COUNTY OF SAN MATEO

2021 Multijurisdictional Local Hazard Mitigation Plan

Volume 1—Planning-Area-Wide Elements

Public Review Draft

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TETRA TECH

2021 Multijurisdictional Local Hazard Mitigation Plan

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PREPARED FOR

County of San Mateo Department of Emergency Management

501 Winslow
Redwood City, CA 94063

PREPARED BY

Tetra Tech

1999 Harrison St., Suite 500
Oakland, CA 94612
510-302-6300 | tetratech.com

Tetra Tech Project #103s7389

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DEFINITIONS/ACRONYMS

°F—Degrees Fahrenheit

0.2 percent-annual-chance flood—The flood that has a 0.2 percent chance of being equaled or exceeded in any given year; often referred to as the 500-year flood

1 percent-annual-chance flood—The flood that has a 1 percent chance of being equaled or exceeded in any given year; often referred to as the 100-year flood

AB—Assembly Bill

ABAG—Association of Bay Area Governments

active shooter—A criminal attempt to kill people in a confined and populated area.

ADA—Americans with Disabilities Act

ART— Adapting to Rising Tides Program

API—Advanced Persistent Threat

ATC—(Federal) Air Traffic Controller

asset—Any man-made or natural feature that has value, including people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

BART—Bay Area Rapid Transit System

base flood—The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1 percent annual chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

basin—The area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds."

BAWSCA—Bay Area Water Supply Conservation Agency

benefit/cost analysis—A systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

benefit—A net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

BLM—Bureau of Land Management

CAL FIRE—California Department of Forestry and Fire Protection

Cal OES—California Office of Emergency Services

capability assessment—An analysis of a community's capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out.

CCR—California Code of Regulations

CDBG-DR—Community Development Block Grant Disaster Recovery grants

CDC—Centers for Disease Control and Prevention

CEQA—California Environmental Quality Act

CFR—Code of Federal Regulations

cfs—cubic feet per second

CHP—California Highway Patrol

CIP—Capital Improvement Program

Climate Action Plan—A climate action plan is a detailed and strategic framework for measuring, planning, and reducing greenhouse gas emissions and related climatic impacts. ... Climate action plans, at a minimum, include an inventory of existing emissions, reduction goals or targets, and analyzed and prioritized reduction actions.

Climate Adaptation Plan—The process of adjustment to the impacts of climate change, including actions taken to reduce the negative impacts of climate change, or to take advantage of emerging opportunities.

climate change—A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Community Rating System (CRS)—A voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

critical facilities—Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs.

CSA—County Service Area

CWA—Clean Water Act

cyber-terrorism—An attempt to damage, disrupt, or gain unauthorized access to a computer, computer system or electronic communications network.

dam failure—An uncontrolled release of impounded water due to a partial or complete breach in a dam (or levee) that impacts its integrity.

dam—Any artificial barrier or controlling mechanism that can or does impound or divert water.

DART—Deep ocean Assessment and Reporting of Tsunamis

debris flow—Dense mixtures of water-saturated debris that move down-valley, looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

DEM—Department of Emergency Management

DFIRM—Digital Flood Insurance Rate Map

DHS—Department of Homeland Security

Disaster Mitigation Act (DMA; Public Law 106-390)— The latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving certain federal financial assistance.

drought—The cumulative impacts of long periods of dry weather. These can include deficiencies in surface and subsurface water supplies and general impacts on health, well-being, and quality of life.

DSOD—Division of Safety of Dams (California state agency)

EAP—emergency action plan

earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

Ecology—the branch of biology that deals with the relations of organisms to one another and to their physical surroundings.

Ecosystem Services— An ecosystem service is any positive benefit that wildlife or ecosystems provide to people. The benefits can be direct or indirect—small or large.

EPA—Environmental Protection Agency

Epidemic—The spread of an infectious disease beyond a local population, reaching people in a wider geographical area. Several factors determine whether an outbreak will become an epidemic: the ease with which the disease spreads from vectors, such as animals, to people, and the ease with which it spreads from person to person.

Equity—the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, racially, or geographically.

Equity Lens—The purpose of an equity lens is to be deliberately inclusive as an organization makes decisions. It introduces a set of questions into the decision that help the decision makers focus on equity in both their process and outcomes.

EPA—U.S. Environmental Protection Agency

ESA—Endangered Species Act

exposure—Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

extent—The extent is the size of an area affected by a hazard.

extreme cold—Temperatures from winter storms associated with freezing rain, sleet, snow and strong winds that may cause hypothermia or frostbite.

extreme heat—Temperatures that hover 10 ºF or more above the average high temperature for a region and last for several days.

extreme wind—A windstorm featuring violent winds, generally of short-duration involving straight-line winds or gusts over 50 mph, strong enough to cause property damage.

FBI—Federal Bureau of Investigation

federal disaster declaration—Declarations for events that cause more damage than state and local governments and resources can handle without federal government assistance. A federal disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, to help disaster victims, businesses, and public entities.

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

FHSZ—Fire Hazard Severity Zone

flash flood—A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM)—The official maps on which the Federal Emergency Management Agency delineate the Special Flood Hazard Area.

Flood Insurance Study—A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

FRA—Federal Responsibility Area

freeboard—The margin of safety added to the base flood elevation.

frequency—How often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita scale of tornado intensity—Scale for rating tornado wind speeds, estimated on the basis of damage sustained. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

g—Gravity (%g, percent acceleration force of gravity)

geographic information system (GIS)—A computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

goal—A general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

greenhouse gases—Methane, nitrous oxide and other gases that trap heat and warm the Earth, as a greenhouse traps heat from the sun.

ground shaking—The result of rapid ground acceleration caused by seismic waves passing beneath buildings, roads, and other structures.

hazard—A source of potential danger or adverse condition that could harm people and/or cause property damage.

hazardous material—A substance or combination of substances (biological, chemical, radiological, and/or physical) that, because of its quantity, concentration, or physical, chemical or infectious characteristics, has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazards U.S. Multi-Hazard Loss Estimation Program (Hazus)—A GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards.

HIFLD—Homeland Infrastructure Foundation-Level Data

high-hazard dam—Dams that can cause loss of human life from the failure or improper operation of the dam.

HMI—Hazard Mitigation Insurance

IBC—International Building Code

intensity—The measure of the effects of a hazard.

inventory—The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

IPCC—Intergovernmental Panel on Climate Change

IRC—International Residential Code

ISO—Insurance Services Office

IT—Information Technology

IUCN—International Union for Conservation of Nature

LiMWA—Limit of Moderate Wave Action

liquefaction— Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

local government—Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

LRA—Local responsibility area

magnitude—The measure of the strength of an earthquake.

MCE—Maximum credible earthquake

meteorological drought—Precipitation at levels below normal over a period of time. Meteorological measurements are the first indicators of drought and are usually region-specific.

mitigation actions—Specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

mitigation—A preventive action taken in advance of an event to reduce or eliminate risk to life or property.

MM—Modified Mercalli Scale

mph—Miles per hour

Mw—Moment Magnitude Scale

N/A—Not applicable

NASA—National Aeronautics and Space Administration

Nature Based Solutions—defined by IUCN as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”.

NCEI—National Centers for Environmental Information

NEHRP—National Earthquake Hazard Reduction Program

NFIP—National Flood Insurance Program

NFPA—National Fire Protection Association

NMDC—National Drought Mitigation Center

NOAA—National Oceanic and Atmospheric Administration

NWS—National Weather Service

OCOF—Our Coast, Our Future

ONI—Ocean Niño Index

pandemic—An epidemic of infectious disease that has spread through human populations across a large region, multiple continents, or worldwide.

PCB—Polychlorinated biphenyls

peak ground acceleration (PGA)—A measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

PG&E—Pacific Gas and Electric

PGA—Peak Ground Acceleration

ppm—Part per million

preparedness—Actions that strengthen the capability of government, people, and communities to respond to disasters.

probability of occurrence—A statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

PTWC—Pacific Tsunami Warning Center

radiological incidents—An incident involving radioactive materials that can occur wherever radioactive materials are used, stored, or transported.

RCRA—Resource Conservation and Recovery Act

repetitive loss property—Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced—Four or more paid flood losses in excess of $1000.00; or two paid flood losses in excess of $1000.00 within any 10-year period since 1978; or three or more paid losses that equal or exceed the current value of the insured property.

Recurrence Interval —The recurrence interval (sometimes called the return period) is based on the probability that the given event will be equaled or exceeded in any given year.

risk assessment—The process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards

risk ranking—Process to score and rank hazards based on the probability that they will occur and the impact they will have if they do.

risk—The estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

riverine—Of or produced by a river. Riverine floodplains have readily identifiable channels.

Robert T. Stafford Act—The statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs (Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107). Signed into law November 23, 1988; amended by the Disaster Relief Act of 1974 (Public Law 93-288).

SCADA—Supervisory Control and Data Acquisition

SEMS—Standardized Emergency Management System

SFHA—Special Flood Hazard Area

SFPUC—San Francisco Public Utilities Commission

significant-hazard dam—Dams that can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns, but not necessarily loss of life.

SoVI— Social Vulnerability Index

Social Vulnerability—Social vulnerability refers to potential harm to people. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society.

special flood hazard area—The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

SPI—Standardized Precipitation Index

SRA—State responsibility area

stakeholder—Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

subsidence—The caving in or sinking of an area of land.

surface fault rupture—An offset of the ground surface when fault rupture extends to the Earth's surface.

terrorism—The unlawful use or threatened use of force or violence against people or property with the intention of intimidating or coercing societies or governments. Terrorism is either foreign or domestic, depending on the origin, base, and objectives of the terrorist or organization.

thunderstorm—A storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours).

TOD—Transit-Oriented Development

tornado—A violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds.

transportation incident—A major incident related to a means of transportation such air, rail or highway travel resulting in death, serious injury, or extensive property loss or damage.

UN—United Nations

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USGS—U.S. Geological Survey

vulnerability—Assessment of how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions.

watershed—An area that drains downgradient from areas of higher land to areas of lower land to the lowest point.

windstorm—Generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage.

WUI—Wildland Urban Interface

Zone C, Zone X—Areas determined to be outside the 1 percent and 0.2 percent annual chance floodplains.

zoning ordinance—Ordinance that designates allowable land use and intensities for a local jurisdiction.

EXECUTIVE SUMMARY

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. San Mateo County developed an updated hazard mitigation plan in partnership with the following local governments within the county:

- Town of Atherton
- City of Belmont
- City of Brisbane
- City of Burlingame
- Town of Colma
- City of Daly City
- City of East Palo Alto
- City of Foster City
- City of Half Moon Bay
- Town of Hillsborough
- City of Menlo Park
- City of Millbrae
- City of Pacifica
- Town of Portola Valley
- City of Redwood City
- City of San Bruno
- City of San Carlos
- City of San Mateo
- City of South San Francisco
- Town of Woodside
- Coastside County Water District
- Colma Fire Protection District
- Highlands Recreation District
- Menlo Park Fire Protection District
- Midpeninsula Regional Open Space District
- Mid-Peninsula Water District
- Montara Water & Sanitary District
- North Coast County Water District
- San Mateo Community College District
- San Mateo County Flood & Sea Level Rise Resiliency District
- San Mateo County Harbor District
- San Mateo County Office of Education
- San Mateo Resource Conservation District
- Westborough Water District
- Woodside Fire Protection District

The hazard mitigation plan defines measures to reduce risks from natural disasters in the San Mateo County planning area, which consists of the entire county, including unincorporated areas, incorporated cities, and special purpose districts. The plan complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs for all planning partners. It updates the County's previous plan, the *2016 San Mateo County Hazard Mitigation Plan.*

PLAN DEVELOPMENT APPROACH

Organization

A core planning team consisting of a contract consultant and San Mateo County staff was assembled to facilitate this plan update. A planning partnership was formed by engaging eligible local governments and making sure they understood their expectations for compliance under the updated plan. A steering committee was assembled to oversee the plan update, consisting of both governmental and non-governmental stakeholders within the planning area. Coordination with other local, state, and federal agencies involved in hazard mitigation occurred throughout the plan update process. Organization efforts included a review of the County's 2016 hazard mitigation plan, the California statewide hazard mitigation plan, and existing programs that may support hazard mitigation actions.

Equity Focus

Disparities in health outcomes, inequities in living conditions, and lack of political power place many low income communities, people of color, people with disabilities, pregnant women, and historically disadvantaged people, among others, at greater risk from hazards. The County prepared a framework for addressing equity through the 2021 hazard mitigation planning process. The County developed a resource paper titled "Recommendations for Addressing Equity in Hazard Mitigation Planning" to educate planning partners and the Steering Committee on disparities of underserved communities in hazard planning. Each partner received tools to apply the equity lens perspective. The use of these tools was left to the discretion of each planning partner. Partners who chose to apply the equity lens include the County, nine cities, and four special purpose districts.

Public Outreach

The planning team implemented a multi-media public involvement strategy utilizing the outreach capabilities of the planning partnership that was approved by the Steering Committee. The strategy included public meetings, a hazard mitigation survey, a project website, the use of social media, and multiple media releases.

Plan Document Development

he planning team and Steering Committee assembled a document to meet federal hazard mitigation planning requirements for all partners. The updated plan contains two volumes. Volume 1 contains components that apply to all partners and the broader planning area. Volume 2 contains all components that are jurisdiction-specific. Each planning partner has a dedicated annex in Volume 2.

Adoption

Once pre-adoption approval has been granted by the California Office of Emergency Services and FEMA Region IX, the final adoption phase will begin. Each planning partner will individually adopt the updated plan.

RISK ASSESSMENT

Risk assessment is the process of measuring the potential loss of life resulting from natural hazards, as well as personal injury, economic injury, and property damage, in order to determine the vulnerability of people, buildings, and infrastructure. For this update, risk assessment models were enhanced with new data and technologies. The Steering Committee used the risk assessment to rate risk and to gauge the potential impacts of each hazard of concern in the planning area. The risk assessment included the following:

- Hazard identification and profiling
- Assessment of the impact of hazards on physical, social, and economic assets
- Identification of particular areas of vulnerability
- Estimates of the cost of potential damage.

Based on the risk assessment, hazards were rated for the risk they pose to the overall planning area. Figure ES-1 and Figure ES-2 show two sets of scores and ratings for the entire San Mateo County planning area: a baseline set of results, and a modified set of results that accounts for the equity lens. The results indicate the following general patterns:

- The application of an equity lens as developed for this plan for the countywide risk ranking increases the risk level for every hazard of concern except drought. The change is due to the higher resolution of data for the population impact component of the risk ranking protocol.
- With or without the equity lens, sea-level rise has the highest overall risk score in the countywide ranking.

Each planning partner also rated hazards for its own area. Figure ES-3 summarizes how the participating planning partners rated each hazard; the results shown represent equity lens ratings for partners who chose to apply the equity lens and baseline ratings for those who did not. The results indicate the following general patterns:

- The hazard rated as high risk for the greatest number of planning partners is earthquake, which was rated as a high risk for all partners but one.
- The hazard rated as medium risk for the greatest number of planning partners is severe weather, which was rated as a medium risk for all partners but one.
- The drought and tsunami hazards were rated low risk by the greatest number of planning partners.

Figure ES-1. Countywide Hazard Risk Rating (Baseline)

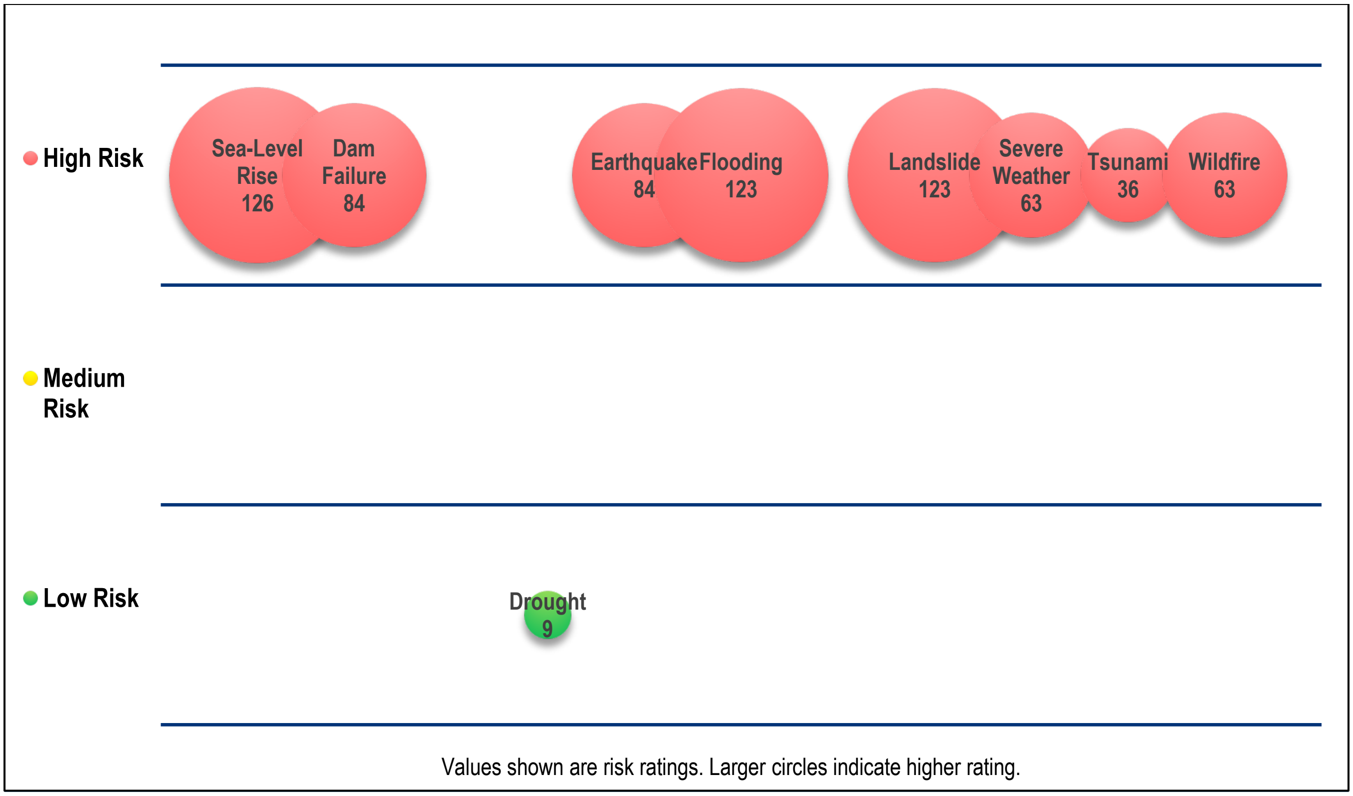


Figure ES-2. Countywide Hazard Risk Rating (Equity Lens)

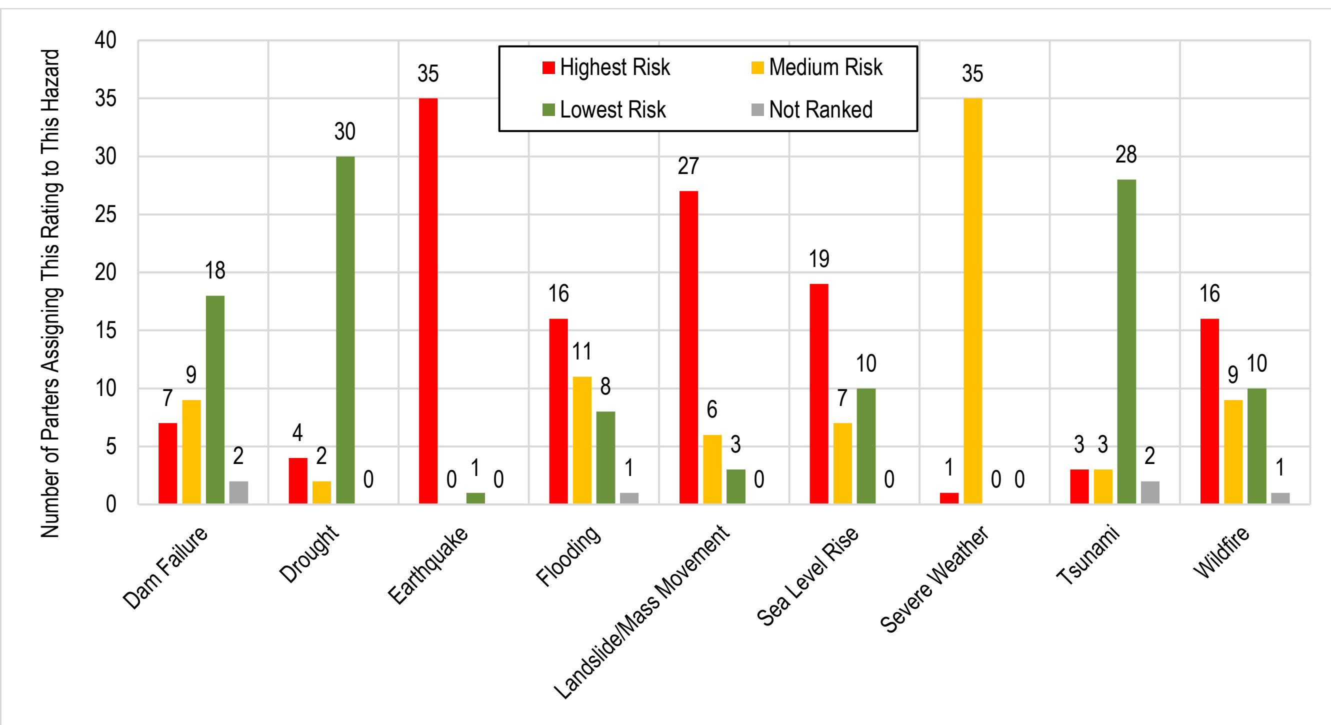


Figure ES-3. Summary of Risk Rating for Individual Planning Partners

MITIGATION GOALS AND OBJECTIVES

The Steering Committee reviewed and made updates to the guiding principles, goals, and objectives from the *2016 San Mateo County Hazard Mitigation Plan*. The following guiding principles guided the Steering Committee and planning partners in selecting actions contained in this plan update:

- Provide a dynamic, actionable approach to hazard planning that integrates with other planning mechanisms to enhance or support hazard mitigation.
- Invite and enhance the public's awareness and understanding of hazards and their input on hazard prioritization and mitigation.
- Create a decision-making tool for policy and decision makers.
- Prioritize multi-benefit actions that reduce risk to vulnerable communities, protect those most at risk, and advance equity, including across racial, ethnic, and rural/urban lines.
- Promote compliance with state and federal program requirements.
- Ensure inter-jurisdictional coordination on hazard mitigation activities.
- Integrate the concepts of climate change into the hazard mitigation planning process.
- Support economic viability, including for those who are most economically vulnerable, after a hazard event.
- Ensure a safe, respectful, non-discriminatory, and inclusive response to hazard events.

Goals

The Steering Committee and planning partners established the following goals for the plan update:

- Protect life and property, including protecting the health and safety of communities.
- Engage the whole community to better understand the hazards of the region and ways to reduce their personal vulnerability to those hazards.
- Promote hazard mitigation as an integrated public policy and as a standard business practice.
- Integrate climate change strategies to increase resiliency of community lifelines (critical facilities) from the impact of climate change.
- Protect and preserve the environment.
- Develop and implement hazard mitigation strategies that use public funds in an efficient and cost-effective way.
- Develop hazard mitigation strategies that eliminate disparities and provide access to quality services for all unserved, underserved, under-resourced, and ineffectively serviced individuals and families.
- Improve community emergency management capability.

The effectiveness of a mitigation strategy is assessed by determining how well these goals are achieved.

Objectives

Each objective meets multiple goals, serving as a stand-alone measurement of the effectiveness of a mitigation action. The objectives also are used to help establish priorities. The objectives are as follows:

1. Improve understanding of the locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life, safety, and health.
2. Establish and maintain partnerships among all levels of government, the private sector, community groups, and institutions of higher learning that improve and implement methods to protect life and property.
3. Conduct culturally competent and transparent community outreach activities that:
    a. Increase stakeholder awareness and understanding of hazard risk, mitigation options, and preparedness strategies
    b. Enable community members to inform risk assessment and ranking, prioritization of mitigation actions and implementation measures and investments
    c. Are clear on how they incorporate input throughout the process by providing regular reports.
4. Prevent or reduce mitigation-related disparities affecting under-served and under-represented communities through plans, investments, and engagement.
5. Develop and provide updated information about threats, hazards, vulnerabilities, climate change, and mitigation strategies to state, regional, and local agencies, as well as private-sector and community groups.
6. Encourage incorporation of hazard mitigation measures into repairs, major alterations, new development, and redevelopment practices, especially in socially vulnerable communities.
7. Promote and implement hazard mitigation plans and projects based on best available data and science that are consistent with state, regional, and local climate action and adaptation goals, policies, and programs.
8. Advance community resilience through preparation, adoption, and implementation of state, regional, and local hazard mitigation plans and projects.
9. Encourage life and property protection measures for all communities, with particular attention to socially vulnerable communities that have less capacity to adapt or to strengthen structures and community lifelines (critical facilities) located in hazard areas.
10. Actively promote effective coordination of regional and local hazard mitigation planning and action among state agencies, cities, counties, special districts, tribal organizations, councils of governments, community-led planning efforts, metropolitan planning organizations, and regional transportation organizations to create resilient and sustainable communities.
11. Improve systems that provide warning and emergency communications, including evaluation of their inclusiveness and accessibility.
12. Build the capacity of the County, the planning partners, and community-based organizations to ensure effective and meaningful engagement throughout the process and equitable outcomes of hazard mitigation action efforts.
13. Retrofit, purchase, and/or relocate structures in high hazard areas, and consider appropriate redevelopment policies in areas known to be repetitively damaged that will maximize public benefits and reduce negative impacts, particularly in socially vulnerable communities.
14. Where feasible, identify and implement strategies that use nature-based solutions.

MITIGATION ACTION PLAN

The planning partners selected mitigation actions to work toward achieving the goals set forth in this plan update. Mitigation actions presented in this update are activities designed to reduce or eliminate losses resulting from natural hazards. The update process resulted in the identification of 699 mitigation actions for implementation by individual planning partners, as presented in Volume 2 of this plan. In addition, the Steering Committee and planning partners identified countywide actions benefiting the whole partnership, as listed in Table ES-1.

Table ES-1-1. Area-Wide Hazard Mitigation Actions

Action Number and Description	Priority for Implementation		Priority for Pursuing Outside Funding
	Baseline	Equity Lens	
CW-1—Continue to maintain a multilingual and culturally appropriate website that will house the multijurisdictional local hazard mitigation plan, progress reports and all components of the plan's maintenance strategy to provide planning partners and the public with ongoing access to the plan and its implementation.	High	High	Low
CW-2—Continue to leverage/support/enhance multilingual and culturally appropriate, ongoing, regional public education and awareness programs, such as SMCAlert, ZoneHaven, and CERT, as a method to educate the public on risk, risk reduction, and community resilience.	High	High	Low
CW-3—Provide technical support and coordination for available grant funding opportunities to the planning partnership.	High	High	Low
CW-4: Develop a standardized GIS dataset for modeling hazards and impacts for regional and jurisdictional assessment purposes. Implement a program to digitally map historical hazard events and future hazard events and impacts.	High	High	Low
CW-5—Develop a multilingual and culturally appropriate business outreach program, in concert with existing business organizations and planning partners, to educate businesses on risk and risk reduction and to identify policies and programs to help businesses become more resilient.	High	High	Low
CW-6: Develop model policy templates to assist with coordinated development and implementation of resiliency policies, such as the Safety Elements.	High	High	Low

IMPLEMENTATION

The Steering Committee developed an implementation and maintenance strategy that includes monitoring of the plan's implementation, annual progress reporting, a strategy for continued public involvement, plan integration with other relevant plans and programs, and establishment of a subcommittee to oversee implementation progress relative to Community Rating System credits, for jurisdictions that belong to the Community Rating System.

Full implementation of the recommendations of this plan will require time and resources. The measure of the plan's success will be its ability to adapt to changing conditions. San Mateo County and its planning partners will assume responsibility for adopting the recommendations of this plan and committing resources toward implementation. The framework established by this plan commits all planning partners to pursue actions when the benefits of a project exceed its costs. The planning partnership developed this plan with extensive public input, and public support of the actions identified in this plan will help ensure the plan's success.

Part 1. BACKGROUND AND METHODS

1. INTRODUCTION

1.1 WHY PREPARE THIS PLAN?

1.1.1 Federal Guidance

Hazard mitigation is defined as any action taken to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term actions implemented before, during and after disasters. Hazard mitigation activities include planning efforts, policy changes, programs, studies, improvement projects, and other steps to reduce the impacts of hazards.

The federal Disaster Mitigation Act (DMA) emphasizes planning for disasters before they occur. The DMA requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Regulations developed to fulfill the DMA's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR).

The responsibility for hazard mitigation lies with not only with local, state, and federal governments, but also with private property owners and commercial and institutional interests. The DMA encourages cooperation among state and local authorities in pre-disaster planning. The enhanced planning network called for by the DMA helps local governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk-reduction projects.

The DMA also promotes sustainability in hazard mitigation. To be sustainable, hazard mitigation needs to incorporate sound management of natural resources and address hazards and mitigation in the largest possible social and economic context.

1.1.2 Local Concerns

Natural and human-caused hazards affect people, property, the environment, and the economy of San Mateo County. Climate change, drought, earthquakes, floods, landslides, severe weather, tsunamis, wildfires, and dam failures have exposed San Mateo County community members and businesses to the financial and emotional costs of recovering after natural disasters. Additionally, human-caused hazards such as hazardous material releases, pipeline and tank leaks, terrorism, airline incidents, and cyber threats have the potential to further affect the county. The risk associated with both natural and human-caused hazards increases as more people move to or visit areas affected by those hazards.

The inevitability of hazards and the growing population and activity within San Mateo County create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future hazard events. Identifying risks posed by hazards and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of people, communities, and visitors. Local community members and businesses can work together with the County to create a hazard mitigation plan that addresses the potential impacts of hazard events.

The *San Mateo County Multijurisdictional Local Hazard Mitigation Plan* is the latest update to a hazard mitigation plan for San Mateo County. In preparing it, the County has partnered with local cities and special-purpose districts. One of the benefits of multijurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. The Federal Emergency Management Agency (FEMA) encourages multijurisdictional planning under its guidance for the DMA. The plan will help guide and coordinate mitigation activities throughout the planning area.

1.1.3 Purposes for Planning

This update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their community members. This is not an emergency response or management plan, although it can be used to identify weaknesses and refocus emergency response planning. The focus of this plan is on better decision-making to avoid future risk and on activities that will eliminate or reduce current risks.

The planning effort identified risks posed by hazards and developed strategies to reduce the impact of hazard events on people and property in San Mateo County. The plan was also developed to meet the following objectives:

- Meet or exceed program requirements specified under the DMA.
- Enable San Mateo County to continue using federal grant funding to reduce risk through mitigation.
- Meet the needs of San Mateo County as well as state and federal requirements.
- Create a risk assessment that focuses on San Mateo County hazards of concern.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible impacts of a disaster are funded and implemented.
- Establish an “equity lens” approach to this plan update process as an option for all planning partners (see Section 2.2.3 for a description of equity and the equity lens).

1.2 WHO WILL BENEFIT FROM THIS PLAN?

All community members, visitors, and businesses in San Mateo County are the ultimate beneficiaries of this hazard mitigation plan update. The plan identifies strategies and actions to reduce risk for those who live in, work in, go to school in, and visit San Mateo County. It provides a viable planning framework for all foreseeable natural hazards. Participation by key stakeholders in developing the plan helped ensure that outcomes will be mutually beneficial. The plan’s goals and recommendations can lay the groundwork for development and implementation of local mitigation activities and partnerships.

1.3 HOW TO USE THIS PLAN

This plan has been set up in two volumes so that elements that are jurisdiction-specific can easily be distinguished from those that apply to the whole planning area:

- **Volume 1**—Volume 1 includes all federally required elements of a disaster mitigation plan that apply to the entire planning area. This includes the description of the planning process, public involvement strategy, goals and objectives, countywide hazard risk assessment, countywide mitigation actions, and a plan maintenance strategy. The following appendices provided at the end of Volume 1 include information or explanations to support the main content of the plan:
  - Appendix A. Hazard Mitigation Planning Equity Recommendations
  - Appendix B. Summary of Federal and State Agencies, Programs and Regulations
  - Appendix C. Summary of Federal and State Agencies, Programs and Regulations
  - Appendix D. Mapping Methods & Data Sources
  - Appendix E. Detailed Risk Assessment Results
  - Appendix F. FEMA Approval and Partner Adoption Resolutions
- **Volume 2**—Volume 2 includes all federally required jurisdiction-specific elements, in annexes for each participating jurisdiction. It includes a description of the participation requirements established by the Steering Committee, as well as instructions and templates that the partners used to complete their annexes. Volume 2 also includes "linkage" procedures for eligible jurisdictions that did not participate in development of this plan but wish to adopt it in the future.

Each planning partner will adopt Volume 1 in its entirety, its own jurisdiction-specific annex in Volume 2, and at least the introduction and appendices to Volume 2. Partners may at their discretion adopt Volume 2 in its entirety.

2. SAN MATEO COUNTY HAZARD MITIGATION PLANNING

2.1 PREVIOUS PLANS

2.1.1 2010 Association of Bay Area Governments Regional Planning Effort

Seventeen jurisdictions in San Mateo County were covered under the 2010 Association of Bay Area Governments (ABAG) regional planning effort. The planning process used to develop the updated ABAG plan was as follows:

- **Reevaluate the functional areas of the 2005 plan based on prioritizing mitigation for long-term recovery issues**—This reevaluation was accomplished through a series of issue-oriented forums at meetings of its main policy standing committee, the Regional Planning Committee.
- **Regional mitigation priority setting by cities, counties, and special districts with public involvement**—This objective was met through a series of workshops where strategies were reviewed for relevance and clarity. Three regional workshops were held to review draft priorities, and the draft priorities were posted online for public comment.
- **Develop chapters to highlight functional areas**—To make a better connection between the functional areas in the 2010 plan, chapters were developed to address mitigation strategies and how they achieved functionality.
- **Raise public awareness**—Public awareness was achieved through a series of campaigns, including an “op-ed” hazard mitigation piece on the anniversary of the Loma Prieta earthquake, securing an opportunity for free print ad and community service space, and public meetings focusing on specific aspects of the plan.
- **Focused outreach in partnership with local jurisdictions**—The 2010 planning process allowed for two opportunities for public comment.

2.1.2 2016 San Mateo County Hazard Mitigation Plan

The first multijurisdictional hazard mitigation planning effort that focused solely on San Mateo County was undertaken in 2016. Twenty-nine planning partners (San Mateo County, 18 cities or towns, and 10 special purpose districts) fully participated in this plan update process. The 2016 plan included planning requirements that applied to all participating partners in Volume 1 and addressed the jurisdiction-specific requirements in Volume 2. The plan assessed the dam failure, drought, earthquake, flood, landslide, severe weather, tsunami, and wildfire hazards. It also included profiles for human-caused hazards and climate change. The plan provided a robust risk assessment using the best available data and science to support Hazus modeling for the flood, tsunami, and earthquake hazards. In total, the plan identified and prioritized 620 mitigation actions. FEMA approved the plan on September 14, 2016.

2.2 REASONS FOR THE 2021 UPDATE

2.2.1 Federal Eligibility

Title 44 of the Code of Federal Regulations (44 CFR) stipulates that hazard mitigation plans must present a schedule for monitoring, evaluating, and updating the plan. This schedule provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. The Robert T. Stafford Act requires that jurisdictions have current hazard mitigation plans to pursue and receive federal funding.

2.2.2 Changes in Development

Upon updating, hazard mitigation plans must be revised to reflect changes in development within the planning area during the previous performance period of the plan, as stated in 44 CFR Section 201.6(d)(3). The plan must describe changes in development in hazard-prone areas that increased or decreased vulnerability since the last plan was approved. If no changes in development altered the overall vulnerability, then plan updates may validate the information in the previously approved plan. The intent of this requirement is to ensure that the mitigation strategy continues to address the risk and vulnerability of existing and potential development and takes into consideration possible future conditions that could affect vulnerability.

According to the State of California Department of Finance, the San Mateo County planning area experienced a 0.5 percent increase in population between 2016 and 2020. (California Department of Finance, 2021). This plan update assumes that some new development triggered by increased population occurred in hazard areas. Because all such new development would have been regulated pursuant to local programs and codes, it is assumed that vulnerability did not increase even if exposure did. San Mateo County and its incorporated cities and towns have general plans that govern land-use decisions and policy-making, as well as specialty ordinances such as building codes and flood-management regulations based on state and federal mandates. More detailed information on the types and location of new construction over the last five years is available in the city and county annexes in Volume 2 of this plan.

The following are significant development and demographic changes in San Mateo County since the previous hazard mitigation plan update:

- Based on development permit data for new construction provided by the municipal planning partners (see Volume 2), the general building stock increased by 2,600 structures, or 1.4 percent. This does not include accessory dwelling units, which are often classified as alterations to an existing property rather than new construction.
- The valuation of the general building stock increased by $31.6 billion, or 14.2 percent (County of San Mateo Assessor, 2021)
- As of January 1, 2021, the reported population for San Mateo County was 765,245, a decrease in population of 0.24 percent from 2016 and a decrease of 0.75 percent from the previous year (California Department of Finance, 2021)

2.2.3 Focus on Public Engagement and Equity

The County's 2016 hazard mitigation plan met the federal requirements for community engagement, but the engagement strategy fell short of County of San Mateo standards. The 2021 planning process was developed to enhance the dialogue between community members, local government, and other stakeholders and to use this dialogue to further existing equity goals.

The first step to integrate equity into hazard mitigation is recognizing that disparities in health outcomes, inequities in living conditions, and lack of political power place many low income communities, people of color, people with disabilities, pregnant women, and historically disadvantaged people, among others, at greater risk from hazards and limits their capacity to adapt, respond and recover. With these factors in mind, the County's framework for addressing equity through the 2021 hazard mitigation planning process had five components:

- Decision making
  - ➢ Adopt equity goals and objectives
  - ➢ Ensure diverse representation
- Outreach and engagement
  - ➢ Promote diverse community participation
  - ➢ Use trusted messengers
  - ➢ Translate materials
  - ➢ Meet people where they are
  - ➢ Ensure a transparent process
- Hazard analysis
  - ➢ Analyze social vulnerability indicators
  - ➢ Identify historical injustices
  - ➢ Overlay hazards and key indicators to find hot spots
- Mitigation actions
  - ➢ Identify actions that mitigate disparities (e.g. language and evacuation barriers)
- Implementation
  - ➢ Build community partnerships for implementation of actions
  - ➢ Track outcomes to ensure accountability

What is equity?

Equity ensures fair outcomes, treatment, and opportunities for all people, ensuring everyone gets what they need to enjoy full, healthy lives. It is the process of reducing disparities that are systematically associated with social advantage/ disadvantage. (Bay Area Climate Adaptation Network, 2021)

What is an equity lens?

Using an equity lens means being deliberately inclusive when making decisions. It introduces a set of questions to help decision makers focus on equity in both their process and their outcomes.

What is social vulnerability?

Social vulnerability is defined by the characteristics that influence an individual's or group's ability to prepare for, respond to, cope with, or recover from a hazard event. Understanding where populations have increased vulnerability and exposure to natural hazards can help emergency managers take actions to lessen impacts to these communities before an event or distribute needed recovery dollars after an event.

The County developed an equity resource paper titled "Recommendations for Addressing Equity in Hazard Mitigation Planning" to present this framework and to educate planning partners and the Steering Committee on disparities of underserved communities, particularly in hazard planning. The paper is provided in Appendix A. Outreach efforts for the current update included a specific focus on socially vulnerable communities and hard-to-reach populations.

FEMA defines social vulnerability as characteristics that influence an individual's or group's ability to prepare for, respond to, cope with, or recover from an event. They note "…heightened vulnerability…may be compounded by deficiencies in infrastructure …. While not predictive, understanding where populations have increased vulnerability and exposure to natural hazards can help emergency managers take actions to lessen impacts to these communities before an event or distribute needed recovery dollars after an event."

Recognizing the multijurisdictional scope for this plan and the variation in core capability and capacity of the planning partnership, components of this framework were made optional for the planning partnership. Each partner received tools to apply the equity lens perspective and well as guidance on how to use them. These protocols are included in the equity resource paper in Appendix A. The use of these tools was not mandated and was left to the discretion of each planning partner. The following planning partners committed to applying the equity lens protocol defined for this plan update process:

- Municipalities:
  - County of San Mateo
  - Brisbane
  - Daly City
  - East Palo Alto
  - Half Moon Bay
  - Menlo Park
  - Pacifica
  - Redwood City
  - San Carlos
  - South San Francisco
- Independent special districts:
  - Mid-Pen Regional Open Space
  - Montara Sanitary District
  - San Mateo County Community College District
  - San Mateo County Flood & Sea Level Rise Resiliency District

2.3 PLAN CHANGES CROSSWALK

The updated plan differs from the previous plan in a variety of ways. Table 2-1 indicates the major changes between the two plans as they relate to 44 CFR planning requirements.

Table 2-1. Plan Changes Crosswalk

44 CFR Requirement	2016 Plan	Updated Plan
Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: • An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval. • An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and • Review and incorporation, if appropriate, of existing plans, studies, reports and technical information.	The 2016 plan followed an outreach strategy utilizing multiple media developed and approved by the Steering Committee. This strategy involved: • Public participation on an oversight Steering Committee. • Establishment of a plan informational website. • Press releases. • Use of a public information survey Stakeholders were identified and coordinated with throughout the process. A comprehensive review of relevant plans and programs was performed by the planning team.	The 2021 plan built upon the success from the 2016 and expanded the outreach strategy to support the equity objectives for the plan update process. These enhancements included: • Establishing the Steering Committee with 50 percent of its members from government agencies and 50 percent from non-government organizations. • Distributing two surveys • Use of multi-lingual surveys • The development of a "StoryMap" to support the plan's implementation • Contracted support from eight community based organizations to increase survey responses and deliver multi-lingual community presentations in socially vulnerable areas and with hard-to-reach populations • Robust mitigation plan website As with the 2016 plan, the 2021 planning process identified key stakeholders and coordinated with them throughout the process. A comprehensive review of relevant plans and programs was performed by the planning team.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	Part 2 of Volume 1 presents a comprehensive risk assessment for the planning area that looks at eight hazards of concern: dam failure, drought, earthquake, flood, landslide, severe weather, tsunami, and wildfire. This section also includes an aggregate profile of human-caused hazards and climate change.	The same methodology, using new, updated data, was deployed for the 2021 plan update. An equity lens factor was established using FEMA's Social Vulnerability Index to support risk ranking. All hazard profiles were updated with the best available data and science, which in some cases (dam failure) resulted in increased risk for the planning area because of better data. Sea level rise was added as a fully assessed hazard of concern, and the profile on climate change impacts was enhanced.
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Volume 1 presents a comprehensive risk assessment of each hazard of concern. Each hazard was profiled as follows: • Hazard profile, including maps of extent and location, historical occurrences, frequency, severity, and warning time • Secondary hazards • Exposure of people, property, critical facilities, and environment • Vulnerability of people, property, critical facilities, and environment • Future trends in development • Scenarios • Issues	The same format, using updated data, was deployed for the 2021 plan update.

