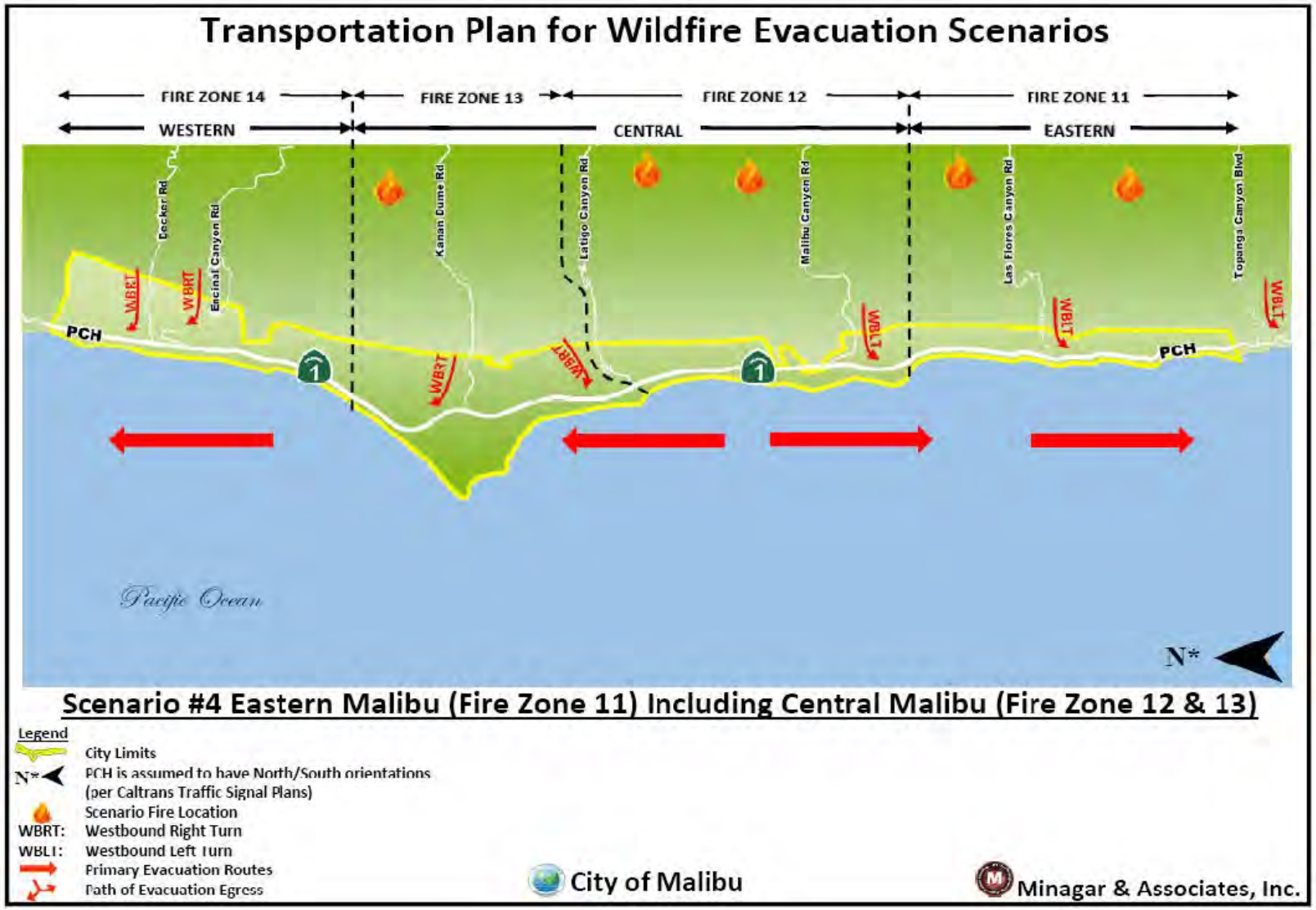
Scenario 3: Wildfire within Western Malibu (Fire Zone 14) Excluding Central Malibu (Fire Zones 12 & 13)

LOS Summary at Each Evacuation Route Intersection *(& compared with Scenario 1)*

Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	*Delay Value Change (sec/veh)*	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)	*Delay Value Change (sec/veh)*
Las Flores Canyon Rd	N/A*	N/A	*N/A*	N/A	N/A	*N/A*
Malibu Canyon Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Latigo Canyon Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Kanan Dume Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Encinal Canyon Rd	A	0.7	*-0.4*	B	13.6	*-6.5*
Decker Canyon Rd	A	0.2	*-0.2*	A	9.5	*-2.4*
Topanga Canyon Blvd	N/A	N/A	*N/A*	N/A	N/A	*N/A*

Signalized Intersection Stop Controlled Approach/Intersection *N/A: Not Applicable

Scenario 4: Wildfire within Eastern (Fire Zone 11) including Central Malibu (Fire Zones 12 & 13)



April 2020

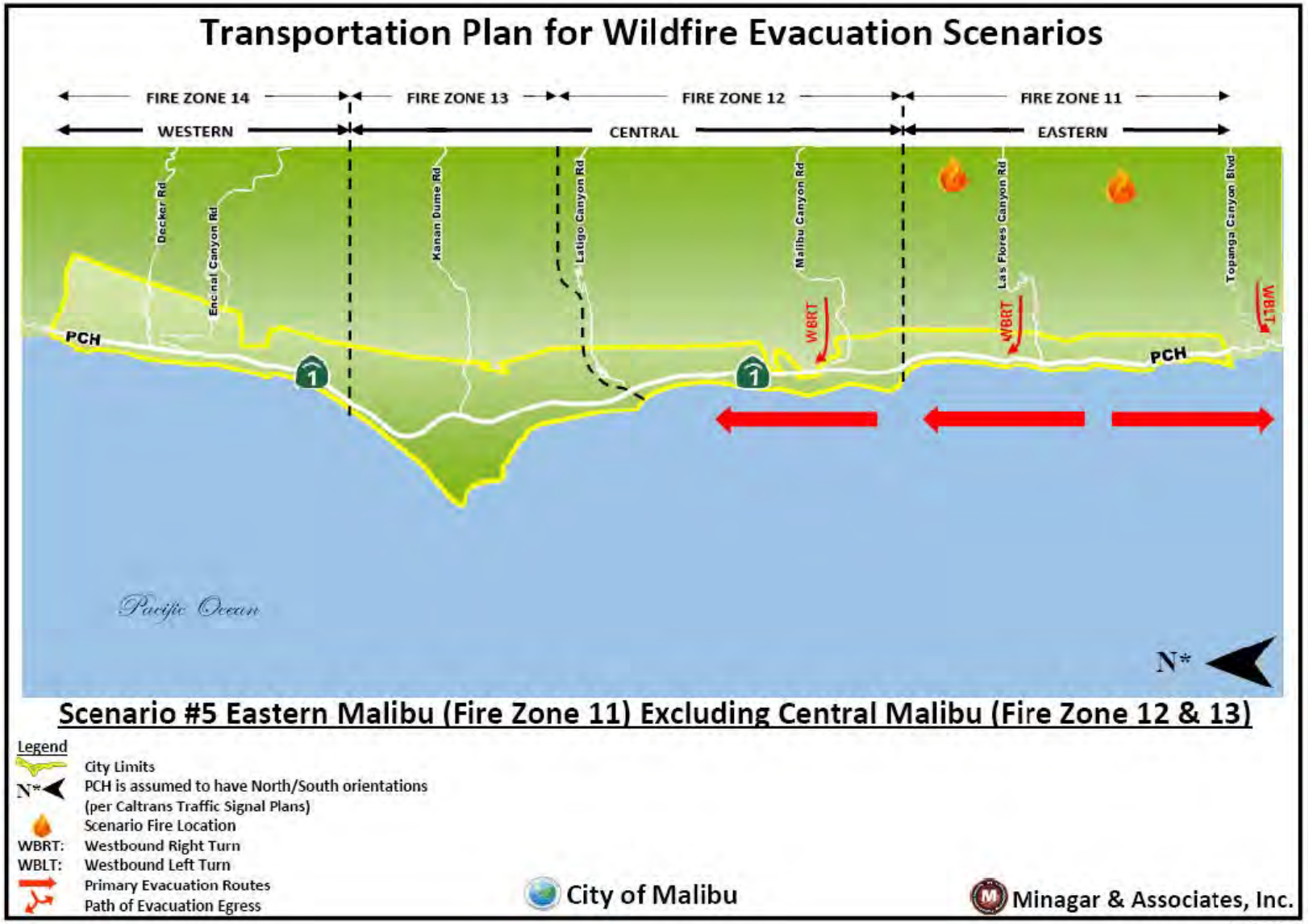
Scenario 4: Wildfire within Eastern (Fire Zone 11) including Central Malibu (Fire Zones 12 & 13)

LOS Summary at Each Evacuation Route Intersection *(& compared with Scenario 1)*

Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	*Delay Value Change (sec/veh)*	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)	*Delay Value Change (sec/veh)*
Las Flores Canyon Rd	A	6.1	*-6.3*	N/A*	N/A	*N/A*
Malibu Canyon Rd	F	94.7	*+49.6*	N/A	N/A	*N/A*
Latigo Canyon Rd	A	0.4	*-4*	C	17.7	*-179.2*
Kanan Dume Rd	F	95.8	*+59*	N/A	N/A	*N/A*
Encinal Canyon Rd	A	0.7	*-0.4*	B	13.6	*-6.5*
Decker Canyon Rd	A	0.2	*-0.2*	A	9.5	*-2.4*
Topanga Canyon Blvd	F	603.9	*+463.8*	N/A	N/A	*N/A*

Signalized Intersection Stop Controlled Approach/Intersection *N/A: Not Applicable

Scenario 5: Wildfire within Eastern (Fire Zone 11) Excluding Central Malibu (Fire Zones 12 & 13)



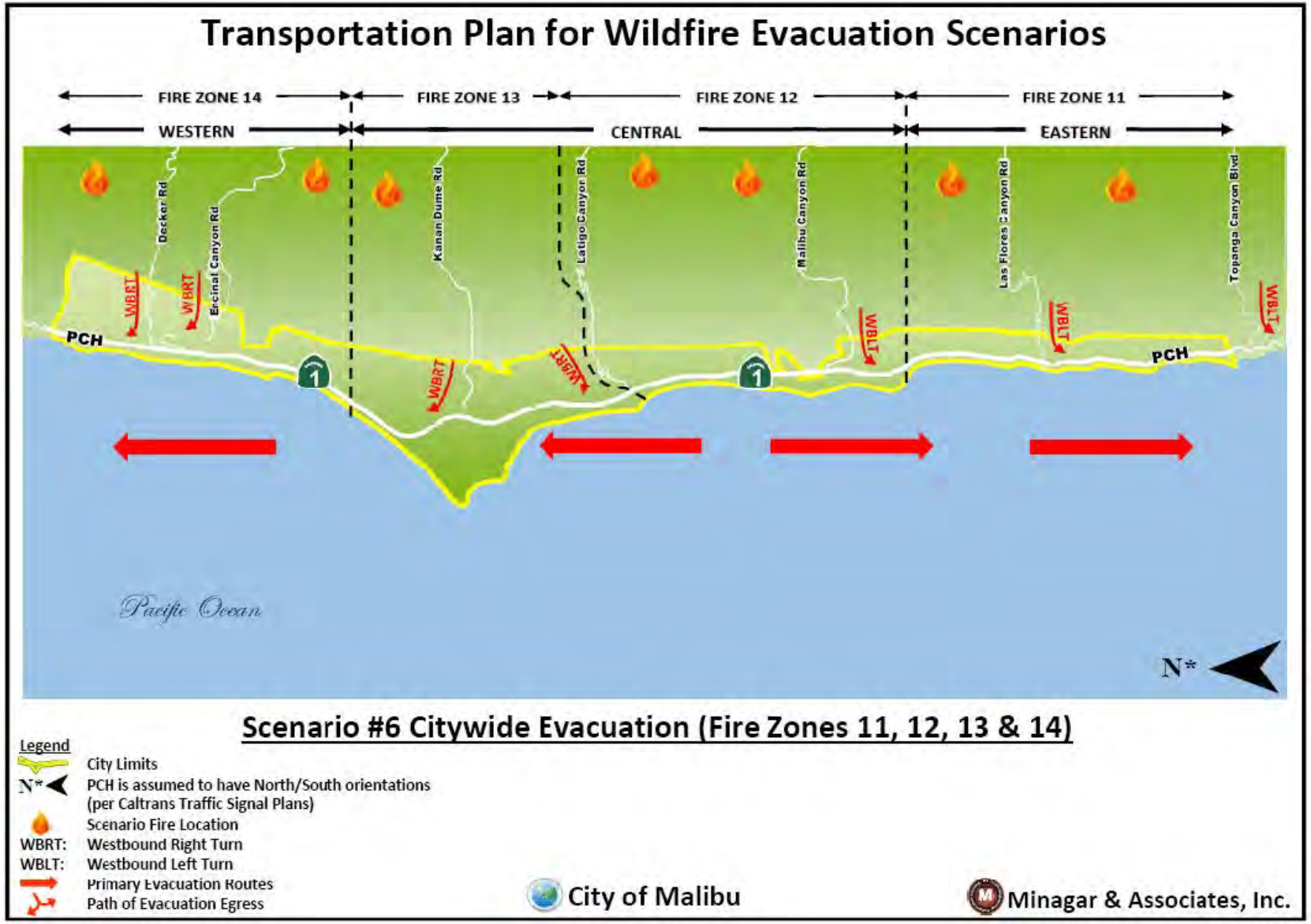
Scenario 5: Wildfire within Eastern (Fire Zone 11) Excluding Central Malibu (Fire Zones 12 & 13)

LOS Summary at Each Evacuation Route Intersection *(& compared with Scenario 1)*

Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	*Delay Value Change (sec/veh)*	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)	*Delay Value Change (sec/veh)*
Las Flores Canyon Rd	B	12.4	*0*	N/A*	N/A	*N/A*
Malibu Canyon Rd	F	94.7	*+49.6*	N/A	N/A	*N/A*
Latigo Canyon Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Kanan Dume Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Encinal Canyon Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Decker Canyon Rd	N/A	N/A	*N/A*	N/A	N/A	*N/A*
Topanga Canyon Blvd	F	603.9	*+493.8*	N/A	N/A	*N/A*

Signalized Intersection Stop Controlled Approach/Intersection *N/A: Not Applicable

Scenario 6: Wildfire Citywide (Fire Zones 11, 12, 13, & 14)



Scenario 6: Wildfire Citywide (Fire Zones 11, 12, 13, & 14)

LOS Summary at Each Evacuation Route Intersection

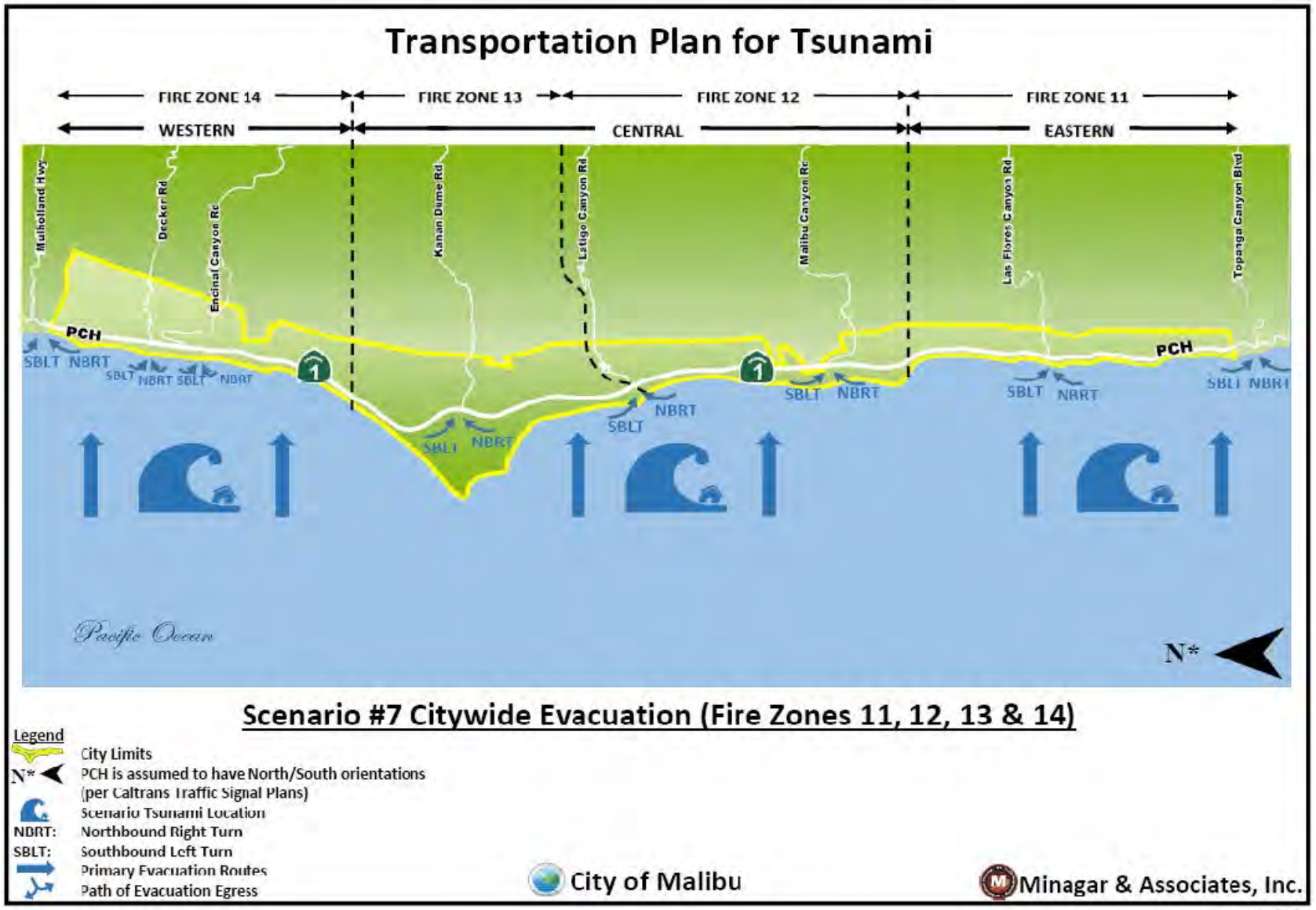
Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	Delay Value Change (sec/veh)	STOP Controlled Approach LOS	STOP Controlled Approach Delay Value (sec/veh)	Delay Value Change (sec/veh)
Las Flores Canyon Rd	A	6.1	-6.3	N/A*	N/A	N/A
Malibu Canyon Rd	F	94.7	+49.6	N/A	N/A	N/A
Latigo Canyon Rd	A	0.4	-4	C	17.7	-179.2
Kanan Dume Rd	F	95.8	+59	N/A	N/A	N/A
Encinal Canyon Rd	A	0.7	-0.4	B	13.6	-6.5
Decker Canyon Rd	A	0.2	-0.2	A	9.5	-2.4
Topanga Canyon Blvd	F	603.9	+463.8	N/A	N/A	N/A

Signalized Intersection

Stop Controlled Approach/Intersection

*N/A: Not Applicable

Scenario 7: Tsunami Citywide (Within Los Angeles County & CGS Tsunami Inundation Areas 2-24 and Fire Zones 11, 12, 13 & 14)



Scenario 7: Tsunami Citywide (Within Los Angeles County & CGS Tsunami Inundation Areas 2–24 and Fire Zones 11, 12, 13 & 14)

LOS Summary at Each Evacuation Route Intersection

Street Name Intersecting PCH	Intersection LOS	Delay Value (sec/veh)	Delay Value Change (sec/veh)
Las Flores Canyon Rd	F	754.2	+741.8
Malibu Canyon Rd	F	684.7	+639.6
Latigo Canyon Rd	F	431.1	+426.7
Kanan Dume Rd	F	698.7	+661.9
Encinal Canyon Rd	D	45.9	+44.8
Decker Canyon Rd	A	8.9	+8.5
Topanga Canyon Blvd	F	1932.0	+1791.9

Signalized Intersection Stop Controlled Approach/Intersection *N/A: Not Applicable

SECTION 05

Strategies & Implementation

Short Term Recommendations

- Depending upon the location of wildfire or tsunami, utilize the recommended Transportation Plan Evacuation Scenarios #2 thru #6 or Scenario #7 respectively.
- Utilize the 2019 14th Edition of the Work Area Traffic Control Handbook (WATCHBOOK) and 2016 Field Guide for Temporary Traffic Control.
- Purchase Additional Changeable/Dynamic Message Signs (CMS/DMS), Trailblazers and Traffic Incident Management Area Signs

Mid-Range Recommendations

- Depending upon the location of wildfire or tsunami, utilize the recommended Transportation Plan Evacuation Scenarios #2 thru #6 or Scenario #7 respectively.
- Harden or Implement Protection Systems for the Critical Infrastructure to prevent Roadway Debris.
- Re-analyze and Re-optimize the Traffic Signals along Pacific Coast Highway.

Long Term Recommendations

- Widen Pacific Coast Highway via more reversible directional lanes with overhead changeable directional signals

- Expand Approach Capacity of Key Intersections.
  - Under EX conditions, two exclusive left turn lanes and one exclusive right turn lanes on Malibu Canyon Road and Kannan Dume Road.
  - Scenario #2, 4, 5, and 6 require either Kanan Dume Road and/or Malibu Canyon Road (#5 only) or to be restricted to right turns only, **where one of the left turn lanes can be changed to a temporary right turn lane** to increase volume flow.

CITY OF MALIBU

CLIMATE VULNERABILITY ASSESSMENT

Prepared for

City of Malibu

Prepared by

Atlas Planning Solutions

September 24, 2025

ATTACHMENT 5

This document includes the following chapters:

Chapter 1 – Introduction

This chapter describes climate adaptation planning and the applicable State requirements as they relate to this Vulnerability Assessment.

Chapter 2 – Community Profile

This chapter provides a description of the City of Malibu's general environment and demographics. Special emphasis is made to discuss climate vulnerable populations.

Chapter 3 – Vulnerability Assessment

This chapter includes forecasts of each of the five climate-related hazards. It also shows where those hazards are most likely to affect the City of Malibu, and which areas are most vulnerable to these changes.

This chapter also evaluates the City's current capacity to address the five climate-related hazards. This includes an assessment of the City's current policies and programs and how they address the ability to respond to hazard events.

Chapter 4 – Vulnerability Evaluation

This chapter evaluates the exposure, sensitivity, and adaptive capacity of each hazard to identify the level of vulnerability.

The City of Malibu Climate Vulnerability Assessment is intended to inform the community about climate hazard exposure, sensitivity, and capacity to adapt to projected changes to the climate. The data collected and analyzed within this assessment represent a snapshot in time as of the date of this document and should be used as a guide, not a final determinant. Data collected from external, publicly available sources will have varying degrees of uncertainty and may contain some nonconformities, defects, inaccuracies, or errors that existed from the primary source. Although reasonable effort is made to present accurate information, the City of Malibu makes no guarantee or warranty with respect to the information provided. The City, its employees, officers, content providers, affiliates, or other representatives are not liable for damages of any kind (including, without limitation, lost profits, direct, indirect, compensatory, consequential, exemplary, special, incidental, or punitive damages) arising out of your use of, your inability to use, or the content of this document, whether or not we have been advised of the possibility of such damages.

CONTENTS

EXECUTIVE SUMMARY

The City of Malibu (City) recognizes that climate conditions are changing and will have profound effects on the community, ecosystem, and economy. Climate change may be a global phenomenon, but the impacts are felt locally. If greenhouse gas emissions continue at current levels globally, the City's average annual minimum temperatures are expected to warm by 4-5° F by the end of the century, potentially leading to extreme heat events and drought and exacerbating wildfire conditions.

The City's climate vulnerabilities were evaluated as part of the 2023 Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan, 2021 Malibu Community Wildfire Protection Plan, the 2021 Los Angeles County Climate Vulnerability Assessment, and the 2023 Malibu Coastal Hazard Vulnerability Assessment. As the Coastal Hazard Vulnerability Assessment was not complete when performing this Vulnerability Assessment, only the Hazard Mitigation Plan, Wildfire Protection Plan and LA County Climate Vulnerability Assessment data and analyses are incorporated herein. Collectively, the three documents evaluate climate focused and natural hazards that inform the overall vulnerability and adaptative capacity of the City. The City recognizes that the hazards influenced by climate change will not affect all residents and assets equally, as vulnerability depends on existing stressors, potential climate impacts, and existing adaptive capacity. In creating this assessment and adaptation framework, the existing exposure and adaptive capacity were considered in evaluating climate vulnerability.

This Vulnerability Assessment addresses relevant natural hazards for the City influenced by a changing climate and includes extreme heat events, drought, wildfire and smoke, flooding, landslides and liquefaction.

The vulnerability assessment revealed the following hazards have, and will continue, to impact the region:

- Wildfire risk affecting wildlife, natural areas, recreation, and public health
- Flooding that exacerbates landslides potentially displacing residents, damaging critical infrastructure, and disrupting the economy
- Intermittent drought that limits water supply and can exacerbate wildfire and landslide conditions

Additionally, all climate-induced hazards have the potential to:

- Risk lives, property, and homes
- Increase mental health impacts and associated trauma
- Overburden emergency services
- Overburdened infrastructure (e.g., electrical blackouts and damage to electrical infrastructure)
- Increase utility and insurance costs
- Overburdened non-profit organizations from the increasing demand for services
- Limit outdoor recreation, potentially lowering revenue from tourism
- Damage trails, forests, wetlands, and meadows

Preparing for the impacts of climate change requires significant investment in time and resources across the region, including emergency services, infrastructure improvements, and expanded social

and environmental programs. New, bold, and adaptable approaches to how people live, move, and manage vital resources are needed. Assessing climate vulnerabilities and developing an adaptation framework is the first step towards greater climate resilience for the City of Malibu.

CHAPTER 1. INTRODUCTION

According to the State of California's Legislative Analyst's Office:

"Addressing the widespread impacts of climate change represents a significant challenge for the State. A changing climate presents California with five key climate hazards: (1) higher temperatures and extreme heat events, (2) more severe wildfires, (3) more frequent and intense droughts, (4) flooding due to extreme precipitation events, and (5) coastal flooding and erosion from sea-level rise. These hazards will threaten public health, safety, and well-being—including from life-threatening events, damage to public and private property and infrastructure, and impaired natural resources."[1]

To address the potential impacts from these hazardous events on the community, the City of Malibu is expanding upon its climate action and hazard mitigation planning efforts to: 1) focus on climate change adaptation by understanding the City's vulnerabilities to climate hazards; and 2) explore strategies to reduce the vulnerability to projected climate change effects, increase the local capacity to adapt, and build resilience.

Note the data, policies, guidance, and regulations discussed herein may become out of date over time as climate change and hazard data is updated and new policies, guidance, and regulations pertaining to climate change hazards are released.

Regulatory Drivers and Guidance for Climate Adaptation Planning

The report includes a Climate Vulnerability Assessment, which will be incorporated into the City's General Plan Safety Element, in compliance with SB 379, Government Code section 65302(g)(4)[2] and the California Governor's Office of Land Use and Climate Innovation General Plan Guidelines. According to SB 379, General Plan Safety Elements must address climate change vulnerability, adaptation strategies, and emergency response strategies. SB 379 states:

"This bill would, upon the next revision of a local hazard mitigation plan on or after January 1, 2017, or, if the local jurisdiction has not adopted a local hazard mitigation plan, beginning on or before January 1, 2022, require the Safety Element to be reviewed and updated as necessary to address climate adaptation and resiliency strategies applicable to that County or county. The bill would require the update to include a set of goals, policies, and objectives based on a Vulnerability Assessment, identifying the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts, and specified information from federal, State, regional, and local agencies."