44 CFR Requirement	2016 Plan	Updated Plan
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was assessed for all hazards of concern. The Hazus computer model (version 2.2) was used for the earthquake, flood and tsunami hazards. These were abbreviated Level 2 analyses using planning partner and County data. Site-specific data on County-identified critical facilities was entered into the Hazus model. Hazus outputs were generated for other hazards by applying an estimated damage function to affected assets. The asset inventory was extracted from the Hazus model. Best available data was used for all analyses.	The same methodology was deployed for the 2021 plan update, using updated data. Hazus version 4.2 was utilized for all analyses. Analyses were expanded for the dam failure and sea-level rise hazards. All analyses utilized best available data and science.
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	The repetitive loss section was provided to meet Disaster Mitigation Act and Community Rating System planning requirements. The update includes a comprehensive analysis of repetitive loss areas that includes an inventory of the number and types of structures in the repetitive loss area. Repetitive loss areas were delineated, causes of repetitive flooding were cited, and these areas were reflected on maps.	The 2021 plan included a Community Rating System level-of-detail repetitive loss area analysis based on 2016 repetitive loss data and the 2017 Community Rating System Coordinator's Manual.
Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure and critical facilities located in the identified hazard area.	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern at the Census block/tract level. This data was updated with relevant current assessor's data where available. Each hazard chapter provides a discussion on future development trends as they pertain to each hazard.	The same methodology was deployed for the 2021 plan update, using updated data. The Steering Committee elected to revise the definition of critical facilities and infrastructure to follow FEMA's "lifeline" construct. The critical facilities inventory was adjusted accordingly.
Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.	Estimates of dollar loss were generated for all hazards of concern. These were generated by Hazus for the earthquake, flood, and tsunami hazards. For the other hazards, loss estimates were generated by applying a regionally relevant damage function to the exposed inventory. In all cases, a damage function was applied to an asset inventory. The asset inventory was the same for all hazards and was generated in the Hazus model.	The same methodology was deployed for the 2021 plan update, using updated data. Hazus modeling was expanded for dam failure and sea-level rise hazard profiles
Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	A qualitative analysis of future trends in development was applied to all hazards of concern.	The same methodology was deployed for the 2021 plan update, using updated data. In addition, a look at the change in risk due to new development over the performance period of the plan was performed for each hazard of concern.

44 CFR Requirement	2016 Plan	Updated Plan
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	The 2016 plan included both countywide initiatives and jurisdiction-specific initiatives. The plan identified 7 guiding principles, 7 goals and 11 objectives. Objectives were utilized to help prioritize the actions. Each planning partner fully assessed the capabilities and capacities to implement actions.	The same methodology for setting goals, objectives and actions was applied to the 2021 plan update. The Steering Committee reviewed and reframed the guiding principles, goals, and objectives. Each planning partner used the progress reporting from the plan maintenance and evaluated the status of actions identified in the 2016 plan. Actions that were completed or no longer considered to be feasible were removed. The rest of the actions were carried over to the 2021 plan and in some cases, new actions were added to the action plan.
Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The Steering Committee identified 7 guiding principles, 7 goals and 11 objectives. Objectives were utilized to prioritize actions.	The Steering Committee reviewed and reframed the guiding principles, goals, and objectives. The 2021 plan now has 9 guiding principles, 8 goals and 14 objectives. The reframing of these components focused on the addition of the equity lens to the plan.
Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	The plan included a catalog of mitigation best management practices that was developed through a facilitated process with the Steering Committee looking at strengths, weaknesses, obstacles, and opportunities within the planning area. Once the action plans were identified and prioritized, peach planning partner categorized each action under six mitigation categories.	The same catalog of mitigation best management practices was utilized, with enhancements by the Core Planning Team. The same prioritization protocol was applied, with the addition of a social equity priority for planning partners that chose the equity lens option. The mitigation category review was expanded to 8 categories with the addition of "climate resilient" and "community capacity building" categories.
Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	All municipal planning partners that participate in the National Flood Insurance Program identified an action stating their commitment to maintain compliance and good standing under the program. An assessment of program capabilities was included in the capability assessment of each municipal planning partner.	The same methodology was deployed for the 2021 plan update, using updated data.
Requirement: §201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in section (c)(3)(ii) will be prioritized, implemented and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Each recommended initiative is prioritized using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the impact of the project, the benefits of the project and the costs of the project. Two priorities were identified for each action: an implementation priority and a grant pursuit priority.	The same methodology was deployed for the 2021 plan update, using updated data. For planning partners that chose the equity lens option, a third social equity priority was added.

44 CFR Requirement	2016 Plan	Updated Plan
Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	The plan included a plan maintenance strategy that included protocols for: • Steering Committee role • Annual progress reporting • Plan updates • Continuing public involvement • Incorporation of the plan into other plans and programs	The strategy was enhanced to include a twice per year review of the status of actions, with one of the meetings to confirm the annual progress report. All other components were unchanged. A subcommittee will be established for Community Rating System participating communities to meet progress reporting requirements.
Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	The plan details recommendations for incorporating it into other planning components such as: • Emergency response plans • Natural hazard elements of community plans • Capital improvement programs • Municipal codes • Community design guidelines • Landscape design guidelines • Stormwater management programs • Water system vulnerability assessments • Any additional plans as they are reviewed and updated during the performance period of the plan.	This component of the plan maintenance strategy from the 2016 plan was carried over to the 2021 plan update.
Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	The plan details a strategy for continuing public involvement such as: • Website • Libraries • Publication of a progress report	This component of the plan maintenance strategy from the 2016 plan was carried over to the 2021 plan update.
Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).	All planning partners that fully met their participation requirements as defined by the planning process formally adopted the plan.	All planning partners that fully met their participation requirements as defined by the planning process formally adopted the plan.

3. PLAN DEVELOPMENT METHODOLOGY

The process followed to develop this hazard mitigation plan had the following primary objectives:

- Form a core planning team
- Establish a planning partnership
- Define the planning area
- Establish a steering committee
- Coordinate with other agencies
- Review existing programs
- Engage the public.

3.1 FORMATION OF THE CORE PLANNING TEAM

San Mateo County hired Tetra Tech, Inc. to assist with development and implementation of the plan. The Tetra Tech project manager and lead planner reported to the director of the County Department of Emergency Management and to the Multijurisdictional Local Hazard Mitigation Plan project manager. A planning team was formed to lead the planning effort, consisting of the following members:

- Dan Belville, Director, County of San Mateo Department of Emergency Management
- Ann Ludwig, Project Manager, County of San Mateo Department of Emergency Management
- Joe LaClair, Planning Services Manager, County of San Mateo Planning and Building Department (retired in March 2021)
- Melissa Ross, Planning Services Manager, County of San Mateo Planning and Building Department
- Katie Faulkner, Planner III, County of San Mateo Planning and Building Department
- Rumika Chaudhry, GIS and Open Data Supervisor, County of San Mateo GIS/Information Services
- Marcus Griswold, Senior Climate Adaptation Specialist, County of San Mateo Office of Sustainability (until May 2021)
- Hilary Papendick, Climate Change Program Manager, County of San Mateo Office of Sustainability
- David Cosgrave, Division Chief, Coastside Fire Protection District
- Carolyn Bloede, Director, County of San Mateo Office of Sustainability
- Rob Flaner, Project Manager, Tetra Tech
- Bart Spencer, Lead Project Planner, Tetra Tech

- Carol Baumann, Risk Assessment Lead, Tetra Tech
- Jeana Wiser, Public Outreach Lead, Tetra Tech
- Des Alexander, Profiling Lead, Tetra Tech

3.2 ESTABLISHMENT OF THE PLANNING PARTNERSHIP

San Mateo County opened this planning effort to all planning partners from the 2016 planning effort and any eligible local governments within the County not covered by a hazard mitigation plan. A kickoff meeting was conducted by the core planning team on February 1, 2021, where a presentation was made to introduce the mitigation plan update and solicit planning partner commitment to the plan update process.

Each jurisdiction wishing to join the planning partnership was asked to provide a “letter of intent to participate” that designated a point of contact for the jurisdiction and confirmed the jurisdiction’s commitment to the process and understanding of expectations. The planning partners that provided a letter of intent to participate in the plan update process are shown in Table 3-1. Volume 2 of this plan identifies which of these jurisdictions completed this process to be covered by this plan.

Table 3-1. Planning Partners

Jurisdiction	Point of Contact	Title
Cities/County		
Atherton	Dan Larsen	Commander
Belmont	Kacey Treadway	Emergency Services Specialist
Brisbane	Randy Breault	Public Works Director/City Engineer
Burlingame	Martin Quan	Senior Civil Engineer
Colma	Michael P. Laughlin	City Planner
Daly City	Joel Abelson	Battalion Chief
East Palo Alto	Daniel Berumen	Senior Planner
Foster City	Kacey Treadway	Emergency Services Specialist
Half Moon Bay	Corie Stocker	Management Analyst
Hillsborough	Mandy Brown	Senior Management Analyst
Menlo Park	Brian Henry	Assistant Public Works Director
Millbrae	Bill Reilly	Emergency Manager
Pacifica	Chris Clements	Police Captain
Portola Valley	Jeremy Dennis	Town Manager
Redwood City	Dave Pucci	Acting Fire Chief
San Bruno	Jovan Grogan	City Manager
San Carlos	Nicole MacDonald	Senior Management Analyst
San Mateo (city)	Kacey Treadway	Emergency Services Specialist
South San Francisco	Ken Anderson	Senior Emergency Services Manager
Woodside	Sean Rose	Public Works Director
San Mateo County	Dan Belville	Director, Department of Emergency Management

Jurisdiction	Point of Contact	Title
Special Purpose Districts		
Coastside County Water District	Mary Rogen	General Manager
Colma Fire Protection District	Geoffrey Balton	Fire Chief
Highlands Recreation District	Derek Schweigart	General Manager
Menlo Park Fire Protection District	Andres Acevedo	Program Director, Office of Emergency Management
Midpeninsula Regional Open Space District	Brandon Stewart	Land and Facilities Services Manager
Mid-Peninsula Water District	Rene Ramirez	Operations Manager
Montara Water & Sanitary District	Clemens Heldmaier	General Manager
North Coast County Water District	Adrianne Carr	General Manager
San Mateo Community College District	Ben'Zara Minkin	Emergency Manager
San Mateo County Flood & Sea Level Rise Resiliency District	Makena Wong	Associate Project Manager
San Mateo County Harbor District	James B. Pruett	General Manager
San Mateo County Office of Education	Molly Henricks	Coordinator, School Safety & Risk Prevention
San Mateo Resource Conservation District	Sheena Sidhu	Conservation Program Manager for Forest Health and Fire Resiliency
Westborough Water District	Darryl Barrow	General Manager
Woodside Fire Protection District	Don Bullard	Fire Marshal

3.3 DEFINING THE PLANNING AREA

The planning area was defined as the County of San Mateo, which consists of the mid-to southern land mass of the San Francisco Peninsula. The planning area includes San Mateo County's 20 incorporated jurisdictions, special districts, and the unincorporated areas of the County.

3.4 THE STEERING COMMITTEE

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses. A Steering Committee was formed to oversee all phases of the plan. The members of this committee included San Mateo County staff, community members, and other stakeholders from community-based organizations, special districts, cities, and other groups within the planning area. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be affected by its recommendations. The team confirmed a committee of 13 members. Table 3-2 lists the Steering Committee members.

Leadership roles and ground rules were established during the Steering Committee's initial meeting on February 22, 2021. The Steering Committee agreed to meet monthly as needed throughout the course of the plan's development and more frequently during the mitigation initiative development phase. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the plan update. The Steering Committee met six times from February 2021 through July 2021. Meeting agendas, recordings of meetings, and meeting minutes, including attendance logs, are posted on the County's hazard mitigation plan website at https://cmo.smcgov.org/event-information. All Steering Committee meetings were open to the public, and agendas were posted in advance of the meetings.

Table 3-2. Steering Committee Members

Jurisdiction/Agency	Name	Title
San Mateo County Department of Emergency Management	Dan Belville	Director (Chair)
MidPen Housing Corporation	Andrew Bielak	Associate Director of Housing Development
CAL Fire San Mateo Division	David Cosgrave	Division Chief
City of Daly City	John Gamez	Captain, Police Department
San Mateo County Health System, Commission on Disabilities	Robert Hall	President
City of Redwood City	Terence Kyaw	Director, Public Works Services Department
Puente	Rita Mancera	Executive Director (Co-Chair)
San Mateo County Community College District	Ben'Zara Minkin	Emergency Manager
North Fair Oaks Community Alliance	Ever Rodriguez	President
Climate Resilient Communities	Violet Saena	Director
San Mateo County Public Health	Belen Seara	Senior Community Health Planner
SamTrans	Amelia Timbers	Principal Planner, Sustainability
Senior Coastsiders	Sandra Winter	Executive Director

3.5 COORDINATION WITH OTHER AGENCIES

44 CFR requires that opportunities for involvement in the planning be provided to neighboring communities, agencies involved in hazard mitigation, agencies that regulate development, businesses, academia, and other interested groups (Section 201.6.b.2). The initial coordination activity was an invitation to agencies to provide representatives to participate on the Steering Committee. As the plan update process proceeded, the following agencies were invited to participate and were kept apprised of plan development milestones:

- San Mateo County Manager's Office
- San Mateo County Department of Planning and Building
- San Mateo County Office of Sustainability
- San Mateo County Health Department
- San Mateo County Public Works Department
- CAL FIRE San Mateo Division
- Participating jurisdictions

These agencies received meeting announcements, agendas, and minutes by e-mail throughout the plan update process. They supported the effort by attending meetings or providing feedback on issues. All the agencies were provided an opportunity to comment on this plan update, primarily through the hazard mitigation plan website. Each was sent an e-mail message informing them that draft portions of the plan were available for review. In addition, the complete draft plan was sent to the California Governor's Office of Emergency Services (Cal OES) and FEMA Region IX for a pre-adoption review to ensure program compliance.

3.6 REVIEW OF EXISTING PROGRAMS

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). The following plans and programs can affect mitigation within the planning area:

- California Fire Code
- 2019 California Building Code
- California State Hazard Mitigation Forum
- Local Capital Improvement Programs
- Local Codes and Standards
- Local Emergency Operations Plan
- Local General Plans including the Housing and Safety Elements
- Local Coastal Program Policies.
- County of San Mateo Sea-Level Rise Vulnerability Assessment
- San Mateo County, South Coast Sea-Level Rise Vulnerability Assessment and Adaptation Plan
- Climate Adaptation Plans
- Climate Action Plans
- Long-term Recovery Plans

Many of these relevant plans, studies, and regulations are cited in the capability assessment provided in Volume 2 of this plan for each participating jurisdiction. Chapter 6 of this volume provides an overview of state and federal programs that can interface with hazard mitigation and an introduction to local capabilities assessment.

3.7 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The Community Rating System (CRS) expands on these requirements by making credits available for optional public involvement activities. The strategy for involving the public in this plan update emphasized the following elements:

- Adopt an early commitment to place equity at the top of the priority list for all planning-related activities throughout the update process.
- Identify and involve representatives of many different County communities.
- Open Steering Committee meetings to members of the public for ongoing input.
- Use accessible and widely shared surveys to evaluate whether and how the public's perception of risk and support of hazard mitigation has changed since the initial planning process.
- Invite public participation at all public meetings.
- Attempt to reach as many planning area community members as possible using local media, including social media and local/regional communications channels.

3.7.1 Equity Approach

The project team prioritized active work to address equity in the *Multijurisdictional Local Hazard Mitigation Plan* by establishing a framework with key actions for each step of the planning process. Elements of the equity approach included:

- **Ensuring diverse leadership**—The Steering Committee membership included 50 percent community partners from organizations such as Climate Resilient Communities, MidPen Housing Corporation, Puente, the County Commission on Disabilities, Senior Coastsiders, and the North Fair Oaks Community Alliance.

- **Applying an equity-lens to action development**—With input from the Steering Committee and planning partners, the Core Planning Team developed an equity screening tool and other resources to support the development of equitable hazard mitigation actions.
- **Engaging hard-to-reach populations**—In April, the Office of Sustainability began negotiated contracts with eight community-based organizations to assist with community outreach, education, and administering the surveys in order to reach socially vulnerable populations. The organizations serve the following areas: unincorporated coastal communities, Half Moon Bay, Pacifica, East Palo Alto, Belle Haven, Menlo Park, North Fair Oaks, Daly City, San Mateo, South San Francisco, and San Bruno.
- **Translation and Interpretation Services—**The survey and outreach materials were translated into multiple languages to improve accessibility among populations with limited English proficiency. The website uses Google Translate for accessibility in multiple languages. Interpretation services were offered for the first public workshop and will also be offered for the second workshop on August 12.

3.7.2 Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies, community-based organizations, and jurisdictions that have a vested interest in this plan's recommendations. The effort to include stakeholders in this process included stakeholder participation on the Steering Committee, 50 percent of whose members represent organizations such as Climate Resilient Communities, MidPen Housing Corporation, Puente, the County Commission on Disabilities, Senior Coastsiders, and the North Fair Oaks Community Alliance. Other stakeholders targeted for Steering Committee membership included the following:

- San Mateo County and local jurisdiction departments relevant to hazard mitigation planning
- Members of the academic, transportation, and public health communities

3.7.3 Website

At the beginning of the plan update process, the County established a hazard mitigation website (https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan) to serve as a one-stop shop for information about the update process (see Figure 3-1).

Throughout the planning effort, the website was used to keep the public informed on milestones and to solicit input. At the same time, the website was used as a major resource for members of the community, planning partners, and other stakeholders to access information and resources about hazard mitigation planning, equity, and climate change as it impacts natural hazards.

The site's address was publicized in all press releases, mailings, surveys, and public meetings. Information on the plan development process, the Steering Committee, the survey, and phased drafts of the plan was made available to the public on the site throughout the process. San Mateo County intends to keep a website active after the plan is complete to keep the public informed about successful mitigation projects and future plan updates.

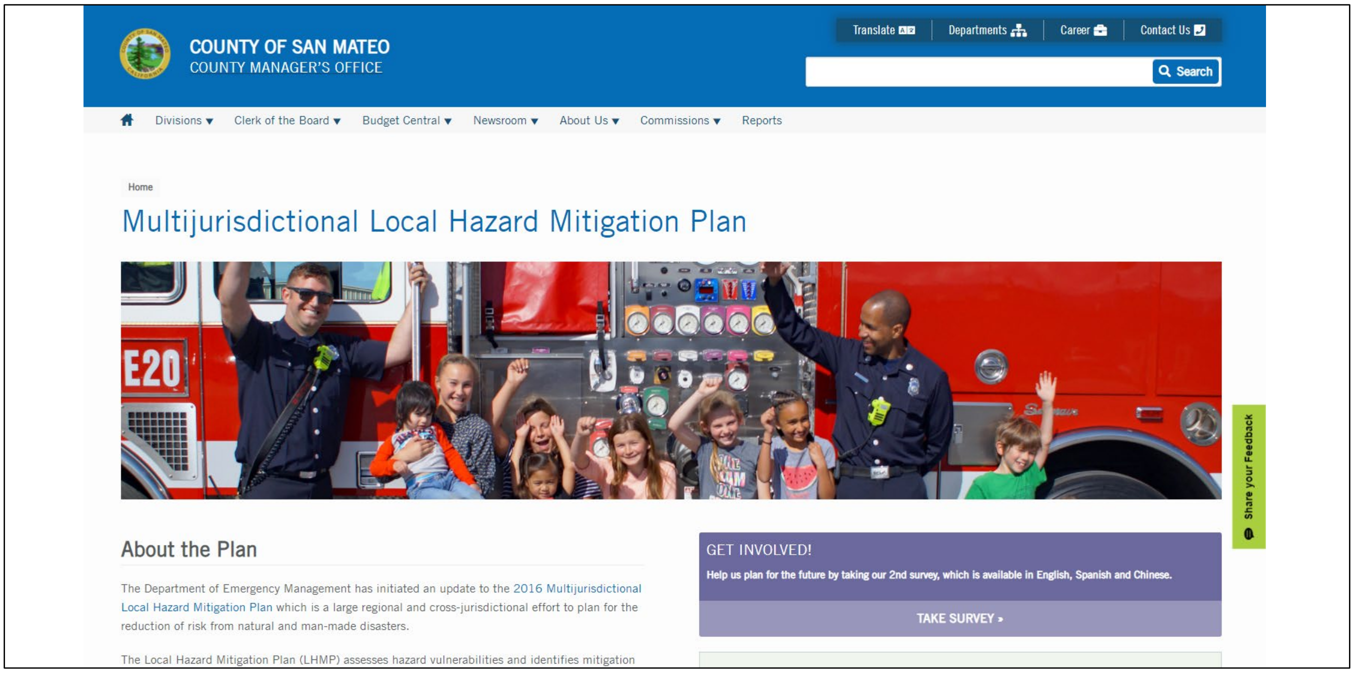


Figure 3-1. Hazard Mitigation Plan Web Site

3.7.4 Hazard Mitigation Surveys

The planning team developed two community hazard mitigation surveys with guidance from the Steering Committee:

- Survey #1 was used to gauge household and individual preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. This survey was designed to help identify areas vulnerable to one or more natural hazards. The answers to its 30 questions helped guide the Steering Committee in affirming goals and objectives and supported the planning partnership in developing and prioritizing mitigation strategies.
- Survey #2 was used to gather input from members of the community about potential mitigation strategies to reduce risks to natural hazards. Its questions focused on three top hazards of concern in San Mateo County: earthquakes, wildfire, and extreme heat. The survey expanded on two central questions:
  - How can we help reduce the risks of hazards in your community?
  - How can we help your family and neighbors get organized and prepared before a disaster?

Survey Monkey, a web-based survey tool, was used to develop, track, and analyze the survey results. Survey #1 was conducted from March 2021 to May 2021. Survey #2 was conducted from June 2021 to July 2021. Multiple methods were used to solicit survey responses:

- A web-based version of Survey #1 was made available on the plan website in six languages: English, Spanish, Mandarin, Tagalog, Tongan, Arabic (see Figure 3-2).
- A web-based version of Survey #2 was made available on the plan website in three languages: English, Spanish, and Chinese (see Figure 3-3).
- Attendees at all public/community meetings and open houses were asked to complete a survey.

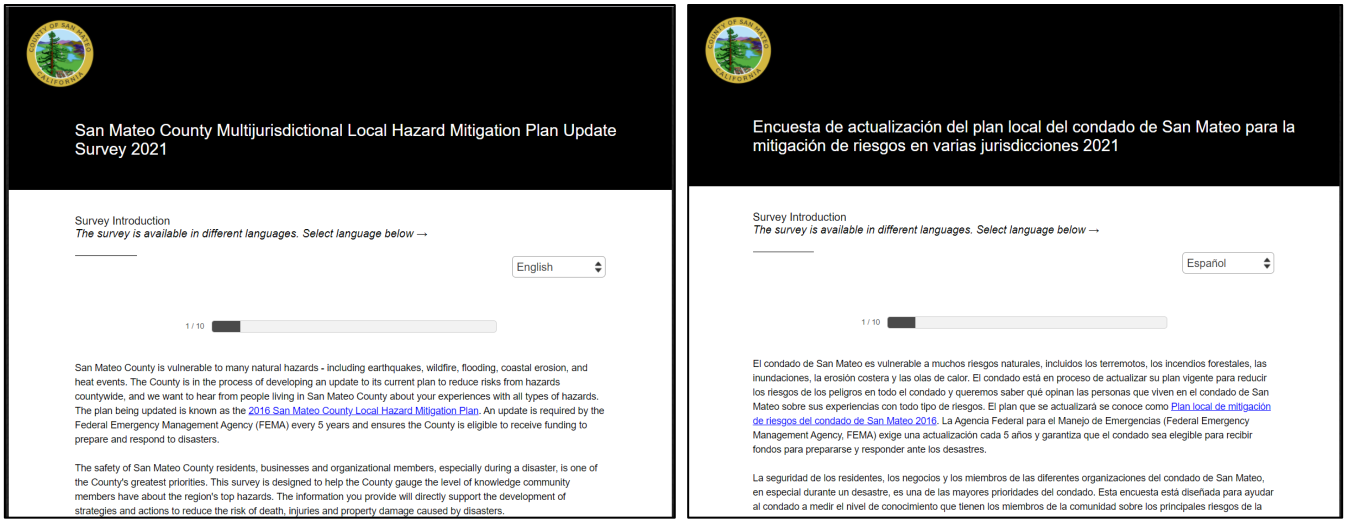


Figure 3-2. Sample Pages from Survey #1 Distributed to the Public (English and Spanish versions)

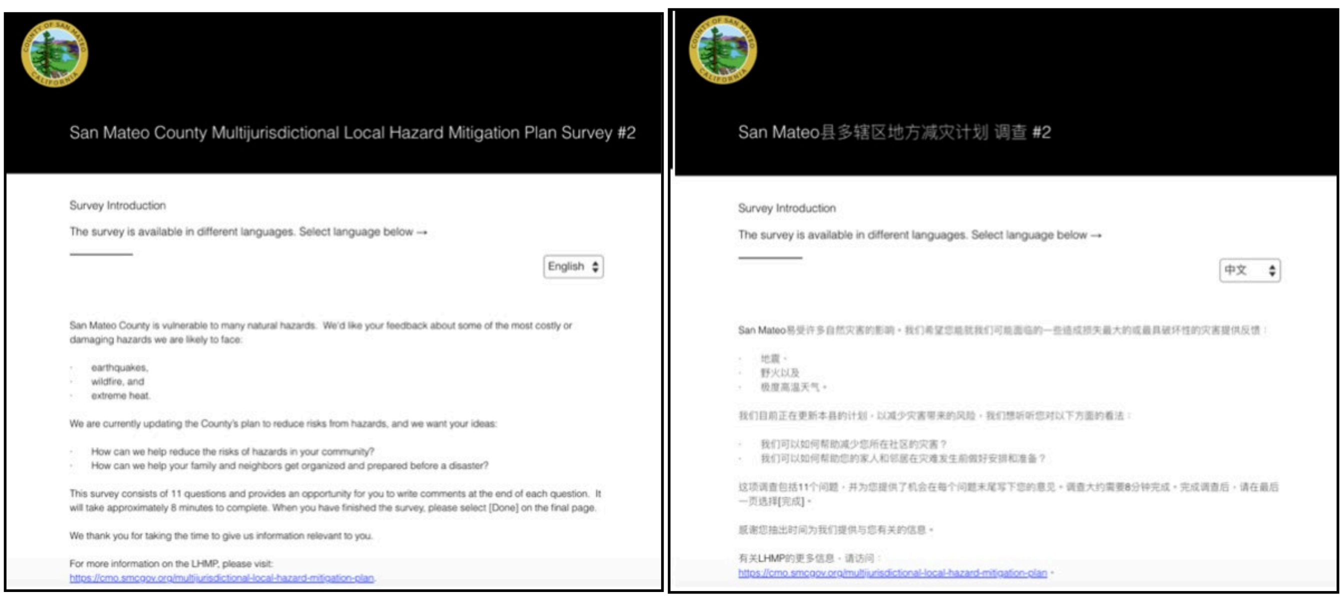


Figure 3-3. Sample Pages from Survey #2 Distributed to the Public (English and Chinese versions)

- Press releases were distributed to local media urging community members to participate.
- San Mateo County and participating planning partners advertised the surveys on social media (Facebook, Instagram, Nextdoor, and Twitter).
- Contracted community-based organizations were provided with a PDF-version of the survey for printing, and distributed paper copies of surveys at community events and COVID-19 vaccine clinics.

The County tracked survey responses by zip code throughout the survey collection period to ensure broad and diverse participation throughout all jurisdictions in the County. Both surveys and a summary of results are included in Appendix B.

3.7.5 Public Meetings and Community Partners

The planning process provided numerous public meeting opportunities. Some public meetings were directly related to the planning process and others were supportive of the planning process, reaching community members who would otherwise not be directly involved with hazard mitigation planning. Over 20 public meetings were directly organized by the County to target outreach and solicit feedback from a diverse range of County stakeholders and community members. To expand the reach of the planning outreach, the County partnered with eight community-based organizations to target socially vulnerable members of the community:

- Bay Area Community Health Advisory Council
- Ayundando Latinos a Sonar
- Senior Coastsiders
- Sustainable South Coast
- Center for Independence of Individuals with Disabilities
- El Concilio of San Mateo County
- Nuestra Casa
- Climate Resilient Communities

Each community partner held its own community outreach events and meetings, in coordination with County and planning partner staff, amplifying the reach of the public outreach efforts. In total, focus groups, presentations and meetings and individual engagements reached over 600 people. Social media postings completed by community-based organizations achieved 30,300 impressions (the number of times an ad appears on a screen). Table 3-3 lists the County-managed public meetings. Figure 3-4 shows a screenshot of a typical virtual public meeting. A report summarizing the outreach efforts is included in Appendix B.

Figure 3-4. Screenshot from June 2021 Climate Resilience Communities Virtual Meeting

Table 3-3. Summary of Outreach Activities

Dates	Activity	Participants/ Target Audience
February 22	Steering Committee Meeting #1	Steering Committee, Planning Partners & Public
March 15	Media Release #1 announcing the project kickoff for the hazard mitigation update and release of Survey #1, including social media (Facebook, Instagram, Nextdoor)	Public
March 20	South Coast Sustainable SC4 Amateur Radio Club	Coastside community; Public; 50 participants
March 22	Steering Committee Meeting #2	Steering Committee, Planning Partners & Public
March 25	Survey Outreach for unhoused populations	Senior Coastsiders (Public); 5 participants
March 25	Public Workshop #1: Risk Assessment and Story Map	Public
April 12	Monthly Meeting #1 (presentation from County staff)	Bay Area Community Health Advisory Council (Public); 22 participants; 90% African American
April 13	Email blast to listserv	Bay Area Community Health Advisory Council (Public); 155 people reached
April 19	Staff meeting	Center for Independence of Individuals with Disabilities (CID) (Public)
April 24	Center for Independence of Individuals with Disabilities (CID) Emergency Preparedness Program/ Food Distribution Event	CID (Public); 8 participants
April 26	Steering Committee Meeting #3	Steering Committee, Planning Partners & Public
April 29	CID Support Group	Public; survey response support; 3 participants
April 30	CID Virtual Peer Support Group Meeting	Public; 1:1 accessibility support; 1 participant
May 10	Monthly Meeting #2 (presentation from County staff)	Bay Area Community Health Advisory Council (Public)
May 10	Presentation to SAM Board (County staff participating)	Public
May 13	Evergreen Seniors event (panel from various coastal jurisdictions)	Senior Coastsiders (Public); 12 participants
May 24	Steering Committee Meeting #4	Steering Committee, Planning Partners & Public
June 3	Wildfire Risk and Resilience in San Mateo County, sponsored by OneShoreline and the League of Women Voters	Public
June 4 – July 11	Media release announcing Survey #2 to community members seeking input on mitigation actions, including social media (Facebook, Instagram, Nextdoor)	Public
June 7 & 10	Center for Independence of Individuals with Disabilities Staff Meeting and Peer Support Group	Outreach to Vulnerable Community Members; 15 participants
June 10	Nuestra Casa Environmental Justice Academy Focus Group	Outreach to Vulnerable Community Members; 25 participants (17 Spanish/8 English)
June 14	Bay Area Community Health Advisory Council Meeting	Outreach to Vulnerable Community Members; 22 participants; 90% African Americans
June 17	CID Support Group	Public; 6 participants
June 23	South Coast Sustainable Focus Group	Outreach to Vulnerable Community Members; 57 participants
June 23	Climate Resilient Communities Event	Public with focus on East Palo Alto, Belle Haven and North Fair Oaks Communities
June 24	South Coast Sustainable Focus Group	Puente; Public; 15 participants; farmworkers and Latinx; Spanish language translation
June 24	North Fair Oaks Community Council	Public
June 28	Steering Committee Meeting #5	Steering Committee, Planning Partners & Public
July 13	Pescadero Municipal Advisory Committee	Public

Dates	Activity	Participants/ Target Audience
July 20	Presentation to the Menlo Park City Council on the Multijurisdictional Local Hazard Mitigation Plan (County staff participating)	Public
July 26	Steering Committee Meeting #6	Steering Committee, Planning Partners & Public
August 5	Media release #3 announcing release of the draft hazard mitigation plan update and Public Workshop #2	Public
August 12	Public Workshop #2: Review of draft Multijurisdictional Local Hazard Mitigation Plan	Steering Committee, Planning Partners & Public

3.7.6 Media Outreach

The following press releases were distributed as key milestones were achieved or before major events:

- March 15, 2021—Announcement of project kick-off, including Survey #1
- June 4, 2021—Announcement of project update and Survey #2
- August 5, 2021—Announcement of draft plan availability and 2-week public comment period

Each press release was supplemented by meeting announcements on the project website. Copies of these press releases can be found in Appendix B.

3.7.7 Public Involvement Results

Summary of Survey #1 Findings

The planning team summarized the findings from responses to Survey #1 as follows:

- Number of completed surveys = 1,299 (most were completed via the internet; some were completed as paper surveys and entered manually into Survey Monkey)
- Surveys were received from every municipality and unincorporated County community (see Figure 3-5).
- Respondents rated the following hazards as those that concern them the most (in order of concern): climate change, wildfire, drought, public health, air quality, earthquakes, and power failures.
- 85 percent of respondents were either extremely concerned, very concerned, or concerned about impacts from climate change in the planning area.
- 81 percent of respondents stated that if likely impacts from natural hazards were explicitly disclosed to them prior to purchasing a home, their decision would be influenced by that kind information.
- Over 60 percent of respondents stated that the presence of natural hazard risk was not disclosed to them at the time of home purchase.
- The concept of incentives to promote hazard mitigation actions on a personal scale was strongly supported, with over 80 percent of the respondents supporting a property tax break or incentive to encourage them to spend money to retrofit their homes.
- Over 50 percent of respondents were not sure if they had hazard-specific insurance coverage (i.e. flood or earthquake).

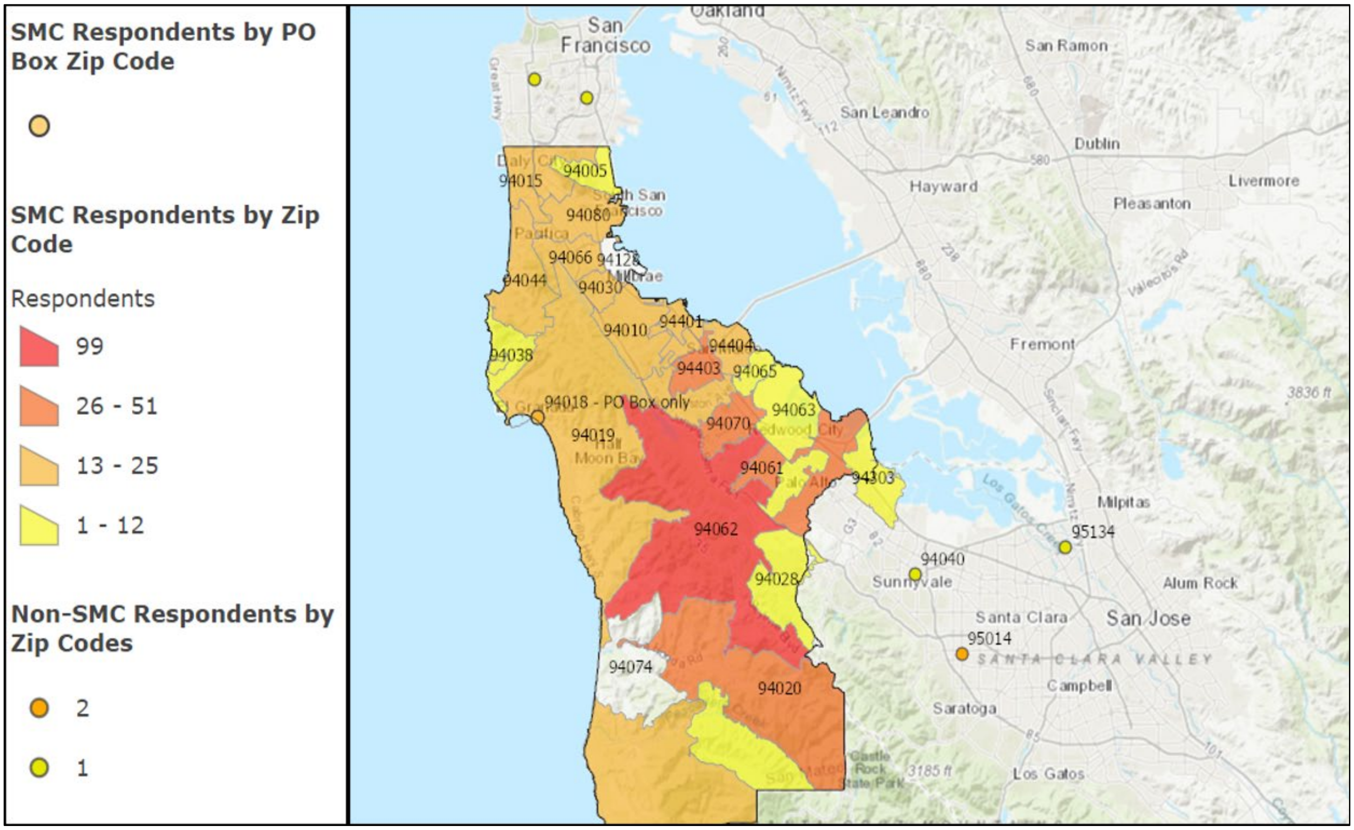


Figure 3-5. Survey #1 Survey Responses by Zip Code

- The majority of the surveys were completed by people who live in households with greater than $230,001 in annual income, by people age 61 or older, and by people who identify as white.
- 475 write-in comments were received from the surveys.

All survey results were provided to the Steering Committee for review in support of confirming the mission statement, goals, objectives, and countywide actions for this plan update. The results also were included in the toolkit provided to each planning partner to help frame mitigation actions and public outreach strategies to include in their action plans. The survey and a summary of results are included in Appendix B.

Summary of Survey #2 Findings

The planning team summarized the findings from responses to Survey #2 as follows:

- Number of completed surveys = 703 (all completed via the internet):
  - 82.1% (577) English
  - 17.6% (124) Spanish
  - 0.3% (2) Chinese
- Survey responses were received from 16 cities and seven unincorporated communities within the County, with the majority of participants coming from Half Moon Bay (18.8%), Pacifica (12.8%), and Redwood City (11.4%). Figure 3-6 shows the distribution of survey responses by zip code.

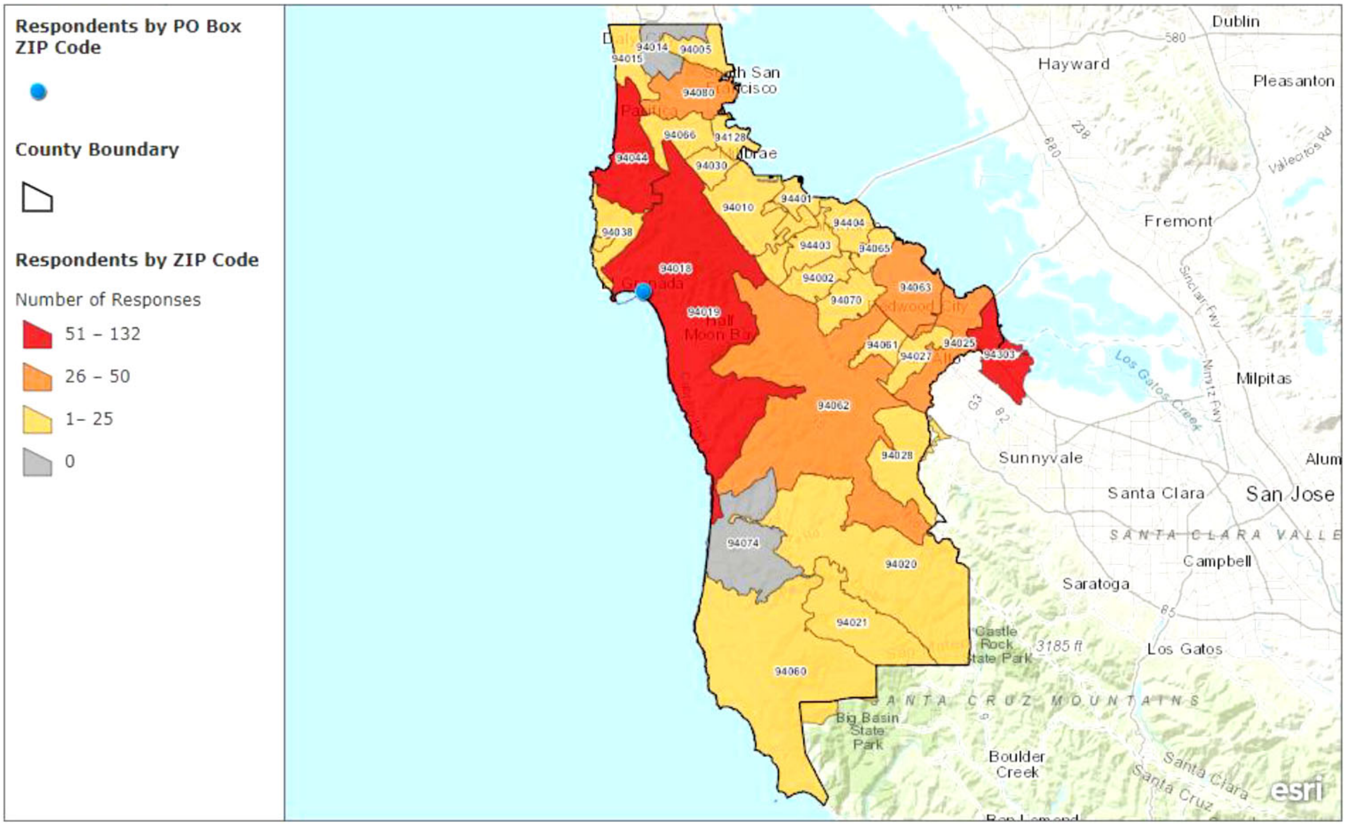


Figure 3-6. Survey #2 Survey Responses by Zip Code

- The survey asked the same question for each of the three top hazards: "To help prepare for an extreme heat/earthquake/wildfire event, what would be most helpful to me is..." Over 70% of survey respondents replied that the top choice for all three is: "Knowing my community can provide safe, accessible emergency shelters for my family and neighbors if we need to leave our homes during such events"

The survey and a summary of results are included in Appendix B.

Meeting Attendance and Participation

Table 3-4 summarizes attendance and comments received from the public meetings.

Table 3-4. Summary of Public Meetings

Date	Location	Number of Community Members in Attendance	Number of Comments Received
February 22	virtual	Steering Committee #1	37
March 22	virtual	Steering Committee #2	22
March 25	virtual	Public Meeting #1	73
April 26	virtual	Steering Committee #3	22
May 24	virtual	Steering Committee #4	15
June 28	virtual	Steering Committee #5	0
July 26	virtual	Steering Committee #6	XX
Total			

3.8 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-5 summarizes important milestones in the development of the plan update.

Table 3-5. Plan Development Milestones

Date	Event/Milestone	Description	Attendance
2020			
11/3	Organize Resources	County release RFP for contractor support to facilitate the plan update process	N/A
12/18	Organize Resources	County selects Tetra Tech to facilitate plan update	N/A
12/23	Organize Resources	Contract scope and schedule confirmation between Tetra Tech and San Mateo County	6
2021			
1/5	Organize Resources	Organization kickoff meeting • Contract status/update • January schedule of activities • Review Steering Committee charter • Sample letters of intent • Organize Core Planning Team • Steering Committee makeup suggestions	5
1/19	Core Planning Team Kickoff Meeting#1	• Project process and timeline • Planning partners kickoff meeting • Review of mission statement, 2016 goals and objectives • Review 2016 plan countywide specific hazards • Public outreach strategy	12
2/1	Organize Planning Partnership	Planning partner kickoff meeting • Planning partner expectations • Letter of intent	38
2/2	Core Planning Team Meeting #2	• Project process and timeline • Planning partners kickoff meeting debrief • Review of proposed goals and objectives • Review of proposed 2021 countywide specific hazards • Review of GIS data list • Public outreach updates • Confirm Core Planning Team & Steering Committee members	12
2/16	Core Planning Team Meeting #3	• Social vulnerability and Hazus analysis • Jurisdictional annex Phase 1 • Confirm list of hazards • Public outreach strategy discussion—survey, StoryMap	11
2/19	Planning Process	Phase 1 jurisdictional annex distributed to planning partners	N/A
2/22	Steering Committee Meeting #1	• Welcome and introductions • Project overview • Steering Committee ground rules • Principles, goals, and objectives • Review Core Planning Team recommended hazards of concern • Outreach and engagement plan • Addressing equity in the hazard mitigation plan	57
3/2	Core Planning Team Meeting #4	• Social vulnerability recommendation • Jurisdictional annex update • Planning process • Hazards of concern	12

Date	Event/Milestone	Description	Attendance
3/15	Public Outreach	Survey #1 goes live	N/A
3/16	Core Planning Team Meeting #5	• Social vulnerability recommendation • Planning process update • Hazard scenario discussion • Primary and secondary hazard discussion • Public outreach update	10
3/19	Planning Process	Phase 1 jurisdictional annexes due	NA
3/22	Steering Committee Meeting #2	• Planning process discussion • Hazards of concern discussion • Critical facilities definition for 2021 update • Public outreach update	46
3/25	Public Outreach	Public Workshop #1 • Overview of hazard mitigation planning • FEMA grant eligible projects & additional grant resources • Preview of StoryMap	73
3/29	Core Planning Team Meeting #6	• County-sponsored internal workshop on social equity • Planning process update • Core capabilities exercise introduction • Hazards data discussion • Public outreach update	9
4/2	Planning Process	Phase 2 jurisdictional annexes deployed	N/A
4/13	Core Planning Team Meeting #7	• County-sponsored internal workshop on social equity • Planning process update • Core capabilities exercise • Public outreach update	13
4/26	Steering Committee Meeting #3	• Results of workshop on social equity in the hazard mitigation plan • Review and approve objectives • Update on jurisdictional annex process • Public outreach update	35
4/27	Core Planning Team Meeting #8	• Update on outreach and engagement activities • Jurisdictional annex process updates • Core capabilities exercise update	11
5/11	Core Planning Team Meeting #9	• Current schedule of hazard mitigation planning activities • Update on outreach and engagement activities • Jurisdictional annex update • Results of core capabilities exercise • Review of draft plan maintenance strategy	12
5/15	Public Outreach	Public Survey #1 closes	N/A
5/21	Planning Process	Phase 2 jurisdictional annexes due	N/A
5/24	Steering Committee Meeting #4	• Results of Survey #1 • Jurisdictional annex process update • County updates—action item development	34
5/25	Core Planning Team Meeting #10	• Debrief from Steering Committee meeting #4 • Volume 1 draft items for Core Planning Team review • Update on outreach and engagement activities • Information on annex activities • Schedule of upcoming events	11

Date	Event/Milestone	Description	Attendance
6/1	Core Planning Team Meeting #11	• Preliminary hazard/risk assessment results presentation • Differences between risk assessment with equity lens and without equity lens	10
6/4	Public Outreach	Media release and Public Survey #2 posted	N/A
6/11	Planning Process	Phase 3 jurisdictional annexes deployed	N/A
6/14	Planning Process	• Phase 3 jurisdictional annex workshop and instruction for municipalities	45
6/15	Planning Process	• Phase 3 jurisdictional annex workshop and instruction for special districts	21
6/16	Planning Process	• Phase 3 jurisdictional annex workshop and instruction for municipalities	30
6/16	Planning Process	• Phase 3 jurisdictional annex workshop and instruction for special districts	14
6/22	Core Planning Team Meeting #12	• Review of draft mitigation actions • Review of mitigation actions catalog • Data and outreach update • Planning process update	12
6/23 – 7/21	Planning Process	Dedicated call-in time every Wednesday from June 23 to July 21 for the Core Planning Team to provide technical assistance to planning partners completing their Phase 3 jurisdictional annexes.	Average 6 per call
6/28	Steering Committee Meeting #5	• Results of hazard/risk assessment • Multijurisdictional Local Hazard Mitigation Plan maintenance plan • Phase 3 workshop updates • County updates—outreach activities	26
7/11	Public Outreach	Public Survey #2 closes	N/A
7/13	Core Planning Team Meeting #13	• Volume 1 and other plan items for Core Planning Team review • Data and outreach update	11
7/23	Planning Process	Phase 3 jurisdictional annexes due	N/A
7/26	Steering Committee Meeting #6	• Volume 1 of Multijurisdictional Local Hazard Mitigation Plan • Planning Process – Annex Submittals • County Updates	38
7/27	Core Planning Team Meeting #14	• Debrief Steering Committee Meeting #6 • Volume 1 Update and SMC Comments/Revisions • Public Comment Process • BATool Training • Public Meeting #2	10
8/5	Public Outreach	• Draft Multijurisdictional Local Hazard Mitigation Plan Public Comment Period Begins	N/A
8/12	Public Workshop #2	• Present and discuss Draft Multijurisdictional Local Hazard Mitigation Plan	XX
8/23	Public Outreach	• Draft Multijurisdictional Local Hazard Mitigation Plan Public Comment Period Ends	N/A
8/31	Plan Review	Submittal draft of the plan submitted to CAL OES for review and approval	N/A
TBD	Plan Review	Approval Pending Adoption received from FEMA Region X	N/A
TBD	Adoption	Adoption window for planning partners opens	N/A
TBD	Approval	Proof of adoption documentation submitted to FEMA Region X and Cal OES	N/A
TBD	Approval	Final approval of the plan by FEMA Region X	N/A

4. SAN MATEO COUNTY PROFILE

San Mateo County covers 455 square miles over four regions: North County, South County, Mid-County, and the Coastside. The county is bounded on the north by San Francisco City and County, on the east by San Francisco Bay, on the south by Santa Clara County and Santa Cruz County, and on the west by the Pacific Ocean. The dense urbanization of the Bayside stands in marked contrast to the agricultural areas, parks and preserves, and undeveloped lands of the rural Coastside region. The planning area is shown in Figure 4-1.

4.1 HISTORICAL OVERVIEW

The area that is now San Mateo County was first inhabited by the Ramaytush subdivision of the Ohlone people of the central and northern California coast. After Mexico seceded from Spain in 1822, California became a territory of Mexico in 1824. Mexican governors of California granted the land encompassing current San Mateo County to soldiers and political allies. During Mexican times, foreigners from the United States and elsewhere began settling in the San Mateo area. Mexico ceded California to the United States through the Treaty of Guadalupe Hidalgo in 1848, and the discovery of gold in California caused an influx of new settlers through 1852.

When San Mateo County officially became a county in 1856, splitting from San Francisco County, development in San Mateo County halted, as economic development was focused on the north. The isolation was particularly felt in coastal areas of the county, where geological features made development difficult.

Efforts to draw the coastal area out of isolation in the late 1800s and early 1900s by constructing the Ocean Shore Railroad came to a halt with the 1906 San Francisco earthquake, when 4,000 feet of rails, along with engines, railroad cars and construction equipment, ended up in the ocean. It was two years before this section of the coast rails was rebuilt.

On the bayside of the county, the 1906 earthquake created a new middle class, as earthquake survivors relocated to San Mateo County for more affordable housing and a stable commute via a newly established streetcar. Ten new towns were established between 1908 and 1927, and in 1928, the San Francisco Bureau of Governmental Research identified San Mateo County’s bayside as an area for future industrial growth.

The San Francisco Peninsula experienced substantial growth during World War II and the post-war periods as the military invested in defense projects and military installations around the area. After World War II, many veterans previously stationed in the area decided to settle in San Mateo County. Most of the resulting population increase occurred on the bayside. The County’s population grew to 236,000 by 1950, to 444,000 by 1960, and to 557,000 by 1970 (NPS 2010).

Figure 4-1. Planning Area

Cities
County Boundary
Highways
Airport
Rail Station

N
0 2 4 Miles

Data Sources: San Mateo Co.

4.2 PHYSICAL SETTING

4.2.1 Geography and Topography

The Santa Cruz Mountain range bisects San Mateo County, essentially creating three regions (SMC, 1986):

- The Bayside largely consist of mudflats, marshes, artificial fill, and broad, flat alluvial plains. The low-lying Bayside region gradually increases in slope toward the Santa Cruz Mountains, eventually becoming rolling foothills. The San Andreas Fault parallels the Santa Cruz Mountain range, delineating the threshold of the Bayside and beginning of the Santa Cruz mountainside.
- The Santa Cruz Mountains are generally rugged with dense forest and steep slopes, often exceeding 50 percent. This area is characterized by large amounts of open space, recreational areas, and trails, including Wunderlich Park, Huddart Park, and the Fifield-Cahill Ridge Trail.
- The Coast-side of San Mateo County consists of sloping foothills of the Santa Cruz Mountains to nearly sea-level coastal terraces along the Pacific Ocean. The difference in topography along the coastline itself ranges from wide, sandy beaches to rocky coves. In some places, high, rocky cliffs have emerged from the gradual erosion of coastal terraces.

Elevation ranges from sea level along the coast and bay to 2,572 feet above sea level at the Santa Cruz Mountains.

4.2.2 Natural Resources

San Mateo County's natural resources range from forested mountains to bayside marshlands and coastal ecosystems. These natural resources face pressure from development, invasive species, natural hazards, and climate change. The Bay Area is home to 35 species protected under the Endangered Species Act (Center for Biological Diversity, 2021). These resources are an integral part of the economy, sense of place, and traditional culture of the island communities. They need to be considered in hazard mitigation planning, because they are affected by natural hazards and can influence the way that hazards alter the built environment.

4.2.3 Water Resources

The bayside of San Mateo County has experienced high amounts of urban development, which required flood control modifications within nearby watersheds. Streams that once naturally flooded and meandered around hillsides before reaching the San Francisco Bay were hardscaped and straightened into channels. However, the coast side of San Mateo County consists mostly of open space and agricultural land with sparsely distributed towns. Most watersheds on the coast side have little to no flood control modifications; however, water diversions, lack of riparian zone management, and water quality issues all present challenges for these resources. There are nine major watersheds in San Mateo County (County of San Mateo Public Works, 2021):

- **Gazos Creek Watershed**—Gazos Creek is a priority watershed for steelhead and coho salmon recovery. Major tributaries include Old Woman's Creek and Middle Fork Gazos Creek.
- **Pilarcitos Creek Watershed**—Major tributaries include Arroyo Leon and Mills Creek. The San Francisco Public Utilities Commission manages the Pilarcitos Reservoir in the upper watershed.
- **Pescadero Creek Watershed**—The Pescadero Creek Watershed is the largest watershed in San Mateo County. It consists of two major sub-watersheds: Pescadero Creek and Butano Creek. The watershed also contains an impressive marsh inhabited by several native and protected species such as steelhead, California red-legged frog, and San Francisco garter snake.

- **Colma Creek Watershed**—The headwaters of Colma Creek are on San Bruno Mountain. The lower reaches of Colma Creek are managed by the San Mateo County Flood Control District
- **San Francisquito Creek Watershed**—Major tributaries include Los Trancos Creek, Corte Madera Creek, and Bear Gulch Creek. Los Trancos and San Francisquito form the boundary between San Mateo and Santa Clara counties.
- **San Gregorio Watershed**—Major tributaries include El Corte de Madera Creek, Alpine Creek, and La Honda Creek. A small lagoon forms at the mouth of San Gregorio Creek during the dry season.
- **San Mateo Watershed**—The San Mateo Creek Watershed includes three reservoirs: San Andreas Lake, and Upper and Lower Crystal Springs Reservoirs, managed by the San Francisco Public Utilities Commission.
- **Belmont Creek Watershed**—Belmont Creek watershed originates east of the Pulgas Ridge in the hills above Hallmark Drive and covers 1,952 acres (3.1 sq mi).
- **Atherton Creek Watershed**—Atherton creek flows from headwaters just west of Interstate 280 to Alameda de las Pulgas. Further downstream, the creek is highly modified and flows through a concrete channel to El Camino Real and then a combination of concrete channel and culverts to San Francisco Bay. Several small tributaries drain into Atherton Creek above Alameda de las Pulgas, but further downstream the drainage network consists of underground culverts or storm drains.

4.2.4 Climate

The climate of San Mateo County is characterized by dry, mild summers and moist, cool winters. About 80 percent of the total annual precipitation occurs during from November through March. Table 4-1 summarizes normal climate date from 1945 through 2016 at Western Regional Climate Center weather station at San Francisco International Airport.

Table 4-1. Normal Precipitation and Temperatures, 1945 – 2020

		Temperature (ºF)		
	Precipitation (inches)	Minimum	Average	Maximum
Annual	19.94	49.3	57.3	65.2
Winter (December – February)	11.62	42.6	50.4	59.1
Summer (June – August)	.19	52.8	62.6	72.0
Spring (March – May)	4.65	46.2	56.0	66.7
Autumn (September – November)	3.48	47.4	60.1	73.4

Weather Station: San Francisco International Airport
Source: Western Regional Climate Center, 2021

4.2.5 Vegetation

San Mateo County's land managing agencies and stewards have the responsibility of caring for a diverse mix of ecosystems, including estuarine, marine, oak woodland, redwood forest, coastal scrub, and oak savannah. Home to more than 112,000 acres of protected lands, the county's open spaces provide community members and visitors with water, recreation opportunities, scenic vistas, wildlife habitat, and vital refuges for threatened, endangered, and special status species. The county's natural resources provide numerous ecological, economic, and social benefits that are vitally linked to the county's communities.

4.2.6 Geology

The San Francisco Peninsula is a relatively narrow band of rock at the north end of the Santa Cruz Mountains separating the Pacific Ocean from San Francisco Bay. It represents one mountain range in a series of northwesterly-aligned mountains forming the Coast Ranges geomorphic province, which stretches from the Oregon border nearly to Point Conception. In the San Francisco Bay area, most of the Coast Ranges have developed on a basement of tectonically mixed Cretaceous- and Jurassic-age (70- to 200-million years old) rocks of the Franciscan Complex. These basement rocks are capped locally by younger sedimentary and volcanic rocks. Most of the Coast Ranges are covered by younger surficial deposits that reflect geologic conditions for about the last million years (City of San Mateo, 2004).

The major fault in the region is the San Andreas Fault. Lateral and vertical movement on the many splays of the San Andreas Fault system and other secondary faults has produced a dominant northwest-oriented topographic trend throughout the Coast Ranges. This trend reflects the boundary between the North American plate to the east and the Pacific plate to the west. The San Andreas Fault system is about 40 miles wide in the Bay Area and extends from the San Gregorio fault at the coastline to the Coast Ranges-Central Valley blind thrust at the western edge of the Great Central Valley. The San Andreas Fault is the dominant structure in the system, nearly spanning the length of California, and capable of producing the highest magnitude earthquakes. Many other subparallel or branch faults within the San Andreas system are equally active and capable of generating large earthquakes. Right-lateral movement dominates on these faults, but an increasingly large amount of thrust faulting resulting from compression across the system is now being identified (City of San Mateo, 2004).

4.2.7 Soils

Uplands comprise about 80 percent of the planning area. The following four soil associations have been mapped and described in the uplands (U.S. Soil Conservation Service, 1961):

- Hugo-Butano—Steep and very steep, brownish, moderately deep and deep soils on sedimentary rocks under coniferous forest.
- Miramar-Sheridan—Steep and very steep, dark-colored, shallow to deep soils on acid igneous rocks under shrubs and forest.
- Sweeney-Mindego—Sloping to very steep, dark-colored, moderately deep soils on basic igneous rocks under grass or forest.
- Lobitos-Santa Lucia-Gazos—Sloping to very steep, grayish-brown, very shallow to deep soils on sedimentary rocks under shrubs and grass with some trees.

Soils of the marine terraces, alluvial fans, and floodplains comprise less than 20 percent of the planning area, but they contain most of the agricultural land and many of the home sites of the survey area. Three soil associations have been mapped in these lower areas (U.S. Soil Conservation Service, 1961):

- Tierra-Colma—Gently sloping to steep, dark-colored, shallow to deep soils on high, dissected marine terraces; composed of weathered sedimentary rocks or alluvium from them; under grass and shrubs.
- Watsonville-Elkhorn—Nearly level to sloping, grayish, shallow to deep soils formed on low marine terraces composed of alluvium from sedimentary rocks or mixed sources; under grass.
- Tunitas-Lockwood—Nearly level to sloping, grayish or brownish, deep soils on fans and floodplains composed of alluvium from various rocks; under grass with some shrubs and trees.

4.3 DEVELOPMENT

4.3.1 Land Use

A key element in risk assessment is to look at existing land use in hazard areas that have a delineated extent, since land use affects the level of risk. For example, an agricultural, low-density use faces a lower risk in a floodplain than a high-density, residential use. Each municipality in San Mateo County has its own land use plan (SMC, 2017). Unincorporated San Mateo County's land is used primarily for resource management. Permitted uses include agricultural, commercial, and residential types of development. The County has adopted residential, commercial, industrial, and other resource management land uses to promote community values for the benefit of future generations. Table 4-2 list San Mateo County's objectives and designations for land use in unincorporated areas. Figure 4-2 shows the distribution of land use in unincorporated San Mateo County.

Table 4-2. Land Use Objectives and Designations for Unincorporated San Mateo County

	Land Use Objectives	Land Use Designations
Urban Unincorporated Areas	• Maximize the efficiency of public facilities, services, and utilities • Minimize energy consumption • Encourage the orderly formation and development of local government agencies • Protect and enhance the natural environment • Revitalize existing developed areas • Discourage urban sprawl.	• Residential • Commercial • Office • Industrial • Airport • Institutional • Recreation • General Open Space.
Rural Unincorporated Areas	• Preserve natural resources • Provide for the managed productive use and monitoring of resources • Provide outdoor recreation • Protect public health and safety.	• Agriculture • Lower Density Residential • Recreation • General Open Space • Timber Production • Solid Waste Disposal Facility.

4.3.2 Building Count, Occupancy Class and Estimated Replacement Value

Table 4-3 presents planning area building counts by occupancy class. Table 4-4 summarizes estimated replacement value for building structures and contents combined.

4.3.3 Critical Facilities

A critical facility is a structure, facility, or other improvement that, because of its function, service area, or uniqueness, provides service that enables the continuous operation of critical business and government functions, and is critical to human health and safety or economic security. Critical facilities are essential to the health and welfare of the population. They become especially important after a hazard event.

Critical facilities typically include police and fire stations, schools, and emergency operations centers. They also include infrastructure such as roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need, as well as utilities that provide water, electricity, and communication services to the community. Also included are facilities and railroads that hold or carry significant amounts of hazardous materials with a potential to impact public health and welfare in a hazard event.

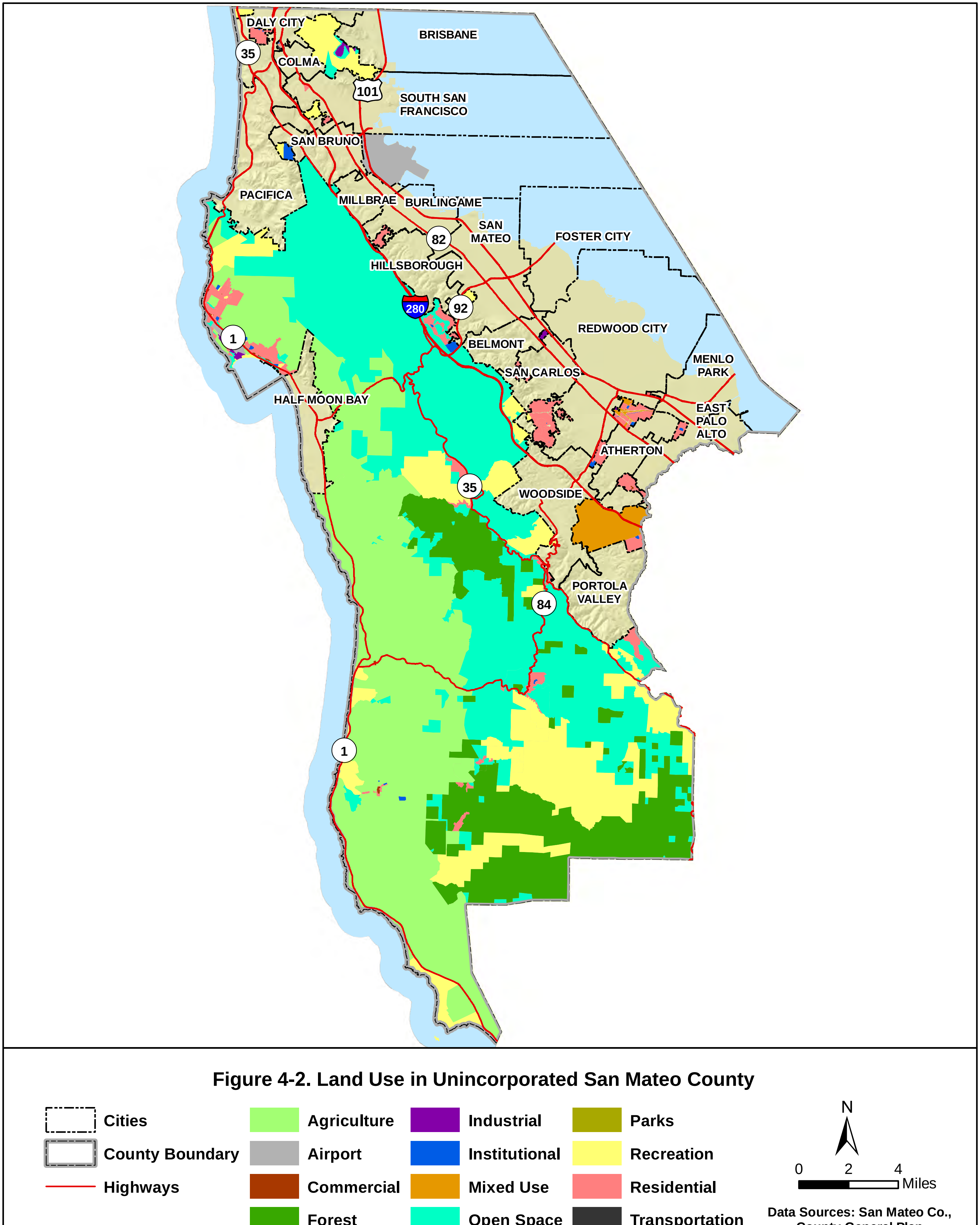


Figure 4-2. Land Use in Unincorporated San Mateo County

Data Sources: San Mateo Co., County General Plan

Table 4-3. Planning Area Building Counts by Occupancy Class

	Number of Buildings							
	Agricultural	Commercial	Education	Government	Industrial	Religion	Residential	Total
Atherton	1	7	15	2	0	0	2,479	**2,504**
Belmont	0	200	18	4	32	9	7,072	**7,335**
Brisbane	0	229	4	3	11	3	1,566	**1,816**
Burlingame	0	573	15	7	53	21	6,932	**7,601**
Colma	1	115	0	1	7	0	321	**445**
Daly City	5	498	28	9	8	28	21,366	**21,942**
East Palo Alto	3	108	14	5	21	30	4,409	**4,590**
Foster City	0	131	8	3	23	7	7,732	**7,904**
Half Moon Bay	26	160	7	3	7	9	3,946	**4,158**
Hillsborough	0	18	5	3	0	0	3,900	**3,926**
Menlo Park	2	399	19	6	76	26	8,545	**9,073**
Millbrae	0	190	12	3	5	7	5,796	**6,013**
Pacifica	4	215	21	5	2	18	11,733	**11,998**
Portola Valley	4	28	8	2	0	3	1,533	**1,578**
Redwood City	0	871	35	13	99	36	18,203	**19,257**
San Bruno	1	395	20	4	22	20	11,234	**11,696**
San Carlos	4	618	13	4	185	10	9,054	**9,888**
San Mateo	2	1,034	39	12	76	48	22,474	**23,685**
South San Francisco	0	1,021	24	10	173	26	15,441	**16,695**
Woodside	2	34	3	2	0	1	1,980	**2,022**
Unincorporated	315	650	47	21	171	22	18,700	**19,926**
Total	**370**	**7,494**	**355**	**122**	**971**	**324**	**184,416**	**194,052**

Table 4-4. Estimated Replacement Value of Planning Area Buildings

Jurisdiction	Estimated Total Replacement Value (Structure and Contents)	Jurisdiction	Estimated Total Replacement Value (Structure and Contents)
Atherton	$2,851,840,817	Millbrae	$4,518,625,975
Belmont	$6,073,411,270	Pacifica	$5,726,928,117
Brisbane	$3,727,060,662	Portola Valley	$1,561,897,019
Burlingame	$11,121,820,561	Redwood City	$21,797,918,834
Colma	$1,269,795,262	San Bruno	$7,904,426,518
Daly City	$12,987,124,886	San Carlos	$10,559,383,070
East Palo Alto	$3,491,181,391	San Mateo	$23,908,243,752
Foster City	$8,139,909,551	South San Francisco	$25,673,267,870
Half Moon Bay	$3,540,059,183	Woodside	$1,694,299,578
Hillsborough	$3,326,778,876	Unincorporated	$19,545,239,679
Menlo Park	$12,491,405,466	**Total**	**$191,910,618,338**

Source: San Mateo County tax parcel data.

The Steering Committee recommended that this plan update use a definition of critical facilities that aligns with FEMA's "community lifelines" concept. The following categories of lifelines are defined as critical facilities:

- **Communications**—Infrastructure, alerts, warnings, messages, 911 and dispatch, responder communications, and financial services
- **Energy**—Power (grid), temporary power, and fuel
- **Food, Water and Shelter—**Evacuations, schools, food/potable water, shelter, durable goods, water infrastructure, and agriculture
- **Hazardous Materials**—Facilities, hazardous debris, pollutants, and contaminants
- **Health and Medical**—Medical care (hospitals), patient movement, public health, fatality management, health care, and supply chain
- **Safety and Security—**Law enforcement/security, search and rescue, fire services, government service, responder safety, and imminent hazard mitigation
- **Transportation**—Highway/roadway, mass transit, railway, aviation, maritime and pipeline

Table 4-5 summarizes critical facilities in the planning area. General locations of identified critical facilities are shown on Figure 4-3 and Figure 4-4.

Table 4-5. Critical Facilities by Jurisdiction and Category

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Atherton	2	0	2	0	0	14	1	19
Belmont	6	1	32	0	4	21	7	71
Brisbane	4	2	1	7	1	6	4	25
Burlingame	26	1	17	4	17	19	14	98
Colma	0	0	0	2	0	1	2	5
Daly City	28	4	22	1	24	46	33	158
East Palo Alto	3	1	30	0	3	23	2	62
Foster City	9	0	4	2	4	19	10	48
Half Moon Bay	5	1	13	2	6	21	3	51
Hillsborough	4	1	0	0	0	11	8	24
Menlo Park	28	8	26	1	14	25	15	117
Millbrae	20	3	7	0	5	15	8	58
Pacifica	8	1	38	0	5	21	12	85
Portola Valley	2	0	0	0	1	6	5	14
Redwood City	36	8	99	17	22	76	34	292
San Bruno	14	4	9	2	13	23	30	95
San Carlos	19	1	21	6	7	28	7	89
San Mateo	49	6	35	1	45	66	59	261
South San Francisco	21	8	36	17	22	39	49	192
Woodside	7	1	3	0	0	9	17	37
Unincorporated	97	16	48	20	11	111	132	435
Total	388	67	443	82	204	600	452	2,236

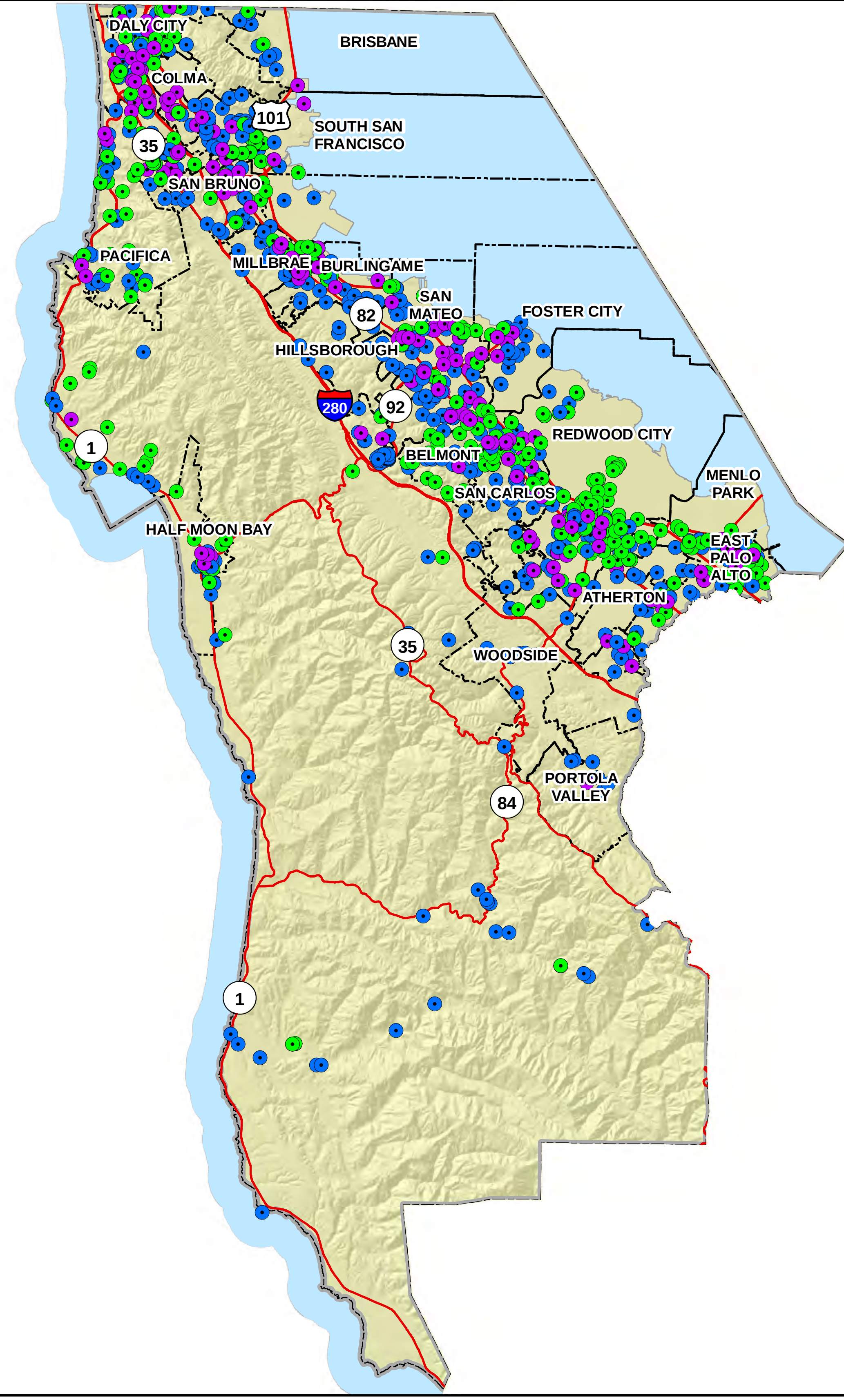


Figure 4-3. Critical Facilities, 1 of 2

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Cities
- County Boundary
- Highways

N

0 2 4 Miles

Data Sources: San Mateo Co., DHS HIFLD

Figure 4-4. Critical Facilities, 2 of 2

Communications
Energy
Hazardous Materials
Transportation
Cities
County Boundary
Highways

N
0 2 4 Miles

Data Sources: San Mateo Co., DHS HIFLD

4.3.4 Development Trends

An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure. The Disaster Mitigation Act requires that communities consider land use trends, which can alter the need for, and priority of, mitigation options over time. Land use and development trends significantly affect exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

New development that has occurred in the last five years and potential future development in the next five years, as identified by each jurisdiction, are addressed in the jurisdictional annexes in Volume 2 of this plan. This section describes general countywide trends.

Areas targeted for future growth and development have been identified across the county. According to the Association of Bay Area Governments (ABAG), the County of San Mateo is expected to grow considerably in the next 10 years, with an estimated population of 862,800 by 2030—a 10 percent increase from the current population. Significant residential and non-residential development are expected, with increasing establishment of technology companies throughout the County likely in the near future. While coastal communities will experience some degree of future exposure based on anticipated land use, most of the future impact will be in the bayside communities.

On May 20, 2021, the ABAG Executive Board approved the *Final Regional Housing Needs Allocation Methodology and Draft Allocations*. The current housing allocation for the 21 listed jurisdictions in San Mateo County (including the unincorporated areas) is 47,687 housing units. Very low income and above moderate-income housing types make up a sizeable portion of this allocation (ABAG, 2021). All cities and the County are currently updating their housing elements. This will assess housing needs from 2023 to 2031 and establish policies and programs to address them. the housing element must also demonstrate that the unincorporated County has sites that can be developed or redeveloped to meet the County's regional housing needs allocation (SMC Planning, 2021).

In fiscal year 2019-20, the County's Planning and Building Department processed 2,294 building permits, barely less than its goal of 2,300, despite almost two months of mandated closure due to the COVID-19 pandemic. Most of these permits were obtained via the new online permit center. The department estimates that the total number of building permits to be issued in fiscal year 2020-21 will be close to the target of 2,300 (SMC, 2021a). The current County budget includes significant continued spending on capital projects, including the San Mateo Medical Center, County Office Building 3, Pescadero Fire Station 59, Tower Road Fire Station 17 replacements, and Memorial Park Facility Improvements (SMC, 2021a). Each municipal planning partner to this plan has performed a building permit assessment for the performance period since the 2016 plan. These assessments are included in Volume 2 of this plan.

Development in San Mateo County will likely be impacted by the COVID-19 pandemic over the next few years. The current County budget reflects $6.3 billion over the next two years for ongoing efforts against COVID-19, including the administration of vaccines, prevention and mitigation measures, and recovery programs to help people, businesses, and community organizations. As multiple sectors recover from the pandemic, San Mateo County will need to address housing concerns for those who are experiencing homelessness. The current budget reflects the acquisition of hotels and the building of a navigation center to house those experiencing homelessness (SMC, 2021a).

4.4 DEMOGRAPHICS

4.4.1 Population Characteristics

San Mateo County has the 14th largest population of California's 58 counties, with an estimated 2020 population of 773,244. The sections below provide details on population history and distribution by jurisdiction within the planning areas.

Recent Population by Jurisdiction

Table 4-6 shows the population of the County and its incorporated cities from 1990 to 2020. Daly City and the City of San Mateo are the largest cities in San Mateo County, together accounting for 27.6 percent of the planning area's population in 2010 and 27.4 percent in 2020. Unincorporated areas accounted for 8.6 percent of the planning area's population in 2010 and about 8.5 percent in 2020. Overall growth in unincorporated areas was about 7.3 percent from 2010 to 2020; Daly City grew about 8.0 percent during the same timeframe, and the City of San Mateo grew by about 6.0 percent.

Table 4-6. Recent Population by Jurisdiction

	Population			
	1990	2000	2010	2020
Atherton	7,163	7,194	6,914	6,942
Belmont	24,165	25,123	25,835	26,669
Brisbane	2,952	3,597	4,282	4,621
Burlingame	26,666	28,158	28,806	30,068
Colma	1,103	1,187	1,454	1,678
Daly City	92,088	103,625	101,072	108,767
East Palo Alto	23,451	29,506	28,155	30,630
Foster City	28,176	28,803	30,567	33,025
Half Moon Bay	8,886	11,842	11,324	12,404
Hillsborough	10,667	10,825	10,825	11,442
Menlo Park	28,403	30,785	32,026	35,120
Millbrae	20,414	20,718	21,532	22,742
Pacifica	37,670	38,392	37,234	38,267
Portola Valley	4,195	4,462	4,353	4,598
Redwood City	66,072	75,402	76,815	86,444
San Bruno	38,961	40,165	41,114	45,392
San Carlos	26,382	27,718	28,406	30,067
San Mateo	85,619	92,482	97,207	102,766
S. San Francisco	54,312	60,552	63,632	67,730
Woodside	5,034	5,352	5,287	5,670
Unincorporated	57,244	61,275	61,611	66,019
Total	**649,623**	**707,163**	**718,451**	**771,061**

Source: California Department of Finance, 2020

Historical Growth Rate

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Figure 4-5 shows the percentage population growth rate per decade from 1970 through 2020 for San Mateo County and for the state. The planning area's population growth of about 5.4 percent through the 1970s increased to 10.6 percent in the 1980s. Population growth slowed slightly in the 1990s and dropped sharply to 1.6 percent between 2000 and 2010. The period from 2010 through 2020 saw an increase in population of about 7.3 percent for San Mateo County while the State of California experienced 6.9 percent growth.

Source: California Department of Finance, 2021

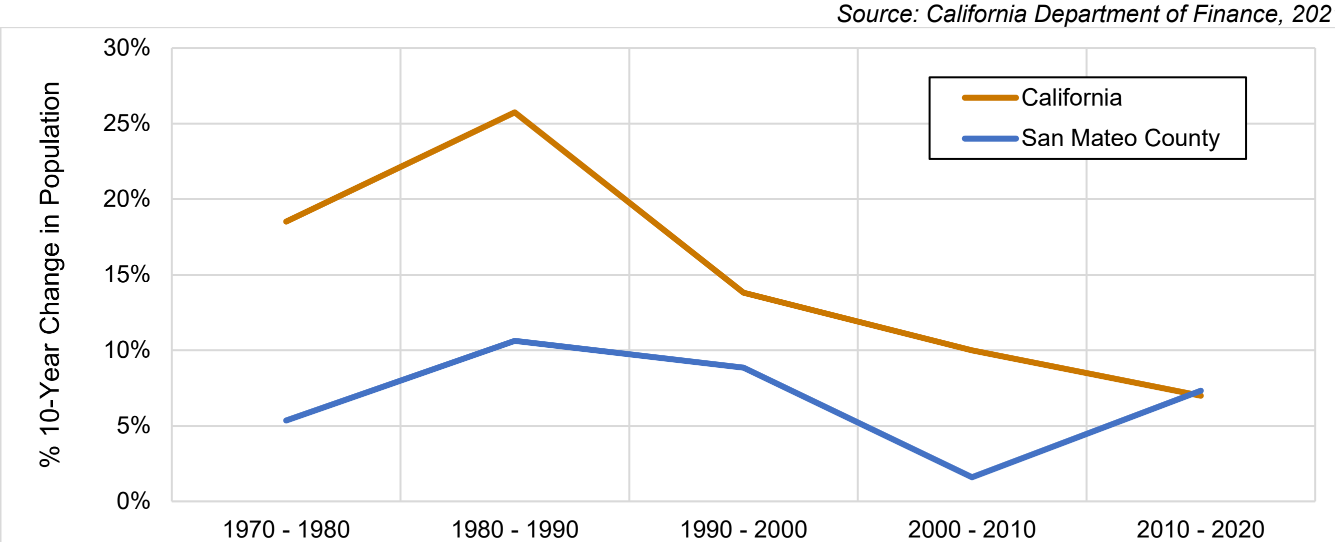


Figure 4-5. State of California and San Mateo County Population Growth per Decade

Daily Commuting Population

County data indicates that San Mateo County has had a greater percentage of people working outside of their place of residence (79.2 percent) than the Bay Area (61.9 percent), California (60 percent), and the United States (43.7 percent). This has remained consistent from 2005 through 2019.

According to the Census Bureau's American Community Survey for 2019, about 56.8 percent of San Mateo County's employed population worked in San Mateo County and 42.8 percent worked outside of the county. San Francisco City and County receives the highest number of commuting workers in the nation, and the highest number of commuters to San Francisco are from San Mateo County, followed by Alameda County.

The majority of commuters to San Mateo County came from San Francisco, followed by Santa Clara County, and Alameda County. Some commuters travel to San Mateo County from as far as Sacramento and Tuolumne Counties. About 150,000 out-of-county commuters work in San Mateo County, and more than 100,000 commuters pass through the county as part of their daily commute to San Francisco, the North Bay Area, Alameda County, or the South Bay Area.

This large commuter contingent has impacts on planning for the County's infrastructure and service needs, as well as on planning for hazard mitigation and emergency management. Commuters may be familiar with the area immediately surrounding their place of business or regular route to work but may be less familiar with the services and resources provided to the population during a disaster event.

The American Community Survey estimates that 66.5 percent of workers in the County commute alone by vehicle to work (U.S. Census Bureau, 2019).

4.4.2 Demographic Indicators for Social Vulnerability

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. People living near or below the poverty line, the elderly, individuals with disabilities, women, children, ethnic minorities, and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members can help to extend focused public outreach and education to the most vulnerable community members.

Indicators from Census data are commonly used to assess social vulnerability. For the social vulnerability demographic profile component for this plan, the following indicators were selected:

- **Population Under 15 Years of Age—**Children, especially in the youngest age groups, often cannot protect themselves during a disaster because they lack the necessary resources, knowledge, or life experiences to effectively cope with the situation. Hazard mitigation planning needs to be tailored such that the community is prepared to ensure that children are safe during disaster events and that families with children have access to necessary information and tools.
- **Population Over 65 years of Age—**People 65 years old and older are likely to require financial support, transportation, medical care, or assistance with ordinary daily activities, especially during disasters. They are more likely to be vision, hearing, and/or mobility impaired, more likely to experience mental impairment or dementia, and more likely to live in assisted-living facilities where emergency preparedness is at the discretion of facility operators. Hazard mitigation needs to account for such needs.
- **People of Color—**Social and economic marginalization of certain racial and ethnic groups, including real estate discrimination, has resulted in greater vulnerability of these groups to all types of hazards. Based on data from a number of studies, African Americans, Native Americans, and populations of Asian, Pacific Islander, or Hispanic origin are likely to be more vulnerable than the broader community. Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during disaster events. Post-disaster recovery often exhibits cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. Hazard mitigation plans need to identify the spatial distribution of these population groups and direct resources to reduce their vulnerability to hazards.
- **Limited English-Speaking Households—**For populations with limited English proficiency, disaster communication may be difficult, especially in communities for whom translators and accurate translations of advisories may be scarce. Such households are likely to rely on relatives and local social networks (i.e., friends and neighbors) for information for preparing for a disaster event.
- **Persons with Disabilities—**Persons with disabilities or other access and functional needs are more likely to have difficulty responding to a hazard event than the general population. Family, neighbors, and local government are the first level of response to assist these individuals, and coordination of efforts to meet

their access and functional needs is paramount to life safety efforts. Emergency managers need to distinguish between functional and medical needs to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with access and functional needs allows emergency management personnel and first responders to anticipate the services needed by that population.