As specified in Government Code section 65302(g)(4)(A) Vulnerability Assessments must identify the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts, utilizing federal, state, regional, and local climate vulnerability documentation such as the California Adaptation Planning Guide and the Cal-Adapt climate tool created by the California Energy Commission (CEC) and University of California, Berkeley Geospatial Innovation Facility. Other sources of information include data from local agencies regarding their adaptive capacity and historical data on natural events and hazards. Per Government Code section 65302(g)(4)(B), adaptation policies,

[1] Legislative Analyst's Office (LAO). 2022. Budget and Policy Post. Climate Change Impacts Across California Crosscutting Issues. April 5, 2022. https://lao.ca.gov/Publications/Report/4575. Accessed April 11, 2022.

[2] SB 379 was enacted to integrate climate change adaptation into California's general plan process.

goals, and objectives are to be developed based on findings from the Vulnerability Assessment. Additionally, Government Code section 65302(g)(4)(C) requires jurisdictions to create a set of feasible implementation measures to reduce climate change impacts on new or proposed land uses.

AB 162 (2007) Gov Code 65302(g)(2)

AB 162 requires that, upon the next revision of the housing element on or after January 1, 2009, cities and counties address flood hazards and safety in the land use, conservation, safety, and housing elements of their general plans.

SB 1241 (2012) Gov Code 65302(g)(3)

SB 1241 revised the Safety Element requirements to require all cities and counties whose planning area is within the State responsibility area (SRA) or very high fire hazard severity zones (VHFHSZs), as defined by California Department of Forestry and Fire Protection (CAL FIRE), to address and incorporate specific information regarding wildfire hazards and risk, and policies and programs to address and reduce unreasonable risks associated with wildfire. Upon the next revision of the Housing Element on or after January 1, 2014, the bill requires those cities and counties to review and update the Safety Element to consider the advice in the Office of Land Use and Climate Innovation's most recent publication of "Fire Hazard Planning, General Plan Technical Advice Series" as well as: information regarding fire hazards, a set of goals, policies, and objectives based on identified fire hazards, and a set of feasible implementation measures designed to carry out those goals, policies, and objectives.

SB 1000 (2016) Gov Code 65302(h)

SB 1000 stipulates those cities and counties with Disadvantaged Communities, as defined by SB 1000 in Government Code Section 65302(h), incorporate environmental justice policies in their general plans through either a stand-alone element, or by integrating relevant goals, policies, and objectives throughout other elements. The bill requires cities and counties to identify Disadvantaged Communities (as defined in SB 1000), include policies and objectives to reduce unique or compounded health risks in Disadvantaged Communities, promote civic engagement in the public decision-making process, and address the needs of Disadvantaged Communities. Compliance with SB 1000 is triggered when two or more elements in a general plan are revised after January 1, 2018.

SB 1035 (2018) Gov Code 65302(g)(5)

SB 1035 requires regular updates to the Safety Element chapter of the General Plan. The latest information regarding flood and fire hazards must be included and climate change adaptation and resilience must be addressed as part of the update. After 2022, Safety Elements must be updated upon each revision of the housing element or local hazard mitigation plan, but no less often than once every 8 years. Housing element revisions are typically on 4–8-year cycles and LHMP revisions are on 5-year cycles.

SB 99 (2019) Gov Code 65302(g)(5)

SB 99 requires that, upon the next revision of the housing element on or after January 1, 2020, the Safety Element must be updated to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes (i.e., points of ingress and egress).

AB 747 (2019) Gov Code 65302.15

AB 747 requires that, upon the next revision of a LHMP on or after January 1, 2022, or beginning on or before January 1, 2022, if a local jurisdiction has not adopted a LHMP, the Safety Element must be reviewed and updated as necessary to identify evacuation routes and their Capacity, safety, and viability under a range of emergency scenarios. If an LHMP, emergency operations plan, or other document that fulfills commensurate goals and objectives, a local agency may use that information in the Safety Element to comply with this requirement by summarizing and incorporating by reference such a plan or other document into the Safety Element.

Consistent with Government Code 65302(g)(4)(A), the following Vulnerability Assessment and adaptation framework also takes guidance from:

California's Fourth Climate Assessment (2018)

California Natural Resources Agency (CNRA), OPR, and CEC prepared California's Fourth Climate Assessment in 2018. The Climate Assessment was designed to present findings in the context of existing climate science, including strategies to adapt to climate impacts and key research gaps needed to spur additional progress on safeguarding California from climate change.

Safeguarding California Plan (2018)

CNRA released an update to the Safeguarding California Plan in 2018, providing a roadmap for State government action to build climate resiliency. The Safeguarding California Plan presents overarching strategies and outlines ongoing actions and cost-effective and achievable next steps to make California more resilient to climate change.

Ocean Protection Council State Sea Level Rise Guidance (2024)

Between 2017 and 2024, the Ocean Protection Council (OPC) released three reports that update their understanding of sea level rise science and best practices for planning and addressing anticipated impacts. The reports synthesize recent evolving research on sea level rise science and provide higher level recommendations for how to plan for and address sea level rise impacts, notably including a set of projections recommended for use in planning, permitting, investment, and other decisions.[3]

California Coastal Commission Sea Level Rise Policy Guidance (2024)

The Coastal Commission's Sea Level Rise Policy Guidance provides an overview of the best available science on sea level rise for California (i.e., extracted from the OPC State Sea Level Rise Guidance 2024) and recommended methodology for addressing sea level rise in Coastal Commission planning and regulatory actions. It is intended to serve as a multi-purpose resource for a variety of audiences and includes a high level of detail on many subjects. Since the document is not specific to a particular geographic location or development intensity, readers should view the content as a menu of options to use only if relevant, rather than a checklist of required actions.

California Adaptation Planning Guide (2020)

The California Office of Emergency Services (Cal OES) released the second version of the Adaptation Planning Guide in 2020 - APG 2.0 - which includes updated guidance, an increased focus on equity and outreach, and best practices. The APG is designed to help local government, regional entities, and

[3] Ocean Protection Council (OPC). 2024. State of California Sea-Level Rise Guidance: 2024 Update.

climate organizations incorporate best practices and current science and research into their adaptation plans.[4]

California Office of Planning and Research Fire Hazard Planning Technical Advisory (2022)

The goal of the technical advisory is to provide a robust planning framework for addressing fire hazards, reducing risk, and increasing resilience across California's diverse communities and landscapes.

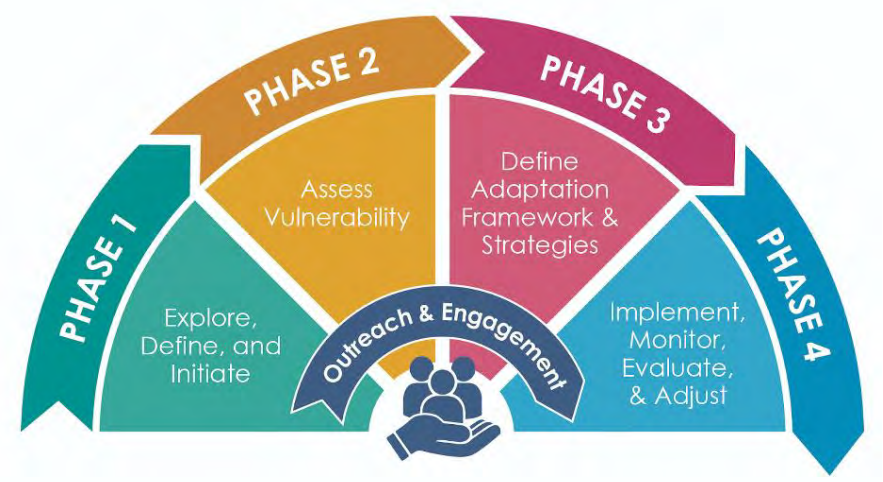
Local and Regional Climate Planning

Historical climate or climate-related assessments evaluated under this effort include:

- Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan (2023)
- 2021 Malibu Community Wildfire Protection Plan
- 2023 Malibu Coastal Hazard Vulnerability Assessment
- 2021 Los Angeles County Climate Vulnerability Assessment

Methodology and Planning Process

The APG 2.0 provides a four-step process that communities can use to plan for climate change. The APG is designed to be flexible and guide communities in adaptation planning.



Source: California Governor's Office of Emergency Services, 2020.

Phases of the Adaptation Planning Process include:

- Phase 1, Explore, Define, and Initiate:

  This phase includes scoping the process and project, such as identifying the potential climate change effects and important physical, social, and natural assets in the community.

- Phase 2, Assess Vulnerability:

[4] California Governor's Office of Emergency Services (Cal OES). California Adaptation Planning Guide. June 2020.

This phase includes analysis of exposure to, sensitivity of, and adaptive Capacity to respond to climate effect to determine physical and social vulnerability.

- Phase 3, Define Adaptation Framework and Strategies:

  This phase focuses on creating an adaptation framework and developing adaptation strategies based on the results of the Vulnerability Assessment. The adaptation strategies are the community's potential response to the Vulnerability Assessment.

- Phase 4, Implement, Monitor, Evaluate, and Adjust:

  In this phase, the adaptation framework is implemented, consistently monitored and evaluated, and adjusted based on continual learning, feedback, and triggers.

The purpose of this report is to document Step 1 through Step 2. The Vulnerability Assessment follows the approach recommended by APG 2.0. Phase 3 and 4 may occur through two possible pathways: 1) Adoption of policies (e.g., Safety Element) to address climate adaptation strategies and monitoring, and 2) The development of a climate adaptation plan.

The Vulnerability Assessment identifies projected climate change exposures for the City at mid- to late-century timeframes. In addition to identifying the City's exposure to the effects of climate change, the Vulnerability Assessment evaluates the sensitivity of key population groups and major community elements to climate change and associated hazards.

CHAPTER 2. COMMUNITY PROFILE

The City of Malibu is located along the Pacific Ocean northwest of the City of Los Angeles. Malibu is generally bounded on the north by the Santa Monica Mountains, on the east by Topanga Canyon, on the west by Ventura County and on the south by the Pacific Ocean. Malibu was incorporated on March 28, 1991. The City has 21 miles of coastline along the Pacific Ocean and has a population of 10,915 (2021 U.S. American Community Survey 5-Year Estimate).

The City of Malibu is a dynamic, internationally recognized community in Northern Los Angeles County that offers a high quality of life for its residents. Celebrated for its natural beauty and unique coastal resources, the City is also renowned for its leadership in environmental stewardship, excellent schools and political activism. Malibu has seven miles of public beaches, canyons and watershed along its 21 miles of coastline and provides numerous opportunities for recreation and outdoor activities.

The geography of Malibu includes a wide variety of terrain changes including mesas, canyons and rugged cliffs facing sandy beaches. The landscape ranges from lush greenery with exotic plants to natural habitats consisting of endemic chaparral, scrub grasses, riparian woodlands, and wetlands. Malibu lies on the fringe of the Santa Monica Mountains, which is an extensive chaparral wilderness area. The City has three large deep gorges and canyons with extensive vegetation growth due to its many streams and creeks.

2.1 VULNERABLE POPULATIONS

Climate change disproportionately affects those with existing disadvantages. Low-income communities and communities of color often live in areas with conditions that expose them to more severe hazards, such as higher temperatures and worse air quality. These communities also have fewer financial resources to adapt to these hazards. For instance, low-income populations are already disproportionately burdened by energy bills and may reduce air conditioning usage out of concerns about cost. People with chronic medical conditions are often more physiologically susceptible to negative health impacts from extreme heat and poor air quality, and those with mobility issues are particularly at risk. These risk factors are often present in older adults, who are more likely to have a limited income, chronic health conditions, and mobility limitations, and are more likely to experience social isolation.[5]

Factors such as age, physical and mental condition, socioeconomic status, access to key services (e.g., public or private transportation), and other factors affect the ability of people to prepare for and protect themselves and their property from climate-related events. Even though hazard events may impact all parts of the City with equal severity, individuals may experience the effects differently. The impacts from climate change such as fires and floods can have acute mental health impacts. As reported in the State's 4th Climate Change Assessment, there are potential links between extreme weather events and anxiety and depression, post-traumatic stress disorder, and suicide.[6]

[5] Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

[6] Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

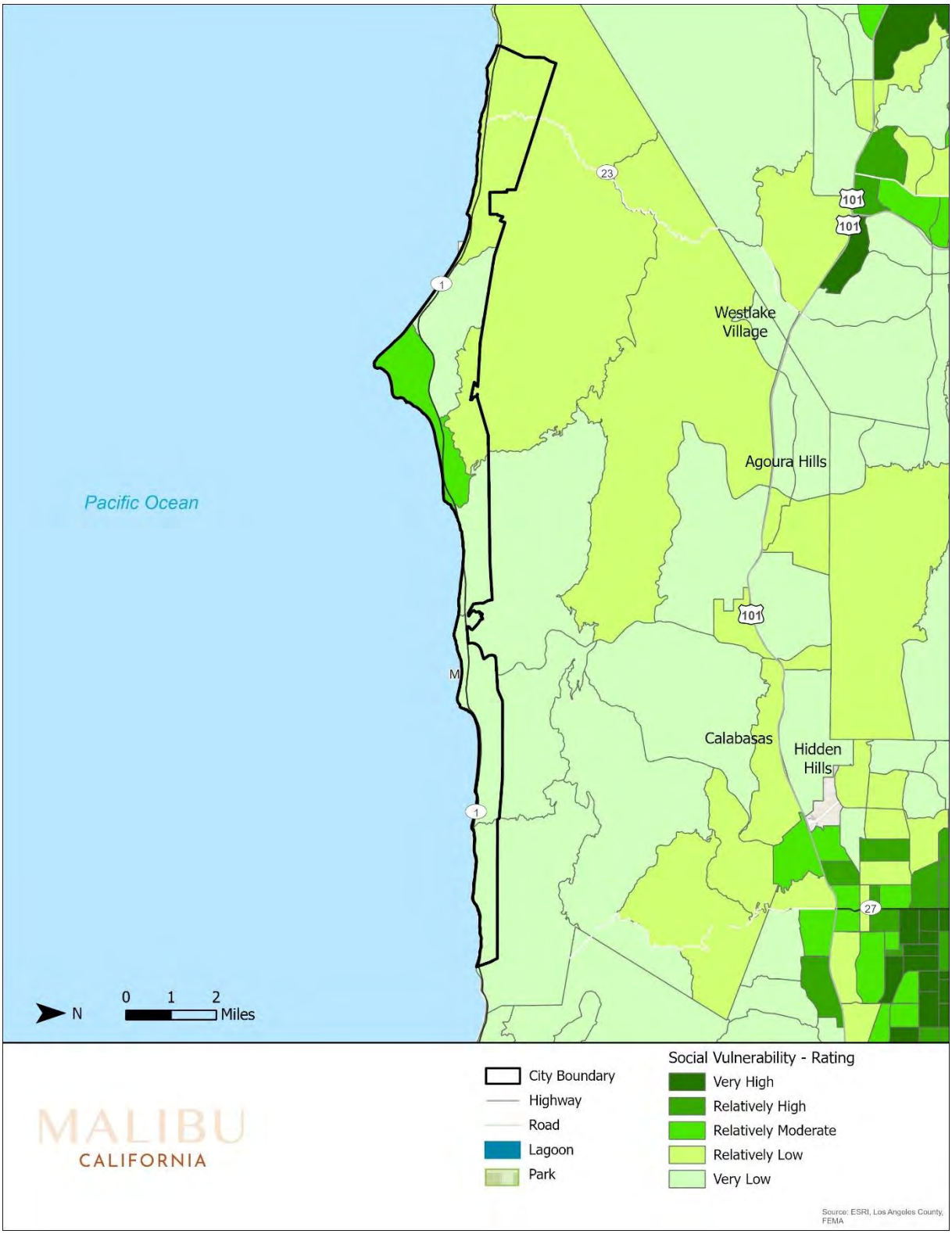
Social Vulnerability

Social Vulnerability is broadly defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social Vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

FEMA's National Risk Index provides Social Vulnerability scores and ratings that represent the relative level of a community's social vulnerability compared to all other communities at the same level. A community's Social Vulnerability score measures its national rank or percentile. A higher Social Vulnerability score results in a higher Risk Index score as shown in Figure 2-1: National Risk Index: Social Vulnerability.[7]

[7] Federal Emergency Management Administration. 2023. National Risk Index. https://hazards.fema.gov/nri/social-vulnerability. Accessed April 25, 2023.

Figure 2-1: National Risk Index: Social Vulnerability



Compared to all census tracts in the State, tracts in Malibu along the Highway 1 corridor have a lower social vulnerability rating, meaning the population have lower vulnerability – with a higher ability to adapt and respond to natural hazards.

Even if an area is identified as having low social vulnerability, specific individuals in any population may be more vulnerable to climate hazard events for the following reasons:

- Disability status: Persons with disabilities may often have reduced mobility and experience difficulties living independently. As a result, they may have little or no ability to prepare for and mitigate hazard conditions without assistance from others.
- Seniors (individuals at least 65 years of age): Seniors are more likely to have reduced mobility, physical and/or mental disabilities, and lower income levels, all of which may decrease their ability to prepare for and mitigate a hazard event.
- People with underlying health conditions, including cardiovascular disease, pulmonary disease, kidney disease, diabetes / obesity, and mental health issues (psychiatric disorders, depression).
- Outdoor workers: People who work outdoors are more likely to become dehydrated and become affected by heat-related illness.
- As of 2024, Malibu, California, is a coastal city with an estimated population of approximately 10,366 residents. The City's median age is 51 years, indicating an older demographic compared to national averages. Economically, Malibu is affluent, with a median household income of over $200,000 and a median property value of $2 million.[8]
- Children and seniors are identified as being highly susceptible to climate-induced hazards. With 13.7 percent of the population under the age of 14 and 28.9 percent of the population is aged 65 years and older, a large proportion of Malibu's community is vulnerable to climate change (see *Table 2-1: Age Distribution Comparison: City of Malibu*)

Table 2-1: Age Distribution Comparison: City of Malibu

	City of Malibu
Under 5	2.5%
5 - 14	11.2%
15 - 24	10.0%
25 - 34	9.6%
35 - 44	10.0%
45 - 54	12.3%
55 - 64	15.5%
Over 65	28.9%

Source: US Census Bureau American Community Survey 2021, Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan

- In California, the percentage of people of retirement age (i.e., 65 years and older) are expected to grow more than twice as fast as the total population, and this growth will vary by region. This means that people are living longer, and the aging population is increasing. This trend is also evident in Malibu where the population aged 65 years and older grew by 35 percent from 2010 to 2024, while the overall City population dropped by over 18 percent in the same period.[9]

[8] United States Bureau of Census, American Community Survey 2018 - 2022[1], ESRI Forecasts 2024

[9] ESRI Forecasts 2024 based on US Census Bureau 2020 Summary File 1

- *Table 2-2: Race and Ethnicity: City of Malibu* illustrates that the ethnic distribution of Malibu's population is predominantly people identifying as White Alone with the cohort representing three-quarters of the total City population.

Table 2-2: Race and Ethnicity: City of Malibu	City of Malibu
White Alone	72.85%
Black Alone	0.64%
American Indian Alone	0.0%
Asian Alone	3.80%
Pacific Islander Alone	0.25%
Some Other Race Alone	2.07%
Two or More Races	6.44%
Hispanic Origin (Any Race)	13.94%

Source: US Census Bureau American Community Survey 2021, Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan

- One aspect of climate hazard planning is the need to address the cultural and language (communications) needs of local populations. This includes the ability to distribute information and provide notification in the event of a regional emergency. For Malibu, an estimated 18.1 percent of the population speaks languages other than English (including English and another language or non-English only) with nearly 0.69 percent speaking English "less than well or not at all".[10] There are potential ramifications to vulnerability if emergency preparedness and climate resiliency programs do not provide information or services in languages besides English.

Unhoused Population

People experiencing homelessness are highly susceptible to impacts from direct and indirect climate effects including extreme heat events, air pollution from wildfires, and precipitation-driven or coastal flooding. Factors contributing to the rise in people experiencing homelessness include the general lack of housing affordable to lower-income people, increases in the number of people whose incomes fall below the poverty level, reductions in public subsidies, the de-institutionalization of those with mental illness, and increasing substance abuse issues. According to the 2025 Greater Los Angeles Homeless Count, in 2025 there were 33 people experiencing sheltered or unsheltered homelessness. This was a decline of over 50 percent from 2024.

To address the issue of homelessness in Malibu, the City has maintained a proactive, service driven approach that strategically bridges outreach and enforcement while considering its impact on the community. Some of those measures include the development of a strategic plan, increased collaboration with stakeholders throughout Los Angeles County, establishing a Homelessness Task Force, securing interim shelter bed opportunities for people experiencing homelessness in Malibu, and the formation of a working group to strengthen cooperation between the various agencies and organizations providing assistance within the community.

[10] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan

The City adopted a Homelessness Strategic Plan in 2018 and currently provides funding for an Outreach Team and a Housing Navigator who work with landlords and shelter facilities throughout Los Angeles County to help people experiencing homelessness get off the streets and into housing. The City also has access to five interim shelter beds in Santa Monica that are dedicated for the City's use and funded by Los Angeles County Measure A through the Las Virgenes-Malibu Council of Governments. City staff conduct routine field checks to prevent the formation of new encampments, address public safety concerns related to homeless encampments in partnership with the Los Angeles County Sheriff's Department, and properly assist those who are experiencing homelessness in the City.[11]

2.2 MAJOR COMMUNITY ELEMENTS

The identification of assets potentially affected by climate change related events are as follows:

Economy

Malibu is a residential community that is also a popular tourist destination. The City has 21 miles of coastline and its beaches are a main attraction. There are also parks owned and operated by the City, National Park Service, State of California, and the Santa Monica Mountains Conservancy / Mountains Recreation Conservation Authority in the Santa Monica Mountains.

Economic activity is one indicator of the potential losses that may be incurred in the event of a disaster. In addition to tourism and recreation, there are numerous retail locations along Pacific Coast Highway including the Malibu Civic Center area. Other service industries in Malibu include real estate, financial, health and beauty, medical, and construction.[12]

Fire and Emergency Services

The Las Virgenes-Malibu COG region is part of Los Angeles County. The City contracts for essential services such as law enforcement with the Los Angeles County Sheriff and fire resources through the Consolidated Fire Protection District of Los Angeles County (LASD).

The Las Virgenes-Malibu COG is located in Division VII – Central Region of the Los Angeles County Fire Department's Regional Plan Divisions. Battalions 1 and 5 of the Los Angeles County Fire Department are assigned to directly serve the Las Virgenes- Malibu region. Battalion 5 is the main division since its stations are located within the region itself. The Local LA County Fire Department Division Headquarters are located at 3970 Carbon Canyon Rd., Malibu 90265. Four additional fire stations are located in the City at:

- Fire Station #71 - 28722 W Pacific Coast Hwy, Malibu, 90265
- Fire Station #72 - 1832 Decker Canyon Rd, Malibu, 90265
- Fire Station #88 - 23720 W Malibu Rd, Malibu, 90265
- Fire Station #99 - 32550 Pacific Coast Hwy, Malibu, 90265[13]

[11] City of Malibu. Homelessness. 2025. https://www.malibucity.org/865/Homelessness. Accessed May 26, 2025.
[12] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan
[13] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan

Sheriff Services

The Malibu/Lost Hills Station provides immediate access and is located at 27050 Agoura Road, Calabasas, CA 91301. This station serves the western portion of Los Angeles County, which is a blend of semi-urban, residential, and rural areas, encompassing both mountain and beach topographies. LASD personnel that serve the Malibu region are stationed at the Malibu Substation located at 23555 Civic Center Way, Malibu, CA 90265. While the substation is equipped with an EOC, in most emergency situations, emergency operations will operate out of the Lost Hills Station.[14]

In addition, the City sponsors the Malibu Volunteer Patrol (MVP), a group of residents trained to assist law enforcement personnel. The volunteers work various assignments including patrolling the community, assisting with dissemination of information to the community and providing community services. The involvement of members of the community working alongside Sheriff's Department personnel improves the communication and understanding between the two groups.

Transportation Systems

The City's Public Works Department operates and maintains 45 lane miles of City streets, curb and gutters, paths and parking lots. Responsibilities include the maintenance, repair, and improvements of the public infrastructure, including streets, traffic signals, City trees, storm drains, stormwater treatment facilities, wastewater and recycled water treatment facilities, and sidewalk and pathways within the public right-of-way.[15]

Lifeline Utility Systems

Infrastructure plays a vital role in mitigating the effects of hazard events. When infrastructure fails, it can exacerbate the extent of certain hazards or create complications for rescue workers trying to reach victims. For example, fallen utility poles due to high winds or seismic activity, can obstruct roadways and prevent emergency vehicles from reaching affected areas. Brief descriptions of major infrastructure in the City that may be affected by climate-related hazards are as follows:

The City obtains its electricity supply Southern California Edison. The City obtains gas from Southern California Gas Company.[16]

The City obtains its water from Los Angeles County Waterworks District 29 and the West Basin Municipal Water District.[17] This water service area encompasses the City of Malibu and the unincorporated community of Topanga. The system consists of approximately 220 miles of potable water pipelines, including a 35- mile-long transmission water main, and 52 potable water tank reservoirs. There are no pump stations or storage tanks.[18]

2.3 CITY OF MALIBU PREPAREDNESS PROGRAMS

The City has implemented programs or partnered with external agencies to prepare for, respond to, and help the community recover from human-caused and natural hazards, including those that are climate related. The following programs improve the overall adaptive capacity of the City:

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[14] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan
[15] City of Malibu Public Works. 2025. https://www.malibucity.org/407/Public-Works. Accessed May 23, 2025.
[16] City of Malibu Public Works. 2025. https://www.malibucity.org/463/Utilities. Accessed May 23, 2025.
[17] City of Malibu Public Works. 2025. https://www.malibucity.org/463/Utilities. Accessed May 23, 2025.
[18] County of Los Angeles Public Works Waterworks Division. 2021. 2020 Urban Water Management Plan for Los Angeles County Waterworks District No. 29: Malibu, and the Marina del Rey Water System

Alert LA County

The system sends shelter-in-place instructions, evacuation, and other emergency messages. It has accessibility features for people with disabilities and others with access and functional needs as well as preferred language for notifications.[19]

AB 38 Gov Code 1102.19

As of July 1, 2021, a seller of a property that is in a high or very high fire hazard severity zone as identified by the State Director of Forestry and Fire Protection must provide the buyer documentation stating that the property is in compliance with local vegetation management ordinances.[20]

Community Emergency Response Team (CERT) Program

In the event of an area wide disaster, critical infrastructure and emergency services will be impacted. The Community Emergency Response Team (CERT) academy trains residents to prepare for and respond to life-threatening events in their community. CERT members can mobilize neighborhood resources, deliver immediate assistance to victims, organize emergency communications and provide support to first responders. Malibu makes available the Community Emergency Response Training (CERT) program to their residents.[21]

The City participates in the Community Emergency Response Team Program (CERT). Under the CERT Program, volunteers are provided with a FEMA-approved 20-hour program. The City holds CERT training courses three times per year. Approximately 30 CERT graduates have taken additional training to become part of the Malibu CERT Team and are registered as Disaster Service Workers.

Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan (2023)

The 2023 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) includes mitigation actions to decrease the risks associated with the hazards addressed within this Vulnerability Assessment. The cities within the Las Virgenes-Malibu Council of Governments (LVMCOG) experience similar hazards and have combined their efforts in order to produce a more thorough Hazard Mitigation Plan. Combining efforts, identifying common threats, and establishing regional mitigation strategies was a collaborative task that allowed mutual participation and more effective use of resources. The LVMCOG also provides a point of coordination and collaboration between its member cities as well as other cities and public agencies. The MJHMP includes four categories of goals as follows:

- To Protect Life, Property, Environment
- Public Awareness
- Partnerships and Implementation
- Emergency Management

Emergency Preparedness Program

In response to numerous floods, fires, and storms that have occurred since incorporation, the City created a robust emergency preparedness program to train City personnel and the community in emergency preparedness and response procedures.

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[19] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan
[20] State of California. 2019. AB38, Wood. Fire safety: low-cost retrofits: regional Capacity review: wildfire mitigation. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB38. Accessed May 26, 2025.
[21] Las Virgenes-Malibu Council of Governments 2023 Multi-Jurisdictional Hazard Mitigation Plan

The City's emergency preparedness program includes quarterly training and exercises to familiarize staff with the functions of the Emergency Operations Center (EOC) and their individual roles under various potential disaster scenarios. The City also provides Community Emergency Response Team training, an annual Public Safety Expo and many other emergency preparedness public education events.

Malibu Search & Rescue Team

The Malibu Search & Rescue Team (SAR) was founded in 1977 and is an all-volunteer organization comprised of Los Angeles County Sheriff's Department Reserve Deputy Sheriffs and a select group of Civilian Volunteer Specialists and Incident Support Personnel. The Malibu SAR Team is a unit of the Los Angeles County Sheriff's Department and a member of the California region of the Mountain Rescue Association.

The Malibu SAR jurisdiction covers 187 square miles of the Santa Monica Mountains from the Los Angeles/Ventura County line to Pacific Palisades, the east face of the Santa Susana Mountains and the contract cities of Westlake Village, Agoura Hills, Malibu, Calabasas, and Hidden Hills. The Malibu SAR will also travel anywhere in Los Angeles County to assist other LASD teams. Furthermore, the team will respond to other states or other countries if requested to do so through the California Governor's Office of Emergency Services (Cal OES). The Los Angeles County Sheriff's Department provides the team with rescue vehicles and rescue operations are conducted under the guidance of the Los Angeles County Sheriff.

Beacon Box

The City of Malibu has strategically placed 47 fire-resistant Beacon Boxes around the City which display critical information for public safety personnel such as water resources, road networks, egress areas, safe refuge areas, and high burn risk areas.

CHAPTER 3. VULNERABILITY ASSESSMENT

Addressing the widespread impacts of climate change represents a significant challenge for the State. A changing climate presents California with five key climate hazards: (1) higher temperatures and extreme heat events, (2) more severe wildfires, (3) more frequent and intense droughts, (4) flooding due to extreme precipitation events and coastal flooding and erosion from sea-level rise, and (5) increased potential for geologic (landslides) and seismic (earthquake-induced liquefaction) hazards. These hazards will threaten public health, safety, and well-being—including from life-threatening events, damage to public and private property and infrastructure, and impair natural resources.[22]

Following State guidance, this report provides an assessment of the City's vulnerabilities to climate change. It identifies and describes the climate hazards and other climate effects that may affect the City in the future. The Vulnerability Assessment follows the process outlined in Phase 2 of APG 2.0 and is composed of the following three steps:

- Exposure: The purpose of this step is to characterize the City's exposure to current and projected climate hazards. Existing hazards that can be worsened by the effects of climate change are identified and described, based on historical data, including the City's 2023 Local Mitigation Plan (LHMP). Climate data are used to develop projections for how existing hazards are expected to change by mid- and late century from future climate change.

- Sensitivity: This step will characterize potential future climate impacts to community populations and assets. Using historical data and research from regional and State reports on climate impacts, this step explores how sensitive vulnerable populations and assets may be affected by the projected impacts of climate change hazards.

- Adaptive Capacity: The City has already taken steps to build resilience and protect sensitive populations and assets from hazards. Thus, the purpose of this step is to characterize the City's current capability to cope with the projected impacts from climate hazards to vulnerable populations and assets. The capacity of the City to adapt to each of the identified climate impacts is determined through a review of existing plans and programs.

[22] California Legislative Analyst's Office (LAO). 2022. Budget and Policy Post. Climate Change Impacts Across California Crosscutting Issues. April 5, 2022. https://lao.ca.gov/Publications/Report/4575. Accessed November 1, 2022.

3.1 EXISTING HAZARDS

The City has a history of major hazard events. Presidential disaster declarations are typically issued for hazard events that cause more damage than State and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. The following table illustrates examples of past hazard events:

Table 3-1: FEMA-Declared Disasters in Malibu

Name of Event	FEMA Disaster Number*	Date
Palisades Fire	DR-4856-DR	January 7, 2025
Franklin Fire	FMAG	December 9-18, 2024
California Covid-19 Pandemic	DR-4482-CA	March 22, 2020
California Covid-19 Emergency	EM-3428-CA	March 13, 2020
Woolsey Fire	*DR-4407-CA*	November 8-25, 2018

* DR = Disaster Declaration; EM = Emergency Declaration; FM = Fire Management; FS = Fire Suppression

Source: FEMA, 2025

3.2 ANALYZING CLIMATE CHANGE

The effects of projected climate change include changes in temperature and precipitation contributing to hazards such as extreme heat events, drought, wildfires (and associated decreases in air quality), flooding associated with large precipitation events, landslides, and coastal flooding and inundation resulting from sea level rise. It is important to note that hazardous events may result from isolated changes, or a combination of changes, in temperature and precipitation.

To assess the potential direct and indirect effects from climate change, APG 2.0 recommends using Cal-Adapt, a global climate simulation model data. Cal-Adapt addresses uncertainty surrounding potential GHG emissions with the use of Representative Concentration Pathways (RCP). The RCPs in this Vulnerability Assessment rely upon two future emissions scenarios: RCP 4.5 and RCP 8.5. RCP 4.5 and 8.5 are used for these analyses because they provide a plausible range of future greenhouse gas emission scenarios. RCP 4.5 assumes global mitigation efforts are moderately successful, leading to a stabilization of emissions mid-century and a radiative forcing of ~4.5 W/m² by 2100. RCP 8.5 is the "high emissions" or “business-as-usual” pathway, assuming continued heavy reliance on fossil fuels with minimal climate policies, resulting in ~8.5 W/m² by 2100. Using both captures lower- to higher-risk futures to assist with addressing uncertainty. [23]

Cal-Adapt also includes ten global climate models, downscaled to local and regional resolution using the Localized Constructed Analogs statistical technique. Four of these models were selected by California’s Climate Action Team Research Working Group as priority models for research contributing to California’s Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:

- A warm/dry simulation (HadGEM2-ES),
- A cooler/wetter simulation (CNRM-CM5),
- A simulation with higher sensitivity to warming (CanESM2), and
- A dynamic simulation with greater variability of precipitation for use in modeling water resources (MIROC5).

California’s Fourth Climate Change Assessment and Cal-Adapt often rely on these four models: together, they span the range from high-sensitivity/hot-dry to moderate/low-sensitivity futures and capture different key processes.

[23] Bedsworth et al. 2018. Statewide Summary Report. California’s Fourth Climate Change Assessment. Publication number: SUMCCCA4-2018-013.

3.3 IMPACTS OF CLIMATE CHANGE

The projected outcomes of climate change include increases or decreases in temperature and precipitation as they relate to the frequency, duration, and intensity of changes. Combined, these changes in the historical patterns of temperature and precipitation contribute to changes in the frequency, duration, and intensity of climate hazard events such as extreme heat events, drought, wildfires (and associated decreases in air quality), flooding associated with large precipitation events, landslides, and coastal flooding and inundation resulting from sea level rise.

3.3.1 TEMPERATURE AND PRECIPITATION

Changes in Temperature

Observations over the past century indicate that temperature has increased across southern California and based on 1896-2015 temperature records for the California South Coast NOAA Climate Division, which encompasses the LA region. Significant trends in annual average, maximum, and minimum temperature have been around 0.16°C per decade. Every month has experienced significant positive trends in monthly average, maximum, and minimum temperature. Monthly average and minimum temperatures have increased the most in September and monthly maximum temperatures have increased the most in January, with each trend exceeding 0.2°C per decade.[24]

According to Cal-Adapt, the historic, observed annual average maximum temperature (1961-1990) for Malibu was 72.2°F.[25] As shown in ***Table 3-2: Projected Change in Annual Average Temperature:*** *City of Malibu*, Malibu is projected to increase by mid-century and further increase by the end of the century. Modeled scenarios illustrate an increase in temperatures of 4.4°F to 7.4°F by the end of the 21st century, corresponding to the medium or high emissions scenario.

The increase in minimum temperatures over time should also be considered as it can have a substantial impact on the community and the economy. Higher minimum temperatures equate to warmer nights that may impact those susceptible to heat effects.

Table 3-2: Projected Change in Annual Average Temperature: City of Malibu

Annual Average Temperature	Historic Annual Average Temperature (1961 - 1990)	Medium Emissions (RCP 4.5)		High Emissions (RCP 8.5)	
		Mid-Century	End-Century	Mid-Century	End-Century
Maximum	72.2°F	77.3°F	78.8°F	77.6°F	82.2°F
Minimum	71.4°F	73.2°F	74.4°F	73.9°F	76.5°F
°F = degrees Fahrenheit					

California Energy Commission. 2025. CalAdapt. Local Climate Change Snapshot for Malibu: Annual Average Maximum and Minimum Temperature. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.

[24] Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

[25] California Energy Commission. 2025. CalAdapt. Local Climate Change Snapshot for Malibu: Annual Average Maximum and Minimum Temperature. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.

Changes in Precipitation

Malibu experiences a warm-summer Mediterranean climate, characterized by mild, wet winters and warm, dry summers. Average high temperatures range from approximately 61°F (16°C) in December to about 80°F (27°C) in August. Nighttime lows vary from around 50°F (10°C) in winter to 64°F (18°C) in summer . Rainfall is concentrated in the cooler months, with December being the wettest, averaging 3.3 inches (83 mm), while the summer months, particularly July and August, are nearly rainless . The coastal location moderates temperature extremes, and marine influences like morning fog, especially during May and June, are common . Overall, Malibu enjoys a temperate climate with modest seasonal variation.[26]

Annual Average Precipitation Levels

According to Cal-Adapt, annual projected precipitation levels in Malibu are expected to experience little to no change by the end of the century. *Table 3-3: Projected Change in Annual Average Precipitation: City of Malibu* identifies estimated annual average precipitation levels.

Table 3-3: Projected Change in Annual Average Precipitation: City of Malibu

Average Annual Precipitation	Historic Annual Average Precipitation (1961 - 1990)	Medium Emissions (RCP 4.5)		High Emissions (RCP 8.5)	
		Mid-Century	End-Century	Mid-Century	End-Century
	16.1 Inches	16.9 Inches	16.0 Inches	16.5 Inches	18.5 Inches

CalAdapt. Local Climate Change Snapshot for Malibu: Annual Average Precipitation. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.

[26] Copernicus Climate Change Service. https://climate.copernicus.eu/. Accessed June 2, 2025.

3.3.2 EXTREME HEAT EVENTS

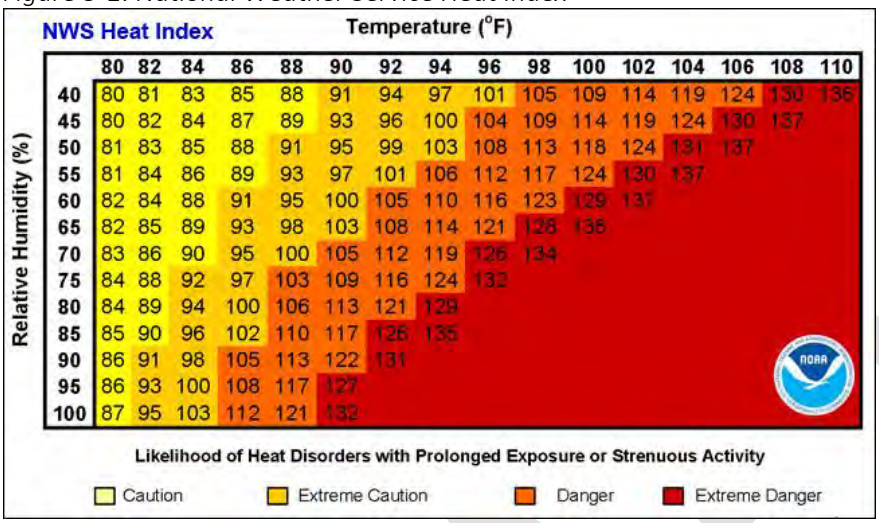
Extreme heat events are a period when temperatures are abnormally high relative to a designated location's normal temperature range. Extreme heat events are one of the leading weather-related causes of death in the United States from 1999 through 2009, extreme heat exposure caused more than 7,800 deaths.[27] There are generally three types of extreme heat events:

- Extreme Heat Days: a day during which the maximum temperature surpasses 98 percent of all historic high temperatures for the area, using the time between April and October from 1961 to 1990 as the baseline.
- Warm Nights: any night between April and October when the minimum temperature exceeds 98 percent of all historical minimum daily temperatures observed between 1961 and 1990 for that location.
- Extreme Heatwaves: a successive series of extreme heat days and warm nights where extreme temperatures do not abate. While no universally accepted minimum length of time for a heatwave event exists, Cal-Adapt considers 4 successive extreme heat days and warm nights to be the minimum threshold for an extreme heatwave.

Extreme heat events will feel different from region to region since different areas have different historic high temperatures. For example, an extreme heat day on the coast will feel different than an extreme heat day in the high desert. This is because humidity plays a factor in the perceived heat that people feel. Humid conditions will make a day feel hotter than non-humid conditions, even though the temperature may be the same. The difference between the perceived temperature and the actual temperature is known as the "heat index." To illustrate the effect of the heat index, a 90°F day with 50 percent humidity feels like 95°F, whereas a 90°F day with 90 percent humidity feels like 122°F. *Figure 3-1: National Weather Service Heat Index* shows the National Oceanic and Atmospheric Administration (NOAA)'s National Weather Service (NWS) Heat Index.[28]

[27] United States Global Change Research Program, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. A. Crimmins, J. Balbus, J. L. Gamble, C. B. Beard, J. E. Bell, D. Dodgen, R. J. Eisen, N. Fann, M. D. Hawkins, S. C. Herring, L. Jantarasami, D. M. Mills, S. Saha, M. C. Sarofim, J. Trtanj, and L. Ziska, Eds.
[28] National Oceanic and Atmospheric Administration (NOAA)'s National Weather Service Heat Index. https://www.weather.gov/safety/heat-index. Accessed May 26, 2025.

Figure 3-1: National Weather Service Heat Index



Source: National Oceanic and Atmospheric Administration National Weather Service Heat Index.

Historical Extreme Heat Events

Malibu has experienced several significant extreme heat events over the years. Significant historic extreme heat events include:

- July 6, 2018. A major heatwave affected Southern California, with nearby areas like Woodland Hills recording temperatures of 117°F. While specific temperatures for Malibu were not detailed, the region experienced significant heat during this period.[29]
- October 24, 2017. Reports indicated that Malibu set an unofficial record for the hottest day and night in its modern history. The extreme temperatures led to early school dismissals and increased fire readiness in the surrounding mountains.[30] While the exact temperature was not provided, the closest weather station at Santa Monica Municipal Airport reached 101 degrees on that day[31].

Unusually hot days and multi-day heatwaves are a natural part of day-to-day variation in weather. As the Earth's climate warms, however, hotter-than-usual days and nights are becoming more common, and heatwaves are expected to become more frequent and intense. Increases in these extreme heat events can lead to more heat-related illnesses and deaths, especially if people and communities do not take steps to adapt.[32]

[29] KCAL News. 2018. Heat Wave Shatters Records Across Southern California. https://www.weather.gov/mtr/Stormsummaries. https://www.cbsnews.com/losangeles/news/heat-wave-malibu-woodland-hills. Accessed June 2, 2025.

[30] The Malibu Times. 2017. Yesterday Could Have Been Hottest Day In Modern Malibu History.

[31] National Centers for Environmental Information. Global Surface Summary of the Day. https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ncdc%3AC00516&utm. Accessed September 16, 2025.

[32] Sarofim, M.C., S. Saha, M.D. Hawkins, D.M. Mills, J. Hess, R. Horton, P. Kinney, J. Schwartz, and A. St. Juliana. 2016. Chapter 2: Temperature-related death and illness. In: The impacts of climate change on human health in the United States: A scientific assessment. U.S. Global Change Research Program.

3.3.2.1 Exposure to Extreme Heat Events

The intensity and frequency of extreme heat are also projected to increase over the LA region. The average hottest day of the year is expected to increase roughly 4-7°F under RCP4.5 and 7-10°F under RCP8.5 by the late-21st century. While the number of extremely hot days is expected to increase in the future, regions along the coast such as Malibu may only see increases of a few days.[33]

Annual mean maximum temperature could increase by 7.4°F by 2100 (see *Table 3-2: Projected Change in Annual Average Temperature: City of Malibu*.[34] As illustrated in *Table 3-4: Projected Change in Number of Extreme Heat Days: City of Malibu (90.1°F)* the annual number of extreme heat days (over 90.1°F, the 98th percentile) in the City could increase up to 33 days by 2100 under the high emissions scenario.[35]

Table 3-4: Projected Change in Number of Extreme Heat Days: City of Malibu (90.1°F)

Number of Extreme Heat Days*	Historic Annual Average Extreme Heat Days (1961 - 1990)	Medium Emissions (RCP 4.5)		High Emissions (RCP 8.5)	
		Mid-Century	End-Century	Mid-Century	End-Century
	4	12	19	18	37

*Number of days in a year when daily maximum temperature is above a threshold temperature of 90.1 °F.
Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.

Warm Nights

Warm night temperatures affect the ability of a community and its residents to effectively cool down from extreme heat days. If temperatures remain higher than normal during the night, the compounding impacts from high daytime temperatures can be highly detrimental to public health.

According to Cal-Adapt, a warm night event in Malibu is a night when the evening temperature exceeds 64.7°F. *Table 3-5: Projected Change in Number of Warm Nights: City of Malibu* identifies the projected average number of warm nights that would occur each year under the RCP 4.5 and RCP 8.5 scenarios. Based on these projections, the City can anticipate increased demand towards the end of the century - for overnight cooling centers and calls for service from vulnerable populations, which are expected to be disproportionately impacted by extreme heat conditions.

33 Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.
34 California Energy Commission. 2025. CalAdapt. Local Climate Change Snapshot for Malibu: Annual Average Maximum Temperature. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.
35 California Energy Commission. 2022. CalAdapt. Local Climate Change Snapshot for Malibu: Extreme Heat Days. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.

Table 3-5: Projected Change in Number of Warm Nights: City of Malibu

Average Annual Number of Warm Nights*	Historic Annual Average Warm Nights (1961 - 1990)	Medium Emissions (RCP 4.5)		High Emissions (RCP 8.5)	
		Mid-Century	End-Century	Mid-Century	End-Century
	4	22	37	34	80

*Number of days in a year when daily minimum temperature is above a threshold temperature of 64.7 °F.
Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.

Source: California Energy Commission. CalAdapt. Local Climate Change Snapshot for Malibu: Warm Nights. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed May 26, 2025.

3.3.2.2 Sensitivity to Extreme Heat Events

The impacts of extreme heat events will be most severely felt in highly developed areas of the City that are intensely paved and surrounded by buildings constructed of dark (heat absorbing) materials without the cooling benefits of tree shade. Compared with rural communities, urbanized areas can experience higher temperatures, greater pollution, and more negative health effects, especially during summer months. This phenomenon is known as the Urban Heat Island Effect (UHIE). Urban heat islands are created by a combination of heat-absorptive surfaces (e.g., dark pavement and roofing), heat-generating activities (e.g., automobile engines and industrial generators), and the absence of "green spaces" (vegetative surfaces that provide evaporative cooling). During extreme heat days and heatwaves, asphalt and darker surfaces reduce nighttime cooling as these surface types retain more heat to be released at night. The UHIE is known to intensify extreme heat days and heatwaves.

Transportation Systems

High temperatures increase the risk of pavement deterioration, depending on the paving materials and the traffic load of a given road.[36,37] Extreme heat may also cause pavement heave and damage to transportation infrastructure and functioning.[38] Extreme heat is also problematic for rail systems, as railroad tracks exposed to high temperatures are at risk of warping or buckling.[39]

Lifeline Utility Systems

Extreme heat interacts with the electricity system in a number of ways on both the supply reliability and demand side. Transmission and distribution lines experience reduced capacity under high temperatures while wooden poles, substations/large transformers and distribution transformers also

[36] Daniel, J.S., J.M. Jacobs, E. Douglas, R.B. Mallick, and K. Hayhoe. 2014. Impact of climate change on pavement performance: Preliminary lessons learned through the Infrastructure and Climate Network (IC Net). dot:10.1061/9780784413326.001.
[37] Rowan, E., C. Evans, M. Riley-Gilbert, R. Hyman, R. Kafalenos, B. Beucler, B. Rodehorst, A. Choate, and P. Schultz. 2013. Assessing the sensitivity of transportation assets to extreme weather events and climate change. Transportation Research Record: Journal of the Transportation Research Board 2326(1):16—23. doi:10.3141/2326-03.
[38] Guo Y, Gasparrini A, Li S, Sera F, Vicedo-Cabrera AM, de Sousa Zanotti Stagliorio Coelho M, et al. (2018) Quantifying excess deaths related to heatwaves under climate change scenarios: A multicountry time series modelling study. PLoS Med 15(7): e1002629.
[39] Magill, B. 2014. "Sun kinks" in railways join the list of climate change's toll. Scientific American, June 2. www.scientificamerican.com/article/sun-links-in-railways-Join-the-list-of-climate-change-s-toll. Accessed May 26, 2025.

experience a reduced lifespan as high temperature stress the infrastructure.37 At the same time, demand for electricity peaks during high heat events and residents, businesses, and industry all use power for cooling. As air conditioning penetration increases in an effort to mitigate the health impacts described above, energy demand continues to increase.[40]

Transmission facilities face increasing climate change-related risks because of increased frequency of wildfires, severe wind, and extreme heat. Extreme heat and drought can add stress to transmission systems, resulting in system failure. Electrical infrastructure may fail due to increased electrical loads and stress from longer periods of increased operation. A 2011 study found that just one extra day with temperatures above 90°F increases annual household energy use by 0.4 percent.[41]

Higher temperatures can reduce the water supply in California from reduced precipitation and snowpack and earlier snowmelt.[42] Evaporation and potential evapotranspiration both increase under greenhouse gas warming and rising air temperatures.[43,44]

Renewable energy and electricity storage technologies can add flexibility to the electricity grid. Together with microgrids, renewables can support increased grid resilience and reliability in the face of extreme weather. Electricity storage also has the potential to replace fossil fuel-fired "peaking" power plants, which are called upon in times of high demand for electricity such as during extreme heat events.[45]

Economic Elements

Extreme heat events have the potential to reduce economic output across a broad range of sectors with exposure to high temperatures and humidity. The California Department of Insurance estimates negative economic impacts to dairy and crop agriculture due to industry productivity losses (e.g., extreme heat events reduce diary milk production) and dairy cow mortality and reduction in crop yields and degradation of crop quality; manufacturing productivity losses due to indoor places of work lacking air conditioning; reductions in time spent working in weather-exposed industries (monetized using lost wages); and business revenue losses due to consumers altering their behavior to avoid extreme heat conditions.[46]

Laborers in weather-exposed industries such as construction and agriculture are the most prone to extreme heat impacts, even if they work fewer hours when it is hotter. Workers are less productive when it is hotter out.[47] Exposure to high temperatures may affect worker safety by increasing rates of

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[40] California Department of Insurance. 2024. Impacts of extreme heat to California's people, infrastructure, and economy.
[41] Deschênes, Olivier and Michael Greenstone. 2011. Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US. American Economic Journal: Applied Economics Vol. 3 No. 4 October 2011
[42] U.S. Environmental Protection Agency. 2016. What Climate Change Means for California. https://www.epa.gov/sites/production/files/2016-09/documents/climate-change-ca.pdf
[43] Jacob Scheff and Dargan M. W. Frierson. 2014. Scaling Potential Evapotranspiration with Greenhouse Warming DOI: https://doi.org/10.1175/JCLI-D-13-00233.1. Journal of Climate.
[44] Thibault Lemaitre-Basset, Ludovic Oudin, Guillaume Thirel, and Lila Collet. 2022. Unraveling the contribution of potential evaporation formulation to uncertainty under climate change. Hydrology and Earth System Sciences.
[45] Abel, D.W., T. Holloway, M. Harkey, P. Meter, D. Ahl, V.S. Limaye, and J.A. Patz. 2018. Air-quality-related health impacts from climate change and from adaptation of cooling demand for buildings in the eastern United States: An interdisciplinary modeling study. PLOS Medicine 15(7):1—27. dot:10.1371/journal.pmed.1002599.
[46] California Department of Insurance. 2024. Impacts of extreme heat to California's people, infrastructure, and economy.
[47] Lemione, Derek. 2021. 4 ways extreme heat hurts the economy. Cornell University Alliance for Science. August 3. https://allianceforscience.cornell.edu/blog/2021/08/4-ways-extreme-heat-hurts-the-economy. Accessed May 23, 2025.

workplace injuries[48] and it may also affect the performance and productivity of workers.[49] Higher temperatures tend to reduce growth in many industries that involve substantial indoor work, including retail, services, and finance. A 1°F increase in the average summer temperature is associated with a reduction in the annual growth rate of state-level economic output of 0.15 to 0.25 percentage points, and rising temperatures could reduce U.S. economic growth by up to one-third over the next century.[50]

The increase in electricity usage on hot days stresses electric grids right when people depend on them most, as seen in California during recent heatwaves. Blackouts can be quite costly for the economy, as inventories of food and other goods can be spoiled, and many businesses either must run generators or shut down. For instance, the 2019 California blackouts cost an estimated $10 billion due to business closures.[51]

Natural Resource Areas

Extreme temperatures — as opposed to warmer average temperatures — are the catalyst for a growing number of extinctions. In 2002, researchers looked at 538 plant and animal species at 581 sites around the world that had been previously surveyed. The goal was to understand what aspects of climate change were the most serious threat to biodiversity. They found that 44 percent of the species at the sites had gone locally extinct, and that the culprit was an increase in the temperature of the hottest days of the year.[52]

Birds suffer more than other animals as they are diurnal (active in the day) and exposed to the hottest part of the day. Small mammals live underground and are generally nocturnal (active at night). A recent study found that the number of areas that native bumblebees occupy has plummeted 46 percent in North America and 17 percent in Europe compared to surveys taken from 1901 to 1974. Those bee-less areas were also places with a high degree of climate variation, especially higher temperatures. The study concluded that climate change--specifically hotter and more frequent extremes in temperatures--is related to the growing risk of extinction that animals are facing around the world.[53]

Water stress induced mortality processes such as hydraulic failure or carbon starvation (when a plant cannot make or access enough sugars to meet its basic energy needs for maintenance and survival) are caused by extreme heat (and drought). Many trees operate at or near their tolerance limit for water stress and may not be able to acclimate to keep pace with the changing climate.[54]

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[48] Park, J., Pankratz, N., & Behrer, A. (2021). Temperature, Workplace Safety, and Labor Market Inequality. IZA Discussion Paper No. 14560

[49] Cui, W., Cao, G., Park, J. H., Ouyang, Q., & Zhu, Y. 2013. Influence of indoor air temperature on human thermal comfort, motivation and performance. Building and environment, 68, 114-122.