- **Families Below the Poverty Level—**Economically disadvantaged families have limited ability to absorb losses due to hazard impacts. Wealth enables families to absorb and recover from losses more quickly, due to insurance, savings, and often the availability of low-cost credit. People with lower incomes tend not to have access to these resources. At the same time, poorer families are likely to inhabit poor quality housing and reside in locations that are most vulnerable to hazard events. Economically disadvantaged neighborhoods are also likely to have relatively poor infrastructure and facilities, which exacerbate the disaster consequences for community members there.

These indicators were selected based on the equity priorities established by the County, and the availability of datasets at a small enough resolution to determine probable characteristics of populations within identified hazard areas. The following sections estimate the age, race, language, and disability indicators for San Mateo County; poverty levels are presented in Section 4.5. Additional data sets that have been aggregated were utilized to support the equity lens for the risk assessment, as explained in detail in Chapter 7.

Age Distribution

The overall age distribution for the County is shown in Figure 4-6. Based on U.S. Census 2019 data estimates, 16.5 percent of the planning area's population is 65 or older, compared with the state average of 14.8 percent. Census data indicate that 26.6 percent of the over-65 population have disabilities of some kind, and 6.0 percent have incomes below the poverty line. It is also estimated that 16.8 percent of the population is 14 or younger, which varies slightly from the state's average of 18.7 percent. Children under the age of 18 account for 6.2 percent of individuals who are below the poverty line.

Race, Ethnicity and Language

Figure 4-7 shows the race/ethnicity distribution in the planning area according to the *San Mateo County Stigma Baseline Survey* (Strata Research, Inc., 2020; based on U.S. Census Bureau 2018 American Community Survey 5-Year Estimates). U.S. Census data show that the planning area has a 35.9 percent foreign-born population. The Census estimates 16.7 percent of community members speak English "less than very well" and lists the following as the five languages most commonly spoken at home (number of people in parentheses) (U.S. Census, 2021):

- English (401,961)
- Spanish (125,880)
- Chinese (64,021)
- Tagalog (45,801)
- Hindi (8,103)

Persons with Disabilities or with Access and Functional Needs

According to the 2019 Census estimates, persons with disabilities or with access and functional needs make up 7.6 percent of the total civilian non-institutionalized population of San Mateo County.

Source: U.S. Census—American Community Survey 1-Year Estimates, 2019

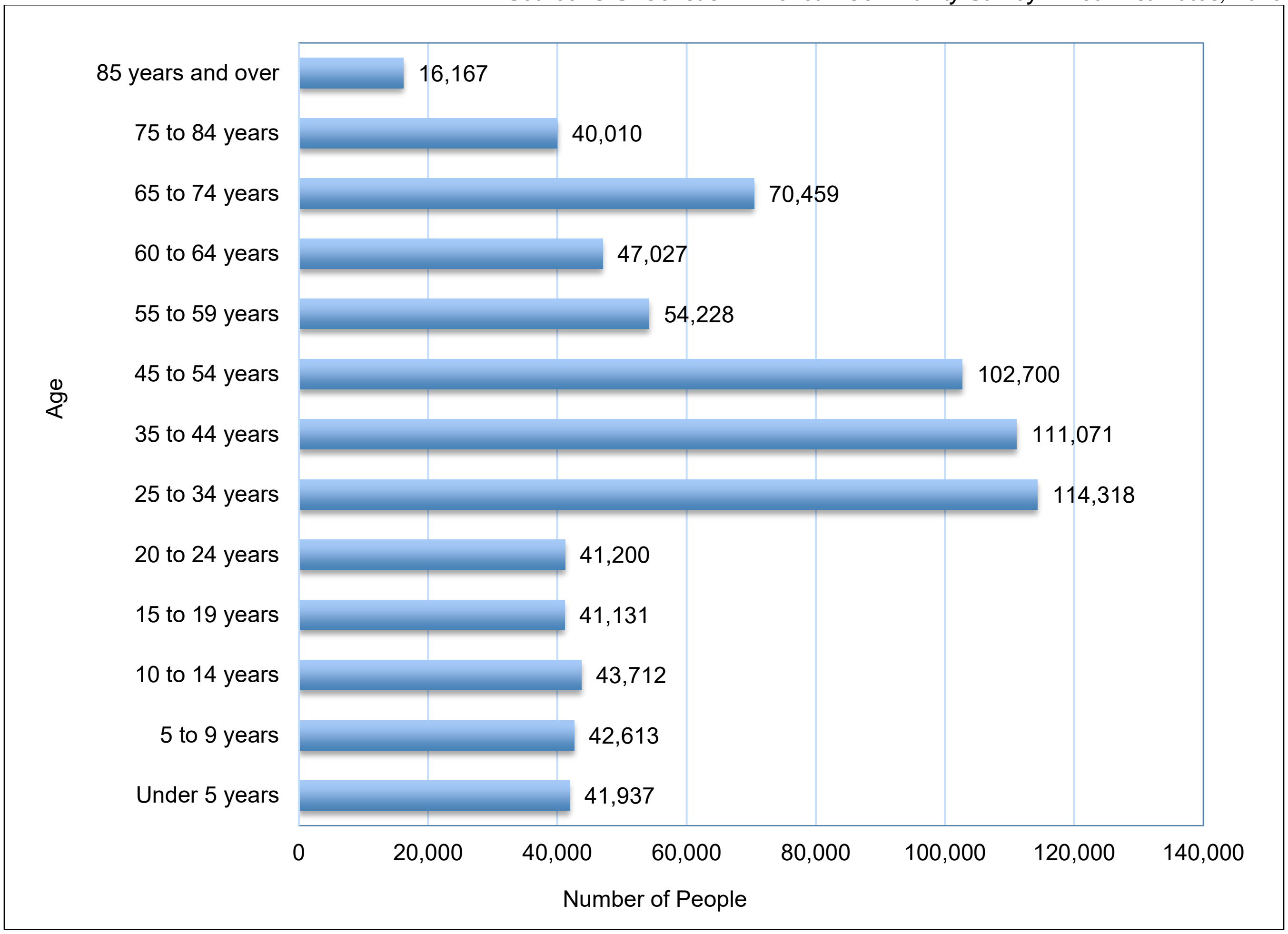


Figure 4-6. Planning Area Age Distribution

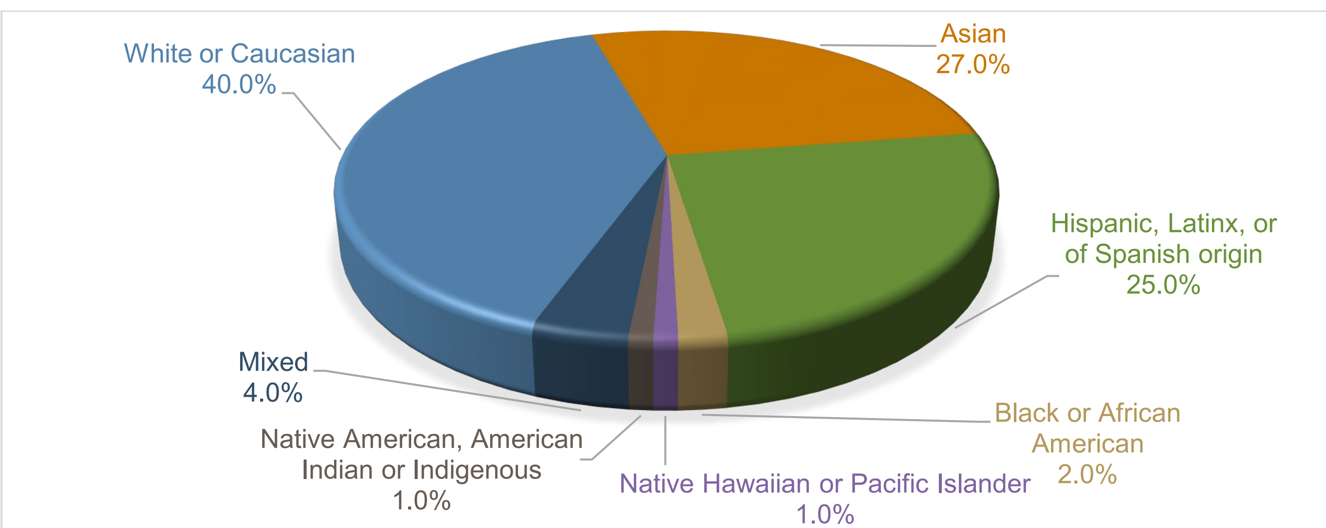


Figure 4-7. Planning Area Race/Ethnicity Distribution

4.5 ECONOMY

4.5.1 Living Wage

The Massachusetts Institute of Technology (MIT) has developed a calculator to estimate the living wage needed to support different types of families. It estimates geographically specific living wages, as an hourly rate, required to acquire basic minimum necessities such as health, housing, and transportation. Table 4-7 presents summary information from the calculator for San Mateo for 2020.

Table 4-7. 2020 Hourly Living Wage Calculation for San Mateo County

	One Adult	One Adult + One Child	Two Adults	Two Adults + One Child
Living Wage	$28.00	$55.59	$41.13	$49.45
Poverty Wage	$6.13	$8.29	$8.29	$10.44
Minimum Wage[a]	$12.00			

a. 2020 California Minimum Wage for Employers with 25 Employees or Less
Source: Massachusetts Institute of Technology, 2020

4.5.2 Household Income

Based on U.S. Census Bureau estimates, per capita income in the planning area in 2019 was $68,949, and the median household income was $138,500. It is estimated that 16.9 percent of households receive annual incomes between $100,000 and $149,999, 46 percent receive annual incomes above $150,000, and 8.3 percent make less than $25,000 per year. According to the 2019 Census estimates, 3.1 percent of households and 6.0 percent of individuals had income that fell below the poverty line.

4.5.3 Employment by Sector

Figure 4-8 shows the breakdown of employment by industry sector in the planning area, as reported in the 2019 American Community Survey.

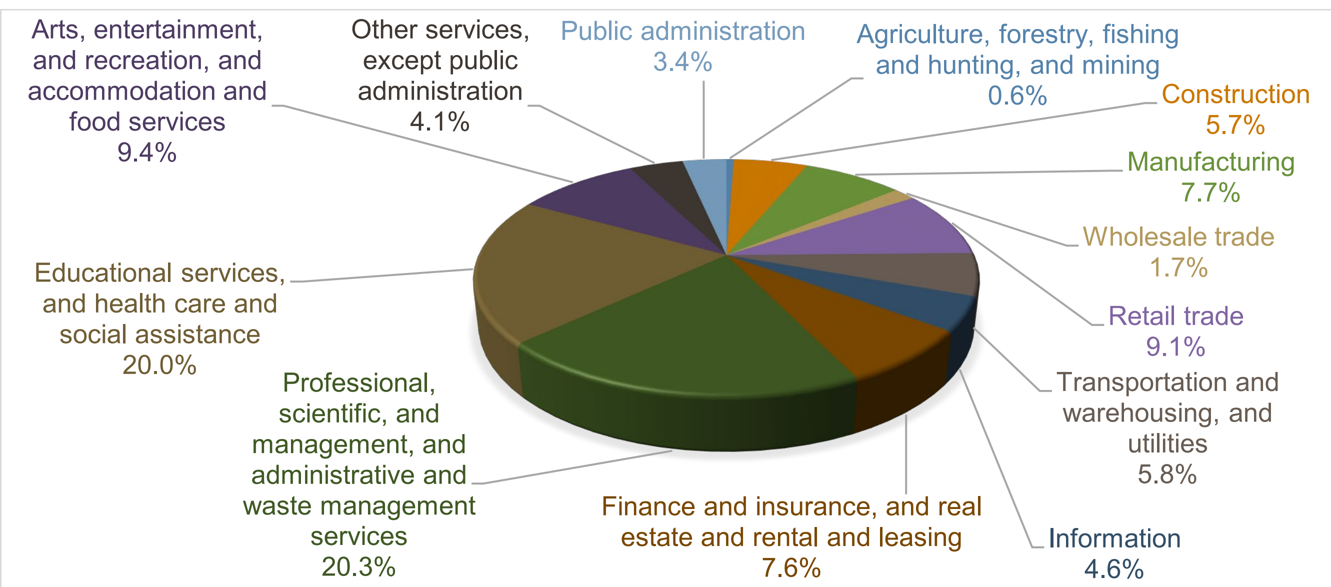


Figure 4-8. Industry in the Planning Area

4.5.4 Large Employers

San Mateo County is home to diverse businesses, from international corporations to small shops and manufacturers. As the social media realm continues to expand, some county businesses such as Facebook's headquarters in Menlo Park become tourist attractions. California state data lists the following as the largest employers in San Mateo County (Employment Development Department, 2021):

- Bart Daly City Station
- Electric Charging Station
- Electronic Arts Inc.
- Facebook Inc.
- Fisher Investments (San Mateo)
- Fisher Investments (Woodside)
- Forced Dump Debris Box Service
- Genentech Inc.
- Gilead Sciences Inc.
- Kaiser Permanente Redwood City
- Kaiser Permanente South San Francisco
- LSA Global
- Mills-Peninsula Medical Center
- Motif Inc.
- Oracle Corporation
- Palo Alto VA Hospital Medical Center
- Plateau Systems
- San Francisco International Airport
- San Mateo County Behavior
- San Mateo County Tax Collector
- San Mateo Medical Center
- Sciex LLC
- SRI International
- Visa Inc.
- YouTube LLC

4.5.5 Employment by Occupation

Figure 4-9 shows the breakdown of employment by occupation in the planning area, as reported in the 2019 American Community Survey.

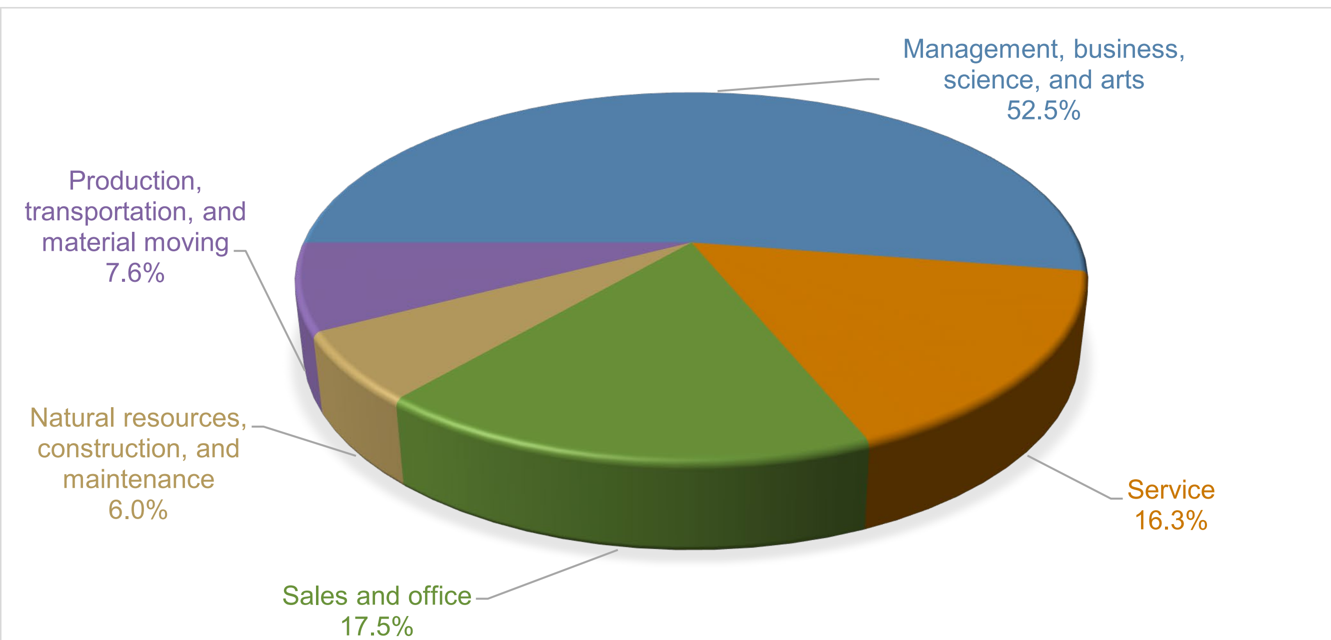


Figure 4-9. Occupations in the Planning Area

4.5.6 Unemployment

According to the American Community Survey, 68.8 percent of the planning area's population 16 and older is in the labor force. Figure 4-10 compares unemployment trends from the State of California and San Mateo County from 2010 through 2020. San Mateo County's unemployment rate decreased each year from 2010 – 2019. At its lowest in 2019, unemployment was at 2.1 percent, before rising precipitously to 6.9 percent in 2020, the year of the COVID-19 pandemic. The state unemployment rate remained higher than the County's throughout this period and experienced a similar fall and rise.

Source: California Employment Development Department, 2021

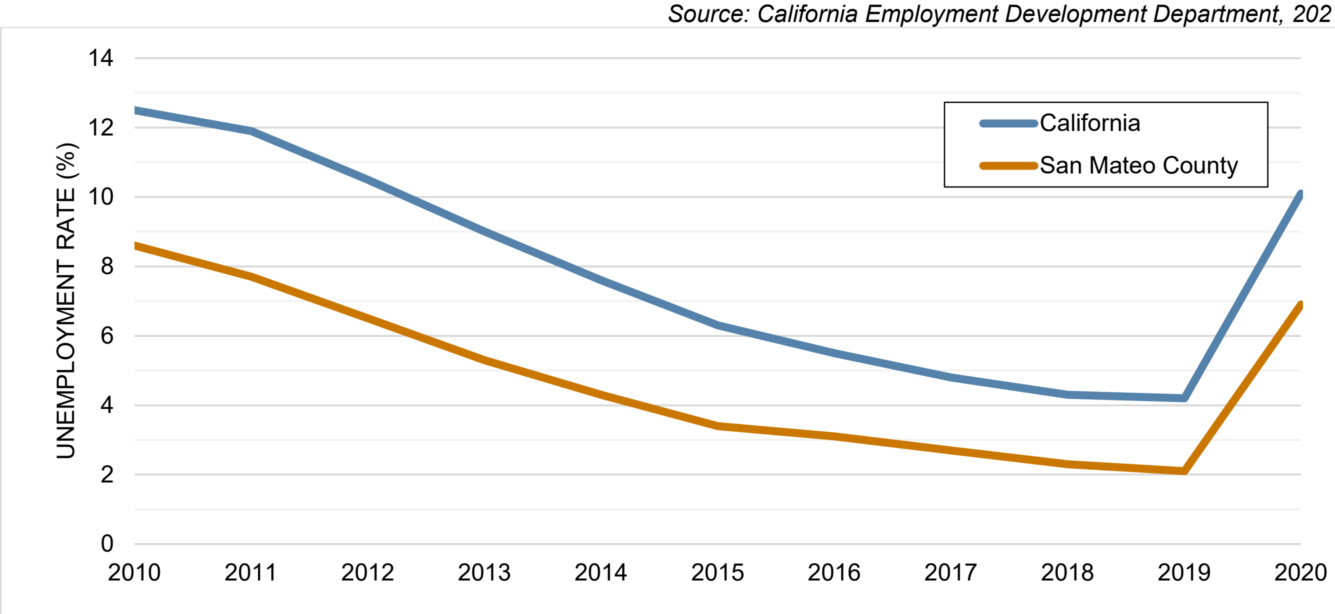


Figure 4-10. State of California and San Mateo County Unemployment Rate

5. HAZARDS OF CONCERN

Defining the hazards that present the greatest risk to the planning area is the first step in assessing overall risk to the community. The planning team and Steering Committee reviewed available information to determine what types of hazards may affect the planning area, how often they can occur, and their potential severity. This effort defined hazards of concern, for which individual risk assessments are presented in this hazard mitigation plan.

5.1 MAJOR PAST HAZARD EVENTS

A list of historical federal disaster declarations affecting the planning area offers an initial indication of the types of hazards most likely to pose risks to the community. Federal 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. A federal disaster declaration puts federal recovery programs into motion to help disaster victims, businesses, and public entities. Some of the programs are matched by state programs. Federal disaster, emergency, or fire management assistance declarations were issued for 22 events since 1954 in the planning area, as listed in Table 5-1.

Table 5-1. Federal Disaster Declarations for Hazard Events that Affected the Planning Area

Type of Event	Disaster Declaration #	Date
Wildfires (CZU Lightning Complex)	DR-4558	August 16 – September 26, 2020
COVID-19 Pandemic	DR-4482	January 20, 2020 – present
Severe Winter Storms, Flooding, and Mudslides	DR-4308	February 1 – 23, 2017
Severe Winter Storms, Flooding, and Mudslides	DR-4305	January 18 – 23, 2017
Severe Storms, Flooding, Landslides, and Mudslides	DR-1646	March 29 – April 16, 2006
Severe Storms, Flooding, Mudslides, and Landslides	DR-1628	December 17, 2005 – January 3, 2006
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998
Severe Storms, Flooding, Mud, and Landslides	DR-1155	December 28, 1996 – April 1, 1997
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046	February 13, 1995 – April 19, 1995
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	January 3 – February 10, 1995
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991
Loma Prieta Earthquake	DR-845	October 17 – December 18, 1989
Severe Storms, Flooding	DR-758	February 12 – March 10, 1986
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983
Severe Storms, Flood, Mudslides, High Tide	DR-651	December 19, 1981 – January 8, 1983
Flooding	DR-145	February 25, 1963
Severe Storms	DR-138	October 24, 1962
Flooding	DR-122	March 6, 1962
Flooding	DR-82	April 4, 1958

Type of Event	Disaster Declaration #	Date
Wildfires	DR-65	December 29, 1956
Flooding	DR-47	December 23, 1955
Flooding	DR-15	February 5, 1954

Source: FEMA 2021

Review of these events helps identify hazards of concern and targets for risk reduction activities. However, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in identifying hazards of concern and establishing their recurrence intervals. Individual jurisdictional annexes in Volume 2 list the events that affected each planning partner.

5.2 IDENTIFIED HAZARDS OF CONCERN

The Steering Committee considered the full range of natural hazards that could affect the planning area and then selected those that present the greatest concern for risk assessment in this plan. The process incorporated a review of state and local hazard planning documents as well as information on the frequency of, magnitude of, and costs associated with hazards that have struck the planning area or could do so. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan addresses the following hazards of concern (presented in alphabetical order; the order of listing does not indicate the hazards' relative severity):

- Climate change
- Dam failure
- Drought
- Earthquake
- Flood
- Landslide/mass movements
- Sea-level rise
- Severe weather
- Tsunami
- Wildfire

Additionally, other "hazards of interest" are qualitatively profiled but not fully assessed. The Steering Committee determined that these other hazards, though not required to be evaluated under federal guidelines for hazard mitigation plans, are important to recognize qualitatively in this plan. Profiles, without quantitative risk assessments, are provided for the following hazards:

- Public health and pandemic
- Terrorism
- Cyber threats
- Communication failure
- Hazardous materials release
- Pipeline and tank failure
- Aircraft incidents.

6. RELEVANT LAWS, ORDINANCES AND PROGRAMS

Existing regulations, agencies and programs at the federal, state, and local level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Information presented in this section can be used to review local capabilities to implement the action plan this hazard mitigation plan presents. Individual review by each planning partner of existing local plans, studies, reports, and technical information is presented in the annexes in Volume 2.

6.1 RELEVANT FEDERAL AND STATE AGENCIES, PROGRAMS AND REGULATIONS

State and federal regulations and programs that need to be considered in hazard mitigation are constantly evolving. For this plan, a review was performed to determined which regulations and programs are currently most relevant to hazard mitigation planning. The findings are summarized in Table 6-1 and Table 6-2. Short descriptions of each program are provided in Appendix C.

Table 6-1. Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Americans with Disabilities Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Bureau of Land Management	Wildfire Hazard	The Bureau funds and coordinates wildfire management programs and structural fire management and prevention on BLM lands.
Civil Rights Act of 1964	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Clean Water Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Community Development Block Grant Disaster Resilience Program	Action Plan Funding	This is a potential alternative source of funding for actions identified in this plan.
Community Rating System	Flood Hazard	This voluntary program encourages floodplain management activities that exceed the minimum National Flood Insurance Program requirements.
Disaster Mitigation Act	Hazard Mitigation Planning	This is the current federal legislation addressing hazard mitigation planning.
Emergency Relief for Federally Owned Roads Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Emergency Watershed Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Endangered Species Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Federal Energy Regulatory Commission Dam Safety Program	Dam Failure Hazard	This program cooperates with a large number of federal and state agencies to ensure and promote dam safety.
Federal Wildfire Management Policy and Healthy Forests Restoration Act	Wildfire Hazard	These documents mandate community-based collaboration to reduce risks from wildfire.
National Dam Safety Act	Dam Failure Hazard	This act requires a periodic engineering analysis of most dams in the country
National Environmental Policy Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
National Fire Plan (2001)	Wildfire Hazard	This plan calls for joint risk reduction planning and implementation by federal, state and local agencies.
National Flood Insurance Program	Flood Hazard	This program makes federally backed flood insurance available to homeowners, renters, and business owners in exchange for communities enacting floodplain regulations
National Incident Management System	Action Plan Development	Adoption of this system for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards is a prerequisite for federal preparedness grants and awards
National Landslide Preparedness Act	Risk Assessment of Landslide Hazard	This act authorized a national landslide hazards reduction program and a 3D elevation program, providing tools and data to assess the landside hazard.
Presidential Executive Order 11988 (Floodplain Management)	Flood Hazard	This order requires federal agencies to avoid long and short-term adverse impacts associated with modification of floodplains
Presidential Executive Order 11990 (Protection of Wetlands)	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable presidential executive orders.
U.S. Army Corps of Engineers Dam Safety Program	Dam Failure Hazard	This program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act.
U.S. Army Corps of Engineers Flood Hazard Management	Flood Hazard, Action Plan Implementation, Action Plan Funding	The Corps of Engineers offers multiple funding and technical assistance programs available for flood hazard mitigation actions
U.S. Fire Administration	Wildfire Hazard	This agency provides leadership, advocacy, coordination, and support for fire agencies and organizations.
U.S. Fish and Wildlife Service	Wildfire Hazard	This service’s fire management strategy employs prescribed fire throughout the National Wildlife Refuge System to maintain ecological communities.

Table 6-2. Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 9: Fire safety: Wildfires: Fire Adapted Communities	Wildfire Hazard	Establishes the Regional Forest and Fire Capacity Program to support regional leadership to build local and regional capacity and develop, prioritize, and implement strategies and projects that create fire-adapted communities and landscapes by improving watershed health, forest health, community wildfire preparedness, and fire resilience.
AB 32: The California Global Warming Solutions Act	Action Plan Development	Establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020
AB 38: Fire safety: Low-Cost Retrofits: Regional Capacity Review: Wildfire Mitigation	Wildfire Hazard	Directs the California Natural Resources Agency to review the regional capacity of each county that contains a very high fire hazard severity zone and establishes a comprehensive wildfire mitigation and assistance program.
AB 70: Flood Liability	Flood Hazard	A city or county may be required to partially compensate for property damage caused by a flood if it unreasonably approves new development in areas protected by a state flood control project
AB 162: Flood Planning	Flood Hazard	Cities and counties must address flood-related matters in the land use, conservation, and safety and housing elements of their general plans.
AB 267: California Environmental Quality Act: Exemption: Prescribed Fire, Thinning, and Fuel Reduction Projects.	Wildfire Hazard	Extends to January 1, 2026, the exemption from requirements of the California Environmental Quality Act for prescribed fire, thinning, or fuel reduction projects on federal lands to reduce the risk of high-severity wildfire that had been reviewed under the National Environmental Policy Act.
AB 380: Forestry: Priority Fuel Reduction Projects	Wildfire Hazard	Requires the Department of Forestry and Fire Protection to identify priority fuel reduction projects annually and exempts the identified priority fuel reduction projects from certain legal requirements.
AB 431: Forestry: Timber Harvesting Plans: Defensible Space: Exemptions	Wildfire Hazard	Extends to January 1, 2026, the exemption from a requirement to complete a timber harvest plan for maintaining defensible space between 150 feet and 300 feet from a habitable structure.
AB 497: Forestry and Fire Protection: Local Assistance Grant Program: Fire Prevention Activities: Street and Road Vegetation Management	Wildfire Hazard	Appropriates funds for local assistance grants for fire prevention activities with priority for projects that manage vegetation along streets and roads to prevent the ignition of wildfire.
AB 575: Civil Liability: Prescribed Burning Activities: Gross Negligence	Wildfire Hazard	Provides that a private entity engaging in a prescribed burning activity that is supervised by a person certified as burn boss is liable for damages to a third party only if the prescribed burning activity was carried out in a grossly negligent manner.
AB 642: Wildfires	Wildfire Hazard	Makes changes to support cultural and prescribed fire, including the creation of a Cultural Burning Liaison at the Department of Forestry and Fire Protection, and requires a proposal for creating a prescribed fire training center.
AB 747: General Plans—Safety Element	Hazard Mitigation Planning	The safety elements of cities' and counties' general plans must address evacuation routes and include any new information on flood and fire hazards and climate adaptation and resiliency strategies.
AB 800: Wildfires: local general plans: safety elements: fire hazard severity zones.	Wildfire Hazard	Establishes provisions for wildfire hazard mapping and applications for that mapping in General Plan Safety Elements.
AB 1255: Fire prevention: Department of Forestry and Fire Protection: Grant Programs	Wildfire Hazard	Requires the Natural Resources Agency to develop a guidance document that describes goals, approaches, opportunities, and best practices in each region of the state for ecologically appropriate, habitat-specific fire risk reduction. Requires consultation with counties related to the Department of Forestry and Fire Protection's local fire prevention grant program.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 1295: Residential development Agreements: Very High-Risk Fire Areas	Wildfire Hazard	Prohibits the legislative body of a city or county from entering into a residential development agreement for property in a very high fire risk area as designated by a local agency or a fire hazard severity zone classified by the director of CAL FIRE.
AB 1439: Property Insurance Discounts	Wildfire Hazard	Requires residential or commercial property insurance policies to include a discount if a local government where the insured property is located funds a local wildfire protection or mitigation program.
AB 1500: Safe Drinking Water, Wildfire Prevention, Drought Preparation, Flood Protection, Extreme Heat Mitigation, and Workforce Development Bond Act of 2022.	Drought, Flood, Extreme Heat and Wildfire Hazards	Authorizes, upon voter approval, the issuance of bonds to finance projects for safe drinking water, wildfire prevention, drought preparation, flood protection, extreme heat mitigation, and workforce development programs.
AB 2140: General Plans—Safety Element	Hazard Mitigation Planning	Enables state and federal disaster assistance and mitigation funding to communities with compliant hazard mitigation plans.
AB 2800: Climate Change—Infrastructure Planning	Action Plan Development	Requires state agencies to take into account the impacts of climate change when developing state infrastructure.
Alquist-Priolo Earthquake Fault Zoning Act	Earthquake Hazard	Restricts construction of buildings used for human occupancy on the surface trace of active faults.
California Coastal Management Program	Flood, Landslide/Mass Movement, Tsunami and Wildfire Hazards	Requires coastal communities to prepare coastal plans and requires that new development minimize risks to life and property in areas of high geologic, flood, and fire hazard.
Board of Forestry and Fire Protection Fire Safe Regulations	Wildfire Hazard	The Fire Safe Regulations set the floor for fire safety standards for perimeters and access to residential, commercial, and industrial building construction.
California Department of Forestry and Fire Protection (CAL FIRE)	Wildfire Hazard	CAL FIRE has responsibility for wildfires in areas that are not under the jurisdiction of the Forest Service or a local fire organization.
California Department of Parks and Recreation	Wildfire Hazard	State Parks Resources Management Division has wildfire protection resources available to suppress fires on State Park lands.
California Department of Water Resources	Flood Hazard	Department of Water Resources is the state coordinating agency for floodplain management.
California Division of Safety of Dams	Dam Failure Hazard	Division of Safety of Dams monitors the dam safety program at the state level and maintains a working list of dams in the state.
California Environmental Quality Act	Action Plan Implementation	Establishes a protocol of analysis and public disclosure of the potential environmental impacts of development projects. Any project action identified in this plan will seek full California Environmental Quality Act compliance upon implementation.
California Fire Alliance	Wildfire Hazard	The alliance works with communities at risk from wildfires to facilitate the development of community fire loss mitigation plans.
California Fire Plan	Wildfire Hazard	This plan's goal is to reduce costs and losses from wildfire through pre-fire management and through successful initial response.
California Fire Safe Council	Wildfire Hazard	This council facilitates the distribution of National Fire Plan grants for wildfire risk reduction and education.
California Fire Service and Rescue Emergency Mutual Aid Plan	Wildfire Hazard	This plan provides guidance and procedures for agencies developing emergency operations plans, as well as training and technical support.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
California General Planning Law	Hazard Mitigation Planning	This law requires every county and city to adopt a comprehensive long-range plan for community development, and related laws call for integration of hazard mitigation plans with general plans.
California Multi-Hazard Mitigation Plan	Hazard Mitigation Planning	Local hazard mitigation plans must be consistent with their state's hazard mitigation plan.
California Residential Mitigation Program	Earthquake Hazard	This program helps homeowners with seismic retrofits to lessen the potential for damage to their houses during an earthquake.
California State Building Code	Action Plan Implementation	Local communities must adopt and enforce building codes, which include measures to improve buildings' ability to withstand hazard events.
Disadvantaged and Low-Income Communities Investments	Action Plan Funding	This is a potential source of funding for actions located in disadvantaged or low-income communities.
Division of the State Architect's AB 300 List of Seismically At-Risk Schools	Earthquake Hazard, Action Plan Development	The Division of the State Architect recommends that local school districts conduct detailed seismic evaluations of seismically at-risk schools identified in the inventory that was required by AB 300.
Governor's Executive Order S-13-08 (Climate Impacts)	Action Plan Implementation	This order includes guidance on planning for sea level rise in designated coastal and floodplain areas for new projects.
Office of the State Fire Marshal	Wildfire Hazard	This office has a wide variety of fire safety and training responsibilities.
Senate Bill 12: Local government: planning and zoning: wildfires.	Wildfire Hazard	Requires safety elements to be reviewed and updated as necessary to include a retrofit strategy to reduce the risk of property loss and damage during wildfires. Requires the planning agency to submit the adopted strategy to the Office of Planning and Research for inclusion in a central clearinghouse.
Senate Bill 92: Dam Emergency Action Plans; Public Resources Portion of Biennial Budget Bill	Dam Failure Hazard	This bill requires dams (except for low-risk dams) to have emergency action plans that are updated every 10 years and inundation maps updated every 10 years, or sooner if specific circumstances change.
Senate Bill 97: Guidelines for Greenhouse Gas Emissions	Action Plan Implementation	This bill establishes that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for California Environmental Quality Act analysis.
Senate Bill 99: General Plans: Safety Element: Emergency Evacuation Routes	Action Plan Implementation	This bill requires the safety element to include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes.
Senate Bill 379: General Plans: Safety Element—Climate Adaptation	Action Plan Implementation	This bill requires cities and counties to include climate adaptation and resiliency strategies in the safety element of their general plans.
Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements	Action Plan Implementation	Under this bill, review and revision of general plan safety elements are required to address only flooding and fires (not climate adaptation and resilience), and environmental justice is required to be included in general plans.
Senate Bill 1241: General Plans: Safety Element—Fire Hazard Impacts	Wildfire Hazard	This bill requires cities and counties to make findings regarding available fire protection and suppression services before approving a tentative map or parcel map.
Standardized Emergency Management System	Action Plan Implementation	Local governments must use this system to be eligible for state funding of response-related personnel costs.
Western Governors Association Ten-Year Comprehensive Strategy	Wildfire Hazard	This strategy implementation plan prepared by federal and Western state agencies outlines measures to restore fire-adapted ecosystems and reduce hazardous fuels.

6.2 LOCAL PLANS, REPORTS AND CODES

Plans, reports, and other technical information were identified and provided directly by participating jurisdictions and stakeholders or were identified through independent research by the planning consultant. These documents were reviewed to identify the following:

- Existing jurisdictional capabilities.
- Needs and opportunities to develop or enhance capabilities, which may be identified within the local mitigation strategies.
- Mitigation-related goals or objectives considered during the development of the overall goals and objectives.
- Proposed, in-progress, or potential mitigation projects, actions and initiatives to be incorporated into the updated jurisdictional mitigation strategies.

The following local regulations, codes, ordinances, and plans were reviewed in order to develop complementary and mutually supportive goals, objectives, and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms:

- General plans (land use, housing, safety, and open space elements)
- Building codes
- Zoning and subdivision ordinances
- National Flood Insurance Program flood damage prevention ordinances
- Stormwater management plans
- Emergency management and response plans
- Land use and open space plans
- Climate action plans
- Community wildfire protection plans

6.3 LOCAL CAPABILITY ASSESSMENT

All participating jurisdictions compiled an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of a jurisdiction's mission, programs, and policies, and evaluates its capacity to carry them out. This assessment identifies potential gaps in the jurisdiction's capabilities.

The planning partnership views all core jurisdictional capabilities as fully adaptable to meet a jurisdiction's needs. Every code can be amended, and every plan can be updated. Such adaptability is itself considered to be an overarching capability. If the capability assessment identified an opportunity to add a missing core capability or expand an existing one, then doing so has been selected as an action in the jurisdiction's action plan, which is included in the individual annexes presented in Volume 2 of this plan.

Capability assessments for each planning partner are presented in the jurisdictional annexes in Volume 2. The sections below describe the specific capabilities evaluated under the assessment.

6.3.1 Legal and Regulatory Capabilities

Jurisdictions have the ability to develop policies and programs and to implement rules and regulations to protect and serve community members. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body.

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision, and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation.

6.3.2 Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees.

6.3.3 Administrative and Technical Capabilities

Legal, regulatory, and fiscal capabilities provide the backbone for successfully developing a mitigation strategy; however, without appropriate personnel, the strategy may not be implemented. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers.

6.3.4 National Flood Insurance Program Compliance

Flooding is the costliest natural hazard in the United States and, with the promulgation of recent federal regulation, homeowners throughout the country are experiencing increasingly high flood insurance premiums. Community participation in the National Flood Insurance Program (NFIP) opens up opportunity for additional grant funding associated specifically with flooding issues. Assessment of the jurisdiction's current NFIP status and compliance provides planners with a greater understanding of the local flood management program, opportunities for improvement, and available grant funding opportunities.

6.3.5 Public Outreach Capability

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement.

6.3.6 Participation in Other Programs

Other programs, such as the Community Rating System, Storm/Tsunami Ready, and Firewise USA, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum requirements set forth by local, state, and federal regulations in order to create a more resilient community. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community.

6.3.7 Development and Permitting Capability

Identifying previous and future development trends is achieved through a comprehensive review of permitting since completion of the previous plan and in anticipation of future development. Tracking previous and future growth in potential hazard areas provides an overview of increased exposure to a hazard within a community.

6.3.8 Adaptive Capacity

An adaptive capacity assessment evaluates a jurisdiction's ability to anticipate impacts from future conditions. By looking at public support, technical adaptive capacity, and other factors, jurisdictions identify their core capability for resilience against issues such as sea level rise. The adaptive capacity assessment provides jurisdictions with an opportunity to identify areas for improvement by ranking their capacity high, medium, or low.

6.3.9 Integration Opportunity

The assessment looked for opportunities to integrate this mitigation plan with the legal/regulatory capabilities identified. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. Planning partners considered actions to implement this integration as described in their jurisdictional annexes.

6.4 HAZARD MITIGATION CAPABILITIES FOR FUTURE DEVELOPMENT

The identification of hazards of concern and the areas that they affect allows local communities to review expected future development to assess whether it would be at risk from those identified hazards. Avoiding such future risk is a core element of local hazard mitigation. Through the capability assessment described in Section 6.3, all planning partners identified their ability to address risks to future development posed by identified planning area hazards of concern.

San Mateo County and all incorporated cities included in this hazard mitigation plan have general plans, adopted under state law, to ensure that their governing bodies take actions that the community has determined to be the most orderly, beneficial, and supportive of the community vision. Decision-makers will guide development through the application of broad-based strategies to every issue pertaining to growth. These strategies provide direction to public and private planning processes, with guidelines for making consistent rational decisions for future development. The County intends to discourage development in vulnerable areas and to encourage higher regulatory standards on the local level.

All planning partners have committed to link their general plans to this hazard mitigation plan. This will create an opportunity for wise land use decisions as future growth impacts hazard areas. The partners all reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

Part 2. RISK ASSESSMENT

7. RISK ASSESSMENT METHODOLOGY

The risk assessments in this plan describe the risks associated with each identified hazard of concern. The following steps were used to define the risk of each hazard:

- **Identify and profile each hazard**—The following information is given for each hazard:
  - A summary of past events that have impacted the planning area
  - Geographic areas most affected by the hazard
  - Event frequency estimates
  - Severity descriptions
  - Warning time likely to be available for response.
- **Determine exposure to each hazard**—Exposure was assessed by overlaying hazard maps with an inventory of structures, facilities, and systems to decide which of them would be exposed to each hazard.
- **Assess the vulnerability of exposed facilities**—Vulnerability of exposed structures and infrastructure was evaluated by estimating potential impacts on people and damage to property and the environment in the event of a hazard incident.

The risk assessments performed for this plan evaluated risk for individual incorporated cities and for the unincorporated portion of the county.

7.1 RISK ASSESSMENT TOOLS

7.1.1 Mapping

National, state, and county databases were reviewed to locate available spatially based data relevant to this planning effort. Maps were produced using geographic information system (GIS) software to show the spatial extent and location of hazards when such datasets were available. These maps are included in the hazard profile chapters of this document and the jurisdiction-specific annexes in Volume 2. Details regarding the data sources and methodologies employed in these mapping efforts is located in Appendix D.

7.1.2 Modeling

Overview

FEMA developed the standardized GIS-based software program Hazards U.S. (Hazus) to identify areas that face the highest risk by estimating losses caused by earthquakes, hurricanes, floods, and tsunamis. Hazus is used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facilities, transportation and utility infrastructure, and multiple models to estimate potential losses from natural disasters. The program maps and calculates hazard data and damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

Hazus provides default data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

7.2 RISK ASSESSMENT APPROACH

7.2.1 Hazard Profile Development

Hazard profiles were developed through web-based research and review of previous reports and plans, including community general plans and state and local hazard mitigation plans. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others.

7.2.2 Optional Equity Lens—Social Vulnerability Index

Social vulnerability is 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.

The update process for this plan included an optional equity lens that participating jurisdictions could choose to apply in development of their hazard mitigation action plans. For that lens, Tetra Tech used indicators from

FEMA's social vulnerability index (SoVI) adjusted for the San Mateo County planning area. The SoVI, developed by the University of South Carolina's Hazards and Vulnerability Research Institute, is a location-specific assessment of social vulnerability based on the following variables:

- % African American (Black) population
- % Asian population
- % children living in married couple families
- % civilian labor force unemployed
- % employment in extractive industries (e.g., farming)
- % employment in service occupations
- % families earning more than $200,000 income per year
- % families with female-headed households with no spouse present
- % female
- % female participation in the labor force
- % Hispanic population
- % households receiving Social Security benefits
- % housing units with no car available
- % Native American population
- % persons living in poverty
- % population living in mobile homes
- % population living in nursing facilities
- % population over 25 with <12 years of education
- % population speaking English as second language (with limited English proficiency)
- % population under 5 years or age 65 and over
- % population without health insurance (County SoVI only)
- % renter-occupied housing units
- % unoccupied housing units
- Average number of people per household
- Community hospitals per capita (County SoVI only)
- Median age
- Median dollar value of owner-occupied housing units
- Median gross rent for renter-occupied housing units
- Per capita income

The social vulnerability score represents the relative level of social vulnerability for a given Census tract. A higher social vulnerability score results in a higher risk score (FEMA, 2021a). Figure 7-1 shows the SoVI data for San Mateo County. Metrics were assigned to each SoVI classification to support risk ranking of each fully assessed hazard of concern. See Chapter 19 for further discussion of these metrics.