[50] Colacito, Riccardo; Bridget Hoffmann, Toan Phan. 2018. Temperature and Growth: A Panel Analysis of the United States. Journal of Money, Credit, and Banking. December 3. https://doi.org/10.1111/jmcb.12574. Accessed May 26, 2025.

[51] Wara, Michael. 2019. Impacts of Wildfire on Electric Grid Reliability. Senate Energy and Natural Resources Committee Testimony. December 19.

[52] Roman-Palacios, Cristian and John J Wiens. 2020. Recent responses to climate change reveal the drivers of species extinction and survival. Proceedings of the National Academy of Sciences. February 10. https://doi.org/10.1073/pnas.1913007117

[53] Soroye, Peter. Tim Newbold, Jeremy Kerr. 2020. Climate change contributes to widespread declines among bumble bees across continents. Science. February 7. Pp. 685-688. DOI: 10.1126/science.aax8591.

[54] Williams I N, Torn M S, Riley W J and Wehner M F 2014 Impacts of climate extremes on gross primary production under global warming Environ. Res. Lett

Climatic changes alter the range, biogeography, and growth of microbes and the vectors of food, water, and vector-borne illnesses. This includes the changes in aquatic environments that could increase harmful algal blooms and lead to increases in foodborne and waterborne illnesses.[55]

Vulnerable Populations

Increased temperatures manifested as heatwaves and sustained high-heat days directly harm human health through heat-related illnesses (mild heat stress to fatal heat stroke) and the exacerbation of pre-existing conditions in the medically fragile, chronically ill, and vulnerable. Increased heat also intensifies the photochemical reactions that produce smog and ground level ozone and fine particulates (PM2.5), which contribute to and exacerbate respiratory disease in children and adults. Increased heat and carbon dioxide enhance the growth of plants that produce pollen, which are associated with allergies.[56]

Higher temperatures and extreme heat can lead to heat cramps, heat exhaustion, heat stroke, respiratory illness, and increase the risk of heat-related mortality and expansion of vector-borne disease.[57]

Whereas a heat event can be relatively harmless for those with a reliable means of staying hydrated and cool, it can be deadly for others. Young children, the elderly, or people suffering from serious medical conditions are physiologically more vulnerable to heatstroke. Some senior citizens also take medicines that can make it harder for their bodies to maintain a safe internal temperature, creating an additional threat from extreme heat events. Young children may not be aware of the signs of dehydration or ways of protecting themselves from heatstroke.

Extreme heat can cause urban surface areas to become 50 to 90°F Fahrenheit warmer than the air temperature. Extreme heat is present at all hours of the day and the night but is most intense during the day and in the summer. Due to changes in the sun's intensity, its magnitude varies with seasons. Surface heat contributes to human discomfort during the day and an increase in energy demand for air conditioning.[58]

Sudden spikes in heat can catch people by surprise. Stores can rapidly sell out of fans, air-conditioning units, or drinking water during a heatwave. Lower-income households or those with limited mobility may be unable to acquire enough insulation or cooling devices without significant advance preparations. This can be further compounded by the threat of Public Safety Power Shutoff events. During these events, extreme heat impacts may affect larger portions of the City and populations that would not be considered as vulnerable under normal circumstances.

While the general population may be less vulnerable to extreme heat events, people have unique and individual thresholds. Extreme heat events including heatwaves can lead to illness and death, particularly among older adults, the very young, and other vulnerable populations. People experiencing homelessness are at a high risk of health complications during heatwaves, especially if they are unsheltered.

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[55] California Department of Public Health. 2017. Climate Change and Health Profile Report Santa Clara County.

[56] Maizlish N, English D, Chan J, Dervin K, English P. Climate Change and Health Profile Report: Santa Clara County. Sacramento, CA: Office of Health Equity, California Department of Public Health; 2017.

[57] Southern California Association of Governments. 2020. Extreme Heat & Public Health Report. September.

[58] Southern California Association of Governments. 2020. Extreme Heat & Public Health Report. September.

3.3.2.3 Adaptive Capacity to Extreme Heat Events

Current research indicates that most people can adapt biologically and physically to incremental increases in average normal temperatures. Children, pregnant women, and older adults are more susceptible to adverse effects because they are less able to regulate their body temperatures. Other at-risk groups include individuals working outdoors, the socially isolated, and those with incomes below the federal poverty level, as well as communities of color. Continuous exposure to increased heat over time will impact how individuals are able to work and play both now and in the future.[59]

Regulation and Planning

The City of Malibu has implemented several measures to address extreme heat and enhance community resilience[60]:

1. Cooling Centers: During heatwaves, Malibu designates facilities such as the Michael Landon Community Center at Malibu Bluffs Park and the Malibu Library as cooling centers. These centers provide residents with air-conditioned spaces and access to cold water to mitigate heat-related health risks.
2. Emergency Alerts and Preparedness: The City's Public Safety Department coordinates emergency responses, including issuing Red Flag Warnings during periods of high heat, low humidity, and strong winds. Residents are encouraged to prepare for potential fires, evacuations, and power outages during such events.
3. Public Safety Events: Malibu hosts annual Safety and Preparedness Fairs in collaboration with the Community Emergency Response Team (CERT). These events educate residents on preparing for various disasters, including extreme heat, by offering trainings and resources.
4. Community Engagement: The City actively communicates with residents through platforms like Nextdoor, providing timely updates on heat advisories and safety recommendations during extreme temperature events.

[59] National Institute of Heath, National Institute of Environmental Health Sciences. 2022. *Temperature-related Death and Illness*. https://www.niehs.nih.gov/research/programs/climatechange/health_impacts/heat/index.cfm#footnote1 Accessed June 7, 2025.

[60] City of Malibu. 2025. News Flash. https://www.malibucity.org/CivicAlerts.aspx. Accessed June 2, 2025.

3.3.3 DROUGHT

Increasing temperatures and changes in precipitation may lead to intensified drought conditions.[61] Warmer temperatures contribute to more frequent and intense droughts by leading to a decline in and faster melting of winter snowpack, greater rates of evaporation, and drier soils. These conditions decrease the amount of spring and early summer snowmelt runoff upon which the State historically has depended on its annual water supply, while they increase the demand for irrigation water in both agricultural and urban settings.

Drought may lead to water-related problems. When rainfall is less than normal for weeks, months, or years, the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth of water in wells increases. If dry weather persists and water-supply problems develop, the dry period can become a drought.[62]

As a result, droughts have widespread impacts across the State, including mandatory water use restrictions, reductions in agricultural crop production, and over-pumping of groundwater, which damages infrastructure from land sinking and dries up and degrades domestic well habitats.[63]

Historical Drought Events

- The 2007–2011 California drought marked the beginning of increased restrictions on State Water Project (SWP) pumping from the Bay-Delta due to environmental considerations. In April 2007, Metropolitan Water District of Southern California (MWD) notified its member agencies that it expected challenges in meeting demands due to insufficient imported water supplies from the SWP and the Colorado River. To meet demands, MWD announced that it would implement shortage-related actions consistent with its Water Surplus and Drought Management Plan (WSDMP).
- In January 2014, Governor Brown proclaimed a state of emergency throughout California, calling for increased conservation across the State. In response to the Governor's drought declaration and call for conservation, the Water Authority activated its WSDMP for the second time since its adoption in 2006, declaring in February 2014 a regional drought response Stage I, Voluntary Supply Management. On April 2, 2017, Governor Brown lifted the drought emergency. This five-year drought (2012 – 2016), which is the most recent, has well-documented agricultural (e.g., reduced water allocations), physical (e.g., groundwater depletion-related subsidence) and environmental impacts (e.g., fish mortality). Surface and groundwater withdrawals were used to mitigate water supply impacts. Water transfers were a primary tool to move water to areas of need, such as permanent crops.[64]
- On April 21, May 10, and July 8, 2021, Governor Newsom issued proclamations that a state of emergency exists in a total of 50 counties due to severe drought conditions and directed State agencies to take immediate action to preserve critical water supplies, mitigate the effects of

[61] Maizlish N, English D, Chan J, Dervin K, English P. Climate Change and Health Profile Report: Santa Clara County. Sacramento, CA: Office of Health Equity, California Department of Public Health; 2017.
[62] United States Geological Survey. 2022. California Water Sciences Center. California Drought. https://ca.water.usgs.gov/california-drought/what-is-drought.html. Accessed November 12, 2022.
[63] State of California, Legislative Analyst's Office. 2022. Budget and Policy Post. Climate Change Impacts Across California Crosscutting Issues. April 5, 2022. https://lao.ca.gov/Publications/Report/4575. Accessed November 11, 2022.
[64] United States Geological Survey. 2022. California Water Sciences Center. California Drought. Comparisons. 2012-2016 California Drought: Historical Perspectives. https://ca.water.usgs.gov/california-drought/california-drought-comparisons.html. Accessed November 13, 2022.

drought, and ensure the protection of health, safety, and the environment. On October 19, 2021, Governor Newsom signed a proclamation extending the drought emergency Statewide and further urging Californians to reduce their water use.

- On January 4, 2022, the State Water Resources Board passed Resolution No. 2022-0002 adopting an emergency regulation to supplement voluntary water conservation.[65]
- In 2022, California faced one of its most severe droughts on record. By October, 99.77 percent of the state was experiencing Moderate (D1) to Exceptional (D4) drought conditions, with 23.34 percent in Extreme (D3) and 16.57 percent in Exceptional (D4) drought. This period marked the driest three-year span since 1896, leading to widespread water shortages and significant impacts on agriculture and ecosystems.
- The 2023 water year (October 2022 to September 2023) was characterized by extreme weather variability. A series of atmospheric rivers brought substantial rainfall and snowpack, replenishing reservoirs and alleviating drought conditions. By March, all areas previously classified under Exceptional and Extreme drought had improved, and the state concluded the water year with reservoirs at 128 percent of historical averages.
- 2024 saw a return to drier conditions. By October, approximately 67 percent of California was not under drought, but regions in Southern California, including San Bernardino, Riverside, and Imperial counties, experienced Moderate to Extreme drought levels. Statewide precipitation was near average, but certain areas, particularly in the south, remained below average.
- As of June 2025, drought conditions have intensified. Approximately 38 percent of California is under drought, with an additional 21 percent classified as Abnormally Dry. Central and Southern California have been particularly affected, with below-normal precipitation and snowpack leading to concerns about water availability and increased wildfire risks.[66]

Monitoring Drought

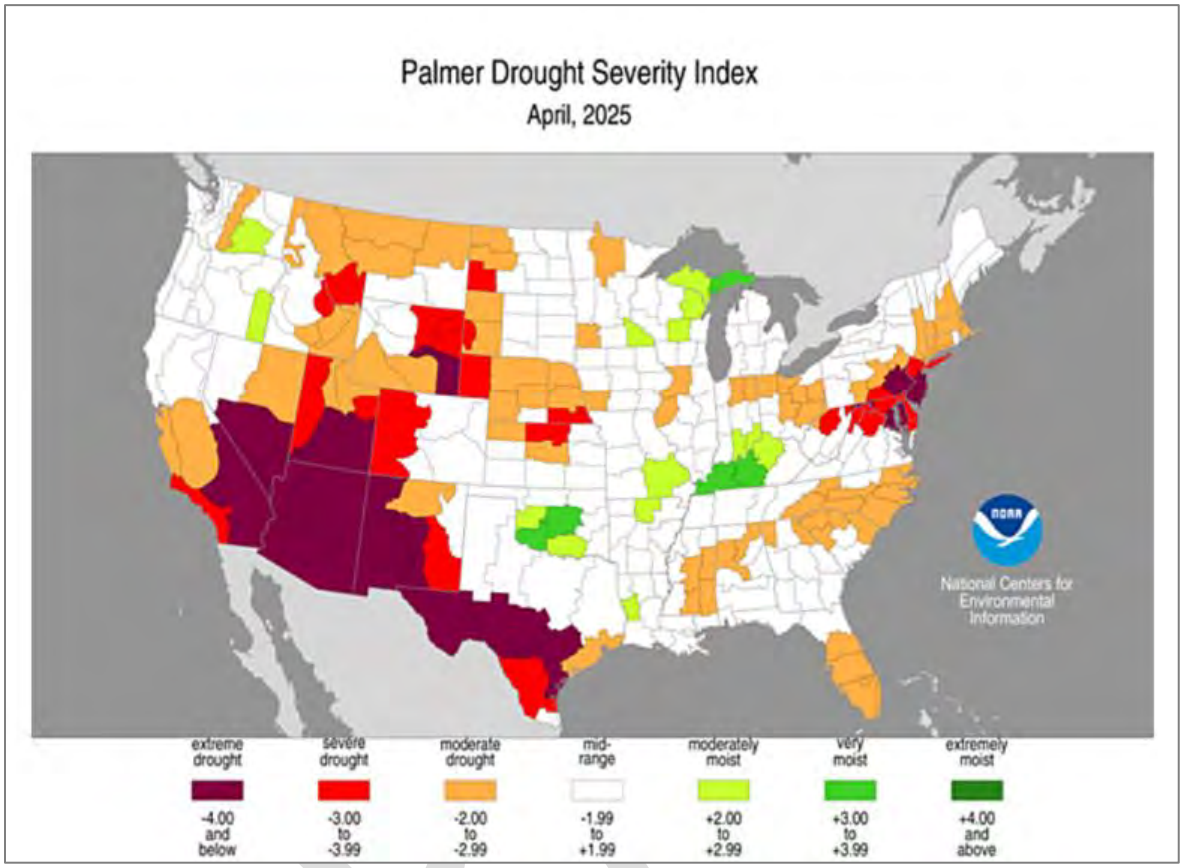
The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations. The Palmer Drought Index measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month depends on current weather plus the cumulative weather of previous months. The Palmer Drought Index responds rapidly as weather patterns change quickly. *Figure 3-2: Palmer Hydrological Drought Index Long-Term Hydrologic Conditions For April 2025* shows this index for April 2025.

As the climate continues to change, many historically dry areas like ours are likely to experience less precipitation and increased risk of prolonged droughts, erratic and unseasonal rainfall patterns, flash floods and surface runoff, topsoil erosion, decline in forest canopy, depletion of groundwater supplies, land subsidence, increased dependence on expensive imported water supplies, and subsequent impacts on human health, economy and more. Droughts are among the most expensive weather-related disasters in the world, affecting ecosystems, agriculture, and human society.

[65] California Department of Water Resources. 2022. Resolution no. 2022-0002 to adopt an emergency regulation to supplement voluntary water conservation. January 4.

[66] California Department of Water Resources Water Use Efficiency Branch. 2024. A Report to the State Water Resources Control Board pursuant to California Water Code Section 10644(c)(1)(B). September 2024.

Figure 3-2: Palmer Hydrological Drought Index Long-Term Hydrologic Conditions For April 2025



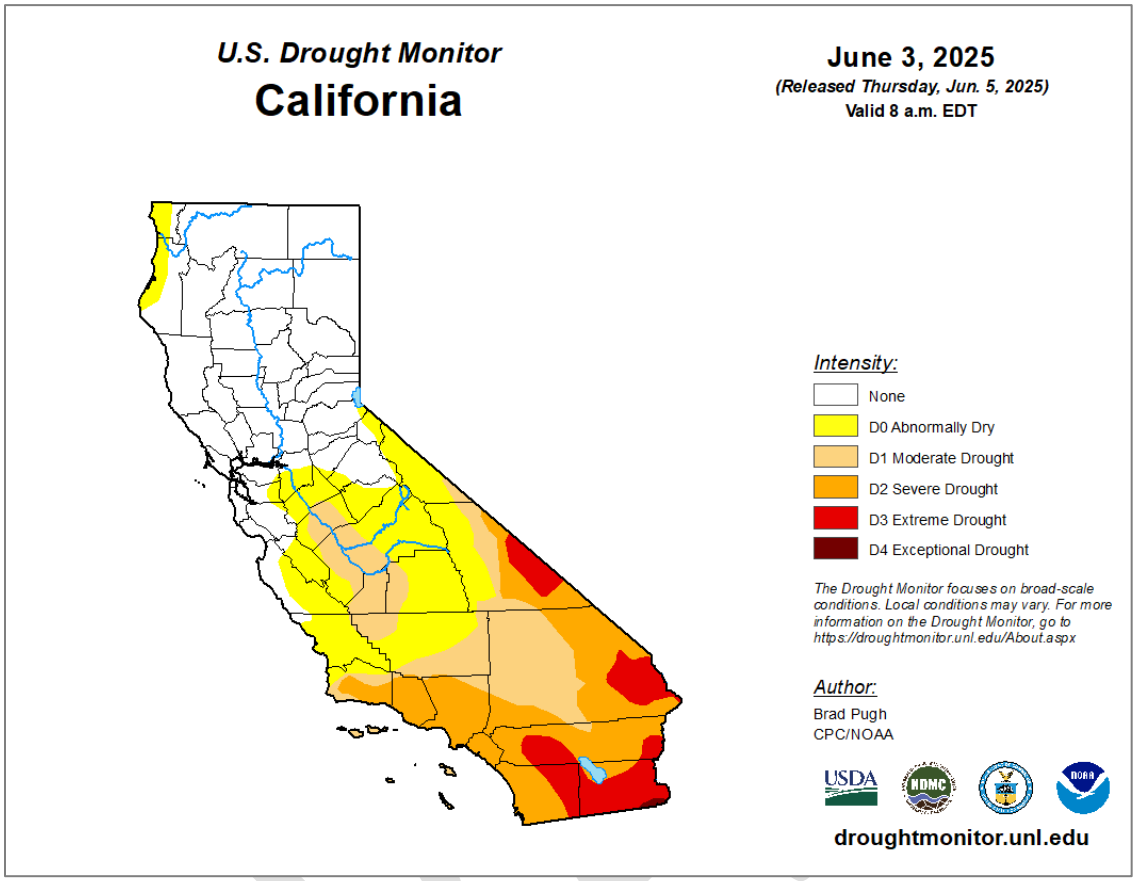
Source: National Oceanic and Atmospheric Administration. Palmer Drought Severity Index. https://www.ncei.noaa.gov/access/monitoring/historical-palmers/. Accessed May 26, 2025.

The Palmer Drought Severity Index (PDSI) uses monthly temperature and precipitation data to calculate a simple soil water balance. The index is a relative measure that typically ranges from -4 (extremely dry) to +4 (extremely wet) and represents how soil moisture availability differs from that expected for a given place and time of year. The PDSI includes a "memory" component that considers past conditions and persistence of soil moisture surplus or deficit.[67]

The June 3, 2025, Drought Monitor map for California *(Figure 3-3. Drought Monitor)* shows that localized drought conditions as “Severe Drought” in Malibu.

[67] Carolinas Precipitation Patterns & Probabilities. 2023. https://www.cisa.sc.edu/atlas/glossary.html. Accessed January 20, 2023.

Figure 3-3. Drought Monitor



The Drought Monitor is a joint effort of the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center at the University of Nebraska-Lincoln. A map is released each week with drought conditions across the country, indexing everything from groundwater storage to river levels.

Source: National Drought Mitigation Center — University of Nebraska-Lincoln. https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA. Accessed June 6, 2025.

3.3.3.1 Exposure to Drought

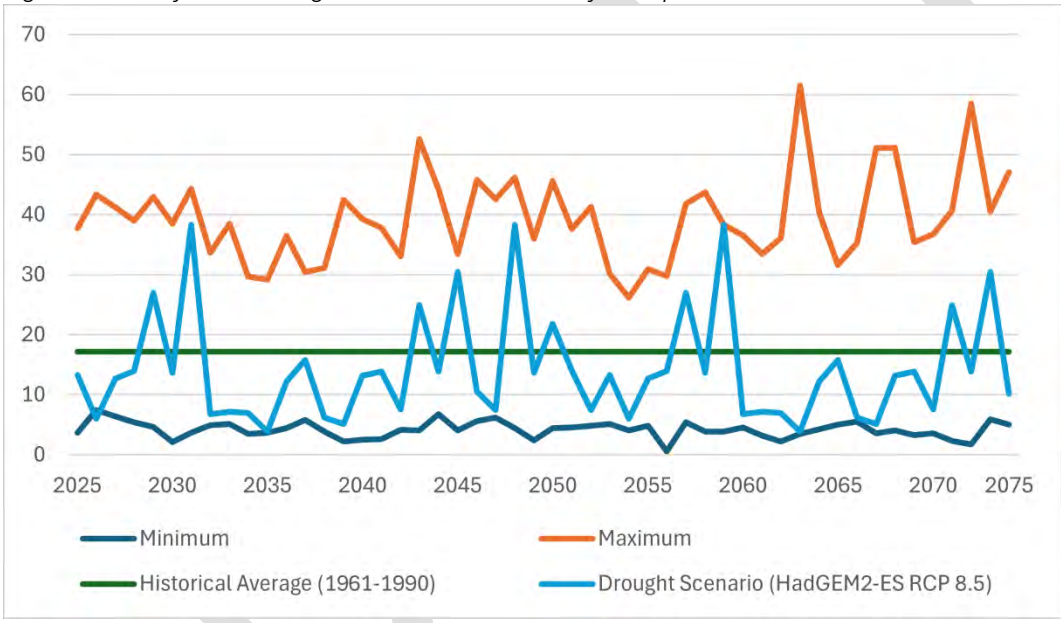
As shown *Table 3-3: Change in Annual Average Precipitation: City of Malibu* under both the medium and high emissions scenarios, Malibu is not expected to experience significant changes in average precipitation. However, Malibu's water security is tied to regional hydrology in the Sierra Nevada and Colorado River Basin. Drought in those source regions can tighten supplies, raise costs, and trigger restrictions in Malibu—even if Malibu's future rainfall is not reduced. California, and by extension the City, has been experiencing prolonged periods of drought. Recent research suggests that extended drought occurrence (a "mega-drought") could become more pervasive in future decades. An extended drought scenario is predicted for all of California from 2025 to 2075 under the HadGEM2-ES simulation and high emissions scenario. The extended drought scenario is based on the average annual precipitation between 1961 and 1990 of 10.9 inches. As shown in *Figure 3-4: Projected Drought*

Conditions: Inches of Precipitation, under the projected drought scenario between 2051 and 2070, the City's precipitation is not expected to vary from the 1961-1990 baseline of 17.1 inches per year.[68]

The Relationship of Drought to Flooding

According to climate forecasters at NASA, the future of fresh water will be full of extremes in the frequency and magnitude of floods and droughts. Droughts will pose serious challenges to the safety, health, and food and water supplies of plants, and animals and humans in the City if imported water supplies are reduced. Forecasts must now focus on predicting where it rains or does not, but also how much, and how frequently heavy rain falls versus light rain. Rainfall amounts impact soils saturation and how high streams and rivers rise, which then changes their capacity to hold more in the event of another storm. Drier conditions from extended drought can exacerbate flooding conditions.[69]

Figure 3-4: Projected Drought Conditions: Inches of Precipitation



Source: California Energy Commission. CalAdapt. Local Climate Change Snapshot for Malibu: Extended Drought Scenarios. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed June 6, 2025.

3.3.3.2 Sensitivity to Drought

Drought will continue to be a foreseeable event in the future of California, including the City of Malibu because of its reliance on imported water. Since most droughts are almost entirely contingent on global weather phenomena, which vary from year to year, it is impossible to predict either the frequency or severity of future drought events.

[68] California Energy Commission. Cal-Adapt. 2025. Extended Drought Scenarios, Precipitation by Year for City of Malibu. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed June 6, 2025.

[69] National Aeronautics and Space Administration. 2019. Earth's Freshwater Future: Extremes of Flood and Drought. https://climate.nasa.gov/news/2881/earths-freshwater-future-extremes-of-flood-and-drought/. Accessed January 23, 2023.

Two key challenges to the water supply that would be associated with climate change and drought (not including operating in a complex regulatory environment, aging infrastructure and invasive species impacts). The first key challenge is the reliance on imported water if Los Angeles County's water supply availability and reliability are undermined (due to, e.g., threats to the Delta, reduced snowpack, sea level rise, and levee failures) could undermine water supply availability and reliability thereby increasing demand for water across the region (e.g., due to shifts in land use, groundwater pumping, and new development).

As vegetation changes because of drought conditions, the animal species that depend on certain plant communities for food supply and habitat may be affected. The projected increase in the duration of droughts through the end of the century may threaten ecosystems as species become weak due to limited access to water and become susceptible to disease, pest, and decay.[70]

An indirect hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Millions of board feet of timber have been lost, and in many cases, erosion has occurred, has caused serious damage to aquatic life, irrigation, and power production due to heavy silting of streams, reservoirs, and rivers.

Drought is also often accompanied by extreme heat, exposing people to the risk of sunstroke, heat cramps and heat exhaustion. Pets and farmed animals are also vulnerable to heat-related injuries. Crops, already susceptible to drier conditions, can become even more vulnerable to extreme heat events as well.

Lifeline Utility Systems

Climate change is also expected to increase the average temperature and cause more frequent and prolonged heatwaves in California and the City. During these events, water supplies may be diverted for cooling functions throughout Los Angeles County. Hotter temperatures may also lead to increased surface water evaporation which could lead to greater water consumption. If a drought were to occur during a future heatwave, it could place the water supply under strain due to increased consumption potentially in combination with reduced supply.

From a statewide perspective, snowpack has fluctuated widely depending weather conditions. Much of California's water comes from melted snow in the high sierra. In April 2022, the Sierra snowpack was in decline, at 38 percent of the Statewide average. The snowpack was the lowest it had been since 2015 and registered the sixth lowest April measurement in State history. In January 2023, storms in the Sierra Nevada more than doubled the snowpack for a normal January and surpassed the April annual average.[71] In April 2025, snowpack was 90 percent of the average.[72]

Economic Elements

Drought causes the most significant economic impacts on industries that use or depend on water for their business — most notably agriculture and related sectors (forestry, fisheries, and waterborne

[70] California Natural Resources agency, Governor's Office of Planning and Research, and California Energy Commission. 2019. California's Fourth Climate Change Assessment; San Diego Region Report. Available: https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-009_SanDiego_ADA.pdf. Accessed November 1, 2022.

[71] California Department of Water Resources. 2023. Snow Water Equivalents. January 20.

[72] California Department of Water Resources. 2025. March Delivers: Statewide Snowpack Near Average As California Approaches End of Wet Season. Accessed June 6, 2025.

activities). In addition to losses in crop yields and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. As the general drying of the landscape occurs in a drought, there can be a dramatic shift from high moisture to low moisture, prompting nuisance pests to migrate earlier in the year and in a more concentrated manner.[73] And for certain insects that thrive in warm, dry weather, like grasshoppers, populations increase dramatically. Left unaddressed, grasshoppers could cause agricultural damage so severe that beef and crop prices would go up.[74] Drought can lead to reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. This can lead to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease. Additionally, removal of dead trees can be costly and challenging, which can add to the financial impacts of drought.

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely to follow years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners in the form of increased water bills. However, these impacts are not considered critical in planning for impacts from the drought hazard.

The water sector is central to public health and the economy. Water utilities ensure a reliable supply of clean water to communities and ecosystems and contribute significantly to the resilience of many other sectors, including agriculture, energy, and manufacturing. Drought can result in impacts on water utility operations, including:

- Loss of water pressure and water supply
- Poor water quality that may require additional treatment to meet drinking water standards. Poor water quality from drought is due to a number of interconnected variables including, but not limited to, the increased concentration of contaminants, low-oxygen reservoirs, increased salinity and bromide, and increased microbial growth.
- Inability to access alternative and supplementary water sources because of high demand and competition from other users
- Increased customer demand
- Increased costs and reduced revenues related to drought impacts.

Natural Resource Areas

Climate change threatens biodiversity, as urban development has left species with limited room to migrate. Drier soils may impact the ability of plant species to survive in their native habitats, and riverine ecosystems may experience decreasing populations of aquatic species. Climate change is likely to exacerbate the spread of invasive species and plant diseases that threaten ecosystem health. Aquatic ecosystems may see a decrease in surface water quality, which would place stress on aquatic life and could result in the spread of invasive species. Climate related ecosystem vulnerabilities may lead to habitat fragmentation, which would impede species migration and threaten the connectivity of regional ecosystems.[75]

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[73] Schellman, Anne. 2015. California drought may be causing shifts in pest invasion behavior. UC Division of Agriculture and Natural Resources. https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=19008. Accessed January 21, 2023.

[74] Brown, Matthew. 2021. Forget cicadas. Drought-stricken West is getting plagued by voracious grasshoppers. Los Angeles Times. June 24.

[75] Valley Water. Climate Change Action Plan. 2021.

When a drought occurs, the existing pressures on the ecosystem's natural water supplies are amplified. If the ecosystem's water needs are not considered in water allocation decisions, then this already vulnerable ecosystem may be pushed beyond the threshold at which it can recover. The ecosystem will begin to function differently, leading to a loss in the critical services it once provided humans—such as purifying water and air, preventing erosion, and providing recreation opportunities.[76] An exceptionally severe drought could dramatically reduce the amount of water available for landscaping in the City and deprive trees of the irrigation they require for their survival.

Lack of moisture, already at a severe level in California due to a current multi-year drought and decades of fuel accumulation from historical forestry and fire suppression practices, increases the risk of wildfires. Devastating wildfires like the Palisades Fire of 2025 impact watersheds and increase the risk of landslides or mudslides, which increase sediment in runoff that reduces water quality.

Tree mortality is a key secondary impact of drought. Drought can affect a tree's ability to generate pitch, which it uses to defend itself against infestation by insects such as the bark beetle. Prolonged periods of drought, such as the one just experienced by the State of California, can cause extensive damage to trees. Since May 2016, the U.S. Forest Service has identified 36 million new dead trees, bringing the total estimate of dead trees in California to 62 million. These impacts are not instantaneous and sometimes are not felt by communities for many years following a drought. Any tree has the potential to be infested by pests that could result in the tree's death. This means all areas of the City that are landscaped with trees could experience tree mortality. These areas include parks, landscaped parkways and street medians, schools, as well as private homes.

Vulnerable Populations

The entire population of Malibu is vulnerable to drought. Drought can affect people's health and safety, including health problems related to low water flows, poor water quality, or dust. Droughts can also lead to loss of human life. In addition to fire-related injuries, local and regional transport of smoke, ash, and fine particles increases respiratory and cardiovascular risks. Drought may increase exposure to health hazards including wildfires, dust storms, extreme heat events, flash flooding, degraded water quality, and reduced water quantity. Other possible impacts include recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and hygiene; compromised food and nutrition; and increased incidence of illness and disease.

3.3.3.3 Adaptive Capacity to Drought

Los Angeles County

- The LA County Water Plan: Focuses on achieving regional water resilience through collaborative Strategies. Over 200 agencies in Los Angeles County manage a complex network of water systems to meet the needs of our communities and environment. To achieve sustainability, resilience, and equity, cross-sector teamwork and a holistic approach to best leverage natural systems and infrastructure are essential. This plan is a living document. The targets, strategies, and actions are a starting point in this effort. There are four key focal areas:
    1. Regional Water Supply Reliability: Improving regional water supply reliability by better leveraging our collective local and imported water resources and infrastructure.

[76] National Integrated Drought Information Systems. Ecosystems. https://www.drought.gov/sectors/ecosystems. Accessed November 5, 2022.

2. Groundwater Management And Quality: Realizing our shared groundwater management opportunities by sharing expertise and resources to overcome challenges.
3. Small, At-Risk System Resilience And Drinking Water Equity: Ensuring a consistently high standard of water service for everyone in Los Angeles County by providing regional support for small systems, with focused attention to under-resourced communities because many small systems lack revenue and staffing, have only one source, and serve communities that bear higher risk of service interruptions or quality problems; and regional support fills those gaps.[77]
4. Watershed Sediment Management: Mitigating the impacts of wildfire on our water supplies through coordinated efforts between land and water managers. Essentially, Plan calls for shared planning, pre-cleared permits, joint investments, and synchronized operations—so post-fire ash/sediment and runoff do not overwhelm flood control, recharge, or treatment systems.[78]

Local Water Conservation Efforts

- Malibu Smart Program: The City partners with LA County Waterworks District 29 and West Basin on the Malibu Smart campaign, a comprehensive water conservation program aiming to save 28 million gallons of water annually through rebates, audits, and educational workshops.[79]

[77] An example of a small system is the Small community water system (SCWS): a community water system serving ≤3,300 service connections or ≤10,000 people. California Code, Health and Safety Code - HSC § 116275

[78] Los Angeles County 2023. Los Angeles County Water Plan. 2023 Edition. Water Supply Resilience.

[79] Institute for Local Government. 2019. City of Malibu Sustainability Best Practices Activities.

3.3.4 WILDFIRE AND SMOKE

According to the State's Fourth Climate Change Assessment, by 2100, the frequency of extreme wildfires burning over 25,000 acres could increase by nearly 50 percent.[80] As with other climate hazards, the State is already beginning to experience an increase in severe wildfires. Most of California's largest and most destructive wildfires have occurred in recent decades. This pattern has been particularly notable in the last decade, which has seen some of the worst wildfires in the State's recorded history.[81]

Wildland fire is a recurrent feature of ecosystems in semi-arid climates throughout the world, including the American West and California. The Mediterranean-type climate of California (and climatically similar regions in other parts of the world) is especially fire prone, as the winter rains support vigorous plant growth and the summer dry season dries out the vegetation, making it exceedingly flammable. Hot and dry conditions, combined with offshore winds in autumn create high risk conditions that rapidly spread fires. Fire ignitions in California are primarily due to Increased development in Fire-Prone Areas, utility infrastructure management, and unhealthy forests and climate contribute to higher risk of rapid-fire spread.[82]

Not only do high-severity wildfires take lives and level homes, public facilities, and community infrastructure, but they also destroy fish and wildlife habitats. Moreover, intense wildfires can also impair air quality throughout the State.

Historical Wildfire Events

Malibu has experienced large and destructive fires. These include:

- 1993 — Old Topanga fire, which burned approximately 350 homes, burned approximately 17,500 acres, caused 3 deaths.
- 2018 — Woolsey fire consumed approximately 96,949 acres across both Los Angeles and Ventura counties destroying or damaging almost 2,000 structures and was responsible for three deaths.
- 2024 — Franklin fire burned over 4,000 acres and destroyed 20 structures.
- 2025 **—** The Palisades Fire burned over 23,ooo acres, destroyed over 1,000 structures, and was responsible for twelve deaths.

3.3.4.1 Exposure to Wildfire

Climate change will result in changes in precipitation patterns, increased temperature, and drought conditions. Wetter months may lead to increased vegetative growth, while following periods of drought will allow for the vegetative growth to dry up, creating greater amounts of fuel for fires.

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[80] State of California Climate Adaptation Strategy. 2023. https://climateresilience.ca.gov/overview/impacts.html. Accessed March 7, 2023.
[81] State of California, Legislative Analyst's Office. 2022. Budget and Policy Post. Climate Change Impacts Across California Crosscutting Issues. April 5, 2022. https://lao.ca.gov/Publications/Report/4575. Accessed April 11, 2022.
[82] California Legislative Analyst Office. 2025. Frequently Asked Questions About Wildfires in California. https://lao.ca.gov/Publications/Report/4952. Accessed June 16, 2025.

Climate change will also worsen existing severe wind events, which fuel the spread and intensity of wildfires.

The City's highest priority is human life-safety. Historically, large wildfires in Malibu and Los Angeles County have resulted in an unfortunate number of casualties and injuries to both firefighters and residents, with the recent 2025 Palisades Fire and the 2018 Woolsey Fire causing some of the most devastating impacts on public safety and property in and around Malibu.

The Malibu Community Wildfire Protection Plan Planning Area[83] presents numerous life safety challenges including:

- Emergency evacuation and management
- Difficult and potentially congested travel routes for use during evacuations
- Poor egress and access for citizens, firefighters, and law enforcement
- Limited and/or deficient defensible space in certain neighborhoods
- High percentage of existing building stock with deficient structural hardening

The City of Malibu's topography and past development practices impedes access and egress for emergency services and efficient evacuation of residents, tourists and other visitors. These impediments include narrow winding roads, steep roads, vegetation encroachment into roadways, gates, bridges, addresses not clearly visible from the road systems, and other speed limiting factors such unlit roads and intersections, unlit street signage, and limited turnaround capabilities. The recent and fast-moving 2025 Palisades Fire and 2018 Woolsey Fire, underscores the need for residents to be prepared to evacuate with clear plans on how they can rapidly access Highway 1/ PCH, the safest primary east-west evacuation route, as well as local city and County transportation boards in managing downstream transit capacities and controls (or the receiving road network's ability and rules to handle Malibu evacuees once they leave the City).[84]

Wildland Fire vs. Wildland-Urban Interface Fires

Fire science distinguishes between two types of wildfires: "wildland" fires, which burn predominately in undeveloped areas, and "wildland-urban Interface" (WUI) fires. This distinction is important because mitigation, damage, and actions related to the two types may differ significantly.

Wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may be beneficial to the landscape if they burn within the historic range of variability for fire size and intensity. Many species are adapted to California's natural fire regimes and flourish after a low or mixed severity burn. These fires also enhance ecosystem function by creating landscapes that have more variation, are more resilient to other disturbances, and are better able to withstand extremes in precipitation. The wildland fire may result in secondary negative impacts in the form of air pollution, soil erosion (resulting in siltation of streams and lakes), or mudslides, though these impacts tend to be far less than would occur following high severity fires in areas of historic fire suppression. However, unless these fires or their related secondary impacts occur in or near developed areas they are rarely classified as disasters because they do not affect people or the built environment.

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[83] The City's Planning Area as defined in the 2021 Malibu Community Wildfire Protection Plan, is approximately 19.3 square miles (12,352 acres) of predominantly rural residential and recreational land-use designations, with limited commercial development near the Civic Center and Point Dume areas.

[84] City of Malibu. 2021. Community Wildfire Protection Plan.

The WUI is characterized by the intersection of the natural and the built environments and has been defined as "the area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels" (Society of American Foresters). The WUI can be configured in many ways including a classic "interface" (e.g., a community that abuts a National Forest at a distinct boundary), an "intermix" (e.g., vegetative fuels distributed between buildings throughout a subdivision between buildings), or an "occlusion" (e.g., a community that completely surrounds a designated open space area).

WUI fires represent an increasingly significant concern for the State of California. California has a chronic and destructive WUI fire history with significant losses of life, structures, infrastructure, agriculture, and businesses. Even relatively small-acreage WUI fires may result in disastrous damage. Most local governments that have submitted Local Hazard Mitigation Plans (LHMPs) have identified wildfire and WUI fires as specific hazards.[85]

Fire Hazard Severity Zones

CAL FIRE has mapped wildfire hazard zones using a model that designates moderate, high, or very high Fire Hazard Severity Zones (FHSZ), based on how a fire would behave in an area and the probability of flames and embers threatening buildings. For wildland areas, the FHSZ model uses burn probability and fire behavior based on weather, fuel, and terrain. For urban areas, hazard levels are based on vegetation density, distance from wildlands, and the levels assigned to surrounding zones. Each area gets a score for flame length, embers, and the likelihood of burning. Scores of smaller areas are averaged over larger zones that encompass them.

FHSZ ratings are derived from a combination of fire frequency (how often an area burns) and expected fire behavior under severe weather conditions. CAL FIRE's model derives fire frequency from 50 years of fire history data. It also is based on frequency of fire weather, ignition patterns, and expected rate-of spread. It accounts for flying ember production, which is the principal driver of the wildfire hazard in densely developed areas. A related concern in built-out areas is the relative density of vegetative fuels that can start new fires and spread to adjacent structures. The model refines the zones to account for fire exposure mechanisms that cause ignitions to structures.[86]

While FHSZs do not predict when or where a wildfire may occur, they do identify areas where wildfire hazards could be more severe and of greater concern. As such, the zones identify locations where increased wildfire safety provisions for various building and site components (e.g., fire resistant materials, vents, decks, windows, defensible space wildland-urban-interface safety requirements) would be required for all new construction per California Building Code Chapter 7A. The zone designations must also be included in real estate disclosures and are used by local governments to support wildfire risk analysis and hazard mitigation planning.[87]

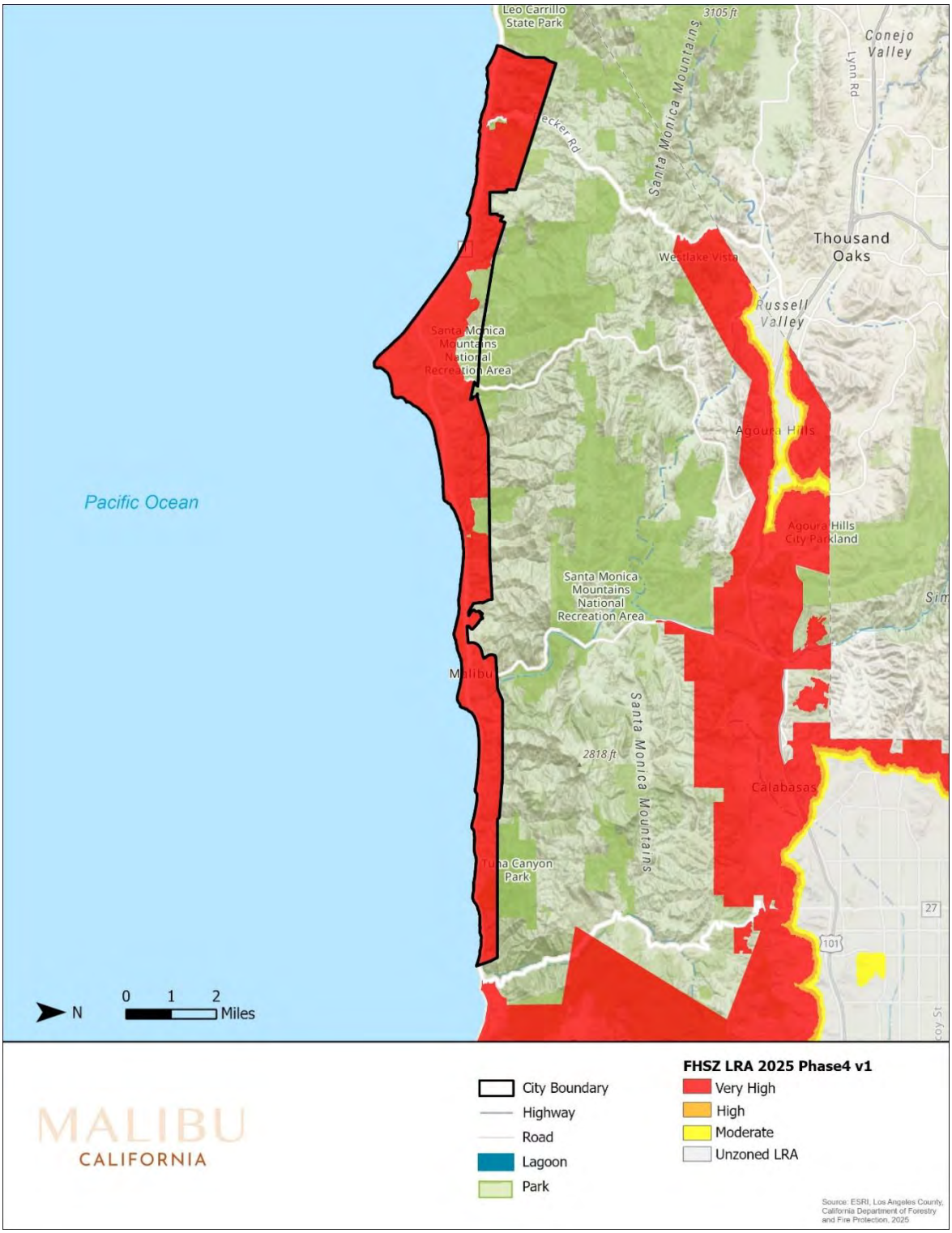
The entire City is located in a classified Local Responsibility Area (LRA) Very High Fire Severity Zone (VHFSZ), while also surrounded by the State Responsibility Area (SRA) Very High Fire Severity Zone. (See *Figure 3-5: Fire Hazard Severity Zones*).

Climate models have difficulty projecting exactly where and how fires burn as the frequency, severity and impacts of wildfire are sensitive to climate change as well as other factors, such as development

[85] California Governor's Office of Emergency Services. 2023 State Hazard Mitigation Plan.
[86] California Governor's Office of Emergency Services. 2023 State Hazard Mitigation Plan.
[87] City of Malibu. 2021 Community Wildfire Protection Plan.

patterns and pest infestations. Instead, climate models estimate increased risk from wildfires. As shown in *Table 3-6: Modeled Annual Area Burned – City of Malibu*, The amount of area within the City at risk of wildfire is projected to increase substantially by the end of the century (depending on scenario) compared with the historic baseline as a result of various interconnected factors including climate conditions, fuel and vegetation characteristics, increases in population density and fire history. Of important note is that with an increase in the area that may burn is an increase in the frequency and of the fire duration. However, the severity of fire will depend on local conditions, including but not limited to, land use development patterns, weather patterns, other fires occurring at the same time, and availability of emergency resources.

Figure 3-5: Fire Hazard Severity Zones



Source: Office of the State Fire Marshall. 2025. Fire Hazard Severity Zones (FHSZ).

Table 3-6: Modeled Annual Area Burned: City of Malibu

Baseline (acres) (1961 - 1990)	Medium Emissions (RCP 4.5)		High Emissions (RCP 8.5)	
	Mid-Century	End-Century	Mid-Century	End-Century
379.6 acres	494.8 acres	494 acres	508.6 acres	493.1 acres

Source: California Energy Commission. CalAdapt. Local Climate Change Snapshot for Malibu: Wildfire: Modeled Annual Area Burned. https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed June 9, 2025.

The Annual Average Area Burned can help inform the City if wildfire activity is likely to increase in the study area. Much of California can expect an increased risk of wildfire, with a wildfire season that starts earlier, runs longer, and features more extreme fire events.

Based on the RCP 8.5 scenario, the annual average of area burned could increase by over 126 acres by the end of the century. Increases in fuel loading (the amount of burnable vegetation (fuel) present per unit area),could cause wildfires to move faster and increase the threat to the City. Increased fuel loading increases the potential for higher flame lengths (intensity) and higher heat output (burn severity) but not necessarily rate of spread. Fuel type (think grass vs timber) rather than loading influences rate of spread and the speed/direction at which a wildfire moves is most influenced by wind and slope.

According to *Table 3-7: Fire Hazard Severity Zone: Vulnerable Populations*, residents living in the VHFHSZ have demographic characteristics similar to the entire City as the VHFSZ covers a vast majority of the City. There are unique challenges for the City, as almost 50 percent of households in the Fire Hazard Severity Zone have at least one individual aged 65 years and older. Additionally, almost 15 percent of households have at least one person living with a disability. Challenges that these populations face include potential inability to access emergency supplies, evacuate, or receive and understand emergency information. The effects of climate change hazards can result in infrastructure disruptions including power outages. Such events could result in additional health hazards for the elderly or people with disabilities who rely on power to sustain medical equipment or assistive technology.

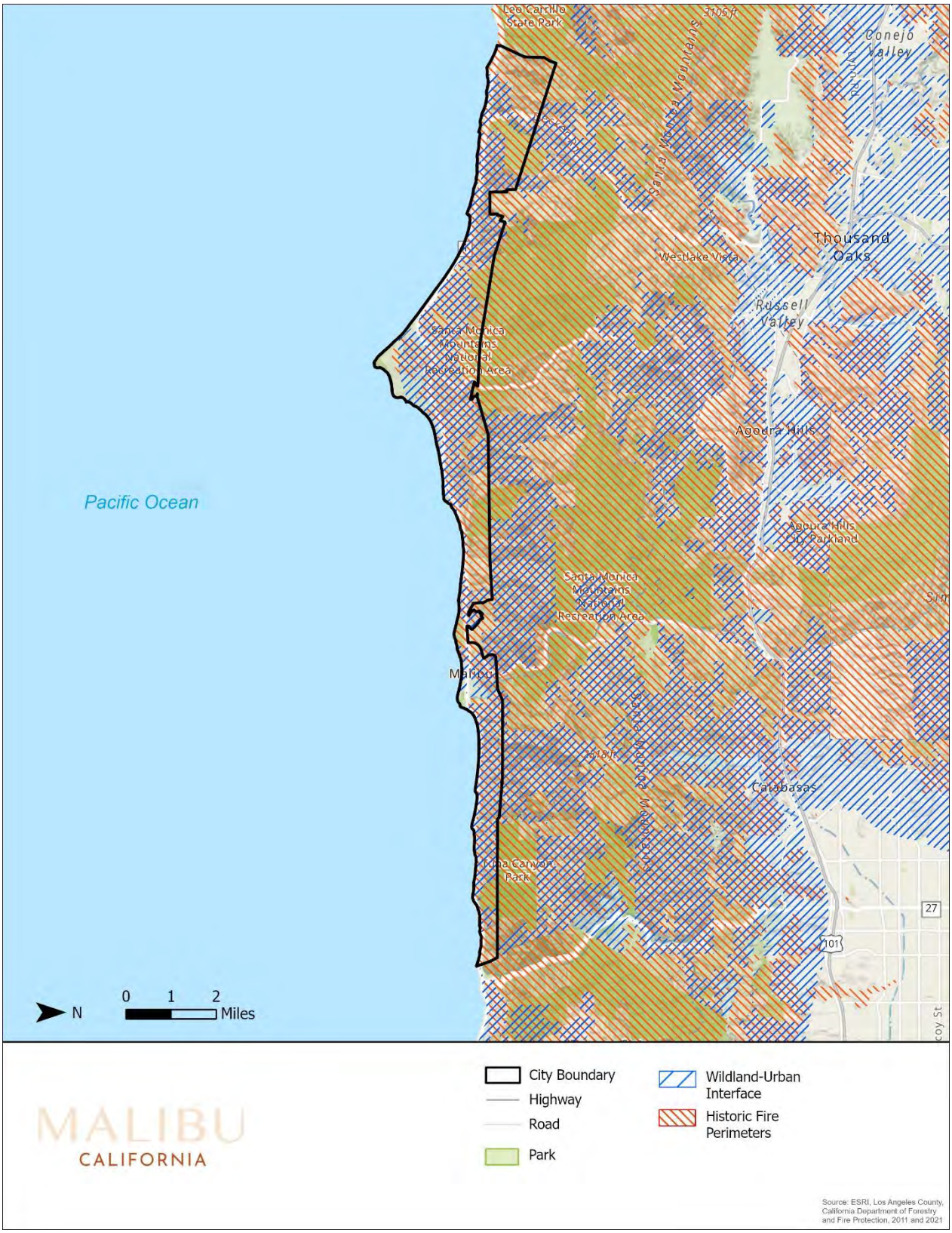
Table 3-7: Fire Hazard Severity Zone: Vulnerable Populations	VHFHSZ	City of Malibu
Total Population[1]	10,003	10,366
Percent of residents who are children (less than 10 years old)[2]	6.0%	6.0%
Percent of households that have people 65+ years old[1]	49.3%	49.3%
Percentage of households with at least one person living with a disability[1]	14.6%	14.6%
Median age[2]	51.0	51.0
Total households[1]	4,364	4,498
Median household income[2]	$200,001	$200,001
Percent of rental households[2]	29.3%	29.1%
Percent of household income below poverty level[1]	8.0%	7.7%

Source: US Census Bureau, ACS 2018 - 2022[1], ESRI Forecasts 2024[2]

Wildland Urban Interface

This Vulnerability Assessment evaluates housing density and wildfire hazard attributes (FHSZ) in an effort to capture Wildland Urban Interface (WUI). *Figure 3-6: Wildland Urban Interface* displays the overall pattern of WUI development in the City and adjacent unincorporated areas.

Figure 3-6: Wildland Urban Interface



Note: The WUI dataset is not refined through a field review process; it is not suited for WUI designations for individual houses or neighborhoods.

Table 3-8: Wildland Urban Interface: Vulnerable Populations	WUI	City of Malibu
Total Population[1]	8,788	10,366
Percent of residents that are children (less than 10 years)[2]	5.9%	6.0%
Percent of households that have people 65+ years[1]	50.0%	49.3%
Percentage of households with at least one person living with a disability[1]	14.9%	14.6%
Median age[2]	51.3	51.0
Total households[1]	3,885	4,498
Median household income[2]	$200,001	$200,001
Percent of rental households[2]	29.4%	29.1%
Percent of household income below poverty level[1]	8.0%	7.7%

Source: US Census Bureau, ACS 2018 - 2022[1], ESRI Forecasts 2024[2]

According to *Table 3-8: Wildland Urban Interface: Vulnerable Populations*, residents living in the Wildland Urban Interface have demographic characteristics similar to the Very High Fire Hazard Severity Zones as shown in *Table 3-7: Fire Hazard Severity Zone: Vulnerable Populations*, and therefore the City's concern would also be similar.

The 2021 Malibu Community Wildfire Protection Plan performs a hazard and risk assessment to measure the potential impact of a WUI fire and what impact current and possible mitigations may have on the resultant risk. Malibu is considered by CAL FIRE as being "At-risk" due to Federal, State or Local designations.

3.3.4.2 Sensitivity to Wildfire

Wildfire can cause significant damage to critical infrastructure, leading to a potential long-term disruption of public services.

Electrical services, water facilities, wastewater treatment, transportation and police/fire stations comprise just part of the overall critical infrastructure. These major facilities and infrastructure are priority locations for hazard reduction and wildfire hardening projects. Wildfire mitigation actions to protect critical infrastructure are often the responsibility of the entity operating these facilities or services.

Critical Infrastructure

The following is a brief description of critical infrastructure identified in the Community Wildfire Protection Plan (CWPP) Planning Area.