7.2.3 Exposure and Vulnerability

Flood, Dam Failure, Earthquake, and Tsunami

Community exposure and vulnerability to the following hazards were evaluated using Hazus:

- **Dam Failure, Flood, and Tsunami**—A Level 2 user-defined analysis was performed for general building stock and for critical facilities. Current mapping for the planning area was used to delineate hazard areas for flood, dam failure, and tsunami and estimate potential losses. To estimate damage that would result from these inundation-based hazards, Hazus uses pre-defined relationships between water depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting inundation depth data and known property replacement cost values, dollar-value estimates of damage were generated.

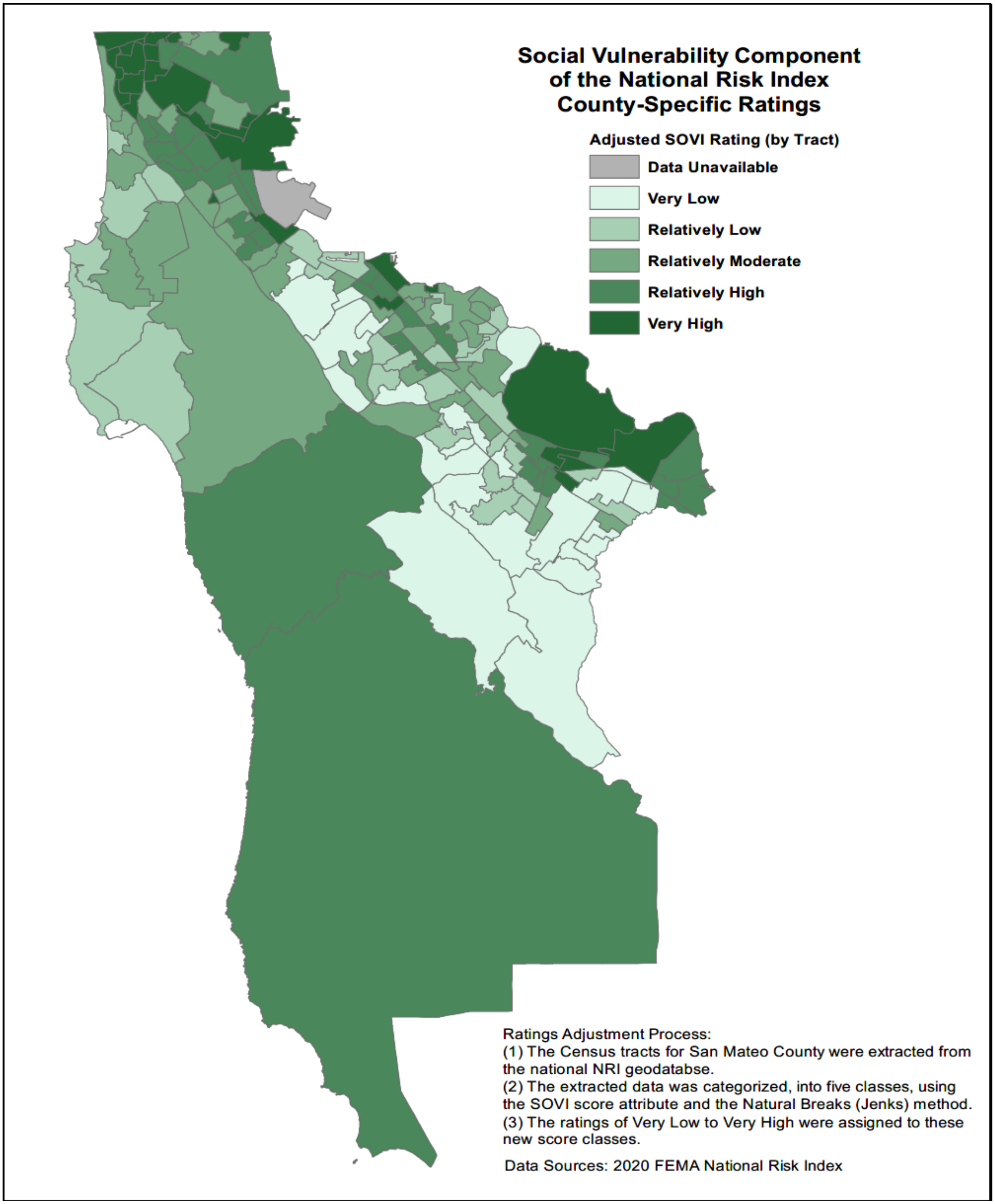


Figure 7-1. SoVI Map for San Mateo County

- **Earthquake**—A Level 2 analysis was performed to assess earthquake exposure and vulnerability for four scenario events and one probabilistic event:
  - A Magnitude-6.93 event on the Butano Fault with an epicenter 17.5 miles south of Redwood City
  - A Magnitude-7.14 event on the Monte Vista Shannon Fault with an epicenter 16 miles south-southeast of Redwood City
  - A Magnitude-7.38 event on the San Andreas Fault with an epicenter 4 miles west of Belmont
  - A Magnitude-7.44 event on the San Gregorio Fault with an epicenter 4 miles south of Half Moon Bay
  - The standard Hazus 100-year probabilistic event

Sea Level Rise, Landslide/Mass Movements, Severe Weather, and Wildfire

Historical datasets were not adequate to model future losses for these hazards of concern. However, areas and inventory susceptible to some of the hazards of concern were mapped by other means to evaluate exposure. A qualitative analysis was conducted for other hazards using the best available data and professional judgment.

Drought

The risk assessment methodologies used for this update focus on damage to structures. Because drought does not impact structures, the risk assessment for this hazard was more limited and qualitative than the assessment for the other hazards of concern.

7.3 SOURCES OF DATA USED IN MODELING AND EXPOSURE ANALYSES

7.3.1 Building and Cost Data

Replacement cost is the cost to replace the entire structure with one of equal quality and utility. Replacement cost is based on industry-standard cost-estimation models published in the 2020 edition of *RS Means Square Foot Costs*. It is calculated using the RS Means square foot cost for a structure, which is based on the Hazus occupancy class (i.e., multi-family residential or commercial retail trade), multiplied by the square footage of the structure. The construction class and number of stories for single-family residential structures also factor into determining the square foot costs.

Replacement cost values and detailed structure information derived from parcel and building footprint data were loaded into Hazus. When available, an updated inventory was used in place of the Hazus defaults for critical facilities and infrastructure.

7.3.2 Hazus Data Inputs

The following hazard datasets were used for the Hazus Level 2 analysis conducted for the risk assessment:

- **Flood**—The effective Digital Flood Insurance Rate Map (DFIRM) for the planning area was used to delineate flood hazard areas and estimate potential losses from the FEMA 1-percent-annual chance and 0.2-percent-annual-chance (100- and 500-year) flood events. Using the DFIRM floodplain boundaries and base flood (1-percent-annual chance flood) elevation information, and the County's 5-foot digital elevation model data, flood depth grids were generated and integrated into the Hazus model.
- **Dam Failure**—Dam failure inundation area boundaries and depth grids for were provided by the California Department of Water Resources for 13 dams: Bear Gulch, Coastways, Crocker, Emerald Lake 1 Lower, Felt Lake, Laurel Creek, Lower Crystal Springs, Notre Dame, Pilarcitos, Pomponio

Ranch, San Andreas, Searsville, and Spencer Lake. The individual dam depth grids were combined—using the maximum depth where the dam inundation areas overlapped—and the combined depth grid was integrated into the Hazus model.

- **Tsunami**—Tsunami hazard area data provided by the California Geological Survey and the County's 5-foot digital elevation model data were used to develop inundation depth grids that were integrated into the Hazus model.
- **Earthquake**—Earthquake ShakeMaps and probabilistic data prepared by the U.S. Geological Survey (USGS) were used for the analysis of this hazard. A National Earthquake Hazard Reduction Program (NEHRP) soils map from the California Department of Conservation, Association of Bay Area Governments' (ABAG) liquefaction susceptibility data, and susceptibility to deep-seated landslides data from the California Geological Survey were also integrated into the Hazus model.

7.3.3 Other Local Hazard Data

Locally relevant information on hazards was gathered from a variety of sources. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others. Data sources for specific hazards were as follows:

- **Sea-Level Rise**—Sea-level rise data were provided by the Our Coast, Our Future (OCOF) tool developed by the USGS and Point Blue, and the Adapting to Rising Tides (ART) program prepared by the San Francisco Bay Conservation and Development Commission. The exposure analysis used the OCOF scenario of 200 cm (78 inches) of rise with a 100-year storm for the Pacific Ocean coastline and the ART scenario of 108 inches of rise for the San Francisco Bay shoreline.
- **Drought—**No GIS format drought hazard area datasets were identified for San Mateo County.
- **Landslide/Mass Movements**—The California Geological Survey provided data on susceptibility to deep-seated landslides. Areas categorized as very high and high susceptibility (Categories X, XI, VIII, and VII) were used in the exposure analysis.
- **Severe Weather**—No GIS format severe storm area datasets were identified for San Mateo County.
- **Wildfire—**The California Department of Forestry and Fire Protection (CAL FIRE) provided data on fire hazard severity zones in local and state responsibility areas. Very high and high fire hazard severity zones were used in the exposure analysis.

7.3.4 Data Source Summary

Data sources on critical facilities used for the risk assessment for this plan are listed in Table 7-1; sources for all other data used in the assessment are in Table 7-2

7.4 LIMITATIONS

Loss estimates, exposure assessments and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment.

Table 7-1. Hazus Model Data Documentation—Critical Facilities

Data	Source	Date	Format
Coastal energy facilities	San Mateo County Climate Ready	2020	Digital (GIS)
County facilities	San Mateo County Climate Ready	2020	Digital (GIS)
Food, clothing, and shelter facilities	San Mateo County Climate Ready	2020	Digital (GIS)
Health facilities	San Mateo County Climate Ready	2020	Digital (GIS)
Police stations	San Mateo County Climate Ready	2020	Digital (GIS)
Schools	San Mateo County Climate Ready	2020	Digital (GIS)
Senior centers	San Mateo County Climate Ready	2020	Digital (GIS)
Storm pump stations	San Mateo County Climate Ready	2020	Digital (GIS)
Wastewater treatment plants	San Mateo County Climate Ready	2020	Digital (GIS)
Airports	San Mateo County	Provided 2021	Digital (GIS)
Correctional facilities	San Mateo County	Provided 2021	Digital (GIS)
Electric substations	San Mateo County	Provided 2021	Digital (GIS)
Emergency operations centers	San Mateo County	Provided 2021	Digital (GIS)
Fire stations	San Mateo County	Provided 2021	Digital (GIS)
Food distributors	San Mateo County	Provided 2021	Digital (GIS)
Government facilities	San Mateo County	Provided 2021	Digital (GIS)
Solid waste hazard facilities	San Mateo County	Provided 2021	Digital (GIS)
Hazmat facilities	San Mateo County	Provided 2021	Digital (GIS)
Historic sites	San Mateo County	Provided 2021	Digital (GIS)
Hospitals	San Mateo County	Provided 2021	Digital (GIS)
Human services agencies	San Mateo County	Provided 2021	Digital (GIS)
Local bridges	San Mateo County	Provided 2021	Digital (GIS)
Medical centers	San Mateo County	Provided 2021	Digital (GIS)
Natural gas stations	San Mateo County	Provided 2021	Digital (GIS)
Petroleum terminals	San Mateo County	Provided 2021	Digital (GIS)
Pharmacies	San Mateo County	Provided 2021	Digital (GIS)
Power stations	San Mateo County	Provided 2021	Digital (GIS)
Rail stations	San Mateo County	Provided 2021	Digital (GIS)
Skilled nursing facilities	San Mateo County	Provided 2021	Digital (GIS)
State highway bridges	San Mateo County	Provided 2021	Digital (GIS)
EMS stations	San Mateo County	Provided 2021	Digital (GIS)
VA medical facilities	San Mateo County	Provided 2021	Digital (GIS)
Waste water facilities	San Mateo County	Provided 2021	Digital (GIS)
Critical facilities in planning partner annexes	2021 Hazard Mitigation Plan	2021	Digital (text)
Communications Facilities	2016 Hazard Mitigation Plan	2016	Digital (GIS)
Potable Water Facilities	2016 Hazard Mitigation Plan	2016	Digital (GIS)
Waste Water Facilities	2016 Hazard Mitigation Plan	2016	Digital (GIS)
AM transmission towers	Homeland Infrastructure Foundation-Level Data (HIFLD)	Downloaded 2020	Digital (GIS)
Cellular towers	HIFLD	Downloaded 2020	Digital (GIS)
FDIC insured banks	HIFLD	Downloaded 2020	Digital (GIS)
FM transmission towers	HIFLD	Downloaded 2020	Digital (GIS)
Land mobile commercial transmission towers	HIFLD	Downloaded 2020	Digital (GIS)
Port facilities	HIFLD	Downloaded 2020	Digital (GIS)

Table 7-2. Hazus Model Data Documentation

Data	Source	Date	Format
Property parcel data including building information (use code, square footage, year built)	San Mateo County	2021	Digital (GIS)
Building footprints	San Mateo County	Unknown	Digital (GIS)
Building replacement (square foot) costs	RS Means	2020	Digital (pdf)
California State dam breach inundation maps (inundation boundaries and depth grids)	California Department of Water Resources	2018-21	Digital (GIS)
ShakeMap—Butano M6.93	USGS	2017	Digital (GIS)
ShakeMap—Monte Vista Shannon M7.14	USGS	2017	Digital (GIS)
ShakeMap—San Andreas (Peninsula) M7.38	USGS	2017	Digital (GIS)
ShakeMap—San Gregorio (North) M7.44	USGS	2017	Digital (GIS)
NEHRP soils	California Department of Conservation	2015	Digital (GIS)
Liquefaction susceptibility	ABAG (USGS)	2006	Digital (GIS)
Digital Flood Insurance Rate Map—San Mateo County, effective 4/5/2019	FEMA	2019	Digital (GIS)
Susceptibility to deep-seated landslides	California Geological Survey	2011	Digital (GIS)
Adapting To Rising Tides Bay Area Sea Level Rise & Mapping Project: San Mateo County/SF Bay	San Francisco Bay Conservation and Development Commission	2017	Digital (GIS)
Sea level rise data	Our Coast, Our Future	2020	Digital (GIS)
Tsunami hazard area San Mateo	California Geological Survey; California Governor's Office of Emergency Services	2021	Digital (GIS)
Very high fire hazard severity zones in local responsibility areas	California Department of Forestry and Fire Protection	2007	Digital (GIS)
Fire hazard severity zones for state responsibility areas	California Department of Forestry and Fire Protection	2007	Digital (GIS)
San Mateo County digital elevation model (5-foot resolution)	San Mateo County	2017	Digital (GIS)
Social Vulnerability Index component of the National Risk Index	FEMA	2020	Digital (GIS)

Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic, or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice community members have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate and should be used only to understand relative risk. Over the long term, the planning partners will collect additional data to assist in estimating potential losses associated with other hazards.

8. DAM FAILURE

8.1 GENERAL BACKGROUND

8.1.1 Definition and Classification of Dams

A dam is an artificial barrier that can store water, wastewater, or liquid-borne materials for many reasons—flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of these functions. They are an important resource in the United States. In California, dams are regulated by the State of California Division of Safety of Dams. Additional regulatory oversight of dams is cited in Chapter 5 and described in Appendix C.

The California Water Code (Division 3) defines a dam as any artificial barrier, together with appurtenant works, that does or may impound or divert water, and that either:

- Is 25 feet or more in height from the natural bed of the stream or watercourse at the downstream toe of the barrier (or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse) to the maximum possible water storage elevation; or
- Has an impounding capacity of 50 acre-feet or more.

Dams can be classified according to their purpose, the construction material or methods used, their slope or cross-section, the way they resist the force of the water pressure, or the means used for controlling seepage. Materials used to construct dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, plastic, rubber, and combinations of these.

8.1.2 Causes of Dam Failure

Partial or full failure of dams has the potential to cause massive destruction to the ecosystems and communities located downstream. Partial or full failure can occur as a result of one or a combination of the following reasons (FEMA, 2015):

- Overtopping caused by floods that exceed the dam capacity (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams

- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides).

Many dam failures in the United States have been secondary results of other disasters. The most common causes are earthquakes, landslides, extreme storms, equipment malfunction, structural damage, foundation failures, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

8.1.3 Planning Requirements

State of California

All dams whose inundation areas may impact the planning area have emergency action plans (EAPs) on file. The EAPs must include the following (Cal OES, 2018):

- Emergency notification flow charts
- Information on a four-step response process
- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists.

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (State of California, 2018).

Federal Energy Regulatory Commission

Dams that fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC) also have specified planning requirements. FERC has the largest dam safety program in the United States. It cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans are designed to serve as an early warning system if there is a potential for, or a sudden release of water from, a dam failure or accident to the dam. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows and procedures for notifying affected community members and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that in emergency situations everyone knows what to do, thus saving lives and minimizing property damage.

8.1.4 Secondary Hazards

Dam failure can cause secondary hazards of landslides, bank erosion, and destruction of downstream habitat. Dam failure may worsen the severity of a drought by releasing water that might have been used as a potable water source. A loss of water supply could exacerbate the wildfire hazard by hindering an impacted area's ability to fight fire.

8.2 HAZARD PROFILE

8.2.1 Past Events

The only recorded dam failure in San Mateo County was the failure of a small dam in the community of El Granada in 1926. According to the 2018 State of California Multi-Hazard Mitigation Plan, there have been nine failures of federally regulated dams elsewhere in the state since 1950. Overtopping caused two of the nine dam failures in the state, and the others were caused by seepage or leaks. The most catastrophic event was the failure of the St. Francis Dam in Los Angeles County, which failed in 1928 and killed an estimated 450 people. If a dam is determined to be unsafe, the California Department of Water Resources Division of Safety of Dams (DSOD) requires reduction of the water level to allow for partial collapse without catastrophic loss of water.

The state's most recent dam emergency occurred in February 2017 when the Oroville Dam in Butte County was on the verge of overflow. The dam's concrete spillway was damaged by erosion and a massive hole developed. The auxiliary spillway was used to prevent overtopping of the dam, and it experienced erosion problems also. Evacuation orders were issued in advance of a potential large uncontrolled release of water from Lake Oroville, but such a release did not occur. After this incident, state officials ordered that flood-control spillways be reinspected on 93 California dams with potential geologic, structural or performance issues that could jeopardize their ability to safely pass a flood event. The San Andreas Dam near Millbrae and San Bruno was one of the dams reinspected.

8.2.2 Location

List of High-Hazard Dams

According to DSOD, 24 dams are in San Mateo County. Twelve of these, plus another nearby in Santa Clara County, could endanger lives and property if an uncontrolled release or catastrophic failure occurs. Table 8-1 lists dams with potential to endanger lives and property in the County. Their locations are shown on Figure 8-1.

The Lower Crystal Springs Dam is the largest dam in San Mateo County, making it a higher priority for regulation and preventative maintenance by county, state, and federal officials. This dam impounds water to form the Lower Crystal Springs Reservoir, which serves as a water supply for San Francisco and most cities in San Mateo County. Although located directly on the San Andreas Fault, the dam survived both the 1906 San Francisco earthquake and 1989 Loma Prieta earthquake. In 2010, DSOD inspected the Lower Crystal Springs Dam to investigate effects of an 8.3 magnitude earthquake and determined dam failure to be a low probability. Despite this low probability, the County and dam owner, San Francisco Public Utilities Commission, are seeking to enhance safety and quality of the dam. Significant upgrades to the dam and a nearby overpass bridge occurred between 2010 and 2015 to restore maximum storage capacity of the reservoir. The project involved widening the spillway, raising the parapet wall, and replacing the stilling basin with a new and larger facility (San Mateo County OES 2015).

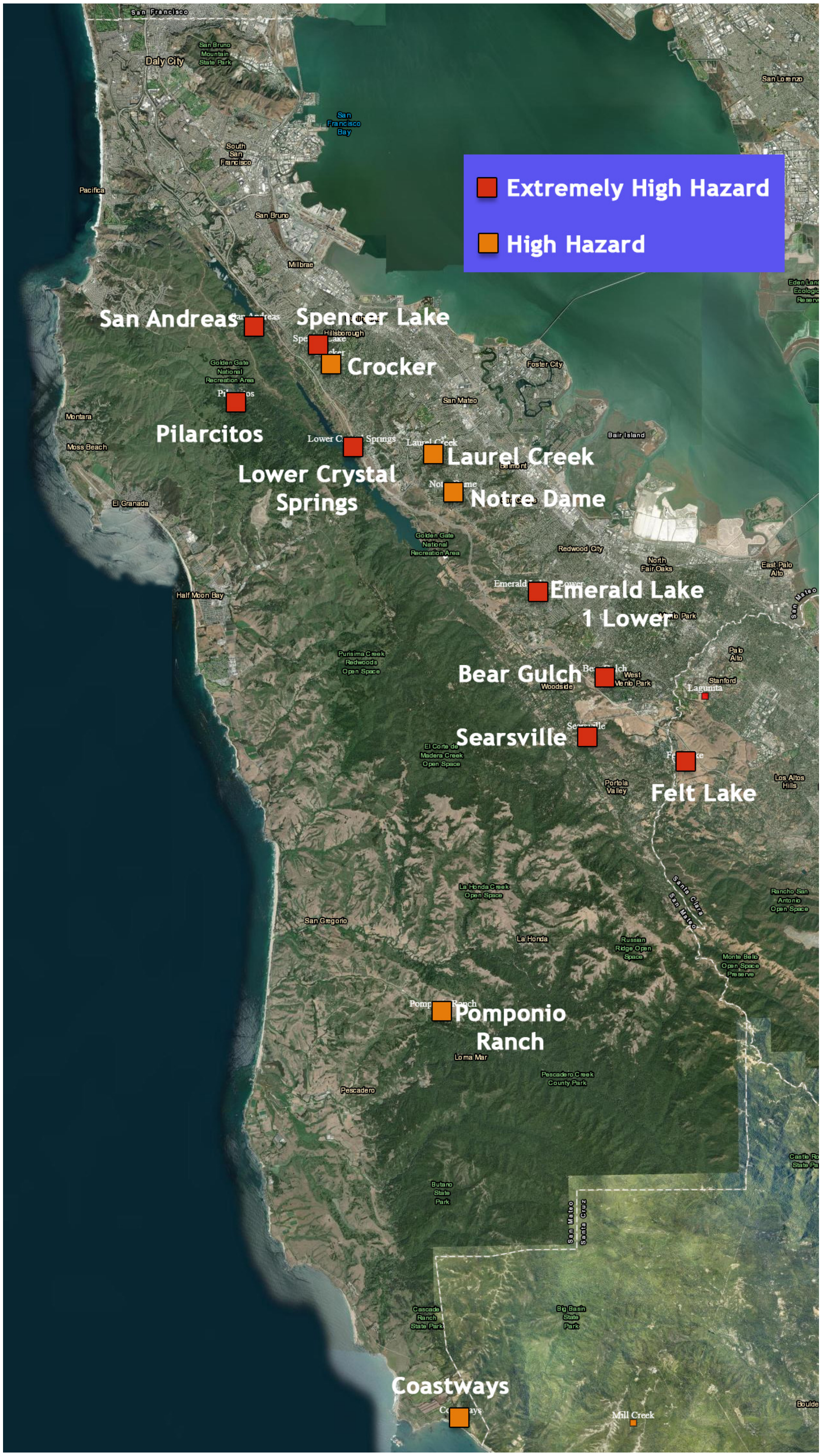


Figure 8-1. Locations of Dams in San Mateo County

Table 8-1. San Mateo County Dams with Potential to Endanger Lives and Property

Name	National ID#	Water Course	Owner	Year Built	Dam Type	Crest Length (feet)	Height (feet)	Storage Capacity (acre-feet)	Drainage area (sq. mi.)
Extremely High Downstream Hazard									
Bear Gulch	CA00658	Tributary, San Francisco Bay	California Water Service Company	1896	Earth	730	61	672	0.2
Emerald Lake 1 Lower	CA00668	Lower Emerald Lake	Emerald Lake Country Club	1885	Earth	280	57	45	0.25
Felt Lake[a]	CA00670	Tributary, Los Trancos Creek	Stanford University	1930	Earth	590	67	900	0.2
Lower Crystal Spring	CA00127	San Mateo Creek	SF PUC Water Department	1888	Gravity	600	140	57,910	28.71
Pilarcitos	CA00128	Pilarcitos Creek	SF PUC Water Department	1866	Earth	520	103	3,100	3.8
San Andreas	CA00129	Tributary, San Mateo Creek	SF PUC Water Department	1870	Earth	727	107	19,027	4.4
Searsville	CA00669	Corte Madera Creek	Stanford University	1890	Gravity	260	68	952	14.8
Spencer Lake	CA00673	Tributary, San Francisco Bay	Town of Hillsborough	1876	Earth	400	87	73	0.2
High Downstream Hazard									
Coastways	*c*		Coastways Ranch						
Crocker	CA00672	Sanchez Creek	Town of Hillsborough	1890	Earth	200	45	22	0.26
Laurel Creek	CA00901	Laurel Creek	City of San Mateo	1969	Earth	287	40	55	0.9
Notre Dame	CA00674	Belmont Creek	City of Belmont	*b*	Earth	210	51	120	0.53
Pomponio Ranch	*c*		Private Entity						

a. Felt Lake is within Santa Clara County, approximately 1,300 feet from San Mateo boundary lines. It has been included here due to its proximity to the county.
b. Year built unavailable.
c. Coastways and Pomponio Ranch dams are not included in the national inventory

Sources: San Mateo County OES 2015; U.S. Army Corps of Engineers National Inventory of Dams 2016; DSOD 2020

Inundation Mapping

A key element for EAPs required for dams in California is a map defining the potential downstream inundation should the dam fail. The DSOD reviews and approves inundation maps prepared by licensed civil engineers and submitted by dam owners for extremely high, high, and significant hazard dams and their critical appurtenant structures. Inundation maps approved by DSOD are a tool used to develop emergency action plans. They provide general information for emergency planning. For this risk assessment, available dam failure inundation mapping prepared by DSOD was combined into a single inundation area. The combined dam failure inundation area is shown in Figure 8-2. Simultaneous failure of all dams is highly unlikely, but the assessment provides information adequate for planning purposes.

Figure 8-2. Dam Failure Inundation Area Used for Risk Assessment

Data Sources: San Mateo Co.
CA DWR

8.2.3 Frequency

Dam failure events are infrequent and usually coincide with or follow events such as earthquakes, landslides and excessive rainfall and snowmelt. Although the recent Oroville event raised public concern about dam failure, the probability of such failures remains low in today's regulatory environment. The single recorded dam failure in the planning area—in El Granada in 1926—represents a frequency of about one event in 100 years.

All dams face a "residual risk" of failure, which represents the risk that conditions may exceed those for which the dam was designed. For example, dams may be designed to withstand a probable maximum precipitation, defined as "theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular geographical location at a certain time of the year" (Taylor, 2006). The chance of occurrence of a precipitation event of a greater magnitude than that represents residual risk for such dams. This in turn represents a theoretical probability of future occurrence for a dam failure event, though the probability of an event exceeding the assumed maximum is not generally calculated as part of dam design.

8.2.4 Severity

Dam failure can be catastrophic to all life and property downstream. California's Division of Safety of Dams has developed a hazard potential classification system for state-jurisdiction dams, as shown on Table 8-2. This system is modified from federal guidelines, which recommend three-tier classification. The California system adds a fourth hazard classification of "extremely high." Dams classified as extremely high hazard may impact highly populated areas or critical facilities or have short evacuation warning times (California Division of Safety of Dams, 2017).

Table 8-2. State of California Downstream Hazard Potential Classification

Hazard Category	Direct Loss of Life	Economic, Environmental, and Lifeline Losses
Low	None expected	Low and principally limited to dam owner's property
Significant	None expected	Yes
High	Probable (one or more expected)	Yes, but not necessary for this classification
Extremely High	Considerable	Yes, major impacts on critical facilities or property

Source: California Division of Safety of Dams, 2017a

8.2.5 Warning Time

Advance Warning of Failure

Warning time for dam failure varies depending on the cause of the failure. Events of extreme precipitation or massive snowmelt can be predicted in advance, so evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no or limited warning time. The USGS Earthquake Hazards Program has several dam-safety related earthquake programs, including dam-specific earthquake monitoring programs in California to help monitor safety concerns following seismic events.

San Mateo County and its planning partners have established protocols for emergency warning and response through its adopted emergency operations plan. The San Mateo Department of Emergency Management maintains copies of the most recent dam EAP and inundation maps, and it has used this information to plan notification needs for downstream areas in the event of a failure (San Mateo County Sheriff, 2015).

Time for Failure to Occur

The process of the dam failure affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until either the reservoir water is depleted, or the breach resists further erosion. Concrete gravity dams also tend to have a partial breach as one or more monolith sections are forced apart by escaping water. The time of breach formation ranges from a few minutes to a few hours.

8.3 EXPOSURE

Exposure and vulnerability to dam failure hazard were assessed by overlaying the mapped combined inundation area in Figure 8-2 with planning area features including general building stock and critical facilities. Detailed results by jurisdiction are included in Appendix E; countywide summaries are provided below.

8.3.1 Population and Property

Table 8-3 summarizes the estimated population living in the evaluated dam failure inundation areas and the estimated property exposure. Figure 8-3 shows the structure type of buildings in the inundation area. Residential properties makeup 94.6 percent of this exposure.

Table 8-3. Exposed Population and Property in Evaluated Dam Failure Inundation Areas

Population	
Population Exposed	111,185
% of Total Planning Area Population	14.4%
Property	
Acres of Inundated Area	15,429
Number of Buildings Exposed	26,867
Value of Exposed Structures	$16,136,073,660
Value of Exposed Contents	$11,261,306,886
Total Exposed Property Value	**$27,397,380,546**
Total Exposed Value as % of Planning Area Total	14.3%

8.3.2 Critical Facilities

Figure 8-4 shows critical facilities located in the dam failure inundation zone by facility type. The total count of critical facilities in the dam failure inundation zone (299) represents 13.4 percent of the planning area total of 2,236. Exposed critical facilities include the following major roads:

- State Highway 1 (Pacific Coast Highway)
- State Highway 82 (El Camino Real)
- State Highway 84 (Woodside Road)
- State Highway 92
- State Highway 109 (University Avenue, East Palo Alto)
- State Highway 114 (Willow Road, Menlo Park)
- US Highway 101
- Interstate 280

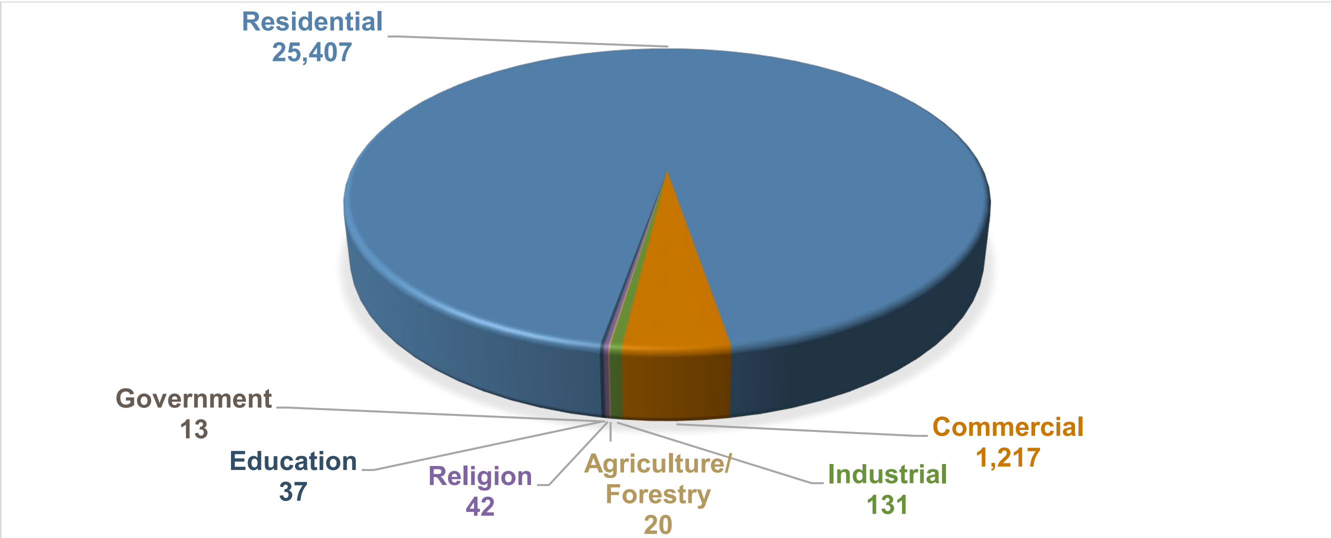


Figure 8-3. Number of Structures within the Dam Failure Inundation Area by Occupancy Class

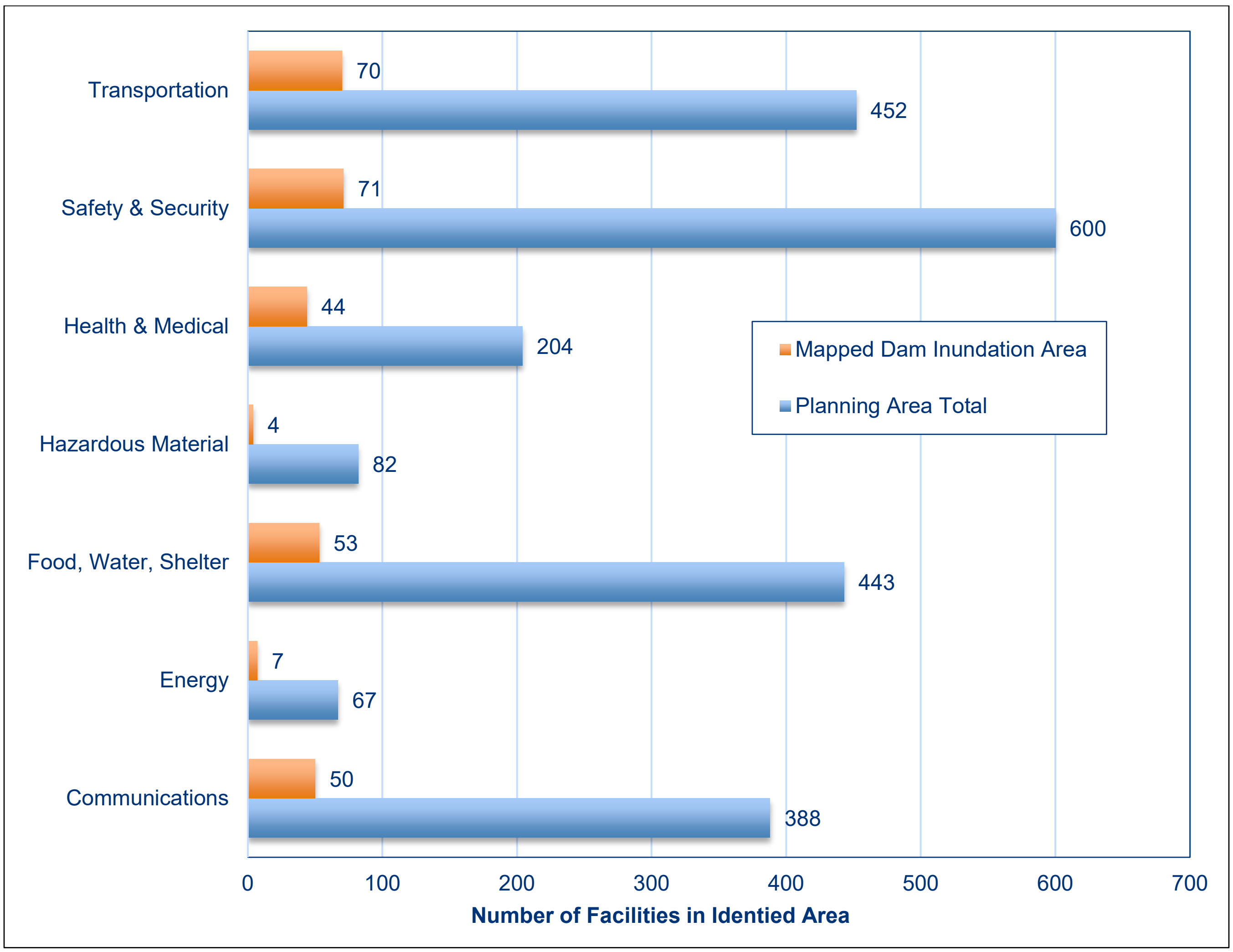


Figure 8-4. Critical Facilities in Dam Failure Inundation Zones and Countywide

8.3.3 Environment

The environment would be exposed to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways, possibly destroying downstream habitat and exerting detrimental effects on many species of animals.

8.4 VULNERABILITY

The vulnerability of people, property, and critical facilities was evaluated for the mapped dam failure inundation area. Detailed results by jurisdiction are included in Appendix E; countywide summaries are provided below.

8.4.1 Population

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area before floodwaters arrive. Impacts on persons and households for the combined dam failure inundation area were estimated through the Level 2 Hazus analysis. This population includes categories identified for the SoVI rating (see Section 7.2.2), as detailed by jurisdiction in Appendix E and summarized for the overall planning area in Table 8-4.

Table 8-4. Distribution of Population Exposed to Dam Failure Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	12,222	10.8%
Relatively High	29,701	26.2%
Relatively Moderate	40,010	35.4%
Relatively Low	24,952	22%
Very Low	6,301	5.6%

Additional countywide results of the Hazus analysis are as follows:

- Number of displaced households = 93,665
- Number of persons requiring short-term shelter = 7,209

8.4.2 Property

Vulnerable properties are those closest to the dam failure inundation zone. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam waters would collect. Properties in the dam failure inundation zone that are built to National Flood Insurance Program minimum construction standards may have some level of protection against dam failure inundation, depending on the velocity and elevation of the inundation waters. These properties also are more likely to have flood insurance. Table 8-5 summarizes the loss estimates for dam failure.

8.4.3 Critical Facilities

Hazus estimated damage to critical facilities in the dam failure inundation zones as summarized in Figure 8-5.

Table 8-5. Loss Estimates for Dam Failure

Structure Debris (tons)	1,240,544
Buildings Impacted[a]	26,780
Structure Value Damaged	$4,787,170,491
Content Value Damaged	$5,002,136,295
Total Value Damaged	**$9,789,306,786**
Damage as % of Total Value	*5.1%*

a. "Impacted" means water over the 1st floor of the structure

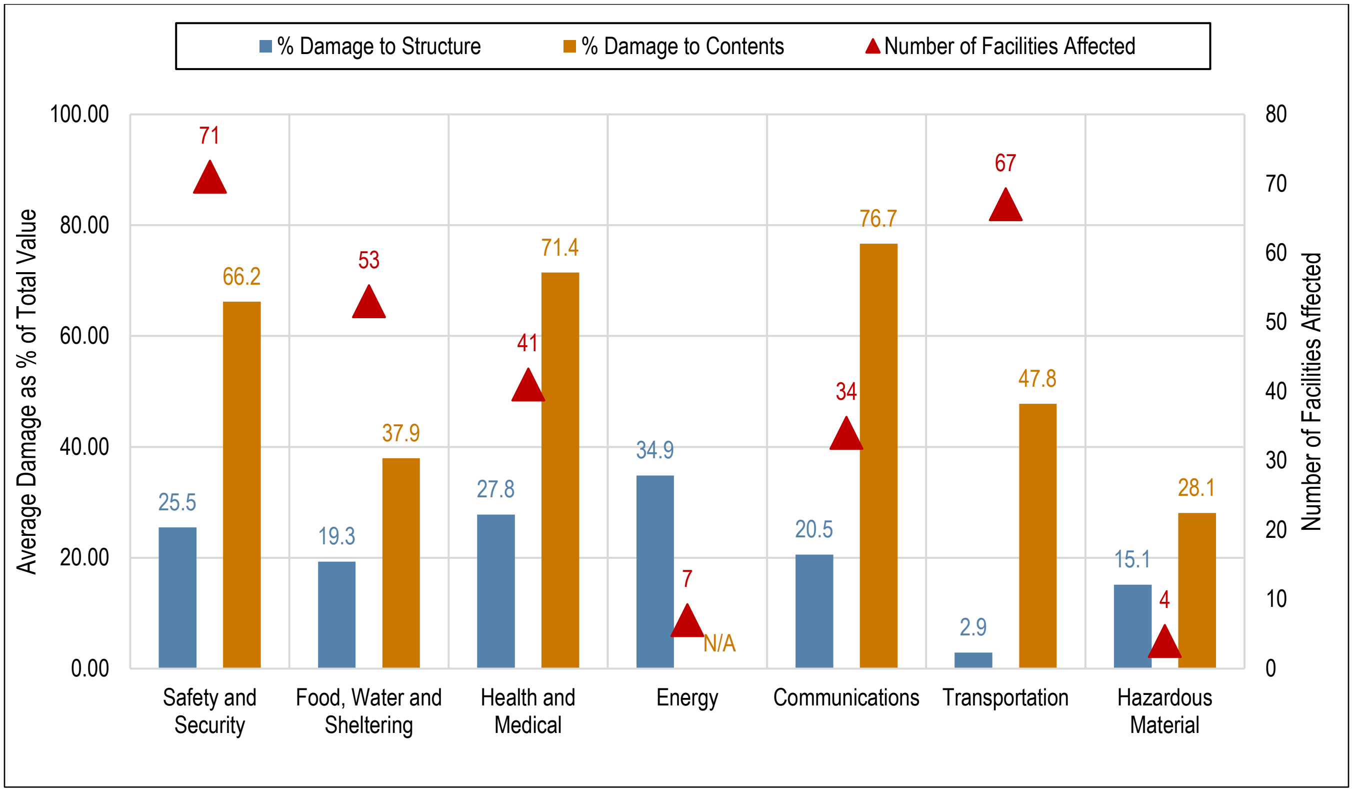


Figure 8-5. Estimated Damage to Critical Facilities from Dam Failure

Typical vulnerabilities of affected critical facilities include the following:

- Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues and significant disruption to travel. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge.
- Utilities such as overhead power lines, cable, and phone lines in the inundation zone could be vulnerable. If phone lines were lost, significant communication issues may occur in the planning area due to limited cell phone reception in many areas.
- Emergency response would be hindered due to the loss of transportation routes the inundation zone.
- Some protective-function facilities in the safety and security category located in the inundation zone could be lost.
- Recovery time to restore many critical functions after an event may be lengthy.

8.4.4 Environment

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce foreign elements into local waterways, resulting in destruction of downstream habitat and detrimental effects on many species of animals, especially endangered species.