- Transportation Systems: Wildfire could damage roads in several ways. Unsafe conditions and damage could lead to road closures. Difficulties may arise with simultaneous evacuation and fire response due to roads that are narrow, steep, or have a dead end. Typical asphalt mixtures could ignite or melt/excessively soften. Debris from fires and subsequent landslides

could block roads.[88,89] Most major roads have sidewalks that create a small defensible space. Roads can be damaged by increased traffic of heavy vehicles, and vehicles that exceed weight limits, used during emergency response or recovery efforts. Costs associated with transportation infrastructure losses include repair costs, clean-up costs, and costs related to service disruptions.[90]

Transportation and the movement of individuals to safety ahead of wildfire is a great challenge for City, County and State governments. State Route 1 (PCH) is the principal evacuation route for residents of Malibu and provides east/west egress in the event of a wildfire. Unfortunately, eastbound travel on PCH into West Los Angeles has limited capacity and resulted in significant congestion during evacuations in previous fires. Coordination with the Cities of Los Angeles and Santa Monica and the multiple jurisdictional law enforcement agencies is necessary to better execute future evacuations.

Several north/south travel routes through the Santa Monica Mountains, including Malibu Canyon Road, Kanan Dume Road and Decker Road provide travel routes out of Malibu. Unfortunately, most major wildfires in the area have approached Malibu through one or several of these canyon roads, making them unsafe and/or unpassable during a wildfire.

The City is also challenged with a series of narrow canyon roads with poor inter-connectivity. Several neighborhoods have only a single primary egress route, which has historically been congested and/or blocked with traffic for those attempting to access PCH.

Protecting the viability of road systems in the Planning Area is critical to the safety of the public and emergency responders. The maintenance of roadside rights-of-way and prevention of neighborhood landscape vegetation from encroaching onto the road networks will be imperative for the resiliency of not only protecting the physical transportation network, but also the capacity to provide access and egress for the first responders and the public during a major wildfire event.

- Electrical services: Southern California Edison (SCE) is the service provider for the Malibu Community Wildlife Protection Plan Planning Area and maintains two substations, one located in Latigo and the other in Tapia. While no high voltage transmission lines exist within the Planning Area, major transmission corridors pass through the Santa Monica Mountains north of the City. The two City substations are connected to SCE defined “sub-transmission line” identified as 66kV lines. SCE may use Public Safety Power Shutoffs (PSPS) as preemptive outages to implement during extreme fire weather (e.g., high winds, low humidity, and dry fuels) to reduce the risk of power lines igniting a wildfire.
- Water delivery: Domestic water for City residents is supplied by County Waterworks District No. 29 from the Metropolitan Water District of Southern California. During recent wildfires,

[88] Carvel, R., & Torero, J. (2006). The Contribution of Asphalt Road Surfaces to Fire Risk in Tunnel Fires: Preliminary Findings. Proceedings of the International Conference on Risk and Fire Engineering for Tunnels, Stations, and Linked Underground Spaces (pp. 83-87). Hong Kong: Tunnel Management International.

[89] Cannon, S., & DeGraff, J. (2009). The Increasing Wildfire and Post-Fire Debris-Flow Threat in Western USA, and Implications for Consequences of Climate Change. In K. Sassa, & P. Canuti, Landslides - Disaster Risk Reduction (pp. 177-190). Verlag Berlin Heidelberg: Springer.

[90] Feo, Teresa J., Amber J. Mace, Sarah E. Brady, and Brie Lindsey. 2020. The Costs of Wildfire in California An Independent Review of Scientific and Technical Information. California Council on Science and Technology. ISBN Number: 978-1-930117-66-2.

the water distribution system has become unserviceable in portions of the City. This has driven local neighborhoods to invest in portable generators to help provide a more resilient power source to help sustain water systems for fire suppression operations. The Los Angeles County Fire Department has water supply requirements for the issuance of final approval of development projects. New construction projects will not receive final approval unless they can show adequate fire flow capacity. Additionally, the Fire Department will no longer accept onsite water tanks to be used as a primary source of water for fire-fighting purposes.

- Wastewater treatment: There are no municipal sewer service or wastewater treatment facilities in the City of Malibu. All properties in the City are currently served by individual onsite wastewater treatment systems, with the exception of those served by five small package treatment plants within the City – Latigo Bay Shores, Point Dume, Trancas Canyon, Malibu Mesa, and Maison de Ville.
- Pipelines: Two natural gas distribution pipelines pass north of the City through the Santa Monica Mountains. Both pipelines are subsurface and are not considered at risk from wildfire.
- Cellular service: Cellular communication is limited throughout the City of Malibu and surrounding communities in the Santa Monica Mountains. Several cellular towers exist in the Santa Monica Mountains, with several repeaters within the City Planning Area. However, due to the steep topography and numerous canyons throughout the area, cell communication is currently considered unreliable as a primary method for first responders to alert and inform the public concerning wildfire threats. Alternative methods of communication.[91] Cell service is also likely to be interrupted with the frequent power outages.

Economic Elements

Wildfire can lead to the loss of buildings and infrastructure that may need to be repaired from damage or replaced if destroyed. Additional economic losses include the value of private property or inventory that is damaged along with a home, costs associated with temporary accommodation or service disruptions, and costs related to toxic material and debris cleanup. When infrastructure losses cause service disruptions, the costs can be borne by customers and communities far from the perimeter of the wildfire as local infrastructure can be funded through regional measures.[92]

Natural Resource Areas

Because of historical forest management trends over the past century, increased temperatures, and more frequent drought, California wildfires are characteristically hotter and more intense as compared to naturally occurring fire regimes. As such, soil structure and moisture retention are damaged, leading to increased susceptibility to erosion or landscapes. If Malibu's foothills become covered with dry, overgrown vegetation because of drought conditions, extreme heat events and high winds will increase the threat of wildfires.

Beyond direct damage to physical property and harmful effects on public safety, wildfires also result in secondary impacts: a major consequence of wildfires is post-fire flooding and debris flow. Wildfires can burn ground cover and vegetation across the landscape, leaving soil exposed and easily erodible by precipitation. In other cases, fires can cause soil surfaces to harden. Instead of the rain soaking into

[91] City of Malibu. 2021 Community Wildfire Protection Plan.

[92] Feo, Teresa J., Amber J. Mace, Sarah E. Brady, and Brie Lindsey. 2020. The Costs of Wildfire in California An Independent Review of Scientific and Technical Information. California Council on Science and Technology. ISBN Number: 978-1-930117-66-2.

the soil, rainwater and melted snow can rush across these hardened surfaces, gaining enough power to erode loose sediments.[93]

Wildfires could alter hydrology by changing vegetation, increasing runoff, and resulting in more sediment that could block drainage and damage structures.[94] The wildfires are unlikely to directly burn and/or damage outfalls themselves due to construction materials and placement near bodies of water.

Conservation areas and open space in the City provide crucial ecosystem services such as the provisioning of clean air and water and climate regulation. If conservation areas are damaged, endangered species could be at increased risk to species survival. If habitats of sensitive species are subject to frequent disturbance or destruction, resources may be needed to conserve these species.

Vulnerable Populations

Wildfires are a major public health concern as they can cause immediate health impacts through burns, injuries, and heat stress. However, wildfire can influence the health outcomes of an area larger than the burn area because the associated smoke can travel long distances and worsen the air quality for extended periods. Wildfires can be a significant contributor to air pollution in both urban and rural areas and have the potential to significantly impact public health through particulates and volatile organic compounds in smoke plumes. Wildfires are a major source of particulate matter, which is an air pollutant that increases one's risk for respiratory illnesses, cardiovascular disease, negative birth outcomes, and premature death.[95] Wildfire smoke contains numerous primary and secondary pollutants, including particulates, polycyclic aromatic hydrocarbons, carbon monoxide, aldehydes, organic compounds, gases, and inorganic materials with toxicological hazard potentials.[96] Wildfire smoke also increases exposure to ground level ozone and toxic chemicals (e.g., pesticides, plastics, and paints) released from burned buildings and other man-made materials. Individuals sheltering in place are also at risk of exposure to hazardous air quality because wildfire smoke penetrates homes, particularly older homes.[97] Beyond these immediate health impacts, the stress, displacement, and loss of home and community from wildfires can cause significant mental health impacts, such as anxiety, depression, and post-traumatic stress disorder.[98]

Outside of the property owners directly impacted by a wildfire event, wildfires can also impact seniors and people with disabilities. During hazard events such as wildfires, flooding, or extreme storms, the elderly and other vulnerable populations, such as persons with disabilities, may require additional

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[93] United States Geological Survey. 2017. Increases in Wildfire-Caused Erosion Could Impact Water in the West. https://www.usgs.gov/news/national-news-release/increases-wildfire-caused-erosion-could-impact-water-supply-and-2. September 17. Accessed June 6, 2025.

[94] U.S. DOT. 2018. Transportation Climate Change Sensitivity Matrix. U.S. Department of Transportation. Retrieved from https://toolkit.climate.gov/tool/transportation-climate-change-sensitivity-matrix

[95] Bell, J.E., S.C. Herring, L. Jantarasami, C. Adrianopoli, K. Benedict, K. Conlon, V. Escobar, J. Hess, J. Luvall, C.P. Garcia-Pando, D. Quattrochi, J. Runkle, and C.J. Schreck, III, 2016: Ch. 4: Impacts of Extreme Events on Human Health. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 99–128.

[96] Künzli, N. et al. 2006. Health effects of the 2003 Southern California wildfires on children. Am J Respir Crit Care Med. 174:1221-8.

[97] Rudolph, L., Harrison, C., Buckley, L. & North, S. (2018). Climate Change, Health, and Equity: A Guide for Local Health Departments. Oakland, CA and Washington D.C., Public Health Institute and American Public Health Association.

[98] Hanigan, Ivan C., Colin D. Butler, Philip N. Kokic, and Michael F. Hutchinson. 2012. "Suicide and Drought in New South Wales, Australia, 1970–2007." Proceedings of the National Academy of Sciences of the United States of America 109 (35): 13950–55.

assistance to adequately respond. These groups may have limited mobility, be immuno-compromised, and/or not receive notifications regarding current conditions and evacuation requirements. For example, a senior who lives alone may not be aware that a wildfire is burning close to their residence and that they have been ordered to evacuate if those notifications were sent in manner that does not reach them. People with disabilities may require special mobility devices or caregiver assistance to go outside, which may not arrive as quickly as needed. As previously mentioned in the exposure analysis, the City should consider focusing a specific effort as it relates to an aging population. A proportionally larger percentage of the population resides in or near the VHFHSZ and the WUI.

Vulnerable populations with an increased threat level to wildfire and smoke include lower-income, renters, and the unhoused. These groups may not possess enough financial resources to purchase and operate air purifiers or rebuild their homes or search for new homes in the aftermath of a fire. The unhoused and seasonal agricultural workers have an additional risk as they are less likely to receive notification of this or other disasters because of a lack of access to information or technology or emergency notifications are not provided in a language they understand.

3.3.4.3 Adaptive Capacity to Wildfire

The City has addressed wildfire in planning documents such as the City of Malibu's 2021 Community Wildfire Protection Plan and the Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan. The City also has regulations and programs in place that are beneficial during wildfires by limiting further potential public health impacts as further described below:

State of California

In similar acknowledgement of the escalating risk of wildfire, the State of California also issued several documents to assist in wildfire planning and preparation, detailed in the following sections.

- Statewide Hazard Mitigation Plan: The State of California Multi-Hazard Mitigation Plan, revised in 2023, considers wildfire along with floods and earthquakes to be the three primary hazards faced by California. Chapter 9 describes wildfire hazards, vulnerabilities, and risk assessment. The document notes the importance of cities complying with State LHMP requirements under AB 2140, SB 379 (2015) and SB 1241 (2012).[99]

Los Angeles County

- Genasys Protect (Zonehaven) Aware Program: The Genasys Protect (Zonehaven) AWARE is a mapping tool used by all LVMCOG cities and is designed to work in combination with public alert and warning systems such as ALERT LA County and local City emergency alert systems. This tool ensures that both first responders and residents have access to the same Zone maps for efficient evacuation planning. Currently implemented in the Santa Monica Mountain region, residents can easily identify their specific "Zone" and access vital information about emergency services, real-time zone status updates, available shelters, and more. In the event of significant incidents requiring evacuations, the Zone map is continuously updated in real time.
- Los Angeles County Fire Department: First Responders: The Las Virgenes-Malibu Region is located at the Central Operations Bureau, Division of the Los Angeles County Department

[99] California Governor's Office of Emergency Services. 2023 State Hazard Mitigation Plan. 2023

(LACoFD). Battalion 23 of the LACoFD serves the Las Virgenes- Malibu Region with a total of 12 stations assigned to serve five cities and over 68,000 residents. The cities include Agoura Hills, Calabasas, Hidden Hills, Malibu, and Westlake Village. Battalion 5 headquarters are located at 29575 Canwood St. Agoura Hills CA 91301.

Operating 9 divisions and 22 battalions, LACoFD answers approximately 400,000 emergency calls annually. The Department currently has 177 fire stations, 75 paramedic squads, 9 wildland fire suppression camps, 10 bulldozers, 10 helicopters, 23 Prevention Offices, 12 Forestry Units and numerous other response vehicles and facilities. It serves 58 incorporated cities, as well as the unincorporated areas of the County. Additionally, the Department has Planning, Information Management, Lifeguard, and Health Hazardous Materials Divisions which provide valuable services to the more than 4.0 million people who reside in the 1.2 million housing units located throughout the Department's 2,311 square mile area. The LACoFD is one of six Contract Counties that maintain a contractual relationship with California Department of Forestry and utilizes the California Fire Plan within Los Angeles County as the primary wildland fire protection plan.[100]

- Fire Prevention Programs: The Los Angeles County Fire Department makes an active effort in order to prevent the possibility of a wildfire occurring within the Las Virgenes-Malibu Region. The following list provides a sample of the programs, activities and practices.
  - Prescribed Burning: The health and condition of brush will determine the magnitude of wildfire. The LACoFD does practice prescribed burning. If fuels (slash, dry or dead vegetation, fallen limbs and branches) are allowed to accumulate over long periods of time without being methodically cleared, fire can move more quickly and destroy everything in its path. The results are more catastrophic than if the fuels are periodically eliminated. Prescribed burning is the most efficient method to remove these fuels.
  - Pre-Fire Management Plan: As a preventative measure, the LACoFD also implements a Pre-Fire Management Plan whose overall goal is to reduce the total cost and losses from wildland fires in California by protecting assets at risk through focused pre-fire management prescriptions and increased initial attacks.
  - Fuel Modification Plan: The Fuel Modification Plan is part of the Forestry Division of the LACoFD. This publication was prepared to establish a set of guidelines and landscape criteria for all new construction relating to fuel modification planning that will reduce the threat of fire in high hazard areas.
  - Vegetation Management Program: The Vegetation Management Program (VMP) is a cost-sharing program that focuses on the use of prescribed fire, mechanical, biological and chemical means for addressing wildland fire fuel hazards and other resource management issues on State Responsibility Area (SRA) and Local Responsibility Area (LRA) lands. The use of prescribed fire mimics natural processes, restores fire to its historic role in wildland ecosystems, and provides significant fire hazard reduction benefits that enhance public and firefighter safety.
  - Brush Clearance Inspection Program: Mandated by the LA County Fire Code, all property owners in the region are presently required to maintain a firebreak around and adjacent to all buildings and structures by removing all flammable vegetation or other combustible

[100] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023

growth for a minimum distance of 200 feet from the structure or to the property line, whichever is closer.[101]

- Wildland Urban Interface (WUI) Program: The Los Angeles County Wildland Interface Program focuses on reducing wildfire risk in areas where human development meets wildland vegetation. This program encompasses various strategies, including community planning, building codes, defensible space requirements, and public education, to protect lives, property, and natural resources.
- CAL FIRE – Ready, Set, Go Program: The Los Angeles County's Fire Department participates in the CAL FIRE "Ready, Set, Go!" program to help property owners properly prepare well in advance of a wildfire to increase safety and protect property. This program provides comprehensive information on how to improve structure resistance to wildfires and prepare people to be ready to leave early in a safe manner.[102]

City of Malibu

- Malibu Community Wildfire Protection Plan (CWPP): This Community Wildfire Protection Plan (CWPP) provides a science and engineering-based assessment of the wildfire threat in the wildland urban interface (WUI) of the City of Malibu in Los Angeles County, California. This CWPP was developed through a collaborative process involving city officials, Los Angeles County Fire Department, surrounding fire agencies, county officials, county-, state-, and federal-land management agencies, HOAs and other community members. It meets the CWPP requirements set forth in the federal Healthy Forests Restoration Act which include: Identifying and prioritizing areas for fuel reduction activities; Stakeholder collaboration and addressing structural ignitability.[103]
- Firewise Communities: As of 2025, there were numerous Firewise Communities in Malibu and one in the process of being certified. The City fully supports residents spearheading the certification process under this program. The Firewise USA® recognition program is administered by the National Fire Protection Association (NFPA) and provides a collaborative framework to help neighbors in a geographic area get organized, find direction, and take action to increase ignition resistance of their homes and community and to reduce wildfire risks at the local level. In 2023, the City launched a program to assist more neighborhoods to become recognized as Firewise Communities.
- Home Ignition Zone Assessments: Since 2019, the City has conducted over 500 home ignition zone assessments to assist residents with recommendations for hardening their homes against flying embers. The assessments are done according to the National Fire Protection Association's Assessing Structure Ignition Potential from Wildfire training that covers wildfire behavior, structure exposure, and the concepts of the Home Ignition Zone and Structure Ignition Potential. A survey of 322 participants of the program indicated that a majority had implemented most, all or more of the recommendations.
- Hazard Tree Removal Program: The City has recently removed more than 500 hazard trees. These included trees that were dead or dying that posed a threat of falling and injuring individuals, damaging property, blocking exit routes or providing additional fuel in a fire.

[101] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023

[102] City of Malibu. 2025. Ready, Set, Go. https://www.malibucity.org/1054/Wildfire-Preparedness. Accessed June 6, 2025.

[103] City of Malibu Community Wildfire Protection Plan 2021

- City of Malibu Building Code: The City of Malibu Building Code includes wildfire mitigation standards for residential construction. Specifically, Section 17.40.040 Residential Development Standards require:

  1. Every residence shall have a roof constructed with roofing material in compliance with a rating as specified by Section 1603 (Fire Zone 4) of Title 26 (Los Angeles Building Code) of this code (see Chapter 15.04).

  8c. Ridgetop development is particularly susceptible to wildfire hazard. In addition to the criteria to reduce visual impact, the planning director shall evaluate all ridgeline development on slopes of at least 3:1 to incorporate adequate setbacks to address potential fire hazard concerns.

- Local Coastal Program Local Implementation Program (LIP) requirements for fuel modification.
- Additionally, all applicable development projects are required to obtain County Fire approval for fire access and fuel modification by the Community Development Department (Planning).
- Beacon Boxes: The City of Malibu has strategically placed 47 fire-resistant Beacon Boxes around the city which display critical information for public safety personnel such as water resources, road networks, egress areas, safe refuge areas, and high burn risk areas.
- Everbridge Alert System: The City of Malibu utilizes Everbridge for their disaster notification system which includes both landline and cell phone contacts.[104] Everbridge is the City's official mass-notification system for imminent threats (e.g., wildfire, evacuations, earthquakes, major road closures). Messages can go out simultaneously by voice call (cell & landline), text/SMS, email, and Everbridge app push, and can be geo-targeted to specific neighborhoods/evacuation zones.[105]

[104] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023
[105] City of Malibu. 2025. Alerts & Emergency Notifications. https://www.malibucity.org/566/Alerts-Emergency-Notifications?utm_source=chatgpt.com

3.3.5 FLOODING

A flood occurs when land that does not normally have bodies of water becomes suddenly inundated with water. Flooding can occur after periods of heavy rainfall, whether it occurs as a single extreme episode or as a series of storms. When heavy rainfall hits an area where the ground is already saturated, the risk of flooding is high. In developed areas, the presence of pavement and other impervious surfaces means that the ground is less able to absorb water. As a result, rainwater must be carried away in storm channels or waterways. Drainages and stream courses may flood their banks and shores if their capacity is exceeded by rainwater.

Floods pose several threats to communities and public safety. Flooding can cause property damage, destroy homes, and carry away vehicles or other large debris. Topsoil and vegetation can be swept away by floodwater, leading to erosion. Floodwater may impede the movement of victims fleeing a flood or of first responders attempting to reach people in need of help.

Climate models predict that California will experience less frequent but more intense storm patterns in the coming decades. The State's precipitation is expected to fall more frequently as rain rather than snow, compared to historical trends. Additionally, earlier and faster spring snowmelt--caused by higher temperatures--will cause the State's streams and rivers to swell more in some years. Scientists suggest the combination of these factors could lead to a 50 percent increase in runoff in future years, challenging the capacity of the State's existing reservoirs, canals, levees, and other flood control systems, and increasing the risk of inland flooding. Floods cause significant risks to human life, and damage roads, buildings, and other infrastructure.[106]

Annual Rainfall in Malibu Region

Rainfall in the LVMCOG region averages nearly 18 inches per year. However, the term "average rainfall" is misleading because over the recorded history of rainfall in the region, rainfall amounts have ranged from no rain at all in some years to well over normal averages in very wet years. Furthermore, actual rainfall in Southern California tends to fall in large amounts during sporadic and often heavy storms rather than in consistent amounts throughout the year. For example, the years 2022 and 2023 experienced greater than average rainfall including Tropical Storm Hilary in August 2023 which was the first severe storm of this type to reach Southern California since the 1930's.[107]

Types of Flooding

Increases in temperature and precipitation can lead to extreme precipitation events that could lead to flooding in the City. In the context of climate change for the City, this Vulnerability Assessment evaluated two types of climate-related floods: riverine and surface flooding caused by precipitation-driven events, and coastal flooding. The following describes the types of floods within each category.

1. Riverine and Surface Flooding from Precipitation-Driven Events
    - *Inland flooding* occurs when moderate precipitation accumulates over several days, intense precipitation falls over a brief period, or river overflows because of an ice or debris jam or dam or levee failure.

[106] State of California, Legislative Analyst's Office. 2022. Budget and Policy Post. Climate Change Impacts Across California Crosscutting Issues. April 5, 2022. https://lao.ca.gov/Publications/Report/4575. Accessed June 2, 2025.
[107] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023

- A *flash flood* is caused by heavy or excessive rainfall in a brief period, generally less than six hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons. They can occur within minutes or a few hours of excessive rainfall.

2. Coastal Flooding
    - A *coastal flood*, or chronic inundation of land areas along the coast, is caused by higher-than-average high tide and worsened by heavy rainfall and onshore winds (i.e., wind blowing landward from the ocean).
    - *Storm surge* is an abnormal rise in water level in coastal areas, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure.[108]

The following analyses describe riverine and surface flooding and coastal flooding vulnerabilities resulting from projected climate change for the City.

Historical Riverine and Surface Flooding Events

- February 1992 – Las Flores Canyon Flooding. Torrential storms led to severe flooding and mudslides in Las Flores Canyon, causing significant damage to homes and infrastructure.
- January 1994 – Post-Wildfire Mudslides. Following the 1993 wildfires, heavy rains triggered massive mudslides near Las Flores Canyon, closing the Pacific Coast Highway (PCH) for months and causing extensive property damage.
- January 2005 – Los Angeles County Flood. Malibu was affected by widespread flooding due to excessive rainfall, leading to infrastructure damage and road closures.
- February 2024 – Atmospheric River Storms. Intense atmospheric river events brought heavy rainfall, resulting in flooding and mudslides that impacted Malibu's transportation routes and communities.
- February 14, 2025 – Severe Flooding and Mudslides. A significant storm system caused severe flooding and mudslides in Malibu, leading to the shutdown of PCH and raising concerns over infrastructure resilience.

3.3.5.1 Exposure to Flooding

Flood zones are geographic areas that the Federal Emergency Management Agency (FEMA) has defined according to varying levels of flood risk. **Figure 3-7: Flood Hazard Zones** shows the mapped flood hazard zones for 100-year and 500-year flood (the 500-year floodplain is land that is covered in water during a flood event that has a 0.2 percent chance of being equaled or exceeded each year). Approximately 9.3 percent of the City is within the 100-year flood plain (1.83 square miles).

[108] NOAA National Severe Storms Laboratory. *Severe Weather 101.* https://www.nssl.noaa.gov/education/svrwx101/floods/types. Accessed December 6, 2022.

Figure 3-7: Flood Hazard Zones

3.3.5.2 Sensitivity to Flooding

If enough precipitation were to fall exceeding the storm drain infrastructure design capacity in the City, physical assets located can expect to be inundated. Electronic or mechanical equipment on the ground could become waterlogged and nonfunctional. Emergency services may also be impacted.

Lifeline Utility Systems

Disruptions to communications (including fiber optic cables, data centers, and communications towers) impact all aspects of residents' lives, from simple services to the complex and interdependent regional economy. Water damaged fiber optic lines can lead to disruptions in communications, which can be catastrophic during a disaster when communication is most essential. Flooded data centers could cause widespread damage to equipment, loss of data, and/or disruption of web-based services that use local data centers for hosting. Flood water can damage equipment at the base of communication towers and can even topple the towers if the water flow is fast enough, causing further damage to nearby homes and businesses.

Economic Elements

Renovations of commercial buildings may be necessary in areas of significant flooding, disrupting associated services. The tourism industry may also be affected by major flood events, as popular vacation areas tend to overlap with flood hazard zones.

Health Materials

Reentering and cleaning homes and buildings also presents hazards. Flooded buildings can pose significant health hazards to people entering them. Electrical power systems can become hazardous. Gas leaks can trigger fire and explosions. Flood debris—such as broken bottles, wood, stones, and walls—may cause injuries to those cleaning damaged buildings. Containers of hazardous chemicals may be buried under flood debris. Hazardous dust and mold can circulate through a building and be inhaled by those engaged in cleanup and restoration

Natural Resource Areas

Flooding events are projected to become more frequent and severe and can create significant ecosystem damage, compromising wildlife habitat from impacts such as erosion or sedimentation.

Vulnerable Populations

Age and disability can affect the ability of individuals to prepare for a flood and to move safely before, during, or after a flood. Individuals 65 years and older are more likely to experience difficulties during flooding, as well as with preparing and responding to rapidly changing environments. As little as 6 inches of floodwater can make sidewalks, streets, and pathways difficult to navigate; the elderly may find withstanding such circumstances especially challenging. When public health infrastructure or services are affected by flooding or erosion, the elderly are more likely to be affected by a lack of services than other age groups and may be more physically compromised in seeking services. Floods and their aftermath present numerous threats to public health and safety:

- Unsafe food—Floodwaters contain disease-causing bacteria, dirt, oil, human and animal waste, and farm and industrial chemicals which can contaminate agricultural fields.

- Contaminated drinking and washing water and poor sanitation—Flooding impairs clean water sources with pollutants. The pollutants also saturate into the groundwater which may put people at risk by drinking contaminated water. Flooded wastewater treatment plants can be overloaded, resulting in backflows of raw sewage. Private wells can be contaminated by floodwater. Private sewage systems can become a cause of bacteria spread if they overflow.
- Floods provide new breeding grounds for mosquitoes in wet areas and stagnant pools.
- Mold and mildew — Flooding can cause the growth of mold and mildew in structures. Excessive exposure to mold and mildew can cause flood victims—especially those with allergies and asthma—to contract upper respiratory diseases.
- Carbon monoxide poisoning—In the event of power outages following floods, built-up carbon monoxide from natural gas appliances can poison people and animals.
- Mental stress – Experiencing a devastating flood can cause a long-term mental impact.

Table 3-9: Vulnerable Populations: Flood Zones

	100 Year Flood Zone	City of Malibu
Total Population[1]	935	10,366
Percent of residents that are children (less than 10 years old)[2]	5.2%	6.0%
Percent of households that have people 65+ years old[1]	49.0%	49.3%
Percentage of households with at least one person living with a disability[1]	12.8%	14.6%
Median age[2]	52.9	51.0
Total households[1]	468	4,498
Median household income[2]	$200,001	$200,001
Percent of rental households[2]	37.4%	29.1%
Percent of household income below poverty level[1]	10.2%	7.7%

Source: US Census Bureau, ACS 2018 - 2022[1], ESRI Forecasts 2024[2]

Coastal Flooding and Inundation from Sea Level Rise

This analysis relies on data from the 2023 Coastal Hazard Vulnerability Assessment. The assessment analyzes coastal hazards including tidal inundation, shoreline and bluff erosion, and extreme coastal storm flooding. The assessment projects the potential impacts and vulnerabilities of sea-level rise (SLR) by mid-century (2050-2060) and late century (2080-2100) in the City of Malibu.

The study area includes Malibu's shoreline that stretches approximately 22.6- miles from Nicholas Canyon County Beach to Topanga Beach and includes the lower Trancas and Zuma canyons and low-lying areas around Malibu Lagoon. The Malibu coastline consists of a series of bluffs backed by the Santa Monica Mountains that are interspersed with streams and river canyons that transition to coastal floodplain areas and sandy beaches, including the lower Trancas and Zuma canyons and low-lying areas around Malibu Lagoon.[109]

Malibu has experienced impacts from numerous coastal storm events over the past few decades that included flooding and erosion damage. The Malibu coastline is most vulnerable to swells coming from southern hemisphere storms that typically arrive outside of the winter storm season. These swells can

[109] City of Malibu Coastal Hazard Vulnerability Assessment. 2023

be very damaging because they typically are long crested and powerful, and the south facing coastline has direct exposure. Typical winter storm swells that come from the northwest are blocked by the Channel Islands. Past years of the biggest swells (southern swells in bold) include: August 19, 1969, December 1969, May 1975, January 1993, April 2004, March 2005, July 2009, September 2011, September 2014, August 2020, August 2021, July 2022, January 2023 (L. Doyel, pers. com. February 2023). In the late fall and winter of 1982/83, California experienced an El Niño that produced significant precipitation, strong winds, and high surf along the southern California coast.

The storms damaged a Paradise Cove Pier, eroded beaches and coastal cliffs, destroyed homes above the beach, and caused flooding in creek and river systems. Other notable El Niño seasons occurred in 1988, 1998, and 2010. Most recently, the Adamson House property was damaged in 2019. Malibu oceanfront properties are also subject to tidal inundation during high tides that occur monthly (spring tides) to yearly (king tides).

Exposure and Sensitivity to Coastal Flooding

With projected sea-level rise, Malibu's vulnerabilities to coastal flooding and erosion are projected to increase. There are many assets shown as currently exposed to flooding and erosion hazards in the coastal zone that are protected to experience greater hazard impacts without action. There are also many assets that are shown as not being currently subject to coastal hazards but may become exposed under projected future conditions. The sections that follow summarize key vulnerabilities in Malibu.

- Critical Facilities and Infrastructure: Critical infrastructure in Malibu includes Lifeguard Towers and the Station at Zuma Beach, which may need modification/relocation to avoid erosion and flooding impacts with sea-level rise. Several stretches of Highway 1 are vulnerable to late century hazards including bluff erosion or coastal storm flooding and wave run-up (along Zuma Beach, Dan Blocker County Beach, Puerco Beach and Carbon Beach). Several fire hydrants may be exposed to coastal flooding and erosion with sea-level rise. Other important infrastructure includes a sewer pump station at the east end of Subarea A that may be exposed to coastal erosion with sea-level rise. In addition, beachfront parcels may also experience issues with onsite septic systems due to rising groundwater levels with sea-level rise. Failure of septic systems may result in discharge of untreated wastewater, poor local water quality and adverse impacts to human health and the environment.
- Development: Vulnerable development in Malibu includes beachfront and blufftop homes and businesses, much of which are currently armored and/or elevated. With sea level rise, development on the beaches or lower bluffs may be subjected to coastal erosion and flooding more frequently, leading to property damage and degradation of existing coastal armoring structures. Some oceanfront property and buildings may become impacted by tidal inundation depending on floor elevation and configuration of utilities beneath structures. Shore and bluff erosion may impact upland property and structures. By late century, much of the commercial area west of Malibu Creek and lagoon is vulnerable to coastal storm flooding and regular inundation by spring tides. Access roads to beachfront development may become exposed to erosion with sea-level rise, while Malibu Colony Road may also be subject to tidal inundation and coastal storm flooding.
- Beaches: Many of the narrow beaches along the Malibu coast may disappear with sea level rise, impacting shore ecology and recreation. Beaches in Malibu mostly exist as narrow stretches along beachfront homes, coastal bluffs and Hwy 1, with wider beaches exist at Zuma/Westward Beach, Point Dume State Beach, and Malibu Surfrider Beach. Today,

approximately one quarter of beaches in Malibu may disappear annually from seasonal fluctuations alone; nearly two thirds may disappear annually by mid-century. In addition, beaches may cease to recover along coastal armoring and other hardened shorelines without action. The disappearance of beaches in Malibu would adversely impact ecological functions along the coastline as well as recreation opportunities for Malibu residents and visitors.

3.3.5.3 Adaptive Capacity to Flooding

Due to the coastal flooding and erosion impacts that have occurred in Malibu, numerous adaptation strategies have already been implemented to reduce vulnerabilities to coastal hazards along the City's shoreline. Numerous beach nourishment projects have been completed in Malibu including Las Tunas Beach (1960-1974) and Zuma Beach (1979). Coastal armoring structures such as seawalls and rock revetments cover approximately 31 percent of the coastline in Malibu. Los Angeles County Department of Beaches and Harbors regularly construct temporary beach sand berms to reduce winter flooding of the lifeguard facilities, restrooms, and maintenance yard in the Zuma Beach parking lots.[110]

[110] City of Malibu Coastal Hazard Vulnerability Assessment. 2023

3.3.6 GEOLOGIC AND SEISMIC HAZARDS

In the context of climate change vulnerability, increased liquefaction (seismic) and heightened possibility of landslide (geologic) events are a concern. Both hazards are an indirect effect of increased precipitation and rising groundwater because soil must be saturated with water for liquefaction or landslides to occur. Both hazards can be triggered by seismic events such as earthquakes. Specifically:

- Liquefaction occurs when seismic energy shakes an area with low-density, fine grain soil, like sand or silt, which is also saturated with water. When the shaking motion reaches these areas, it can cause these loosely packed soils to suddenly compact, making the waterlogged sediment behave more like a liquid than solid ground.
- Landslides occur when earth on slopes becomes destabilized, typically after heavy rains, when the precipitation saturates the soil and makes it less stable, or when significant erosion from rainfall destabilizes the ground. Slopes that have recently burned face a greater risk from rain-induced landslides, as the fires burn the trees, brush, and other vegetation that help stabilize the earth.

Seismic Activity

Changes in the climate do not have a direct effect on seismic activity. However, seismic events such as an earthquake can cause liquefaction and landslides which are made worse by other conditions caused by climate change.[111] California is seismically active because of movement of the North American Plate, east of the San Andreas Fault, and the Pacific Plate to the west, which includes the State's coastal communities. The transform (parallel) movement of these tectonic plates against one another creates stresses that build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a fault.

The Las Virgenes-Malibu area is exposed to six major regional faults as *illustrated in Table. 3-10 Malibu Faults.*[112]

[111] Liquefaction occurs when seismic energy shakes an area with low-density, fine grain soil, like sand or silt, which is also saturated with water. When the shaking motion reaches these areas, it can cause these loosely packed soils to suddenly compact, making the waterlogged sediment behave more like a liquid than solid ground. During liquefaction events, the liquified soil can lose most of its stability which can cause damage to buildings and infrastructure built upon it. In severe cases, some buildings may completely collapse. Pipelines or other utility lines running through a liquefaction zone can be breached during an event, potentially leading to flooding or release of hazardous materials.

[112] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023

Table 3.10 Malibu Faults

Fault Map Code	Fault Name	Probable Magnitude	Length	Distance to LVMCOG	Direction from the LVMCOG
MB	Malibu Coast Fault	6.0 – 7.0 Mw	21.1 miles	0 miles	S
SM	Santa Monica Fault	6.0 – 7.0 Mw	15.0 miles	10 miles	SE
PVZ	Palos Verdes Fault Zone	6.0 – 7.0 Mw	49.7 miles	4 miles	S
SSRZ	Simi-Santa Rosa Fault Zone	6.5 – 7.0 Mw	24.9 miles	8 miles	NW
SMFZ	Sierra Madre Fault Zone	6.0 – 7.0 Mw	Mw 46.6 miles	10 miles	N/NE
RY	Raymond Fault	6.0 – 7.0 Mw	16.2 miles	25 miles	E

Historical Earthquake, Landslide, and Liquefaction Events

- January 1, 1979 – Heavy rain triggered a massive landslide, destroying homes and damaging infrastructure along PCH. Remains one of Malibu's most costly natural disasters.

- January 17, 1994 – Northridge Earthquake (M6.7). Although centered in the San Fernando Valley, this powerful quake caused notable shaking in Malibu, leading to structural damage and highlighting the region's seismic vulnerability.

- September 12, 2024 – Malibu Earthquake (M4.7) A magnitude 4.7 earthquake struck near Malibu, felt across Los Angeles County. While no major damage was reported, it raised concerns about increasing seismic activity in the area.

- March 9, 2025 – Malibu Earthquake (M4.1) A magnitude 4.1 earthquake hit near Malibu, contributing to a pattern of increased seismic activity in Southern California.

3.3.6.1 Exposure to Geologic and Seismic Hazards

Figure 3-8: Liquefaction Susceptibility highlights areas with potential for liquefaction. The underlying dataset combines existing liquefaction areas from local maps and the National Earthquake Hazards Reduction Program which rates soils from hard to soft and known hydric soils from the United States Department of Agriculture Soil Survey to identify the potential areas where liquefaction may occur.

Figure 3-8: Liquefaction Susceptibility

Table 3-11: Liquefaction Susceptibility – Vulnerable Populations illustrates the populations within liquefaction hazard zones within the City. Of special concern to the City is that almost 50 percent of households have at least one person aged 65 and over in addition to 12 percent of households with at least one person living with a disability. While the data may represent the same households, the number of individuals within the liquefaction susceptibility zones should be of special concern for the City when preparing for emergency events including evacuation.

Table 3-11: Liquefaction Susceptibility – Vulnerable Populations	Liquefaction	City of Malibu
Total Population[1]	1,833	10,366
Percent of residents that are children (less than 10 years old)[2]	5.3%	6.0%
Percent of households that have people 65+ years old[1]	49.6%	49.3%
Percentage of households with at least one person living with a disability[1]	12.2%	14.6%
Median age[2]	52.2	51.0
Total households[1]	943	4,498
Median household income[2]	$148,846	$200,001
Percent of rental households[2]	37.8%	29.1%
Percent of household income below poverty level[1]	11.1%	7.7%

Source: US Census Bureau, ACS 2018 - 2022[1], ESRI Forecasts 2024[2]

Landslides

Landslides occur when earth on slopes becomes destabilized, typically after heavy rains, when the precipitation saturates the soil and makes it less stable, or when significant erosion from rainfall destabilizes the ground. Slopes that have recently burned face a greater risk from rain-induced landslides as the fires burn the trees, brush, and other vegetation that help stabilize the earth. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 33 percent.
- A history of landslide activity or movement during the last 10,000 years.
- Stream or wave activity, which has caused erosion, undercut a bank, or cut into a bank to cause the surrounding land to be unstable.
- The presence of an alluvial fan (a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt) indicates vulnerability to the flow of debris or sediments.
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

Earthquakes may also be a source of landslides as the shaking can destabilize already loosened soil. There is the potential for landslides in the steeper portions of the foothills of the City. These areas are characterized with steep topography and geologic units that can become unstable. *Figure 3-9: Earthquake Induced Landslide Zone* identifies the areas of the City that are considered vulnerable to seismic induced landslides.

Figure 3-9: Earthquake Induced Landslide Zone

3.3.6.2 Sensitivity to Geologic and Seismic Hazards

Liquefaction and Landslides

As climate change is anticipated to change the usual precipitation patterns in California, periods of both rain and drought are expected to become more intense and frequent. Therefore, climate change could, depending on the circumstances, increase the future risk of liquefaction in the region.

Table 3-12: Landslide Susceptibility – Vulnerable Populations	Landslide	City of Malibu
Total Population[1]	2,040	10,366
Percent of residents that are children (less than 10 years old)[2]	5.2%	6.0%
Percent of households that have people 65+ years old[1]	45.9%	49.3%
Percentage of households with at least one person living with a disability[1]	11.6%	14.6%
Median age[2]	48.8	51.0
Total households[1]	856	4,498
Median household income[2]	$148,846	$200,001
Percent of rental households[2]	23.2%	29.1%
Percent of household income below poverty level[1]	3.9%	7.7%

Source: US Census Bureau, ACS 2018 - 2022[1], ESRI Forecasts 2024[2]

Critical Facilities and Infrastructure

During liquefaction events, the liquified soil can lose its stability which can cause damage to buildings and infrastructure built upon it. In severe cases, buildings may completely collapse. *(See Figure 3-8: Liquefaction Zones and Figure 3-9: Earthquake Induced Landslide Zone).*

- Roads—Access to major roads is crucial after a disaster event. Services and mobility may be disrupted during and following a liquefaction event. Sidewalks, roadways, and pipelines may become fractured and disjointed because of the liquefying soils. Roads and sidewalks may be usable in some form, but a severe liquefaction event may render them impassable until they are repaired. Landslides may block roadways causing long-term disruptions to the roadway network, infrastructure systems and public agency capabilities.
- Bridges — Earthquake shaking, liquefaction and landslides can significantly damage bridges, which often provide the only access to some neighborhoods. Since soft soil regions generally follow floodplain boundaries, those bridges that cross water courses are considered vulnerable. Key factors in the degree of vulnerability are the facility's age and type of construction and soil classification at the bridge support structure, which indicate the standards to which the facility was built.
- Water and sewer infrastructure — Water and sewer infrastructure would likely suffer considerable damage in the event of an earthquake. This factor is difficult to analyze based on the vast amount of infrastructure and because water and sewer infrastructure are usually linear easements. Without further analysis of individual system components, it should be assumed that these systems are exposed to breakage and failure. Distribution systems with older brittle pipes are vulnerable to shaking and liquefaction.
- Power Lines — Power lines are generally elevated above steep slopes but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines.

Hazardous Materials

Utility lines running through a liquefaction zone can be breached during an event, potentially leading to flooding or the release of hazardous materials. The shaking of the ground can also damage or destroy underground utilities or pipelines, potentially leading to releases of hazardous materials as well as flooding if water lines are breached. The sinking of the ground could also reduce the distance to the groundwater table, which could raise the risk of contamination from hazardous materials.

Economic Elements

Homes, schools, and public facilities may be damaged and would likely be rendered unsafe for occupancy if they experience any leaning or structural damage resulting from the liquefaction or landslides. In addition to potentially causing significant injuries or fatalities, this can cause economic harm and create a need for long-term emergency sheltering and temporary housing until these buildings can be reconstructed.

In consideration of future degradation of structures, the City will want to monitor the quality of older housing stock to ensure it is still safe in a liquefaction event. The U. S. Department of Housing and Urban Development may consider units substandard if they were built before 1940.

Natural Resource Areas

Earthquake-induced landslides in landslide-prone areas can significantly damage surrounding habitat. It is also possible for streams to be rerouted after an earthquake. Rerouting can change the water quality, possibly damaging habitat and feeding areas. There is a possibility that streams fed by groundwater wells will dry up because of changes in underlying geology. Landslides could affect sensitive ecological areas around the community, causing localized harm to the region's ecosystem, although widespread impacts are unlikely.

Vulnerable Populations

Similar to liquefaction impacts, the same concerns apply to those households with residents aged 65 and older or have a disability, as there may exist challenges with mobility that may affect evacuation and response to a catastrophic event.

3.3.6.3 Adaptive Capacity Geologic and Seismic Hazards

The City has addressed liquefaction and landslide events in planning documents such as the Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023 and other agency programs. The City also has regulations and programs in place that are beneficial during liquefaction and landslide events by limiting further potential public health impacts.

- City of Malibu Zoning and Building Code: In addition to the above referenced policies, the City of Malibu Zoning and Building Codes address development regarding grading, drainage, general building guidelines on slopes, as well as Geotechnical Engineering Standards.

- City of Malibu Local Coastal Program Land Use Plan and Local Implementation Plan: The City of Malibu Local Coastal Program Land Use Plan (LUP) and Local Implementation Plan (LIP) adopted by the California Coastal Commission (9/13/2002) includes policies to minimize the hazards associated with shoreline and bluff development including slope stability and landslide potential in hillside areas.[113]

[113] Las Virgenes-Malibu Council of Governments Multi-Jurisdictional Hazard Mitigation Plan 2023

CHAPTER 4. MALIBU HAZARD VULNERABILITY EVALUATION

4.1 EVALUATION FRAMEWORK

The California Adaptation Planning Guide (APG) defines vulnerability as a function of exposure plus sensitivity minus adaptive capacity.

- Exposure: the degree to which Malibu's people, assets, and ecosystems are in harm's way.
- Sensitivity: how strongly those assets or populations are affected once exposed.
- Adaptive Capacity: the ability of systems, institutions, and communities to adjust, respond, or recover.

4.2 HAZARD VULNERABILITY OUTCOME

Using this lens, Malibu's major hazards are evaluated qualitatively below.

Wildfire

Malibu is situated within the wildland–urban interface, making residential neighborhoods, utilities, and transportation routes highly exposed. Sensitivity is elevated due to steep topography, high density of fuels, reliance on a limited evacuation network (Pacific Coast Highway), and the presence of vulnerable populations. Adaptive capacity includes defensible space programs, evacuation planning, and outreach, but capacity is constrained by infrastructure, limited ingress-egress, and reliance on regional firefighting.

Overall Vulnerability: HIGH.

Coastal Flooding and Sea-Level Rise

Homes, beaches, and transportation corridors (especially PCH) are directly exposed. Sensitivity is acute for properties on narrow beaches and low-lying infrastructure. Proactive adaptive capacity exists in Malibu's Local Coastal Program development policies, but hard infrastructure solutions are costly and controversial, and relocation options are limited.

Overall Vulnerability: HIGH.

Storm Events and Flooding

On-shore precipitation events can trigger flooding, debris flows, and landslides (See Liquefaction and Landslides). In areas susceptible to 100-year flood events, roads and structures are the most likely to be affected. Adaptive capacity includes storm drains and building codes to reduce flooding impacts.

Overall Vulnerability: MODERATE.

Extreme Heat

Heat events affect residents, visitors, and outdoor workers. Older adults and low-income households without cooling systems are particularly sensitive. Adaptive capacity is moderate; Malibu's coastal

climate provides some protection, but inland canyons experience greater intensity and cooling centers are limited.

Overall Vulnerability: MODERATE.

Drought and Water Supply Stress

Malibu relies heavily on imported water supplies, making it sensitive to regional drought conditions. Local ecosystems such as creeks and chaparral are highly sensitive. Adaptive capacity includes water conservation measures, but diversification options like desalination are limited.

Overall Vulnerability: MODERATE.

Liquefaction and Landslides

Liquefaction potential is high near the coast and canyon such as Ramirez Canyon and Zuma Canyon. While high, building codes are intended to reduce the impact and therefore overall vulnerability is low.

Landslides vulnerability is highest after high precipitation events when occurring after fires and large erosion events. Intense winter storms can trigger flooding, debris flows, and landslides on eroded or burned hillsides. Infrastructure, homes, and roads (especially canyon roads) are exposed. Sensitivity is high due to steep terrain and soil instability post-fire. Adaptive capacity includes storm drains and slope stabilization, but geology and cost constrain effectiveness. While vulnerability is high after a fire and storm event, as these are specific situations, overall vulnerability is considered moderate.

Overall Vulnerability: MODERATE.

Table 4.1: Hazard Vulnerability Matrix

Hazard	Exposure & Sensitivity	Adaptive Capacity	Overall Vulnerability
Wildfire	Very High	Moderate	High
Coastal Flooding/Sea-Level Rise	High	Low–Moderate	High
Storms/On-Shore Flooding	Moderate	High	Moderate
Extreme Heat	Moderate	Moderate	Moderate
Drought/Water Supply	High	Moderate	Moderate
Liquefaction and Landslide	Moderate	Moderate	Moderate

Conclusion

The hazards that present the highest vulnerabilities for Malibu are wildfire and coastal flooding/sea-level rise, as they combine high exposure and sensitivity with adaptive capacity constraints. Drought and storm-related hazards represent moderate vulnerabilities, depending on climate intensification and water supply constraints. Extreme heat is moderate, buffered somewhat by Malibu's coastal setting but still a concern for inland and sensitive populations.

Safety Element Update - Changes to Existing City of Malibu Safety and Health Element

KEY to Third Column:

Kept– These remain as is, sometimes with minor text changes for clarity/consistency.

Modified – These were revised to reflect current conditions or updated priorities. In some cases, a policy has been modified into an implementation action or incorporated in an existing or new policy developed in the element, or an objective has been modified into a policy.

Removed – These were removed from the element as they may no longer apply to the City, are addressed in a different General Plan Element, or are better suited in other documents outside of the Safety Element or General Plan.

Existing G/P/O/IM #	Existing Text	Safety Element Update - Kept/Removed/Modified
~~S Goal 1. A Community that is Free From all Avoidable Risks to Safety, Health and Welfare from Natural and Man-Made Hazards.~~		
Removed and addressed by the following new goals: GOAL S-1: A Community Better Prepared for Future Emergencies; Goal S-3: A Community Better Prepared to Address the Risks from Natural Hazards; and Goal S-4: A Community Better Protected Against Human-Caused Hazards (Hazardous Materials Release).		
S Objective 1.1	Losses to life and property from natural and man-made hazards greatly reduced from historic levels.	Removed and addressed by Objective S-1.1 and Policies S-1.1, S-1.2, and S1.3, as well as multiple objectives and policies under Goals S-3 and S-4.
S Policy 1.1.1	The City shall protect people and property from environmental hazards.	Removed and addressed by Policies S-1.1.1, S-1.1.2, S-3.3.1 and Objectives S-3.1, S-3.2, S-3.3, S.4.1.
S Policy 1.1.2	The City shall minimize the risk of loss from fire.	Modified – see Policy S-3.3.1.
S Policy 1.1.3	The City shall reduce the amount of non-essential toxic and hazardous substances.	Removed and addressed by Policies S-4.1.1 and S-4.1.2 and Action S-4.2.1a.
S Policy 1.1.4	The City shall promote use of alternatives to hazardous substances.	Modified – see Action S-4.2.1a.
S Policy 1.1.5	The City shall reduce water pollution and improve Malibu's water quality.	Removed. The policy is addressed in the Land Use Element as LU Policy 1.1.2 (The City shall ensure that land uses avoid or minimize adverse impacts on water

		quality and other natural resources, such as undisturbed watershed and riparian areas) and LU Policy 1.1.3 (The City shall control surface runoff into coastal waters, wetlands, and riparian areas), and in the Circulation Element as C Policy 2.1.2. (The City shall strive to ensure uses within Malibu's Planning Area are consistent with the safety, health and welfare of the Malibu community).
S Policy 1.1.6	The City shall reduce air pollution and improve Malibu's air quality. The City shall reduce air pollution and improve Malibu's air quality.	Removed and to be considered for addition to Conservation Element.
S Policy 1.1.7	The City shall minimize the risks from landslides and debris flows.	Kept – see Policy S-3.1.1.
S Imp. Measure 1	Develop a master plan of fire prevention and control identifying hazards, assessing acceptable levels of cost and risk and determining protection programs.	Modified – see Action S-3.3.1a.
S Imp. Measure 2	Work with other agencies to ensure effective and efficient fire suppression, prevention and rescue services.	Modified – see Action S-3.3.13a.
S Imp. Measure 3	Encourage owners of swimming pools to obtain gasoline powered pumps to use in fire fighting.	Removed. Gas-powered pumps can be restricted for environmental and air quality concerns, and the City's Fire Liaison has recommended it be removed. Issues of fire-fighting are addressed in multiple actions under Objective S-3.3.
S Imp. Measure 4	Establish programs and guidelines for fire-safe landscaping including buffers comprised of fire resistant vegetation between residential areas and open space areas and encourage use of fire-safe landscaping principles which emphasize plant species with low fuel volumes.	Modified – see Actions 3-3.3.1c, 3.3.1e, and 3.3.13a.
S Imp. Measure 5	Work with the Los Angeles County Fire	Kept – see Action S-3.3.1d.