8.5 FUTURE TRENDS IN DEVELOPMENT

The planning partners' general plans and other planning activities provide guidance related to hazard mitigation and future development. Dam failure is currently not addressed as a stand-alone hazard in the safety elements of the municipal partners' general plans, but flooding is. Flood-related policies in the general plans will help to reduce the risk associated with dam failure for all future development in the planning area. Municipalities participating in this plan have established comprehensive policies regarding sound land use in identified flood hazard areas. Most of the areas vulnerable to the more severe impacts from dam failure intersect the mapped flood hazard areas. However, there are structures on the perimeter of the dam failure inundation outside of the regulated floodplain that are not subject to floodplain management codes and standards. These structures would be more vulnerable than those constructed with floodplain codes and standards.

8.6 SCENARIO

An earthquake in the region could lead to liquefaction of soils around a dam, without warning during any time of the day. A human-caused incident such as a terrorist attack also could trigger a catastrophic failure of a dam that would impact the planning area. Failure of a high hazard dam in the County would likely result in loss of life, roadways, structures, and property, and exert severe impacts on the local economy. While the possibility of failure is remote, results would be devastating. The worst-case scenario would involve failure of the Lower Crystal Springs Dam. In addition to severe property damage and potential injuries, loss of water from the Crystal Springs Reservoir could lead to reduction in available potable water for the County and the Bay Area. Coupled with the ongoing drought throughout the state and already low water supply availability, this damage could lead to significant water shortages.

8.7 ISSUES

The most significant issues associated with dam failure involve properties and populations within inundation zones. Flooding as a result of a dam failure would significantly impact these areas. Warning time for dam failure plausibly would be limited. Moreover, dam failure is frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits predictability of dam failure and compounds the hazard. Important issues associated with dam failure hazards are as follows:

- A significant number of the structures located in the dam failure inundation zone are located outside of special flood hazard areas, meaning that they are not constructed to withstand floodwaters and are less likely to be covered by flood insurance. Even structures that have been designed with flood hazards in mind may not be able to withstand the height and velocity of flow from a dam failure event.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- California law requires that a property's location in a dam failure inundation be disclosed to a seller if the seller or the seller's agent has knowledge of the property's location within the hazard area or if the local

jurisdiction has compiled a list of parcels that are in the inundation area and has posted at the offices of the county recorder, county assessor, and county planning agency a notice that identifies the location of the list. It is unknown if this list has been compiled for the planning area.

- Dam failure inundation areas are often not considered special flood hazard areas under the National Flood Insurance Program, so flood insurance coverage in these areas is not common.
- Dam infrastructure may require repair and improvement to withstand climate change impacts, such as changing in the timing and intensity of rain events.
- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure. However, the protocol for notification of downstream community members of imminent failure needs to be tied to local emergency response planning.
- In the event of a dam failure that interrupted land line phone service, significant issues with communication could occur.
- Inundation mapping in a digital format to support the risk assessment was available only for state-regulated high-hazard dams in the planning area. Such mapping was not available for federal dams.
- Limited financial resources for dam maintenance during economic downturns result in decreased attention to dam structure operational integrity, because available funding is often directed to more urgent needs. This could increase potential for maintenance failures.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federally regulated dams that estimates inundation depths is needed to better assess risks associated with failure of these dams.
- Although mapping is required for federally regulated dams, development downstream of dams and upgrades to older dams may have altered inundation areas; however, these inundation maps may not have been updated for significant periods of time. Encouraging property owners of dams to update EAPs and inundation maps will ensure availability of the most accurate data to assist emergency planners and local officials.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. Mapping of dam failure scenarios for non-federal-regulated dams that are less extreme than the probable maximum flood, but have a higher probability of occurrence, can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness actions.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- There may be dams located in the planning area that do not meet regulatory thresholds for jurisdiction under State of California or federal programs.
- State and national dam lists are inconsistent regarding the number of dams in San Mateo County. These lists should be evaluated and corrected where needed. Currently, the National Inventory of Dams maintained by the U.S. Army Corps of Engineers lists 24 dams within the County, while DSOD has record of 21.

9. DROUGHT

9.1 GENERAL BACKGROUND

Drought is a significant decrease in water supply relative to what is needed to meet typical demand in each location. It is a normal phase in the cycle of Mediterranean climates such as that of San Mateo County, originating from a deficiency of precipitation over an extended period, usually a season or more. This leads to a water shortage for some activity, group, or environmental sector. Drought is generally defined based on four ways of measuring it (National Drought Mitigation Center, 2021):

- **Meteorological drought**—Based on precipitation deficit compared to normal. Anomalies of precipitation may last from several months to several decades. How long they last depend on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of global weather systems.
- **Agricultural drought**—Based on agricultural impacts due to reduced precipitation and water supply (e.g., crop loss, herd culling, etc.)
- **Hydrological drought**—Based on measurements of stream flows, groundwater, and reservoir levels relative to normal conditions
- **Socioeconomic drought—**Based on direct and indirect socio-economic impacts on society and the economy. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. If a community has stored enough water to meet its needs in the event of a shortage of rainfall, then it may not experience socioeconomic drought even though its geographic area experiences meteorological drought.

9.1.1 Monitoring Drought

National Oceanic and Atmospheric Administration Drought Indices

The National Oceanic and Atmospheric Administration has developed several indices to measure drought impacts and severity and to map their extent and locations:

- The ***Crop Moisture Index*** measures weekly short-term drought to quantify drought impacts on agriculture during the growing season.
- The ***Palmer Z Index*** measures monthly short-term drought.
- The ***Palmer Drought Severity 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 is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long-term wet pattern, and the Palmer Drought Index can respond fairly rapidly.

- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The ***Palmer Hydrological Drought Index*** quantifies long-term hydrological effects. It responds more slowly to changing conditions than the Palmer Drought Index.
- While the Palmer indices consider precipitation, evapotranspiration and runoff, the ***Standardized Precipitation Index*** considers only precipitation. In the Standardized Precipitation Index, an index of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Figure 9-1 shows examples of these indices as of early June 2021.

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that is updated weekly to show the location and intensity of drought across the country. The USDM uses a five-category system (National Integrated Drought Information System, 2020):

- D0—Abnormally Dry
  - Short-term dryness slowing planting, growth of crops
  - Some lingering water deficits
  - Pastures or crops not fully recovered
- D1—Moderate Drought
  - Some damage to crops, pastures
  - Some water shortages developing
  - Voluntary water-use restrictions requested
- D2—Severe Drought
  - Crop or pasture loss likely
  - Water shortages common
  - Water restrictions imposed
- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

The USDM categories show experts' assessments of conditions related to drought. These experts check variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. They also check whether areas are showing drought impacts such as water shortages and business interruptions. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought, and how many people are affected. U.S. Drought Monitor data goes back to 2000.

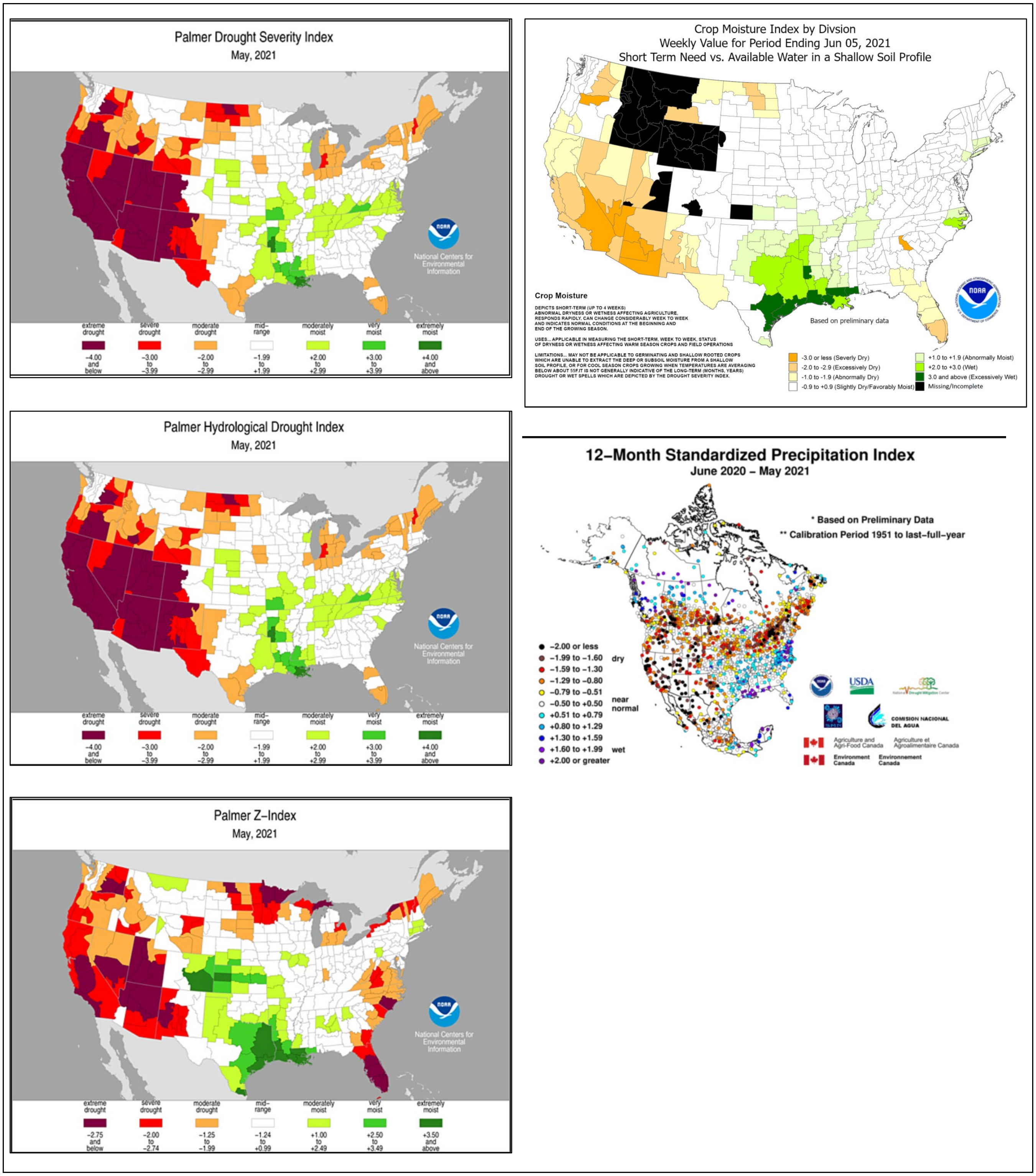


Figure 9-1. Example Drought Index Maps (for June 2021)

9.1.2 Drought Impacts

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to structures, as do other natural disasters. The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- **Economic Impacts**—These impacts of drought cost people (or businesses) money. Farmers' crops are destroyed; low water supply necessitates spending on irrigation or drilling of new wells; water-related businesses (such as sales of boats and fishing equipment) may experience reduced revenue; power shutoffs may occur.
- **Environmental Impacts**—Plants and animals depend on water. When a drought occurs, their food supply can shrink, and their habitat can be damaged. Drought also has the potential to increase the risk of wildfire.
- **Social Impacts**—Social impacts include public safety, health, power failures, conflicts between people when there is not enough water to go around, and changes in lifestyle.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental needs—contributes to drought impacts. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression. There are also issues such as growing conflicts between agricultural uses of surface water and in-stream uses, surface water and groundwater interrelationships, and the effects of growing water demand on uses of water.

Vulnerability of an activity to drought depends on its water demand and the water supplies available to meet the demand. The impacts of drought vary between sectors of the community in both timing and severity:

- **Water supply—**The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes ground water supplies due to reduced recharge from rainfall.
- **Power supply—**Production of all types of energy requires water. Because the energy sector is dependent on water availability, drought can severely impact energy systems.
- **Agriculture and commerce—**The agriculture and commerce sector includes the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing.
- **Environment, public health, and safety—**The environmental, public health, and safety sector is affected by wildfires, which are detrimental to the forest ecosystem and hazardous to the public. It also experiences the impacts of desiccating streams, such as the reduction of in-stream habitats for native species.

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Droughts can affect groundwater storage as reserves are drawn down in anticipation of drought impacts. Such conjunctive use assists in drought resilience, but it can take years to replenish the water that was stored. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest.

9.1.3 Defined Drought Stages in California

During critically dry years, the California State Water Resources Control Board can mandate water entitlements on water right holders to address statewide water shortages. Table 9-1 shows the state drought management program stages mandated to water right holders.

Table 9-1. State Drought Management Program

Drought Stage	State Mandated Customer Demand Reduction	Rate Impacts
Stage 0 or 1	<10%	Normal rates
Stage 2	10 to 15%	Normal rates; Drought surcharge
Stage 3	15 to 20%	Normal rates; Drought surcharge
Stage 4	>20%	Normal rates, Drought surcharge

9.1.4 Secondary Hazards

The secondary impact 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. In addition, lack of sufficient water resources can stress trees and other vegetation, making them more vulnerable to infestation from pests, which in turn, can make them more vulnerable to ignition. Prolonged droughts can impact underground aquifers, thus impacting groundwater supplies. Algae blooms can occur in surface water reservoirs that are stressed by drought impacts.

9.2 HAZARD PROFILE

9.2.1 Planning Area Water Supply and Drought Response

Water Supply Infrastructure

San Mateo County receives 92 percent of its water through the regional Hetch Hetchy Water System, with the remainder of the County's water supply coming from surface, ground, and recycled water (San Mateo County OES, 2015). The water system was so-named because 85 percent of the water supply comes from the Sierra Nevada snowmelt stored in the Hetch Hetchy reservoir along the Tuolumne River in Yosemite National Park; the remaining 15 percent comes from runoff in the Alameda and Peninsula watersheds (Bay Area Water Supply Conservation Agency, 2016)

The Hetch Hetchy Water System (see Figure 9-2) was approved in 1913 under the Raker Act, which allowed use of federal lands in the Sierra Nevada Mountains to build that water system. The system was constructed by San Francisco over 20 years, with first delivery of water in 1934. Although San Francisco owns the system, it was designed from the beginning to serve as a regional water supply system (Bay Area Water Supply Conservation Agency 2021).

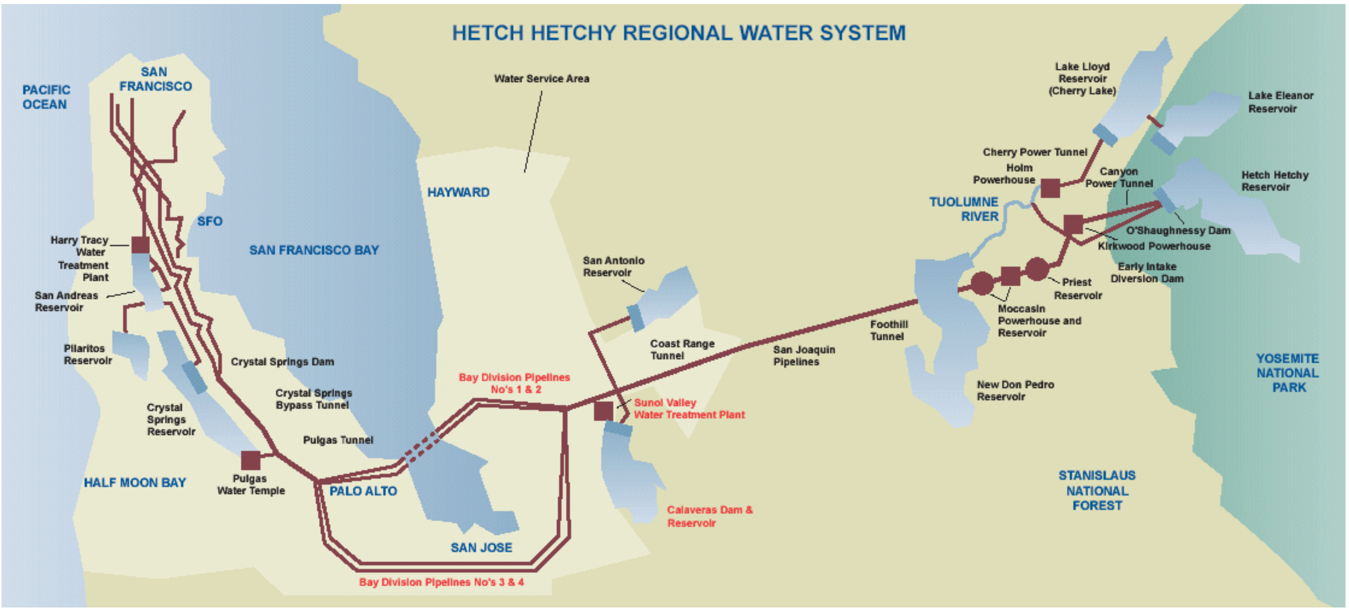


Figure 9-2. Hetch Hetchy Water System

In 2002, the San Francisco Public Utilities Commission (SFPUC) adopted a $2.9 billion capital improvement plan to enhance the water system. Need for the improvements had been recognized after the Loma Prieta earthquake in 1989 and drought in the 1990s. Much of the water supply system is 75 to 100 years old and does not meet modern seismic codes, and major pipelines cross earthquake faults. A 2000 SFPUC study found that a major earthquake could cripple the water supply system for up to 30 days. SFPUC has highlighted nine priority projects for implementation, completion of which should help ensure relative continuity of operations of the water supply system following a large seismic event (Bay Area Water Supply Conservation Agency 2016).

San Mateo County maintains the infrastructure for County Service Area (CSA) 7 and CSA 11, the two local water systems within its borders (San Mateo County 2016):

- CSA 7 includes an intake and pump in Alpine Creek, a water treatment plant, a 500,000-gallon storage tank, and a distribution system. The treatment plant was constructed in the early 1990s, but parts of the distribution system date to the 1920s.
- CSA 11 was established in 1988 and consists of two wells, one 135,000-gallon distribution tank, and a distribution system. Water flows from the distribution tank through the water system under force of gravity; no distribution pumps are required. CSA 11 was determined to be necessary after relatively high concentrations of nitrate and other naturally occurring salts were found in local groundwater sources, raising concern that continued use of previously used small domestic wells could lead to unintended health consequences.

Water Supply Strategy

The Bay Area Water Supply Conservation Agency (BAWSCA) is the main water provider for much of the Bay Area. It allows San Mateo County and its cities, water districts, and private utilities to coordinate to ensure the continual water supply necessary to maintain health, safety, and economic wellbeing of the community. BAWSCA agencies manage two-thirds of water consumption from the Hetch Hetchy Water System, providing water to 2.4 million people in San Francisco, Santa Clara, Alameda, and San Mateo Counties. In San Mateo

County, BAWSCA services Brisbane, Burlingame, Daly City, East Palo Alto, Hillsborough, Menlo Park, Millbrae, Redwood City, San Bruno, Coastside County Water District, Estero Municipal Improvement District, Guadalupe Valley Municipal Improvement District, Mid-Peninsula Water District, Westborough Water District, and California Water Service Company (private utility) (Bay Area Water Supply Conservation Agency, 2021).

BAWSCA applies a long-term water supply strategy for its customers throughout the Bay Area. This strategy recognizes that drought year shortfalls can be significant, resulting in system-wide cutbacks of up to 20 percent. Impacts of water shortages are regional and can lead to secondary detrimental economic effects. BAWSCA focuses on identifying options for filling all or portions of the drought year supply shortfall. BAWSCA also developed a *Water Conservation Implementation Plan* (2015) with the following objectives:

- Help BACSWA member agencies evaluate potential water savings and cost-effectiveness associated with additional water conservation measures.
- Determine potential present and future water savings from a range of new conservation measures.
- Determine BAWSCA's role in helping member agencies achieve individual water conservation goals.
- Develop a regional plan for water conservation measures to serve as a guideline for member agencies.

In August 2017, BAWSCA released a drought report outlining state and local drought response actions in three categories (Bay Area Water Supply Conservation Agency, 2017):

- Demand management actions to reduce water use, including public information and water conservation programs
- Water supply actions
- Regulatory and policy support.

While BAWSCA is the primary water service agent in the County, it is not the only option for community members and businesses. The County Public Works Department operates CSA No. 7 and CSA No. 11. These service areas provide potable water to approximately 70 customers in the La Honda community and 90 customers in the Pescadero community, respectively. CSA 7 also supplies two County facilities—Camp Glenwood Boys Ranch and Sam McDonald Park (San Mateo County 2016).

Moreover, some County residents have domestic wells on their property. The South Central Regional Office of California Department of Water Resources monitors wells for San Mateo County to help protect groundwater quality (California Department of Water Resources, 2016). According to the California Resources Agency, database of well completion reports by County, there were 10,747 wells within San Mateo County as of May 28, 2020 (California Natural Resources Agency, 2021).

Defined Drought Levels

Neither San Mateo County nor BAWSCA has defined "drought level." County and regional drought response is determined case by case, and response priorities are typically based on imminence of potential water shortages. BAWSCA has developed both Tier 1 and Tier 2 Drought Implementation Plans; however, these plans do not specify specific trigger levels. The Tier 1 plan is for SFPUC and BAWSCA; the Tier 2 plan is for BAWSCA member agencies. The Tier 2 plan includes calculations to determine water allocations for member agencies during water shortages. Drought stages defined by the California State Water Resources Control Board (see Table 9-1) can serve as a reference for County and stakeholder agencies when determining need for response.

9.2.2 Past Events

California Department of Water Resources hydrologic data from the early 1900s shows multi-year droughts from 1912 to 1913, 1918 to 1920, 1922 to 1924, and 1928 to 1934 (California Department of Water Resources, 2017). The 1929 to 1934 drought established the criteria for designing storage capacity and yield for large Northern California reservoirs. The following sections describe the most recent prolonged droughts that have impacted the planning area.

2020 to Present Drought

The U.S. Department of Agriculture declared a drought disaster that include San Mateo County on April 21, 2020. April 2021 was the third driest April in the past 127 years (National Integrated Drought Information System, 2021). As of June 2021, San Mateo County was at the D3—Extreme Drought level, putting the county at risk for wildfire on a year-round basis (National Integrated Drought Information System, 2021). On April 15, 2021, the SFPUC sent wholesale customers a letter on water supply availability estimates for 2021 and current hydrological conditions. The letter stated the following conditions and projections at that time (San Francisco Public Utilities Commission, 2021):

- The Hetch Hetchy watershed was experiencing very dry conditions
- The April 1 snow course index was about 60 percent of the median historical snowpack level.
- San Francisco needed about 554,000 acre-feet to fill the entire water system by July 1, 2021.
- Snowmelt forecasts indicated that the Hetch Hetchy reservoir would fill during the year.
- The water bank was not expected to fill.

2012 to 2017 Drought

California's last drought set several records for the state. The period from 2012 to 2014 ranked as the driest three consecutive years for statewide precipitation. Calendar year 2014 set new records for statewide average temperatures and for low water allocations from the State Water Project. Calendar year 2013 set minimum annual precipitation records for many communities. Detailed executive orders and regulations addressed water conservation and management. The statewide drought emergency was lifted in April 2017.

This drought had significant effects on the southern coastline of San Mateo County because many community members in this area rely on creeks and wells that have stopped flowing. Rural communities in the County faced stringent limitations on bathing, using toilets, and washing items, and many ranches and farms in the area saw significant economic downturns. Urban parts of the San Francisco Bay area experienced limitations in order to conserve water, but not to the extent imposed on rural community members (SFGate 2014).

During this drought, San Mateo County and its cities implemented initiatives to maintain the quantity and quality of water resources in the County (San Mateo County 2016):

- San Mateo Countywide Water Pollution Program
- Groundwater Protection Program
- Land Use and Septic Wells Program
- Recreational Water Quality Program

- Small Drinking Water Systems Program
- Municipal Facilities Water Conservation Efforts.

2007 to 2009 Drought

The state proclaimed a statewide drought emergency on June 4, 2008, after spring 2008 was the driest spring on record. On February 27, 2009, the state proclaimed a state of emergency for the entire state as severe drought continued. The largest court-ordered water restriction in state history (at the time) was imposed.

1987 to 1992 Drought

California received precipitation well below average levels for four consecutive years. While the Central Coast was most affected, the Sierra Nevada range in Northern California and the Central Valley counties were also affected. During this drought, only 56 percent of average runoff for the Sacramento Valley was received. In 1991, the State Water Project sharply decreased deliveries to water suppliers. By February 1991, all 58 counties in California were experiencing drought. Urban areas as well as agricultural areas were impacted.

1976 to 1977 Drought

California had a severe drought due to lack of rainfall during the winters of 1976 and 1977. 1977 was the driest period on record in California at that time, with the previous winter recorded as the fourth driest in California's hydrological history at that time. The cumulative impact led to widespread water shortages and severe water conservation measures statewide. Only 37 percent of average Sacramento Valley runoff was received, with just 6.6 million acre-feet recorded. Over $2.6 billion in crop damage was recorded in 31 counties. FEMA declared a drought emergency (Declaration 3023-EM) on January 20, 1977, for 58 California counties.

9.2.3 Location

Drought is a regional phenomenon that has the potential to impact the entire planning area. A drought affects all aspects of the environment and the community simultaneously and has the potential to impact every person in the planning area directly or indirectly, as well as adversely affecting the local economy.

9.2.4 Frequency

Drought has a high probability in the planning area:

- From 2000 through May 2021, some part of San Mateo County experienced a USDM rating of D1 or higher in 437 out of 1,117 weeks—slightly more than one out of every three weeks (see Figure 9-3).
- The county been included in U.S. Department of Agriculture (USDA) drought disaster declarations in six of the past seven years.
- The county has experienced seven significant multi-year droughts in the last 40 years (1980 to 2020), amounting to a severe drought every 5 to 6 years on average.

Source: U.S. Drought Monitor, 2021

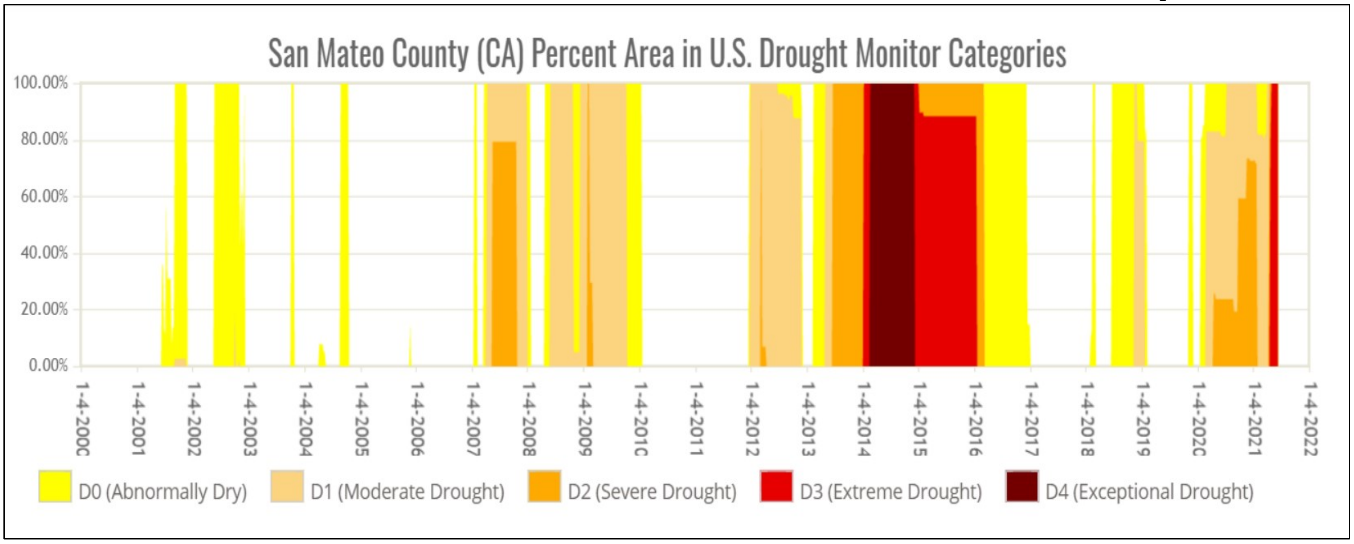


Figure 9-3. Percent of San Mateo County Affected by Each USDM Rating, 2000 – 2021

9.2.5 Severity

The severity of any given drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts.

U.S. Drought Monitor Ratings

San Mateo County has a history of severe droughts. As shown in Figure 9-3, at least part of the county has experienced extreme (D3) or exceptional (D4) droughts more than once since 2000.

Drought Impact Reporter

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Information comes from a variety of sources: on-line, drought-related news stories and scientific publications, members of the public who visit the website and submit a drought-related impact for their region, members of the media, and staff of government agencies. The database is being populated beginning with the most recent impacts and working backward in time.

The Drought Impact Reporter indicates 1,208 impacts from drought that specifically affected San Mateo County from January 2011 through May 2021, 90 percent of them based on media reports (Drought Impact Reporter, 2021). The following are the reported numbers of impacts by category (some incidents are assigned to more than one impact category):

- Agriculture—287
- Business and Industry—99
- Energy—11
- Fire—190

- Plants and Wildlife—324
- Relief, Response, and Restrictions—545
- Society and Public Health—316
- Tourism and Recreation—122
- Water Supply and Quality—686

9.2.6 Warning Time

Predicting drought depends on the ability to forecast precipitation and temperature. Scientists currently do not know how to predict drought more than a month in advance for most locations. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions.

Determination of when drought begins is based on impacts on water users and assessments of available water supply, including water stored in reservoirs or groundwater basins. Different water agencies have different criteria for defining drought. Some issue drought watch or drought warning announcements.

9.3 EXPOSURE

All people, property and environments in the planning area would be exposed to some degree to the impacts of moderate to extreme drought conditions.

9.4 VULNERABILITY

9.4.1 Population

The entire population of the County is vulnerable to drought events. 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 (National Drought Mitigation Center, 2018). 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 (Centers for Disease Control and Prevention, 2012).

The County of San Mateo, BAWSCA, regional water purveyors, and other regional stakeholders have devoted considerable time and effort to protect life, safety, and health during times of consecutive dry years. Steps have been taken to analyze and account for anticipated water shortages. With coordination from its cities, the County has the ability to minimize and reduce impacts on community members and water consumers in San Mateo County. No significant life or health effects are anticipated as a result of drought in San Mateo County.

9.4.2 Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can have significant impacts on other types of property such as landscaped areas and economically important natural resources. Drought causes the most significant economic impacts on industries that use water or depend on water for their business, most notably agriculture and related sectors (forestry, fisheries, and waterborne activities), power plants, and oil refineries. In addition to losses in yields in crop and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. Drought can lead to other losses because so many sectors are affected - losses that include reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. This leads 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.

9.4.3 Critical Facilities

Critical facilities as defined for this plan will continue to be operational during a drought. Critical facility features such as landscaping may not be maintained due to limited water resources, but the risk to critical facility core functions is low.

9.4.4 Environment

Groundwater and Streams

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest. Where stream flows are reduced, development that relies on surface water may seek to establish new groundwater wells, which could further increase groundwater depletion.

Other Potential Losses

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. The following are potential impacts of drought:

- Wildlife habitat may be degraded through the loss of wetlands, lakes and vegetation. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.
- Drought conditions greatly increase the likelihood of wildfires, the major threat to timber resources.
- Water shortages and severe drought conditions would have a significant impact on Native American tribes' way of life in fishing and farming subsistence.
- Scenic resources in the County are vulnerable to the increased likelihood of wildfires associated with droughts.
- Drying up or dying off of forests could reduce ecological and eco-tourist values.
- Any shortage of water supply can have significant economic impacts.

9.4.5 Economic Impact

Drought causes the most significant economic impacts on industries that use water or depend on water for their business, most notably, agriculture and related sectors (forestry, fisheries, and waterborne activities). In addition to losses in yields in crop and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. Drought can lead to other losses because so many sectors are affected—losses that include reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. This leads 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.

When a drought occurs, the agricultural industry faces greatest risk of economic impact and damage. During droughts, crops do not mature, resulting in smaller crop yields, undernourishment of wildlife and livestock, decreases in land values, and ultimately financial losses to farmers (FEMA, 1997). Agriculture production has been a significant and growing factor in San Mateo County, especially as agricultural effects on the economy start to normalize (after a period of decline). Agricultural production created $148.3 million in total economic output within the County ($47.3 million of which resulted from multiplier effects), and indirect and induced spending supported another 3,425 jobs in the County (San Mateo County, 2012).

Direct effects (excluding indirect and induced spending benefits) can be evaluated based on information in USDA reports. According to the 2017 Census of Agriculture, 241 farms were present in San Mateo County, encompassing 45,972 acres of total farmland. The average farm size was 191 acres. San Mateo County farms had a total market value of products sold of $79.4 million, averaging $329,562 per farm. The Census indicated that 187 farm operators reported farming as their primary occupation (USDA, 2017). Table 9-2 lists acreage of agricultural land exposed to the drought hazard.

Table 9-2. Agriculture Land and % Change in San Mateo County in 2017

Number of Farms	% Change since 2012	Land in Farms (acres)	% Change since 2012	Average Size of Farm (acres)	% Change since 2012
241	-28%	45,972	-5%	191	+32%

Source: Census of Agriculture, County Profile, USDA, 2017

In 2017, the following were the top categories of agricultural products sold in San Mateo County (USDA 2017):

- Nursery, greenhouse, floriculture, and sod at $61.6 million
- Vegetables, melons, potatoes, and sweet potatoes at $12.2 million
- Fruits, tree nuts, and berries at $3.3 million.

San Mateo County was fifth highest ranked in the state and the country in sales of Brussels sprouts; it was eighth highest ranked in the state for sales of cut Christmas trees; and 11th highest ranked in the state for floriculture and bedding crops.

A prolonged drought can affect a community's economy significantly. Increased demand for water and electricity may result in shortages and higher costs of these resources. Industries that rely on water for business may be impacted the most (e.g., landscaping businesses). Although most businesses will still be operational, they may be affected aesthetically—especially the recreation and tourism industry. Moreover, droughts within another area could affect food supply and the price of food for community members within the county.

9.5 FUTURE TRENDS IN DEVELOPMENT

The planning partners' general plans and other planning activities provide guidance related to hazard mitigation and future development. General plans include policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local municipal level to protect future development from the impacts of drought. In addition, water providers in the planning area have plans and programs in place to balance competing needs for water resources within the planning area.

9.6 SCENARIO

A multi-year drought that impacts the entire west or the State of California, similar to the 2012 to 2017 drought, is the worst-case scenario for the planning area. The 2012-2017 drought and the wildfires and floods that followed it caused extensive damage to natural systems. If another severe drought occurs before these systems have a chance to recover, it could exacerbate the stress already placed on existing planning area water resources. Surrounding counties, also under drought conditions, could increase their demand for the water supplies on which San Mateo County also relies, triggering social and political conflicts. The higher density population of the Bay Area increases likelihood of such conflicts, despite existence of the BACSWA drought implementation plans. Additionally, the longer drought conditions last in or near the County, the greater the effect on the local economy; water-dependent industries especially will undergo setbacks.

9.7 ISSUES

The planning team has identified the following drought-related issues:

- Alternative water supplies need to be identified and developed, as well as alternative strategies to allocate and distribute existing water sources.
- Alternative techniques (groundwater recharge, water recycle, local capture and reuse, desalination, and transfer) could stabilize and offset Sierra Nevada snowpack water supply shortfalls.
- Development of local or regional (BACSWA) drought-level indicators to correspond with Drought Implementation Plans or other water conservation measures.
- Drought in the county could increase and expand fire-prone areas and adversely affect the timber economy.
- Water planning should consider impacts of additional drawdowns on groundwater supplies as pressure on surface water increases during drought.
- The effectiveness of long-term reliable water supply strategy projects, water conservation incentive projects, and water system capital improvement project upgrades should be monitored.
- More studies need to be done regarding overall county water usage and how it relates to the economy to prepare for a worst-case scenario drought.
- Planning must address the degree of future development in drought-prone areas.
- Drought frequencies and durations may increase due to climate change.
- Water conservation should be actively promoted, even during non-drought periods.
- Frequent or prolonged droughts may limit the County's and community members' ability to successfully recover from or prepare for more occurrences.

10. EARTHQUAKE

10.1 GENERAL BACKGROUND

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

10.1.1 Earthquake Location

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter.

10.1.2 Earthquake Geology

Tectonic Plates

The Earth's crust, which is the rigid outermost shell of the planet, is broken into seven or eight major tectonic plates (depending on how they are defined) and many minor plates. Where the plates meet, they move in one of three ways along their mutual boundary: convergent (two plates moving together), divergent (two plates moving apart), or transform (two plates moving parallel to one another). Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along these plate boundaries. Subduction is a geological process that takes place at convergent boundaries of tectonic plate, in which one plate moves under another. Regions where this process occurs are known as subduction zones, and they have the potential to generate highly damaging earthquakes.

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 rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

The sliding movement of earth on either side of a fault is called fault rupture. Fault rupture begins below the ground surface at the earthquake hypocenter, typically between 3 and 10 miles below the ground surface in California. If an earthquake is large enough, the fault rupture will travel to the ground surface, potentially destroying structures built across its path.

Faults

Geologists have found that earthquakes reoccur along faults, which are zones of weakness in the earth's crust. When a fault experiences an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake can still occur. In fact, relieving stress along one part of a fault may increase it in another part.

Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years) (California Department of Conservation, 2003).

Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. The majority of the seismic hazards are on well-known active faults. However, inactive faults, where no displacements have been recorded, also have the potential to reactivate or experience displacement along a branch sometime in the future. An example of a fault zone that has been reactivated is the Foothills Fault Zone. The zone was considered inactive until evidence of an earthquake (approximately 1.6 million years ago) was found near Spenceville, California. Then, in 1975, an earthquake occurred on another branch of the zone near Oroville, California (now known as the Cleveland Hills Fault). The State Division of Mines and Geology indicates that increased earthquake activity throughout California may cause tectonic movement along currently inactive fault systems.

10.1.3 Earthquake-Related Hazards

According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect people's normal activities. This includes the following:

- **Surface Faulting**—Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes, those with an epicenter less than 20 kilometers.
- **Ground Motion (shaking)**—The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.
- **Landslid**e—A movement of surface material down a slope.
- **Liquefaction**—A process by which water-saturated sediment temporarily loses strength and acts as a fluid. Earthquake shaking can cause this effect.
- **Tectonic Deformation**—A change in the original shape of a material due to stress and strain.
- **Tsunami**—A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or violent underwater volcanic eruptions.

10.1.4 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (M_W), the most common scale used today (USGS, 2017a). This scale is based on the total moment release of the earthquake (the product of the distance a fault moved and the force required to move it). The scale is as follows:

- Great—Mw > 8
- Major—Mw = 7.0 – 7.9
- Strong—Mw = 6.0 – 6.9
- Moderate—Mw = 5.0 – 5.9
- Light—Mw = 4.0 – 4.9
- Minor—Mw = 3.0 – 3.9
- Micro—Mw < 3

Intensity

The most commonly used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 10-1. The modified Mercalli intensity scale is generally represented visually using shake maps, which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the variation of ground shaking in a region immediately following significant earthquakes (for technical information about shake maps see USGS, 2018).

Table 10-1. Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA = peak ground acceleration. Measured in percent of g, where g is the acceleration of gravity
Sources: USGS, 2008; USGS, 2010

10.1.5 Ground Motion

Earthquake hazard assessment is based on expected ground motion. During an earthquake when the ground is shaking, it also experiences acceleration. The peak acceleration is the largest increase in velocity recorded by a particular station during an earthquake. Estimates are developed of the annual probability that certain ground motion accelerations will be exceeded; the annual probabilities can then be summed over a time period of interest.

The most commonly mapped ground motion parameters are horizontal and vertical peak ground accelerations (PGA) for a given soil type. PGA is a measure of how hard the earth shakes, or accelerates, in a given geographic area. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. PGA is measured in g (the acceleration due to gravity) or expressed as a percent acceleration force of gravity (%g). These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage “short period structures” (e.g., single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (e.g., apartment buildings, factories, high-rises, bridges). Table 10-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

10.1.6 USGS Earthquake Mapping Programs

ShakeMaps

The USGS Earthquake Hazards Program produces maps called ShakeMaps that map ground motion and shaking intensity following significant earthquakes. ShakeMaps focus on the ground shaking caused by the earthquake, rather than on characteristics of the earthquake source, such as magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth’s crust.

A ShakeMap shows the extent and variation of ground shaking immediately across the surrounding region following significant earthquakes. Such mapping is derived from peak ground motion amplitudes recorded on seismic sensors, with interpolation where data are lacking based on estimated amplitudes. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. In addition to the maps of recorded events, the USGS creates the following:

- Scenario ShakeMaps of hypothetical earthquakes of an assumed magnitude on known faults
- Probabilistic ShakeMaps, based on predicted shaking from all possible earthquakes over a 10,000-year period. In a probabilistic map, information from millions of scenario maps are combined to make a forecast for the future. The maps indicate the ground motion at any given point that has a given probability of being exceeded in a given timeframe, such as a 100-year (1-percent-annual chance) event.

National Seismic Hazard Map

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown et al., 2001). The USGS updated the National Seismic Hazard Maps in 2018. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2018 map, shown in Figure 10-1, represents the best available data as determined by the USGS.

Source: USGS, 2018

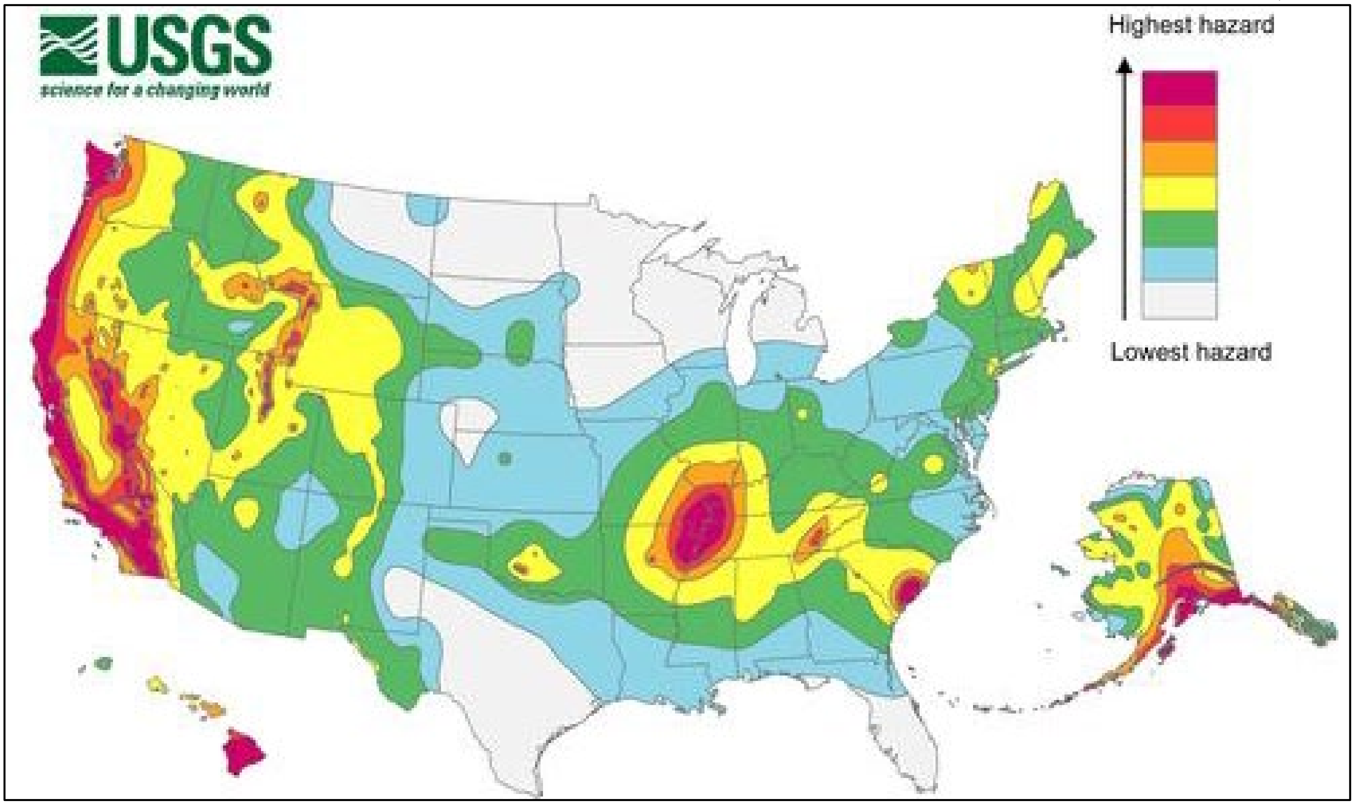


Figure 10-1. Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years

10.1.7 Liquefaction and Soil Types

Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people.

A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. NEHRP soil types define the locations that will be significantly impacted by an earthquake. Table 10-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F (SCEC, 2018). In general, these areas are also most susceptible to liquefaction. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F.

Table 10-2. NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

10.1.8 Secondary Hazards

Earthquakes can cause disastrous landslides. River valleys are vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Earthen dams and levees are highly susceptible to seismic events, and the impacts of their eventual failures can be considered secondary risk exposure to earthquakes. Depending on the location, earthquakes can also trigger tsunamis. Additionally, fires can result from gas lines or power lines that are broken or downed during the earthquake. It may be difficult to control a fire, particularly if the water lines feeding fire hydrants are also broken.

10.2 HAZARD PROFILE

10.2.1 Past Events

Table 10-3 lists recent earthquakes with a magnitude of 5.0 or greater within 100 miles of San Mateo County. The last significant (greater than magnitude 6.0) seismic event in the San Mateo vicinity was the 7.1 magnitude San Andreas Loma Prieta Earthquake in 1989, which originated 10 miles northeast of Santa Cruz. Other significant local earthquakes include the 1906 earthquake in San Francisco and the 2014 Napa earthquake. Although the 1906 earthquake is most associated with the City of San Francisco, San Mateo County was also greatly affected.

Table 10-3. Recent Earthquakes Magnitude 5.0 or Larger Within 100-Mile radius

Date	Magnitude	Epicenter Location
8/24/2014	6.0	6 miles southwest of Napa, CA
10/31/2007	5.6	10 miles northeast of San Jose, CA
8/10/2001	5.50	9 miles west of Portola, CA
9/3/2000	5.17	8 miles northwest of Napa, CA
10/17/1989	7.1	10 miles northeast of Santa Cruz, CA
3/31/1986	5.70	12 miles east-northeast of Milpitas, CA

Source: USGS, 2021

10.2.2 Location

Fault Locations

San Mateo County is in a region of high seismicity because of the presence of the San Andreas Fault that bisects the county, the Hayward Fault across the bay to the east, and the San Gregorio Fault to the west. The primary seismic hazard for the county is potential ground shaking from these three large faults. Table 10-4 lists additional faults in the Bay Area. Figure 10-2 shows locations and event probabilities for Bay Area fault lines.

Table 10-4. Additional Faults within a 50-Mile Radius

Fault	Approximate Distance (miles/direction)
Calaveras	17 miles from East Palo Alto
Greenville	23 miles from Menlo Park
Mount Diablo Thrust	27 miles from South San Francisco
Concord-Green Valley	30 miles from South San Francisco
Rogers Creek (Part of Hayward Fault System)	35 miles from South San Francisco

San Andreas Fault

The San Andreas Fault is a transform boundary that spans 810 miles from the East Pacific rise in the Gulf of California through the Mendocino fracture zone off the shore of northern California. The fault is estimated to be 28 million years old. The San Andreas Fault is an example of a transform boundary exposed on a continent. The fault forms the tectonic boundary between the Pacific Plate and the North American Plate, and its motion is right-lateral strike-slip.

The San Andreas Fault is typically referenced in three segments. The southern segment extends from its origin at the East Pacific Rise to Parkfield, California, in Monterey County. The central segment extends from Parkfield to Hollister, California. The northern segment extends northwest from Hollister, through San Mateo County, to its junction with the Mendocino fracture zone and the Cascadia subduction zone in the Pacific Ocean.

The San Andreas Fault crosses the center of the county, passing through the population centers of Daly City and San Bruno and posing considerable risk for surface fault rupture within those cities. The San Andreas Fault has a 21 percent chance of generating a magnitude 6.7 or greater earthquake in the next 30 years.

The last earthquake with a magnitude over 5.0 with an epicenter in San Mateo County was the 1957 Daly City earthquake, with a magnitude of 5.3. While the epicenter of the magnitude 7.8 earthquake in 1906 on the San Andreas Fault was not within the county, it still caused extreme ground shaking. A similar earthquake in the future would likely do the same, especially in the heavily populated Bayside, much of which is underlain by alluvial deposits, bay mud, and artificial fill. A rupture along the peninsula would cause extremely violent ground shaking throughout the county. The bay margins are likely to experience liquefaction in a major earthquake (ABAG 2013).

Monte Vista-Shannon Fault

The Monte Vista-Shannon fault zone is a predominantly a southwest-dipping oblique slip fault that extends about 28 miles along the northeastern margin of the Santa Cruz Mountains from the vicinity of Los Trancos Creek southeast to the Alamitos Creek area, near Calero Reservoir (USGS, 2020).

Butano Fault

The Butano Fault is a 23-mile-long fault that falls along Pescadero Creek in San Mateo County. It merges with the San Andreas fault from the northwest and the Sargent fault from the southeast. It appears to have a symmetrical relation to the San Andreas fault and may have similar seismic potential (USGS, 1974).

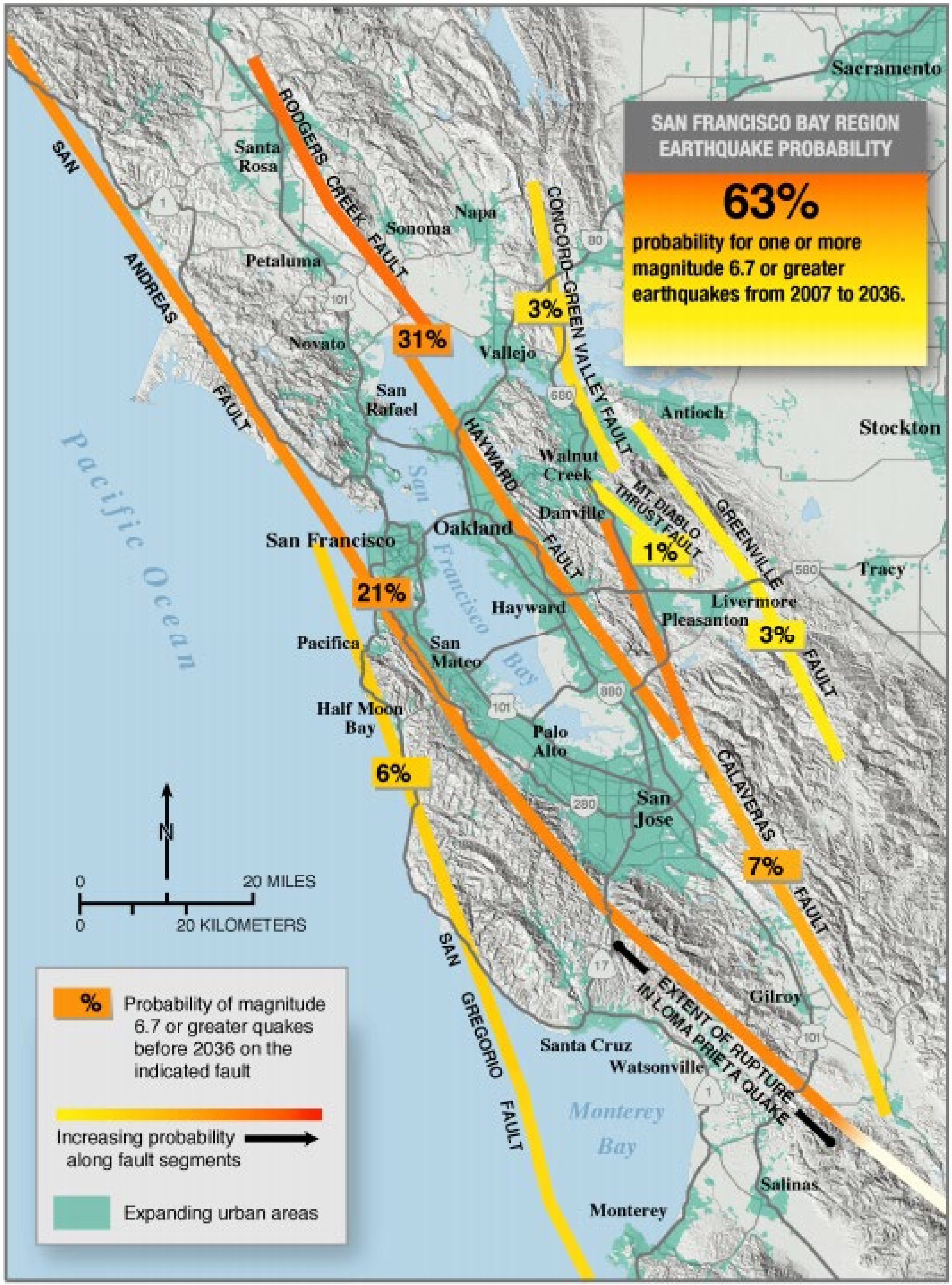


Figure 10-2. Significant Known Faults in the Bay Area

Hayward Fault

The Hayward Fault is a 45-mile-long fault that parallels the San Andreas Fault on the East Bay. The Hayward Fault extends through some of the Bay Area's most populated areas, including San Jose, Oakland, and Berkeley. The Hayward Fault is a right lateral slip fault.

The Hayward Fault has a 31-percent chance of producing a magnitude 6.7 or greater earthquake in the next 30 years. An earthquake of this magnitude has regional implications for the entire Bay Area, as the Hayward Fault crosses numerous transportation and resource facilities, such as highways and the Hetch Hetchy Aqueduct. Disruption of the Hetch Hetchy system has the potential to severely impair water service to San Mateo County. The Hayward Fault is increasingly becoming a hazard priority throughout the Bay region because of its increased chance for activity and its intersection with multiple highly populated areas and critical facilities.

San Gregorio Fault

The San Gregorio Fault is a northwest-trending right-lateral slip deformation near the western edge of San Mateo County, crossing briefly over uninhabited land in San Mateo County around Pillar Point at Half Moon Bay. The fault runs from southern Monterey Bay through Bolinas Bay, where its north section intersects with the San Andreas Fault offshore north of San Francisco. San Gregorio is the principal active fault west of the San Andreas for the Bay Area region.

The San Gregorio Fault is one of the less studied fault lines, the result of its primary location offshore and its proximity to the better-known San Andreas Fault and Hayward Fault. Its probability of experiencing a magnitude 6.7 or greater earthquake within the next 30 years is 6 percent—significantly less than San Andreas Fault or Hayward Fault. However, the location of the fault poses a significant threat to San Mateo County.

NEHRP Soil Type and Liquefaction Mapping

Figure 10-3 shows NEHRP soil classifications in San Mateo County. Figure 10-4 shows areas that have moderate, high or very high susceptibility to liquefaction.

Alquist-Priolo Zone Maps

Alquist-Priolo zone maps provide regulatory zones for potential surface fault rupture where fault lines intersect with future development and populated areas. The purpose of these maps is to assist in the geologic investigation before construction begins to ensure that the resulting structure will not be located on an active fault. Daly City and San Bruno are located in designated Alquist-Priolo Zones for the San Andreas Fault.

Alquist-Priolo maps were referenced, but not specifically used, in the assessment of risk for this plan as a result of the existence of current extensive studies and regulations and ongoing monitoring and update of Alquist-Priolo Zones by the State of California. This plan assumes that the studies conducted, and information provided by the State of California are the best available data for surface rupture risk and could not be improved through a separate assessment for this plan. Alquist-Priolo maps are available to the public at:

http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps.

Figure 10-3**. NEHRP Soil Class**

C (Dense soil/soft rock)
D (Stiff soil)
E (Soft clay)
Cities
County Boundary
Highways
Airport
Rail Station

N
0 2 4 Miles

Data Sources: San Mateo Co., CGS

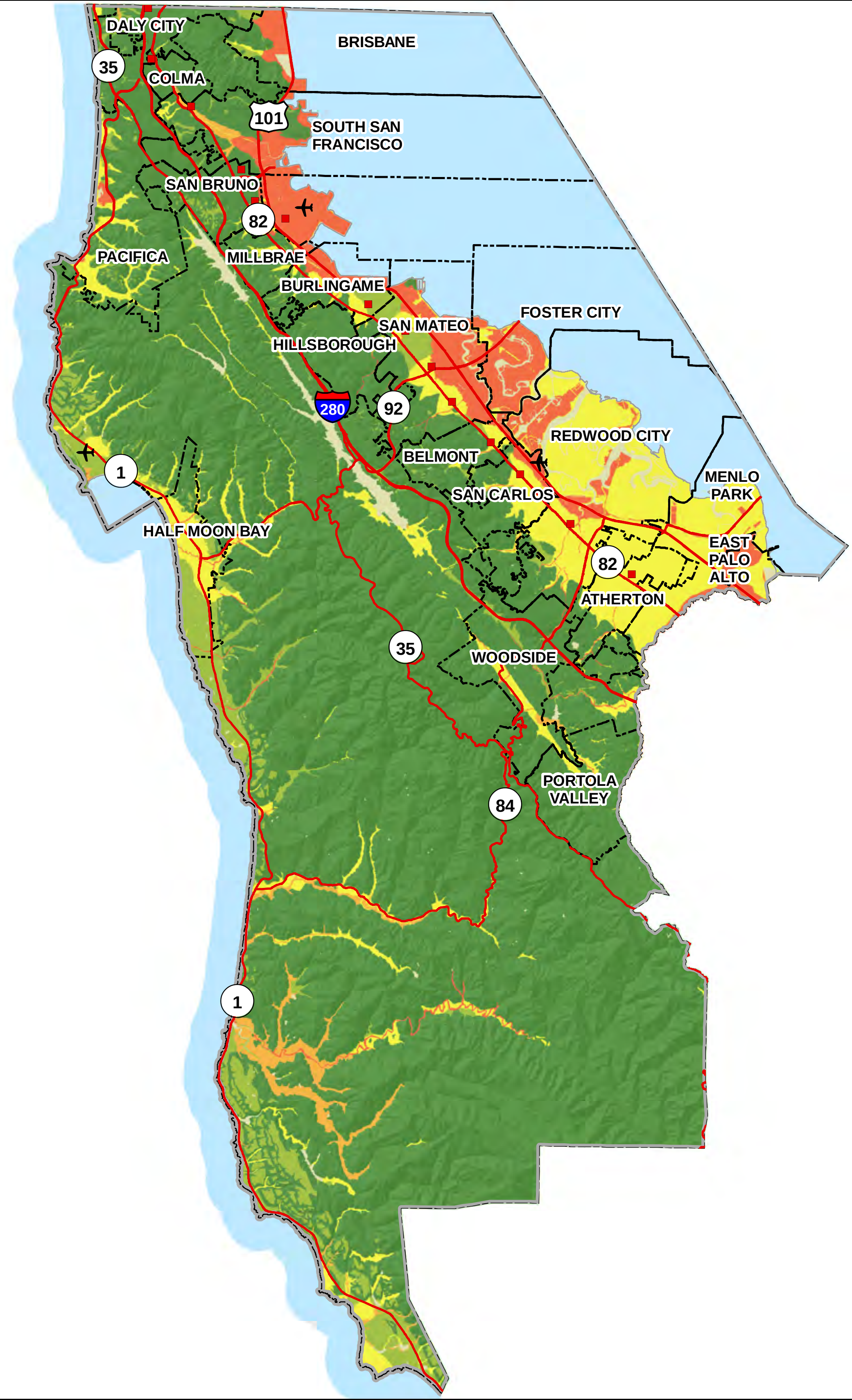
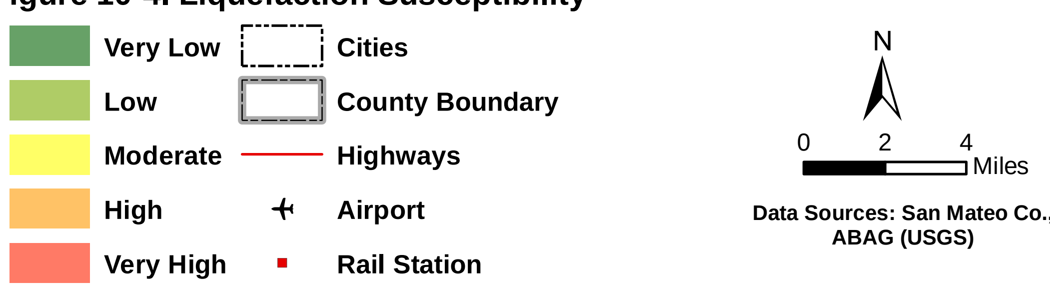


Figure 10-4. Liquefaction Susceptibility



Data Sources: San Mateo Co., ABAG (USGS)

10.2.3 Frequency

Historical records of earthquake occurrences give some indication of future probabilities. Seismic activity was more frequent from 1830 to 1930 than it has been since. This leads some scientists to suspect that pressure is building up along the faults in the Bay Area that can result in a large quake. Such a quake could have dramatic and devastating effects throughout the Bay Area. The USGS reports the following earthquake probabilities for the Bay Area over next 30 years (U.S. Geological Survey, n.d.):

- 72 percent probability of an earthquake measuring magnitude 6.7
- 51 percent probability of an earthquake measuring magnitude 7
- 20 percent probability of an earthquake measuring magnitude 7.5

The *Third Uniform California Earthquake Rupture Forecast* identified recurrence intervals for four deterministic scenarios applicable to San Mateo County (Working Group on California Earthquake Probabilities, 2021):

- San Andreas Fault scenario, recurrence interval = 160 years
- San Gregorio Fault Scenario = 481 years
- Butano Fault Scenario = 2,881 years
- Monte Vista Fault Scenario = 1,894 years

10.2.4 Severity

The severity of an earthquake can be expressed in terms of intensity or magnitude (see Section 10.1.3). The State of California Department of Conservation probabilistic ground shaking maps, based on current information about fault zones, show the PGA that has a certain probability of being exceeded in a 50-year period. San Mateo County is in a high-risk area, with a 10-percent probability in a 50-year period of ground shaking from a seismic event exceeding 60 percent of gravity in some parts of the County. Figure 10-5 shows the expected peak horizontal ground accelerations for this probability.

10.2.5 Warning Time

There is no current reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that detect the lower energy compressional waves (P waves) that precede the secondary waves (S waves) experienced as an earthquake. Earthquake early warning systems may provide a few seconds' or a few minutes' notice that a major earthquake is about to occur. The warning time is very short, but it could allow for someone to get under a desk, pause hazardous or high-risk work, or initiate protective automated systems in critical facilities.

10.3 EXPOSURE

10.3.1 Population

The entire population of the planning area is potentially exposed to direct damage from earthquakes or indirect impacts such as business interruption, road closures, and loss of function of utilities.

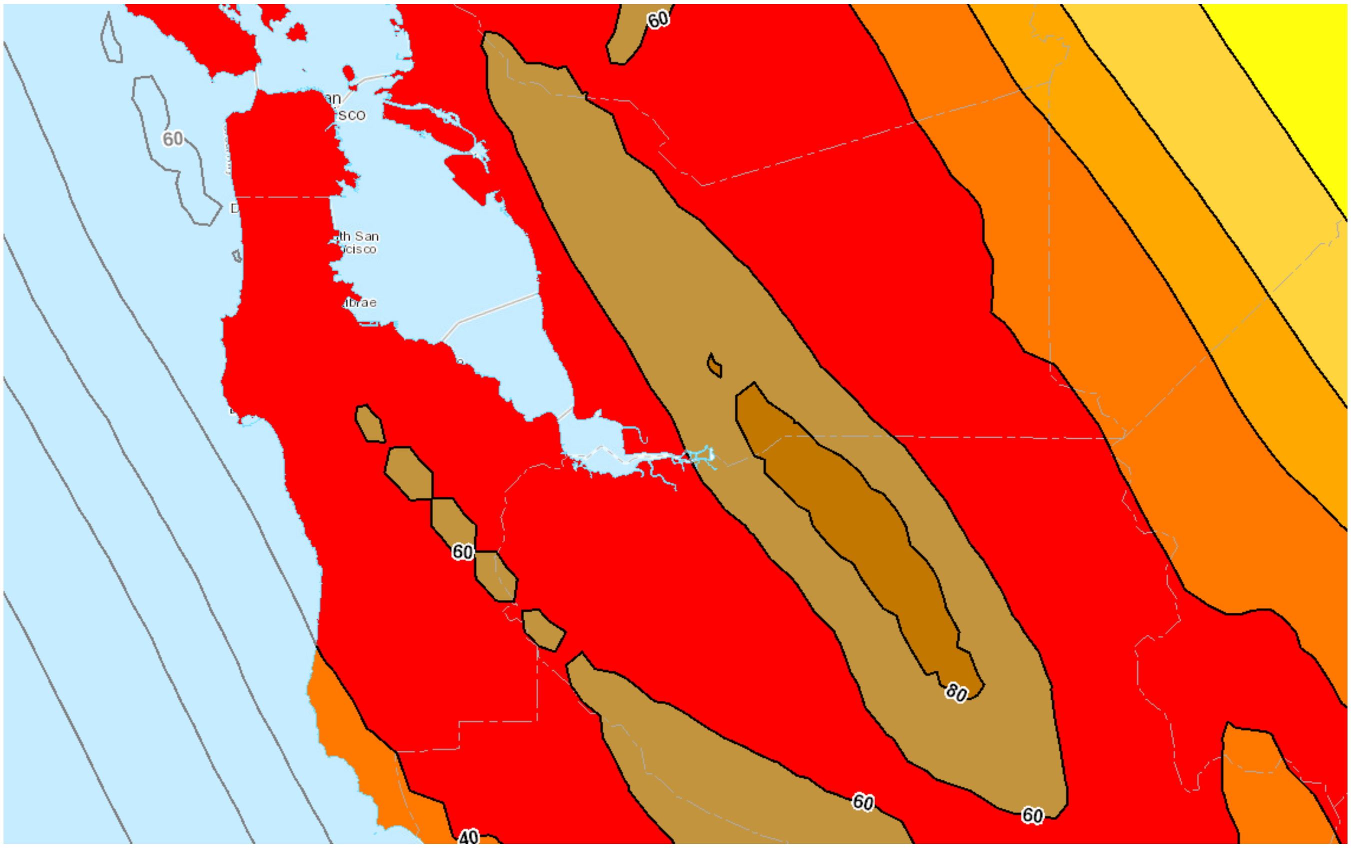


Figure 10-5. Peak Ground Acceleration with 10% Probability of Exceedance in 50 Years

10.3.2 Property

According to County Assessor records, there are 194,052 buildings in the planning area. Most of the buildings (95 percent) are residential. All buildings are considered to be exposed to the earthquake hazard.

10.3.3 Critical Facilities

Since the entire planning area has exposure to the earthquake hazard, all critical facilities components are considered to be exposed. The breakdown of the numbers and types of facilities is presented in Table 4-5. Critical facilities constructed on NEHRP Type D and E soils are particularly at risk from seismic events. Figure 10-6 shows the number of critical facilities built on these soils in the planning area, by type of facility.

10.3.4 Environment

The entire planning area is exposed to the earthquake hazard, including all natural resources, habitat and wildlife.

10.4 VULNERABILITY

Earthquake vulnerability data for the risk assessment was generated using a Hazus Level 2 (user-defined) analysis for the for the events listed in Table 10-5. The analysis results are summarized in the sections below, and more detailed information, broken down by municipality, can be found in Appendix E.

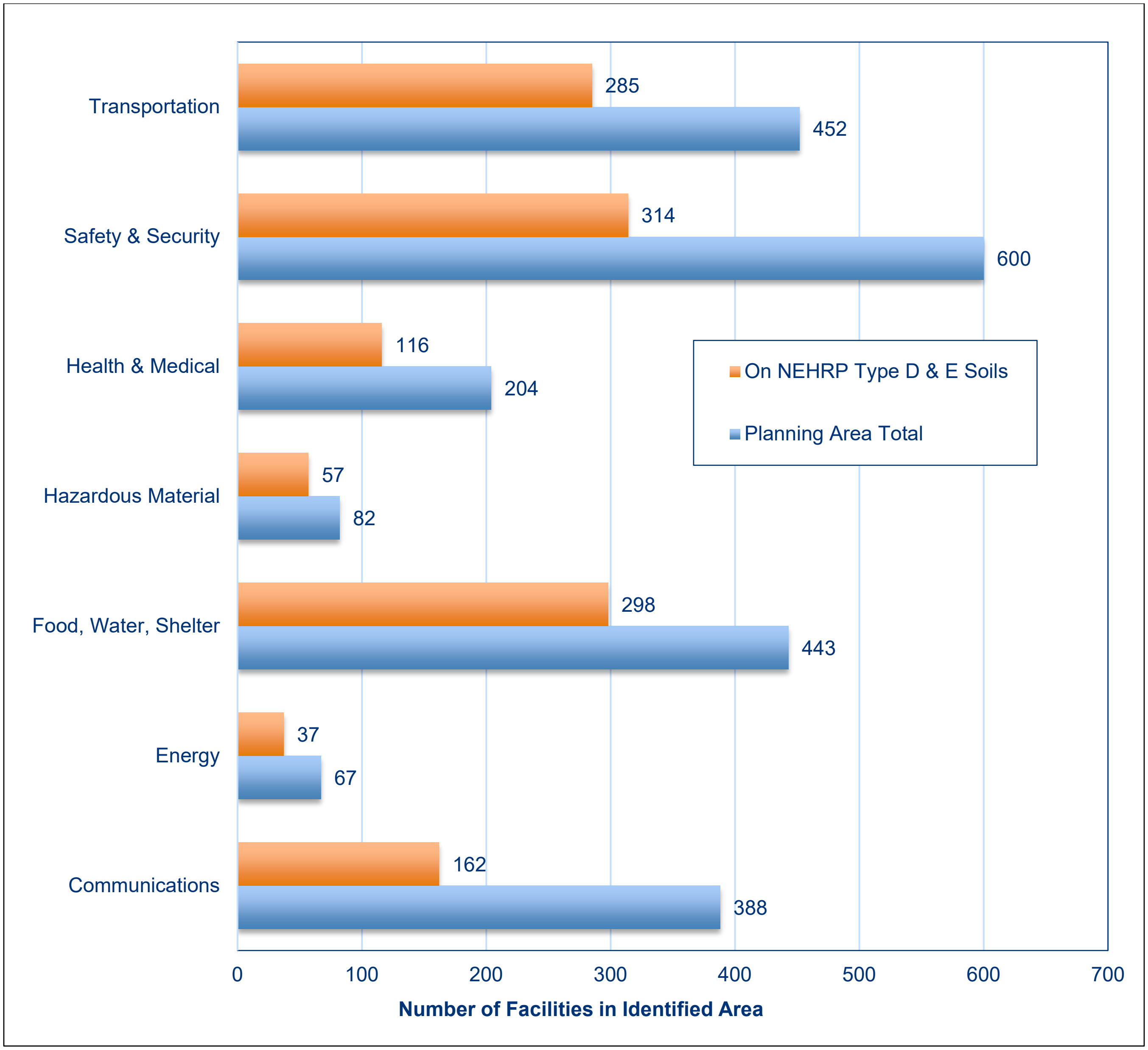


Figure 10-6. Critical Facilities Constructed on NEHRP Type D and E Soils, and Countywide

Table 10-5. Earthquakes Modeled for Risk Assessment

Event	Magnitude	Focal Depth	Epicenter Location	Figure #
San Andreas Fault Scenario	7.38	7.0 km	N37.52 W122.36	Figure 10-7
San Gregorio Fault Scenario	7.44	7.7 km	N37.41 W122.43	Figure 10-8
Butano Fault Scenario	6.93	9.1 km	N37.24 W122.15	Figure 10-9
Monte Vista Fault Scenario	7.14	7.8 km	N37.27 W122.09	Figure 10-10
100-Year Probabilistic	N/A	7.8 km	N/A	Figure 10-11

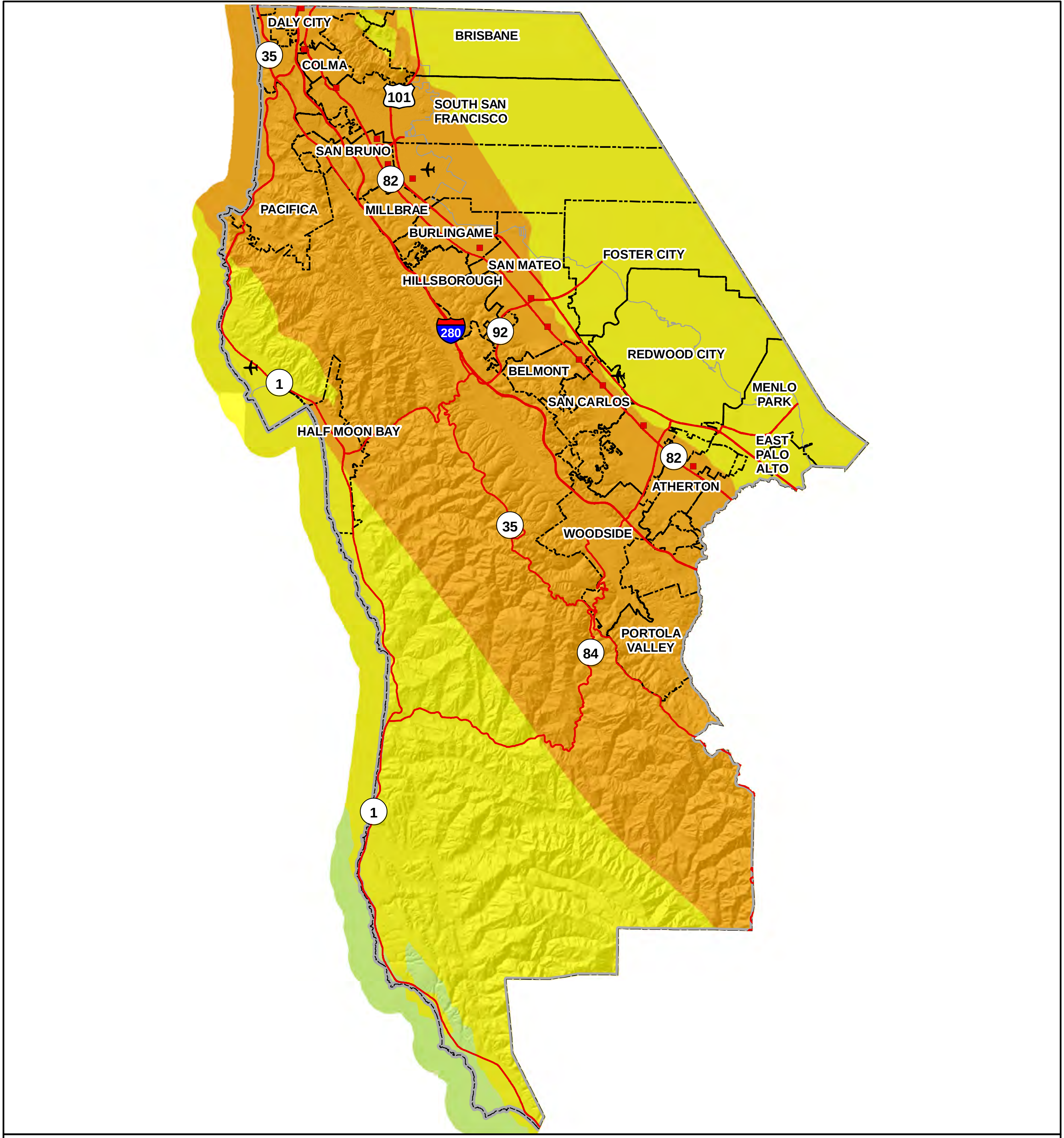


Figure 10-7. San Andreas ShakeMap Scenario

Mercalli Intensity Scale

- **VI (Strong/Light)**
- **VII (Very Strong/Moderate)**
- **VIII (Severe/Moderate-Heavy)**

- **Cities**
- **County Boundary**
- **Highways**
- **Airport**
- **Rail Station**

N

0 2 4 Miles

Data Sources: San Mateo Co., USGS

Intensity scale described as: (perceived shaking / potential damage)

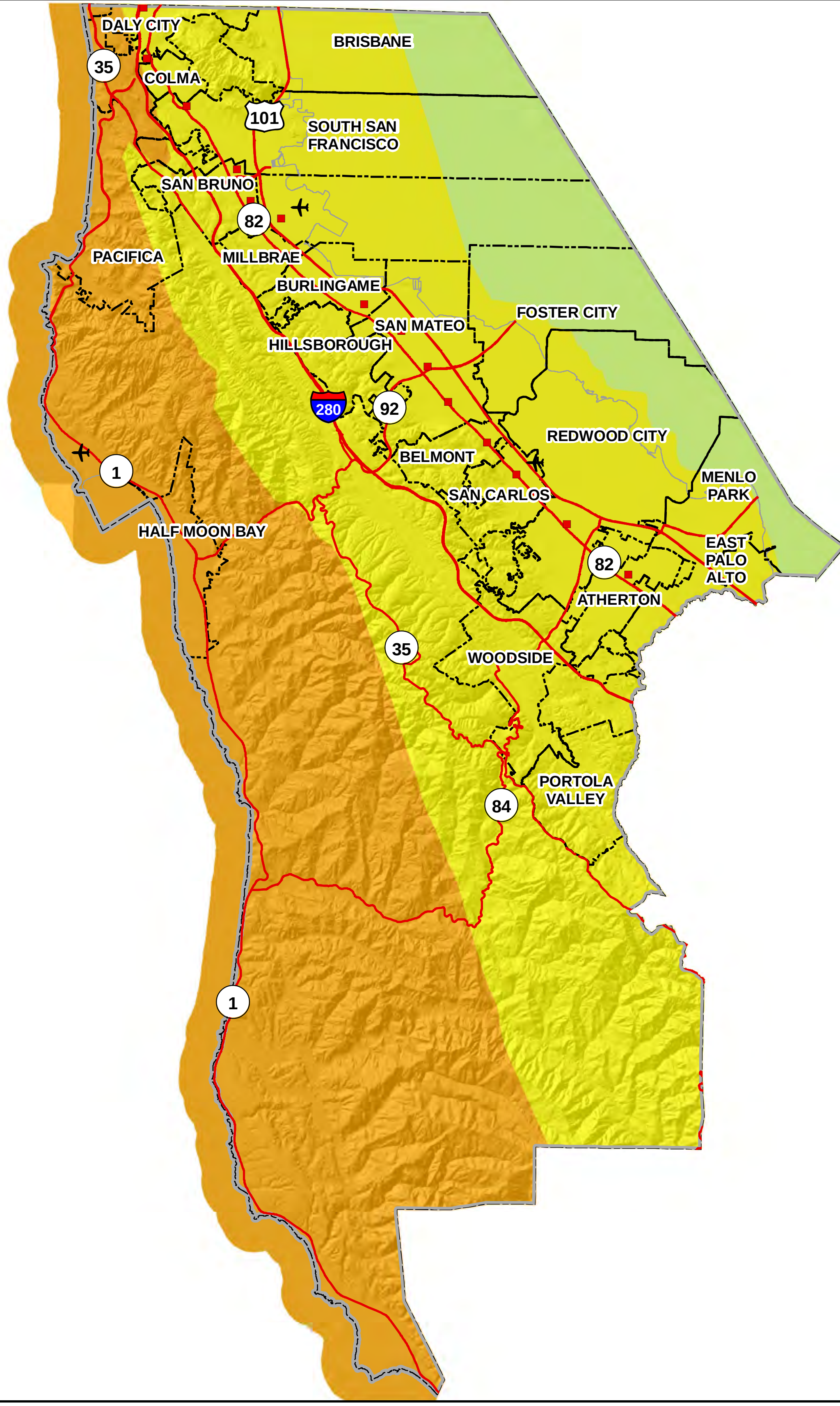


Figure 10-8. San Gregorio ShakeMap Scenario

Mercalli Intensity Scale

- **VI (Strong/Light)**
- **VII (Very Strong/Moderate)**
- **VIII (Severe/Moderate-Heavy)**

Cities

County Boundary

Highways

Airport

Rail Station

N

0 2 4 Miles

Data Sources: San Mateo Co., USGS

Intensity scale described as: (perceived shaking / potential damage)

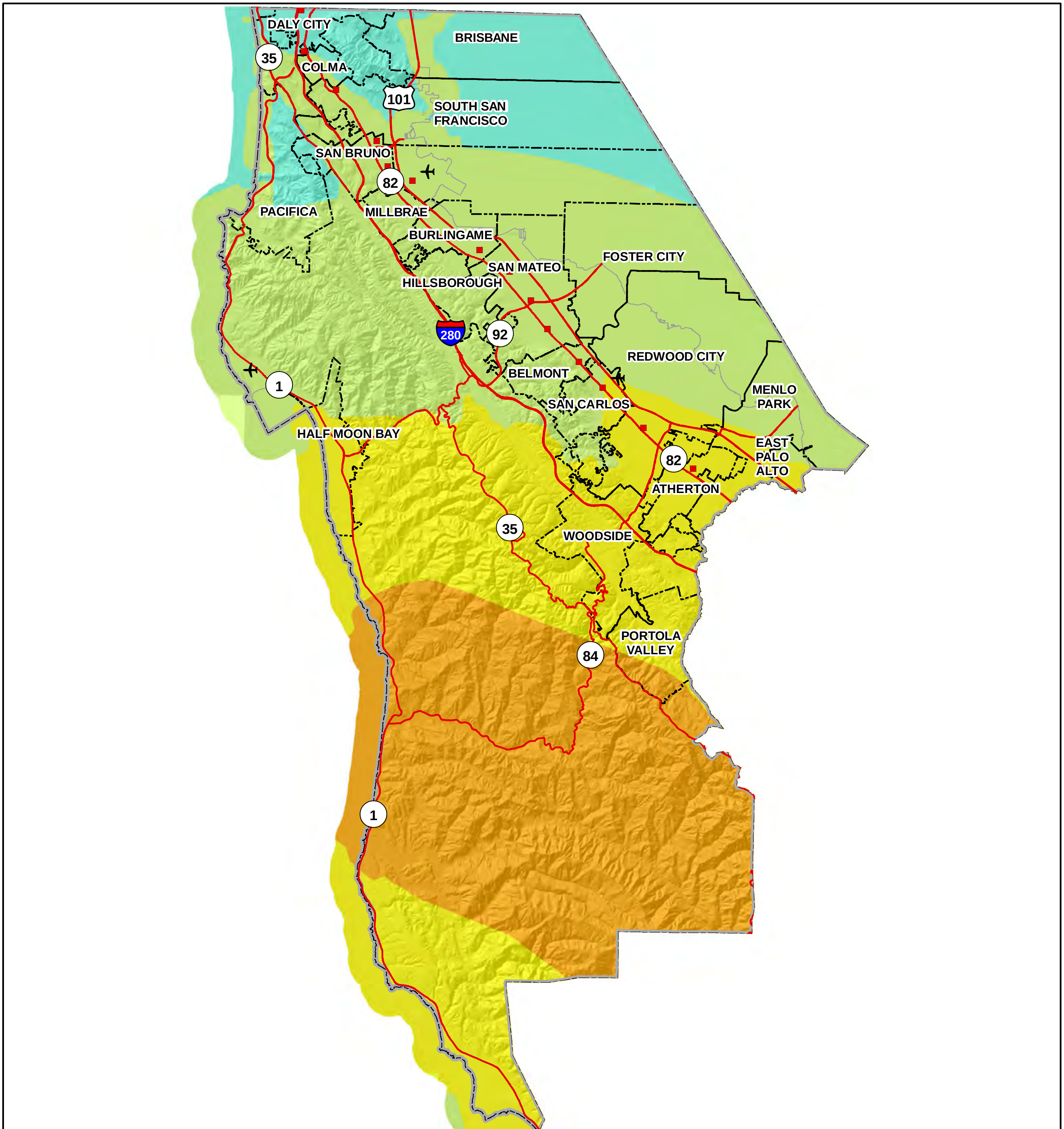


Figure 10-9. **Buta**no ShakeMap **Scenario**

Mercalli Intensity Scale

V (Moderate/Very Light)

VI (Strong/Light)

VII (Very Strong/Moderate)

VIII (Severe/Moderate-Heavy)

Intensity scale described as: (perceived shaking / potential damage)

Cities

County Boundary

Highways

Airport

Rail Station

N

0 2 4 Miles

Data Sources: San Mateo Co., USGS

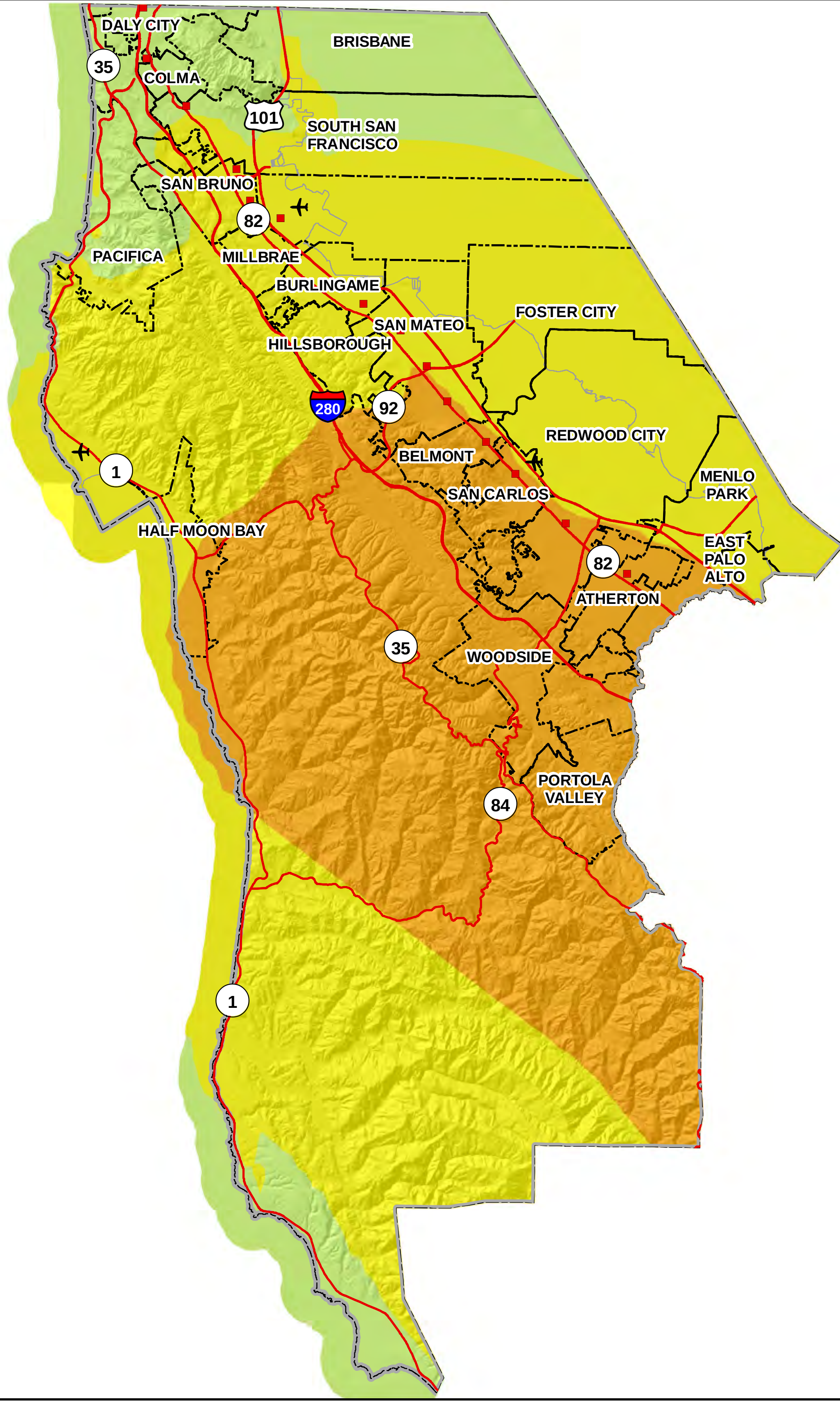


Figure 10-10 Monte Vista ShakeMap **Scenario**

Mercalli Intensity Scale

VI (Strong/Light)