	Department to adopt a program for controlled burning of combustible vegetation, based on the recommendations of the responsible forestry and fire-protection official.	
S Imp. Measure 6	Work with the Los Angeles County Fire Department to enforce code requirements for flammable brush clearance, and reduction of flammable vegetation, including both native plants and ornamental landscaping.	Kept – see Action S-3.3.1e.
S Imp. Measure 7	Work with appropriate agencies to assure sufficient stored water and provide non-monetary incentives for on-site or area-wide shared storage water suitable for firefighting equal to one gallon for each square foot of structural floor area for all new development.	Modified – see Action S-3.3.1f.
S Imp. Measure 8	Work with the Los Angeles County Fire Department to establish standards for fire-fighting equipment access suitable for Malibu.	Kept – Action S-3.3.1g.
S Imp. Measure 9	Create a major streets and routes plan which includes streets available as wildfire escape routes.	Modified – see Action S-3.3.1h.
S Imp. Measure 10	Require all new and remodel structures to have Class A fire-retardant roofing.	Modified – see Action S-3.3.1i.
S Imp. Measure 11	Develop guidelines and standards for all new and remodel structures to utilize fire-resistant building materials and designs, and, if feasible, to be sited to minimize fire hazards.	Modified – see Action S-3.3.1i.
S Imp. Measure 12	Provide South Coast Air Quality Management District regional wind patterns maps to homeowners, architects and contractors to help them plan	Kept – see Action S-3.3.1j.

	development siting and design that minimizes fire hazards.	
S Imp. Measure 13	Work with the Los Angeles County Fire Department to provide on-site fire safety inspections of individual homes, when requested by resident or owner, and advise homeowners on ways to minimize fire hazards while maintaining slope stability and appropriate vegetation.	Modified – see Action S-3.3.1k.
S Imp. Measure 14	Encourage and support arson and neighborhood watch programs.	Kept – see Action S-3.3.1l.
S Imp. Measure 15	Require that all camping be in designated fire-safe camping areas.	Removed. This is something addressed in MMC Chapter 8.36.
S Imp. Measure 16	Develop a permanent, ongoing homeowner watershed area management plan to reduce fire hazards while maintaining appropriate vegetation that will stabilize the watershed and control the flow of water from it. Application of such plan in Resource Protection Areas shall be subject to review and approval for compliance with resource protection requirements.	Kept – see Action S-3.3.1m.
S Imp. Measure 17	Work with water service providers to identify neighborhoods with inadequate flow from fire hydrants, and to upgrade deteriorated and undersized water-distribution systems.	Kept – see Action S-3.3.1n.
S Imp. Measure 18	Provide guidelines and incentives for use of non-toxic building materials in new and remodel construction.	Modified – see Action S-3.3.1i.
S Imp. Measure 19	Regulate the transport, storage and use of toxic and hazardous materials.	Modified – see Actions S-4.1.1a and S-4.1.1b and S-4.2.1.a.
S Imp. Measure 20	Work with trash haulers and Los Angeles County Fire Department to provide for the proper collection and disposal of	Kept – see Action S-4.1.1a.

	hazardous wastes.	
S Imp. Measure 21	Work with Los Angeles County Fire Department to ensure compliance with the Hazardous Materials Disclosure Law.	Kept – see Action S-4.1.1b.
S Imp. Measure 22	Establish a household hazardous waste disposal program which enables residents to bring material to a centralized collection facility for proper disposal.	Modified – see Policy S-4.1.2.
S Imp. Measure 23	Inform residents about the safe handling, storage, use, disposal, and alternatives to use of hazardous materials.	Modified – see Action S-4.2.1a.
S Imp. Measure 24	Seek federal, state and county cooperation and funding to identify potential historic hazardous waste disposal sites and the availability of funds for the removal of any wastes discovered.	Modified – se Action S-4.2.1b.
S Imp. Measure 25	Initiate and work with other agencies to assess trends in water quality and establish water cleanliness standards including a program of enforcement.	Removed and to be considered for addition to the Conservation Element or Land Use Element. The Land Use Element already address water quality to some extent.
S Imp. Measure 26	Participate in efforts to identify and eliminate sources of contamination when unhealthful conditions are discovered in creeks, lagoons, intertidal zones, estuaries and wetlands.	Removed and to be considered for addition to the Conservation Element or Land Use Element. The Land Use Element already address water quality to some extent.
S Imp. Measure 27	Require that all above ground discharges and reuse of wastewater for small volume treatment plants meet tertiary treatment standards.	Removed and to be considered for addition to the Conservation Element or Land Use Element. The Land Use Element already address water quality to some extent.
S Imp. Measure 28	Work with other agencies to monitor and adopt receiving water quality standards and update the City's receiving water quality standards as more accurate information becomes available.	Removed and to be considered for addition to the Conservation Element or Land Use Element. The Land Use Element already address water quality to some extent.

S Imp. Measure 29	Encourage the use of new wastewater management technologies to achieve maximum feasible reduction of pathogens from wastewater prior to release into the environment.	Removed and to be considered for addition to the Conservation Element or Land Use Element. The Land Use Element already address water quality to some extent.
S Imp. Measure 30	Work with regional agencies to implement the provisions of the South Coast Air Quality Management Plan (AQMP).	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 31	Promote public education and awareness of air quality.	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 32	Work with other agencies to reduce local sources of air pollution such as dust, smoke, and vehicle emissions.	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 33	Evaluate impacts on air quality in connection with development proposals.	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 34	Encourage residents and visitors to reduce the number of vehicle miles traveled while in the City.	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 35	Provide information about the benefits of native oxygen-producing plants, consistent with fire safety, in order to discourage removal.	Removed and to be considered for addition to Conservation Element.
S Imp. Measure 36	As funding becomes available, study effects of excessive ground water on surface erosion, earth movement, and groundwater "daylighting."	Modified – see Policy S-3.1.3.e.
S Imp. Measure 37	Work with the residents of neighborhoods affected by landslides and debris flows to develop appropriate risk abatement programs.	Kept – see Action S-3.1.1a.
S Imp. Measure 38	Develop a program of water budget determinations by monitoring and recording the contributions of groundwater to local areas from uphill septic tank effluent and water reuse	Removed. This is better addressed with the City's water provider and not something that a Safety Element can govern. If still desired, it should be considered for inclusion in another element of the General Plan that addresses public services.

	installations.	
S Objective 1.2	Risks to residents and businesses from development in hazardous areas are minimized.	Removed and addressed by Policy S-3.1.
S Policy 1.2.1	The City shall require development to provide for analyses of site safety related to potential hazards of fault rupture, earthquake ground shaking, liquefaction, and rockfalls.	Modified and addressed in Policies 3.1.1 and 3.1.2. and 3.1.3, and in Actions S-3.1.3a and S-3.1.3b.
S Policy 1.2.2	The City shall require development to provide site safety analyses related to landsliding, debris flows, expansive soils, collapsible soils, erosion/ sedimentation, and groundwater effects.	Modified and addressed in Policies 3.1.1 and 3.1.2. and 3.1.3, and in Actions S-3.1.3a and S-3.1.3b.
S Policy 1.2.3	The City shall require development to provide for safety from coastal storm flooding, coastal erosion, surfacing septic effluent, and tsunami.	Kept - see Policy S-3.6.1.
S Policy 1.2.4	The City shall require development to be consistent with minimum Federal Emergency Management Agency (FEMA) guidelines for flood plain management.	Kept – see Policy S-3.2.1.
S Imp. Measure 39:	Develop and maintain a development geo-hazard database to incorporate findings from site specific and area hazard-related studies.	Kept - Action S-1.1.2.a.
S Imp. Measure 40:	Adopt and update as appropriate maps of extreme fire danger areas, 100-year flood plains, landslide and debris flow danger, active and potentially active faults, tsunami, and any other hazard areas; and inform residents of those areas of risks and possible mitigation measures.	Modified. Created separate hazard categories and different actions. See also Policy S-3.3.2d. CAL FIRE and FEMA create and maintain hazard maps.

S Imp. Measure 41:	Require that all new construction be designed to be earthquake resistant to maximum probable earthquakes.	Modified – see Policy S-3.1.3.
S Imp. Measure 42:	Apply all restrictions and investigation requirements mandated by the State under the Alquist-Priolo Special Studies Zones Act for faults classified as "active" to development on properties crossed by or adjacent to the Malibu Coast Fault.	Kept – see Action S-3.1.3.a.
S Imp. Measure 43:	Encourage area residents to participate in National Flood Insurance Program.	Kept – see Policy S-3.2.4.
S Imp. Measure 44:	Design coastal development, except supporting structure, to be above the wave uprush level for storms within the past 100 years, and above the 100-year flood plain	Kept – see Action S-3.6.1a.
S Imp. Measure 45:	Require that all critical use facilities (hospitals, police and fire stations) be earthquake resistant designed for the effects of a maximum credible earthquake	Kept – see Policy S-3.1.4.
S Imp. Measure 46:	As soon as feasible, complete coastal morphology studies and establish shoreline construction standards.	Kept - see Action S-3.6.1b.
S Imp. Measure 47:	To protect slope stability, restrict grading or development related vegetation clearance where the slope exceeds 2:1, except as required for fire safety, driveways and utilities and where there is no reasonable alternative.	Kept - see Action S-3.1.3c.
S Imp. Measure 48:	As soon as feasible, complete a study on the effects of seawalls, groins and revetments on beach erosion.	Modified – see Action S-3.6.1c.
S Imp. Measure 49:	Require a coastal engineering report for all proposed revetments, seawalls, cliff	Kept – see Action S-3.6.1e.

	retaining walls and other such construction proposed to protect existing structures to ensure that the structure is constructed utilizing the least environmentally damaging method.	
S. Imp. Measure 50:	Require that soils, geologic and structural evaluation reports with appropriate mitigation measures be prepared by registered soils engineers, engineering geologists, and/or structural engineers and that all recommended mitigation measures be implemented.	Kept - see Action S-3.1.3b.
S Imp. Measure 51:	Evaluate proposed development for its impact on, and from, geologic hazards, flood and mud flow hazard, and fire hazard.	Modified. Created separate hazard categories and multiple different actions to address.
S Imp. Measure 52:	Require water efficient landscaping and irrigation in identified landslide sites to minimize deep percolation in all areas uphill from identified landslides.	Modified – see Action S-3.1.3d.
S Imp. Measure 53:	Require that proposed coastal development exposed to ocean waters, including but not limited to potentially heavy tidal or wave action, be sited landward of state-owned tidelands and be further sited so as not to cause a potential nuisance, hazard to navigation, public safety problem, or interference with the public's right in the navigable waters.	Kept – see ActionS-3.6.1d.
S Objective 1.3	An ongoing, permanent program for cooperating with other jurisdictions, agencies, and public and private organizations to help meet the goals of the safety and health element.	Removed. This has been replaced with several different hazard categories and policies to address cooperation/coordination.

S Policy 1.3.1:	The City shall strive to ensure uses within Malibu's Planning Area are consistent with the safety, health and welfare of the Malibu community.	Removed. Not necessary to be covered in the Safety Element, and several other policies have been included in other General Plan elements that address this concern. See Land Use Element LU Policy 7.2.2 (The City shall monitor actions and occurrences in the planning area which might impact public health, safety or welfare and consider joint powers agreements with other governmental entities and other actions that may be desirable to protect the City's interests for the City's benefit), LU Policy 2.3.1 (The City shall protect and preserve the unique character of Malibu's many distinct neighborhoods), and LU Policy 2.24 (The City shall manage development in accordance with the efficient operation of the traffic system and service infrastructure).
S Imp. Measure 54:	Coordinate and work with other governmental entities to develop appropriate regulations to set minimum flight levels for all aircraft, to include a prescribed distance from the shoreline.	Removed. Regulated at federal level.
S Imp. Measure 55:	Seek cooperation and approval of the FAA to ensure that only safety and emergency uses of aircraft are allowed at altitudes below 600 feet above local ground level, except by City permit.	Removed. Regulated at federal level.
S Imp. Measure 56:	Work with jurisdictions within the Planning Area to ensure that all public water storage facilities have an emergency power supply for their pumps, or gravity-driven water distribution systems.	Removed and to be considered for addition to another element that addresses public services, maybe the Circulation and Infrastructure Element.
S Imp. Measure 57:	Work with utility providers to minimize exposure to electromagnetic fields in publicly accessible areas.	Removed. This is already regulated at the federal and state levels and implemented by utility providers. If this is still desired, consider placing in a different element of the General Plan.

S Imp. Measure 58:	Work with neighboring jurisdictions and the State to develop and expand emergency medical services.	Removed. This is health-related and implemented by first responder agencies and should be incorporated into their annual planning processes.
S Imp. Measure 59:	Work with the appropriate jurisdictions to ensure that highways, roads, bike paths, foot paths, and trails are free of avoidable hazards.	Removed and to be considered for addition to the Circulation and Infrastructure Element.
S Imp. Measure 60:	Work with appropriate agencies to ensure that the quantity of harmful bacteria, viruses and toxic substances in all Malibu shoreline, lagoon, and stream waters are at or below safe levels established by the City, State or Federal government, whichever are more stringent.	Removed. This is already implemented by local, regional, and state agencies through water quality monitoring and permitting processes.
S Imp. Measure 61:	Work with other jurisdictions and agencies to ensure that risks of flooding caused by upstream development are minimized.	Kept – see Policy S-3.2.2.
S Imp. Measure 62:	Work with the responsible jurisdictions to ensure that all dams in the Malibu watershed areas have regular safety inspections.	Kept – see Policy S-3.2.3.
S Imp. Measure 63:	Notify all jurisdictions within the Planning Area and all appropriate agencies at the State level of the City's request to review all plans and programs relating to issues that may concern the health and safety of Malibu residents.	Removed. This is already occurring.
S Imp. Measure 64:	Respond to all proposed development actions in the Planning Area which may endanger the health and safety of the City's residents.	Modified. Created separate hazard categories and multiple different actions to address.
S Imp. Measure 65:	Work with jurisdictions within the Planning Area to ensure that all public recreational areas have adequate toilet	Removed. This issue is a Coastal Act requirement and not the subject of the Safety Element.

	facilities.	
~~S GOAL 2. A Community Prepared for Effective Response to Emergencies, and Recovery when they Occur.~~ Removed and addressed by new Goal S-1 and new Goal S-2: A Community That Can Quickly Recover After a Hazard Event.		
S Objective 2.1	A comprehensive plan for response to all levels of emergency situations.	Removed and addressed by Policy S-1.2.1.
S Policy 2.1.1	The City shall cooperate to achieve efficient and prompt response by local agencies to those emergencies which require no outside help.	Modified – see Policy S-1.2.2.
S Policy 2.1.2	The City shall coordinate efficient utilization of emergency assistance provided by neighboring communities and county agencies under mutual-aid response.	Modified – see Policy S-1.2.2.
S Policy 2.1.3	The City shall develop a plan to ensure that in situations of extreme emergency the community is prepared to survive until outside assistance arrives.	Modified – see Objective S-1.2 and Policy S-1.2.1.
S Imp. Measure 66:	Develop an Emergency Response Plan and update as needed.	Modified – see Policy S-1.2.1.
S Imp. Measure 67:	Support and encourage sufficient local staffing and equipment levels for police, fire fighting, lifeguard, paramedic, and other medical, public works and utility organizations to assure timely and well-coordinated response to alarm calls and to meet most emergencies.	Modified – see Action S-1.2.2a.
S Imp. Measure 68:	Develop response time criteria and monitor law enforcement programs.	Modified – see Action S-1.2.6a.
S Imp. Measure 69:	Work with other agencies to assure access to specialized trauma care within 20 minutes of notification.	Removed. This is a health-related item. In addition, identification of time related standards is not recommended for a General Plan and should be monitored and managed by the appropriate agency that oversees these facilities.
S Imp. Measure 70:	Create a procedure for promptly initiating an Emergency Operations Center to	Modified - see Policy S-1.2.1 and Actions S-1.2.1a and S-1.2.1b..

	coordinate all emergency-response actions from the onset of any emergency which requires mutual aid from neighboring communities.	
S Imp. Measure 71:	Create a procedure for promptly establishing effective intelligence-gathering and command, control and communications functions in all emergencies requiring aid from outside the community.	Removed and addressed by Policy S-1.2.1. This item is currently standard practice, especially with an EOC.
S Imp. Measure 72:	Establish a core of trained and organized volunteers from the community capable of providing intelligence, communications, medical and logistic support to the professional health and safety organizations in emergency situations.	Modified – see Actions S-1.2.4a and S-1.2.4c, and Policy S-1.2.4.
S Imp. Measure 73:	Work with other agencies to close public beaches to recreational use in the event of a pollution emergency.	Removed. This is standard practice.
S imp. Measure 74:	Work with other agencies to close public recreation areas to recreational use in the event of wildfire in the Planning Area.	Removed. This is standard practice. Action S-3.3.1b addresses coordination with other agencies.
S Imp. Measure 75:	Continue to improve the area-wide, volunteer-manned emergency communication system.	Kept – see Action S-1.2.4b.
S Imp. Measure 76:	Organize an area-wide, volunteer-manned emergency medical care system including medical-center locations, patient transport vehicles and drivers, and triage policies and training.	Removed. This is a health-related item.
S Imp. Measure 77:	Organize and equip neighborhood, volunteer-manned emergency response organizations, including trained first-aid volunteers, and locally stockpiled supplies.	Modified – see Action S-1.2.4a.

S Imp. Measure 78:	Develop and maintain an inventory of heavy equipment and trained operators which would be available in major emergency situations.	Removed. This is a standard practice within emergency management to inventory assets for emergency purposes.
S Imp. Measure 79:	Conduct emergency-response drills on a regular basis.	Modified – see Action S-1.2.1b.
S Imp. Measure 80:	Identify emergency helicopter landing sites at strategic points throughout the City in the City's Emergency Response Plan. Provide data on these sites to be included in the Los Angeles County Emergency Response Plan.	Removed. Sites have been identified. This is a topic within the Los Angeles County's jurisdiction.
S Imp. Measure 81:	Participate in a tsunami warning system.	Kept – changed to. Policy S-3.6.3.
S Imp. Measure 82:	Work with the Red Cross, other private agencies, and local, state and federal government agencies on disaster-preparedness education and training.	Kept – see Action S-1.2.4c.
S Imp. Measure 83:	Map all existing and planned safety and health related facilities in Malibu.	Modified – see Action S-1.2.5a.
S Objective 2.2:	A comprehensive plan for recovery from all levels of emergency situations is developed and updated as needed.	Removed and replaced with Objective S-2.1 and Policy S-2.1.1 and Actions S-2.1.1a and S-2.1.1b.
S Policy 2.2.1:	The City shall facilitate timely recovery from all disasters.	Removed and replaced with Policy S-2.1.1 and Action S-2.1.1a.
S Imp. Measure 84:	Create a disaster-recovery team to develop recovery plans and establish/maintain liaison with all agencies involved in recovery from a disaster in Malibu.	Modified – see Actions S-2.1.1a, S-2.1.1b and S-2.5.1a.
S Imp. Measure 85:	Maintain an inventory of potential Government and private sources of aid to recovery from major disasters and assist the community in obtaining this aid.	Removed and replaced with Action S-2.3.1c.
S Imp. Measure 86:	Facilitate short term recovery aid provided by local charitable and other	Removed and replaced with Action S-2.3.1c.

	groups and individuals, during recovery from major disasters.	
S Imp. Measure 87:	Support and encourage residents and local businesses to carry adequate insurance or maintain adequate resources to meet most emergencies.	Removed and replaced with Policy S-3.2.4.
S Imp. Measure 88:	Work with law enforcement agencies to develop techniques to improve local access during times of emergency.	Kept – see Action S-1.3.3c.
~~S Goal S-3: A comprehensive plan for recovery from all levels of emergency situations is developed and updated as needed.~~ – Removed and addressed by new Goal S-2.		
S Objective 3.1	Actively promote health and safety so that residents are exceptionally safe and healthy by national standards.	Removed and replaced with Objectives S-1.1, S-1.3, S-2.4, S-3.1, S-3.2, S-3.3, S-3.4, S-3.5, S-3.6, and S-4.1.
S Policy 3.1.1	The City shall facilitate programs so that people feel safe, and crime and violence are minimized.	Removed. This addresses law enforcement/police protection in general. Law enforcement is a public service and could be considered for placement in a different General Plan element.
S Policy 3.1.3	The City shall assess risks to the health and safety of citizens and visitors and inform the public about those risks and ways to avoid them.	Replaced with multiple policies and actions specific to each hazard type.
S Policy 3.1.4	The City shall encourage efforts by private organizations to enhance community health and safety.	Removed. The City can continue to accomplish this, but it is not necessary to include in the Safety Element.
S Policy 3.1.5	The City shall encourage volunteer efforts to assist in providing safety to businesses, residents and visitors.	Removed. Replaced with Policy S-1.2.4, and Actions S-1.2.4a and S-1.2.4b.
S Policy 3.1.6	The City shall provide effective and efficient law enforcement protection services.	Modified – see Action S-1.2.6a.
S Policy 3.1.7	The City shall discourage the hiring of day workers from sites which might endanger the public health and safety.	Removed. This is not a topic for the Safety Element.
S Imp. Measure 89:	Maintain a comprehensive program for strong police presence to deter criminal	Removed. This addresses law enforcement in general and related to crime, and is not a topic for the Safety

	activity.	Element. Law enforcement is a public service and could be considered for placement in a different General Plan element.
S Imp. Measure 90:	Maintain a comprehensive program to protect the Community from substance abuse.	Removed. This is not a topic for the Safety Element, and commonly not in a General Plan.
S Imp. Measure 91:	Provide law-enforcement personnel to aggressively patrol streets and recreational areas to prevent driving under the influence of alcohol and drugs.	Removed. This addresses law enforcement and is not a topic for the Safety Element. Law enforcement in general is a public service and could be considered for placement in a different General Plan element.
S Imp. Measure 92:	Periodically evaluate Los Angeles County Sheriff's services and service criteria to ensure that the City continues to receive adequate law enforcement services.	Kept – see Action S-1.2.6a.
S Imp. Measure 93:	Work with private charitable groups to continue to provide safe and healthy locations for the hiring of day-workers in Malibu.	Removed. This is not a topic for the Safety Element, and commonly not in a General Plan.
S Imp. Measure 94:	Prohibit smoking in government public buildings and require at a minimum that non-smoking areas be provided in all indoor privately owned facilities used by the public.	Removed. This is not a topic for the Safety Element, and commonly not in a General Plan.
S Imp. Measure 95:	Require that employers provide toilet facilities for all temporary and permanent workers.	Removed. This is not a topic for the Safety Element, and commonly not in a General Plan.
S Imp. Measure 96:	Encourage all service stations and public buildings to provide toilet facilities to the public.	Removed. This is not a topic for the Safety Element, and commonly not in a General Plan.
S Imp. Measure 97:	Support development of paratransit services offered by public and/or private agencies and service providers to improve access to health care facilities.	This is healthcare and transportation topic unrelated to the Safety Element. If desired, it should be considered for the Circulation Element.

S Imp. Measure 98:	Work with health care providers to assure timely access to medical care for all segments in the community.	This is healthcare topic unrelated to the Safety Element. If desired, it should be considered for another element or outside of the General Plan.
S Imp. Measure 99	Encourage efforts to provide in-home health care for the elderly and handicapped residents of Malibu.	This is healthcare topic unrelated to the Safety Element. If desired, it should be considered for another element or outside of the General Plan.
S Imp. Measure 100:	Encourage and promote facilities for hospice care and long term in-patient medical treatment and care for the community's elderly and seriously ill.	This is healthcare topic unrelated to the Safety Element. If desired, it should be considered for another element or outside of the General Plan.
S Imp. Measure 101:	Establish community health-education and safety-education programs, to include the need to prepare well ahead of time for emergency response and recovery.	Kept – see Action S-1.1.2d.
S Imp. Measure 102:	Work with health care providers to promote, encourage, and facilitate provision of urgent care at a reasonable cost to residents and visitors.	This is healthcare topic unrelated to the Safety Element. If desired, it should be considered for another element or outside of the General Plan.
S Imp. Measure 103:	Establish an education and awareness program to enhance household, water, and highway safety, and fire prevention.	Removed. The fire safety-related items are addressed by multiple actions in that hazard section. Topics of water may be placed in the Conservation Element or Circulation and Infrastructure Element. Highway safety could be addressed in the Circulation Element.
S Imp. Measure 104:	Educate the community about risks to swimmers and surfers from ocean pollution.	Removed. If desired, consider placing in the Conservation Element.
S Imp. Measure 105:	Facilitate regular testing of water at suitable locations along the Malibu shoreline to assure that toxic substances, bacteria, and/or virus do not put ocean recreation participants at risk.	Removed. This is standard practice that is already occurring at the local, regional, and state level.
S Imp. Measure 106:	Review data on water quality collected and analyzed by other agencies and document inadequacies and inaccuracies that might impact the health	Removed. If desired, consider placing in the Conservation Element.

	of residents. Coordinate with the monitoring agencies to improve the monitoring program.	
S Imp. Measure 107:	Work with local physicians and environmental groups to assess risks to swimmers and surfers from ocean pollution due to storm drainage.	Removed. If desired, consider placing in the Conservation Element or outside of the General Plan.
S Imp. Measure 108:	Enact ordinances prohibiting the placing of graffiti within the City.	Removed. This item has been implemented already (MMC Chapter 8.20). Additionally, it is not a topic for a Safety Element. If it is desired to remain, consider addressing outside of the General Plan or placing in an element that addresses public services (including law enforcement).
S Imp. Measure 109:	Take swift action to cause removal of any graffiti that appears within the City including properties under the jurisdiction of other governmental agencies.	Removed. This item has been implemented already (MMC Chapter 8.20). Additionally, it is not a topic for a Safety Element. If it is desired to remain, consider addressing outside of the General Plan or placing in an element that addresses public services (including law enforcement).
S Imp. Measure 110:	Work with Sheriff's station to encourage employment of volunteer litter law enforcement offers and posting of violation warning signs.	Removed. Litter is not a Safety Element topic. If still desired, consider if this should be located in another General Plan element or outside of the General Plan.
S Imp. Measure 111:	Establish a volunteer program for cleanup of litter trouble spots on Pacific Coast Highway.	Removed. Litter is not a Safety Element topic. If still desired, consider if this should be located in another General Plan element or outside of the General Plan.
S Imp. Measure 112:	Develop a program to provide conveniently located trash collection receptacles and provide regularly scheduled special litter cleanup for neighborhoods suffering particularly heavy litter accumulation.	Removed. Litter is not a Safety Element topic. If still desired, consider if this should be located in another General Plan element or outside of the General Plan.
S Imp. Measure 113:	Work with other agencies to develop literature to educate the public about the negative impacts of litter.	Removed. Litter is not a Safety Element topic. If still desired, consider if this should be located in another General Plan element or outside of the General Plan.

NOTICE OF PUBLIC HEARING
CITY OF MALIBU
PLANNING COMMISSION

NOTICE OF AVAILABILITY
OF GENERAL PLAN AMENDMENT MATERIALS

The Malibu Planning Commission will hold a public hearing on **MONDAY, March 2, 2026, at 6:30 p.m. in the Council Chambers, Malibu City Hall**, 23825 Stuart Ranch Road, Malibu, CA on the project identified below.

SAFETY ELEMENT UPDATE

General Plan Amendment No. 24-002 – The proposed project is a General Plan Amendment to adopt the Safety Element Update. The State of California requires each county and city to adopt a General Plan, consisting of several "elements," including a Safety Element. The City's General Plan Safety Element has been updated consistent with General Plan and Safety Element state law (Government Code Section 65302 *et seq*.). The Safety Element is a policy document that addresses the following topic areas and establishes related goals, objectives, policies, and implementation actions: emergency preparedness; seismic and geologic hazards; flood hazards; fire hazards; climate adaptation; shoreline protection; and hazardous materials and wastes.

APPLICANT:	City of Malibu
LOCATION:	Citywide
APPLICATION FILED:	August 12, 2024
CASE PLANNER:	Allison Cook, Contract Planner, acook@malibucity.org

The project is exempt from the California Environmental Quality Act (CEQA). CEQA applies only to projects that have the potential for causing a significant effect on the environment. Pursuant to CEQA Guidelines Section 15061(b)(3), where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. Therefore, because the Safety Element Update would involve adoption of a policy document that does not, in and of itself, include any proposed development or land alteration, and would not require rezoning or facilitate development beyond what is currently allowed in the City's General Plan, it can therefore be seen with certainty that there is no possibility that adoption of the Safety Element Update would have a significant effect on the environment.

In addition, pursuant to CEQA Guidelines Section 15308, the project is exempt from CEQA, as it consists of an action taken by a regulatory agency, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment.

A written staff report will be available at or before the hearing for the project. All persons wishing to address the Commission regarding these matters will be afforded an opportunity in accordance with the Commission's procedures. Oral and written comments may be presented to the Planning Commission on, or before, the date of the meeting.

Copies of all related documents can be reviewed by any interested person at the following location during regular business hours:

Malibu City Hall Reception Desk

23825 Stuart Ranch Road
Malibu, CA 90265

IF YOU CHALLENGE THE CITY'S ACTION IN COURT, YOU MAY BE LIMITED TO RAISING ONLY THOSE ISSUES YOU OR SOMEONE ELSE RAISED AT THE PUBLIC HEARING DESCRIBED IN THIS NOTICE, OR IN WRITTEN CORRESPONDENCE DELIVERED TO THE CITY, AT OR PRIOR TO THE PUBLIC HEARING.

Yolanda Bundy, MS, PE, CBO, CFCO, Community Development Director

Publish Date: February 5, 2026