VII (Very Strong/Moderate)

VIII (Severe/Moderate-Heavy)

Cities

County Boundary

Highways

Airport

Rail Station

N

0 2 4 Miles

Data Sources: San Mateo Co., USGS

Intensity scale described as: (perceived shaking / potential damage)

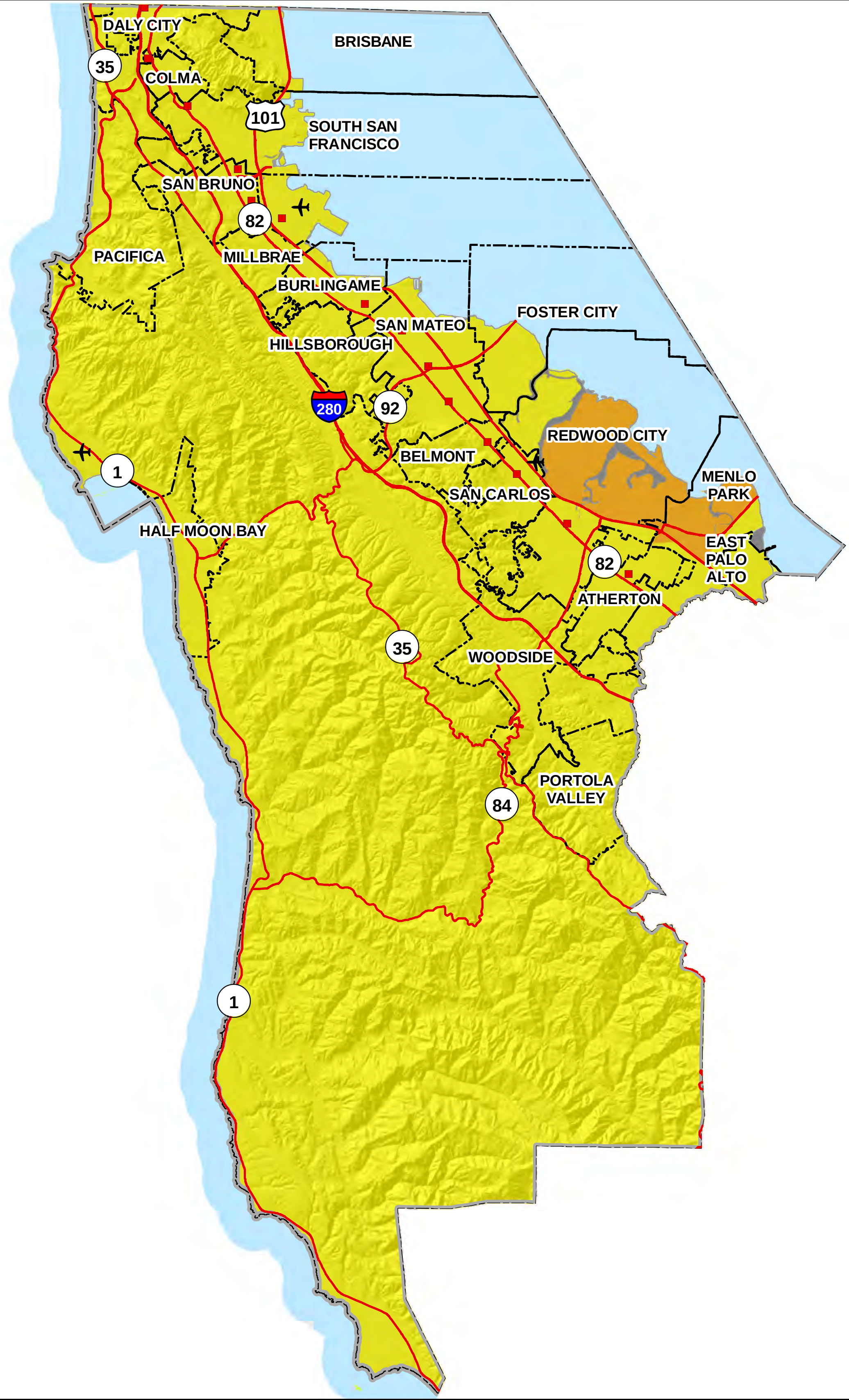


Figure 10-11. 100-Year Probabilistic Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)

- Cities
- County Boundary
- Highways
- Airport
- Rail Station

N

0 2 4 Miles

Data Sources: San Mateo Co., USGS

Intensity scale described as: (perceived shaking / potential damage)

10.4.1 Population

Community Members of High-Risk Areas

The degree of vulnerability is dependent on many factors, including the age and construction type of the structures people live in, the soil types their homes are constructed on, their proximity to fault location, etc. It is estimated that 38.6 percent of San Mateo County's population resides on soil classes considered susceptible to ground shaking from earthquakes (NEHRP Class D and E soils). An analysis was performed of the population living in these susceptible areas using the SoVI ratings (see Section 7.2.2). Detailed results by jurisdiction are in Appendix E. Table 10-6 summarizes results for the overall planning area.

Table 10-6. Distribution of Population Exposed to Earthquake Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	37,073	12.72%
Relatively High	86,842	29.79%
Relatively Moderate	74,000	25.39%
Relatively Low	59,263	20.33%
Very Low	34,301	11.7%

Estimated Impacts on Persons and Households

Hazus estimated impacts on persons and households in the planning area for the four selected earthquake scenarios as summarized in Table 10-7.

Table 10-7. Estimated Earthquake Impact on Persons

Scenario	Displaced Households		Persons Requiring Short-Term Shelter	
	Number	% of Total	Number	% of Total
100-Year Probabilistic	587	0.08%	342	0.04%
San Andreas Fault Scenario	1,977	0.26%	967	0.13%
San Gregorio Fault Scenario	264	0.03%	121	0.02%
Butano Fault Scenario	15	0.002%	6	0.0008%
Monte Vista Fault Scenario	513	0.07%	249	0.03%

10.4.2 Property

Building Age

Table 10-8 identifies significant milestones in building and seismic code requirements that directly affect the structural integrity of development. Using U.S. Census estimates of housing stock age, estimates were developed of the number of housing units constructed before each of these dates. More than 7 percent of the planning area's housing units were constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions. Housing units built before 1933 when there were no building permits, inspections, or seismic standards, account for 7.6 percent. Many of the housing units in the planning area are detached, single-family residences of wood construction, which generally perform well during earthquake events.

Table 10-8. Age of Housing Units in Planning Area

Time Period	Number of Current Planning Area Housing Units Built in Period	% of Total Housing Units	Significance of Time Frame
Pre-1933	15,588	8.0%	Before 1933, there were no explicit earthquake requirements in building codes. State law did not require local governments to have building officials or issue building permits.
1933-1940	10,025	5.2%	In 1940, the first strong motion recording was made.
1941-1960	87,547	45.1%	In 1960, the Structural Engineers Association of California published guidelines on recommended earthquake provisions.
1961-1975	40,454	20.8%	In 1975, significant improvements were made to lateral force requirements.
1976-1994	24,970	12.9%	In 1994, the Uniform Building Code was amended to include provisions for seismic safety.
1994 – present	15,468	8.0%	Seismic code is currently enforced.
Total	**194,052**	100%	

Note: Number and percent estimates are approximation as housing unit age information does not correspond directly with the time periods indicated. In addition, there are significant margins of error associated with the Census estimates.
Source: 2018 American Community Survey, San Mateo County, California

Soft-Story Buildings

A soft-story building is a multi-story building with one or more floors that are “soft” because of structural design. If a building has a floor that is 70-percent less stiff than the floor above it, it is considered a soft-story building. This soft story creates a major weak point in an earthquake. Since soft stories are typically associated with retail spaces and parking garages, they are often on the lower stories of a building. When they collapse, they can take the whole building down with them, causing serious structural damage that may render the structure unusable.

These floors can be especially dangerous in earthquakes because they cannot cope with the lateral forces caused by the swaying of the building during a quake. As a result, the soft story may fail, causing what is known as a soft-story collapse. Soft-story collapse is one of the leading causes of earthquake damage to private residences.

Exposure rates and vulnerability analysis associated with soft-story construction in the planning area are not currently known. ABAG and other agencies in the Bay Area have programs generating this type of data, but it is not known when such data will be available for San Mateo County. This type of data will need to be generated to support future risk assessments of the earthquake hazard.

Unreinforced Masonry Buildings

Unreinforced masonry buildings are constructed from materials such as adobe, brick, hollow clay tiles, or other masonry materials and do not contain an internal reinforcing structure, such as rebar in concrete or steel bracing for brick. Unreinforced masonry buildings pose a significant danger during an earthquake because the mortar holding masonry together is typically not strong enough to withstand significant earthquakes. Additionally, the brittle composition of these houses can break apart and fall away or buckle, potentially causing a complete collapse of the building.

In San Mateo County, unreinforced masonry buildings are generally brick buildings that were constructed before modern earthquake building codes and designs were enacted. The State of California enacted a law in 1986 that required all local governments in Seismic Zone 4 (nearest to active earthquake faults) to inventory unreinforced masonry buildings. The law encourages local governments to adopt local mandatory strengthening programs, delineate seismic retrofit standards, and put into place measures to reduce the number of people in unreinforced masonry buildings.

According to ABAG, housing units in unreinforced masonry buildings account for only 1-percent of the total Bay Area housing stock and 2.9-percent of the total Bay Area multi-family stock.

Loss Potential

Table 10-9 summarizes Hazus estimates of earthquake damage in the planning area for the four scenarios. The debris estimate includes only structural debris; it does not include additional debris that may accumulate, such as from trees. In addition, these estimates do not include losses that would occur from any local tsunamis or fires stemming from an earthquake.

Table 10-9. Estimated Impact of Earthquake Scenario Events in the Planning Area

	100-Year Probabilistic Earthquake	San Andreas Fault Scenario	San Gregorio Fault Scenario	Butano Fault Scenario	Monte Vista Fault Scenario
Estimated Loss					
Structural	$10,073,424,657	$22,126,733,755	$12,276,099,854	$4,677,853,811	$14,347,471,821
Contents	$4,604,600,185	$9,173,501,156	$5,192,968,440	$2,135,742,033	$6,067,256,924
Total	**$14,678,024,842**	**$31,300,234,912**	**$17,469,068,294**	**$6,813,595,844**	**$20,414,728,745**
% of Total Planning Area Replacement Value	7.6%	16.3%	9.1%	3.6%	10.6%
Structural Debris					
Tons	1,058,370	4,136,710	1,198,240	286,470	2,235,260
Truckloads	42,334	165,468	47,929	11,4759	89,410

10.4.3 Critical Facilities

Level of Damage

Hazus classifies the vulnerability of critical facilities to earthquake as no damage, slight damage, moderate damage, extensive damage, or complete damage. Hazus was used to assign a category to each critical facility in the planning area for the assessed earthquake scenarios. Summary results are shown in Figure 10-12 through Figure 10-16.

Time to Return to Functionality

Hazus estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, Hazus may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95 percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the assessed earthquake scenarios. The results are summarized in Figure 10-17 through Figure 10-21. These figures show the average functionality for all critical facilities in each category.

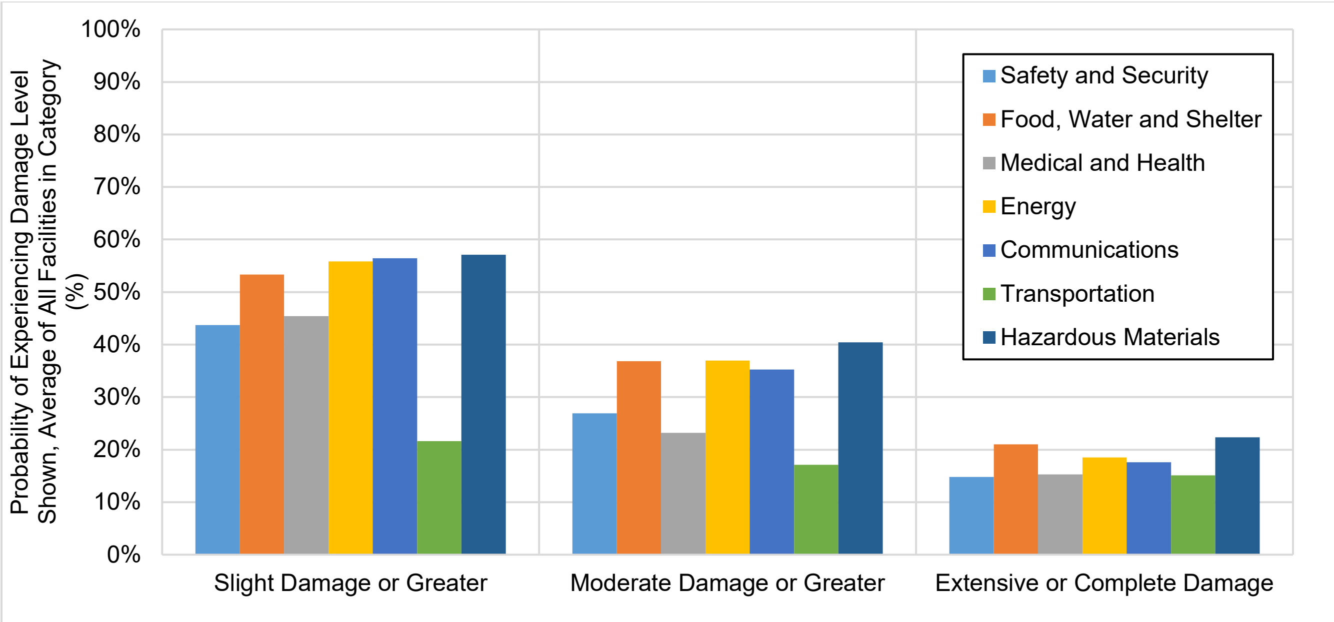


Figure 10-12. Critical Facility Damage Potential, 100-Year Probabilistic Earthquake

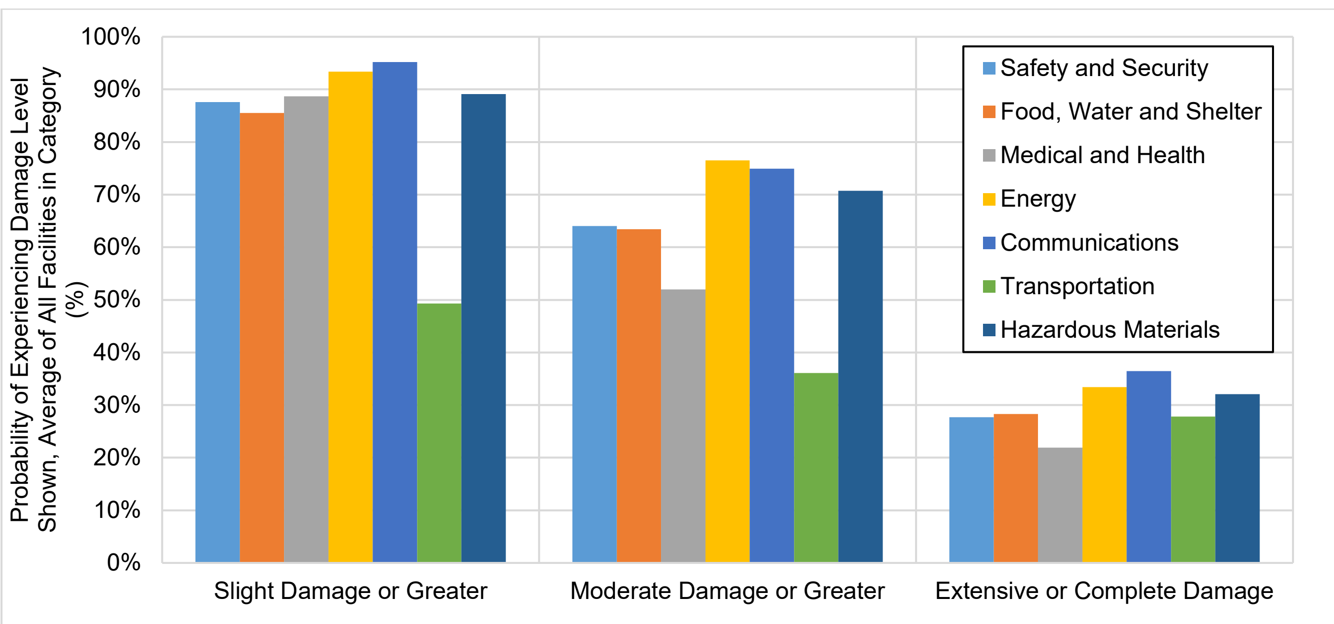


Figure 10-13. Critical Facility Damage Potential, San Andreas Fault Scenario

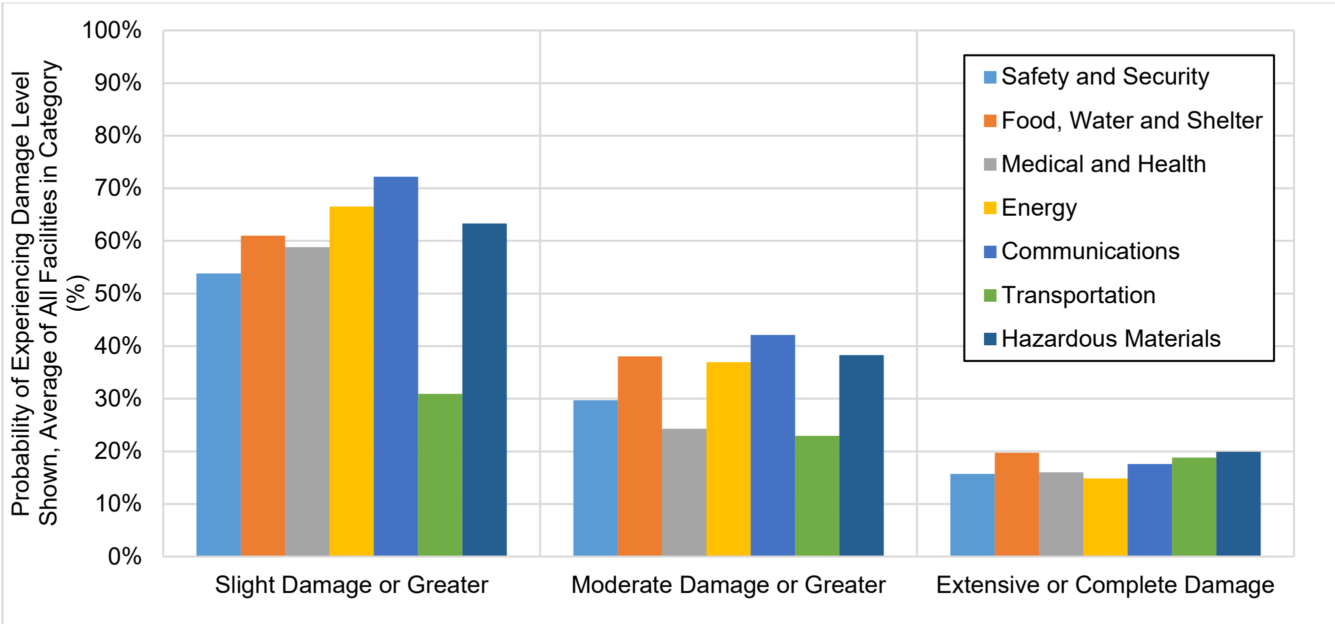


Figure 10-14. Critical Facility Damage Potential, San Gregorio Fault Scenario

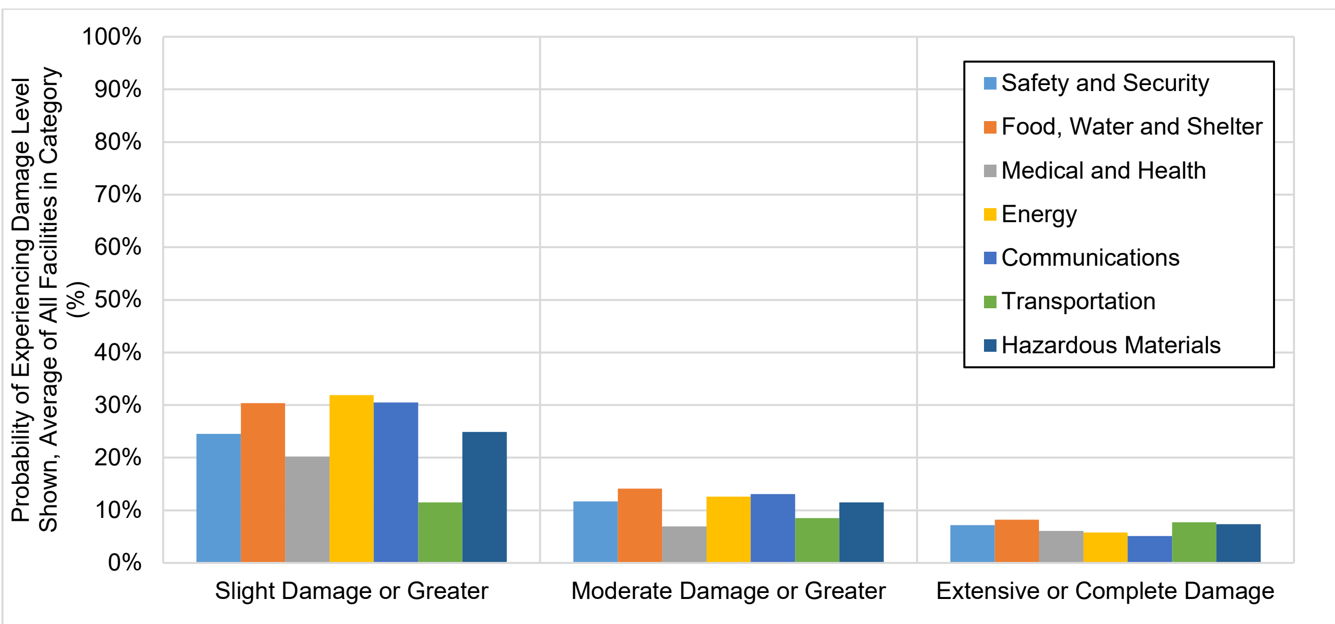


Figure 10-15. Critical Facility Damage Potential, Butano Fault Scenario

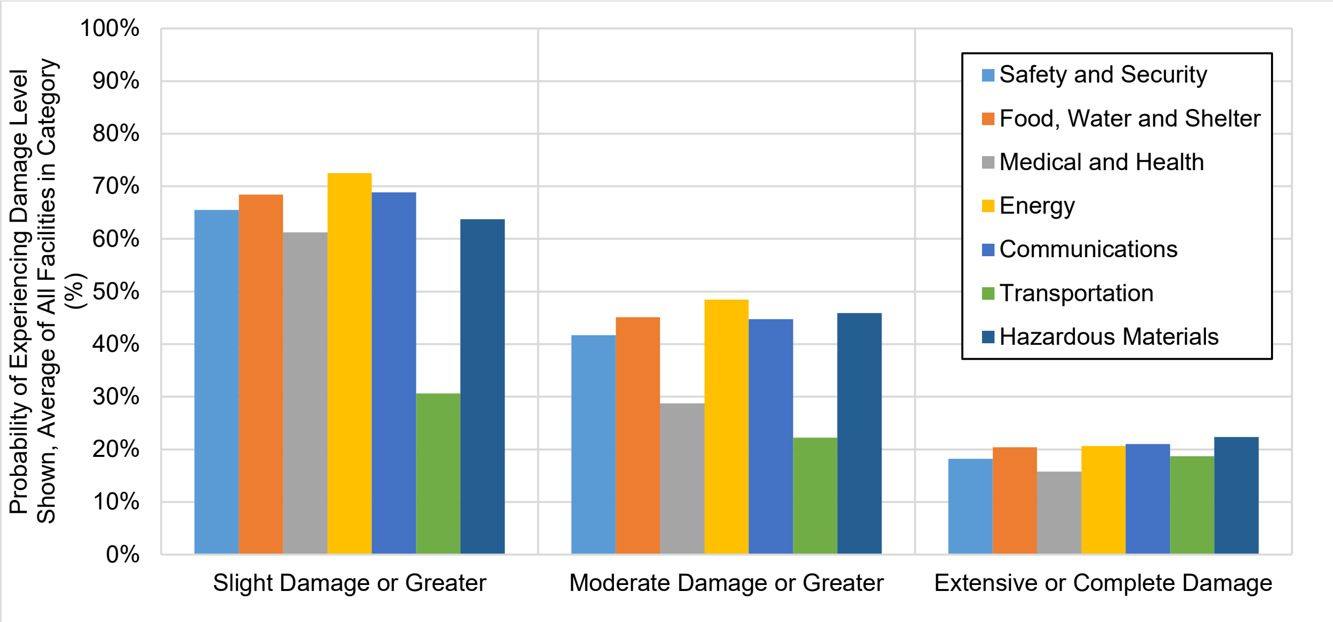


Figure 10-16. Critical Facility Damage Potential, Monte Vista Fault Scenario

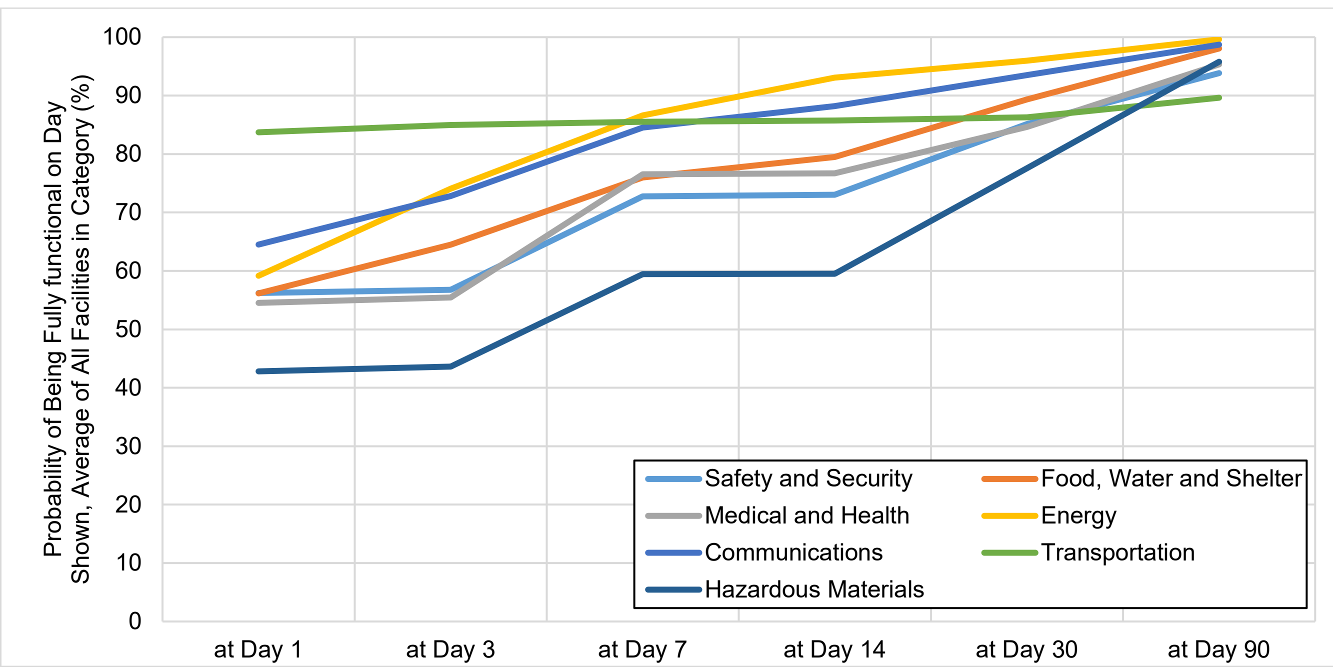


Figure 10-17. Critical Facility Functionality, 100-Year Probabilistic Earthquake

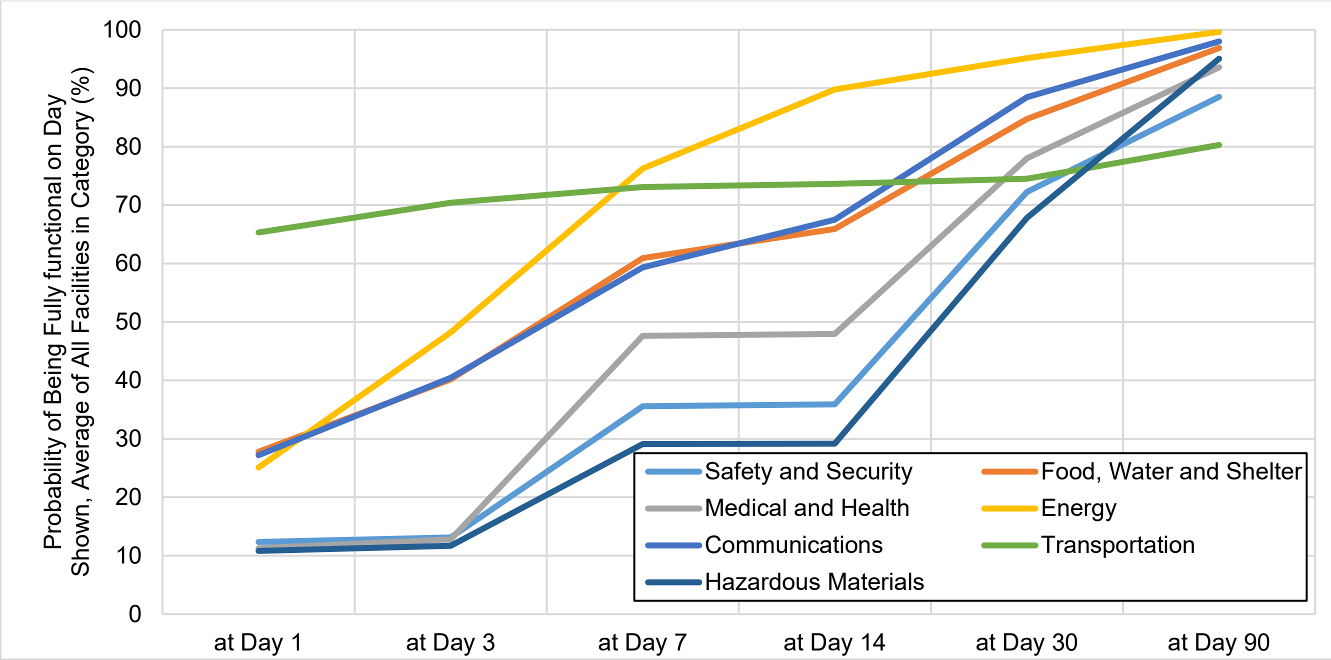


Figure 10-18. Critical Facility Functionality, San Andreas Fault Scenario

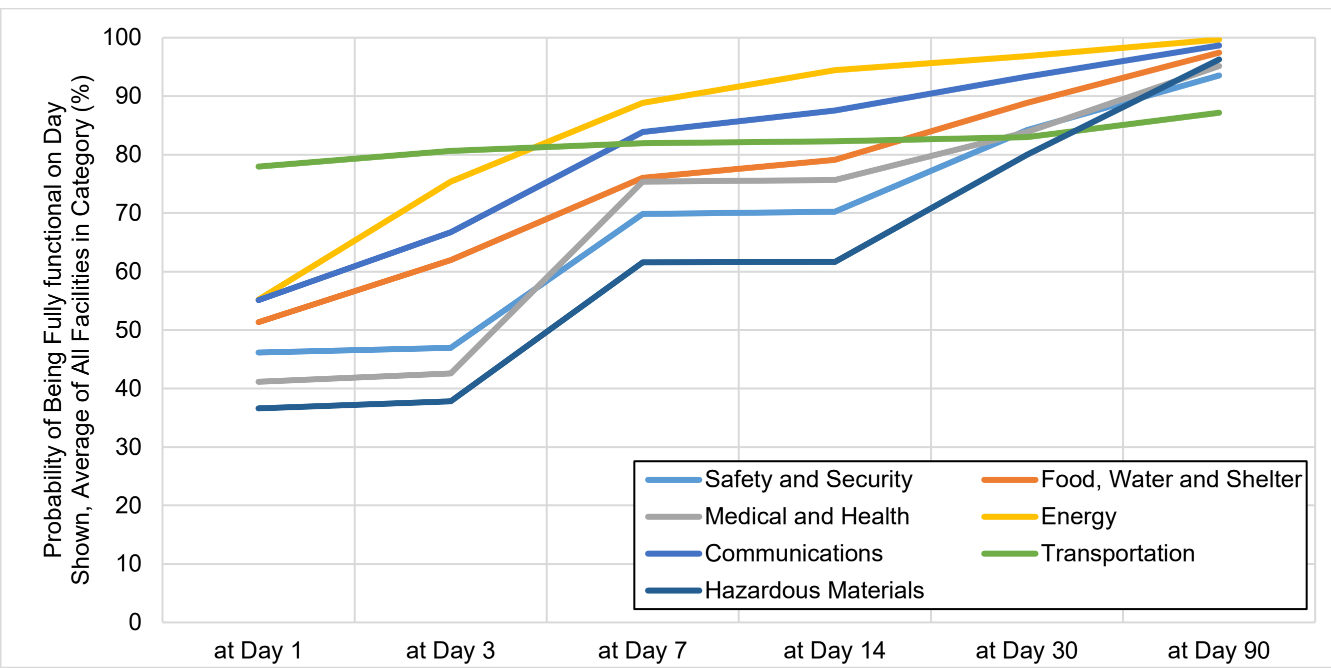


Figure 10-19. Critical Facility Functionality, San Gregorio Fault Scenario

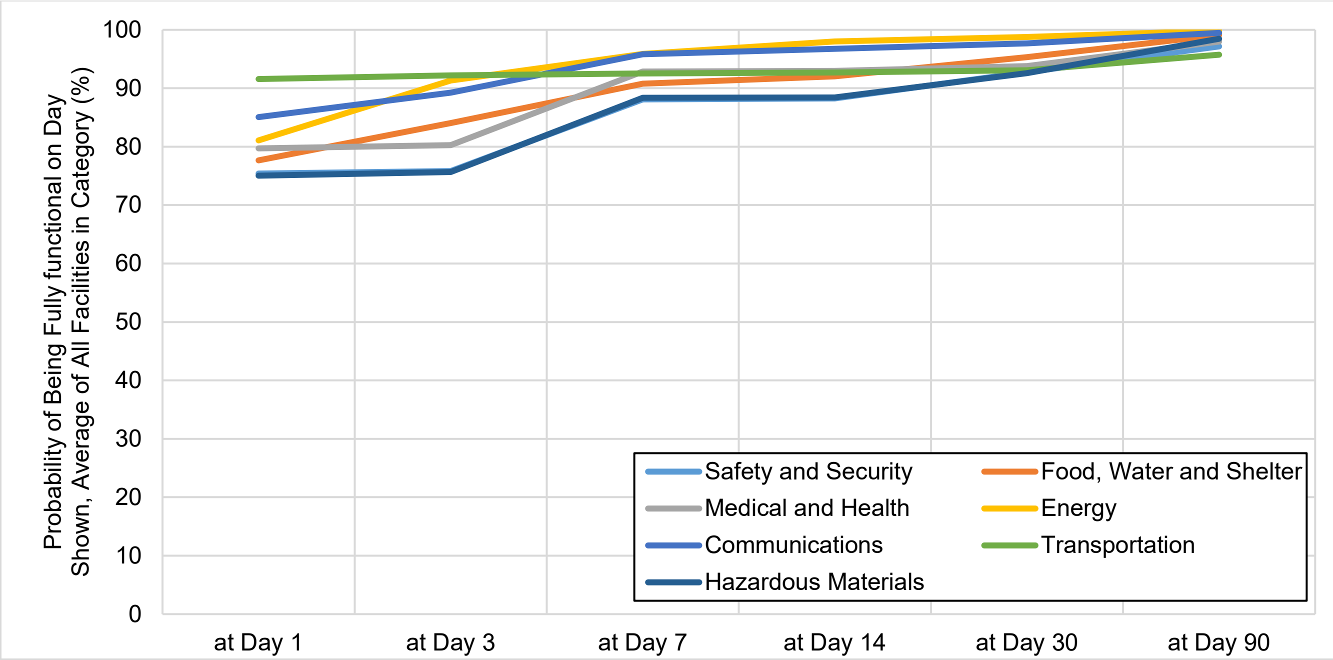


Figure 10-20. Critical Facility Functionality, Butano Fault Scenario

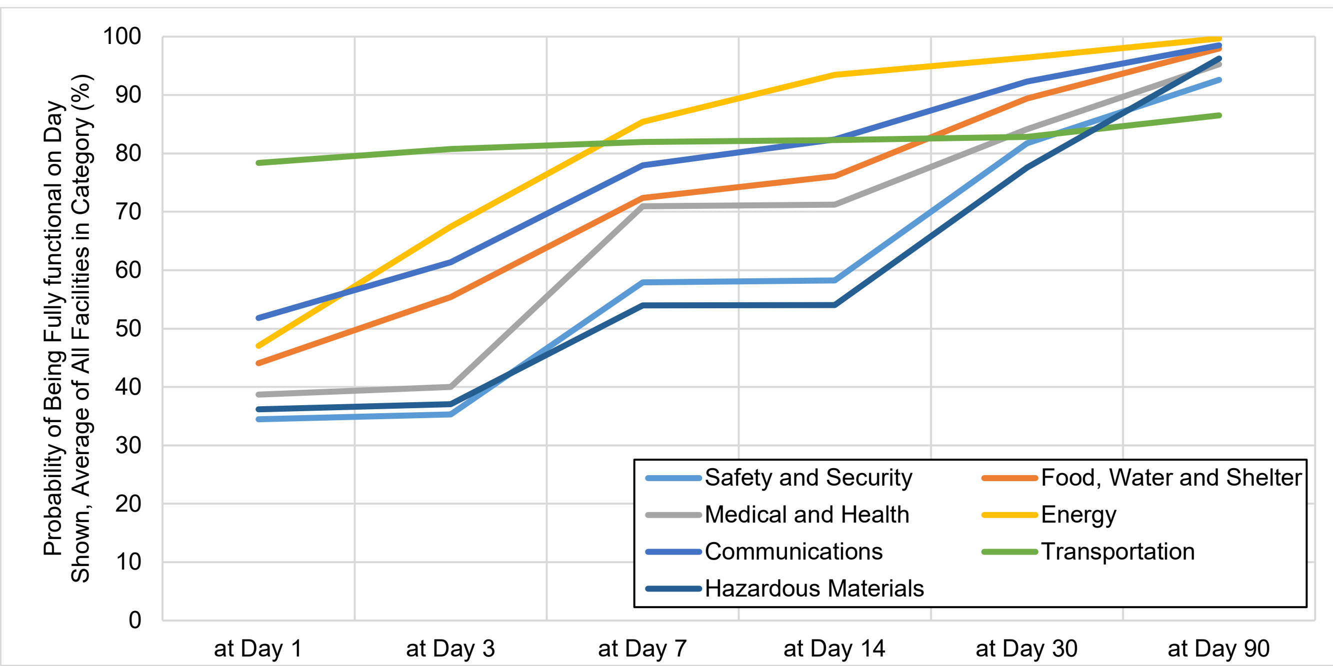


Figure 10-21. Critical Facility Functionality, Monte Vista Fault Scenario

Hazardous Materials

Hazardous material releases from fixed facilities and transportation-related releases can occur during an earthquake.

Transportation

Roads have the potential to be significantly damaged during an earthquake. Access to major roads is crucial to life and safety after a disaster event as well as to response and recovery operations. Disruption in transportation systems is of particular concern to coastal community members, as a major event has the potential to isolate communities from critical assistance and aid. Additionally, Bay Area Rapid Transit (BART) provides transportation service to the northern portion of San Mateo County from South San Francisco to Millbrae and the San Francisco Airport. Much of the BART transportation infrastructure in San Mateo County is underground. BART tunnels may collapse during a high magnitude event, leading to loss of life and potential release of hazardous materials.

Earthquakes can significantly damage bridges, which often provide the only access to some neighborhoods. Since soft soil regions generally follow floodplain boundaries, bridges that cross water courses are vulnerable. Key factors in the degree of vulnerability are the facility's age and type of construction, 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 amount of infrastructure and because water and sewer infrastructure are usually linear easements, which are difficult to thoroughly assess in Hazus. Without further analysis of individual system components, it should be assumed that these systems are exposed to breakage and failure.

10.4.4 Environment

Environmental problems as a result of an earthquake can be numerous. Secondary hazards will likely have some of the most damaging effects on the environment. Earthquake-induced landslides 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. Streams fed by groundwater wells can dry up because of changes in underlying geology.

10.5 FUTURE TRENDS IN DEVELOPMENT

The planning area population could increase by as much as 10 percent by 2030. As populations grow, it is critical that the services supporting these communities—such as water, sewer, power, roads, hospitals, and public safety agencies—are able to maintain or quickly resume functionality after a disaster. Land use in the planning area will be directed by general plans adopted under California's General Planning Law. The safety elements of the general plans establish standards and plans for the protection of the community from hazards, including seismic hazards. The information in this plan provides a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. Geologic hazard areas are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

San Mateo County and participating cities strictly enforce all seismic building codes and design standards to prevent loss of life and property caused by earthquake. Municipal planning partners are encouraged to establish general plans with policies directing land use and dealing with issues of seismic safety. These plans provide the capability at the local municipal level to protect future development from the impacts of earthquakes. Public education, cooperation with the development community, and individual preparedness are essential as the planning area welcomes new community members and businesses.

10.6 SCENARIO

Based on history and geology, the planning area will be frequently impacted by earthquakes. The worst-case scenario is a higher-magnitude event (7.5 or higher) with an epicenter within 50 miles of the county. The San Andreas fault scenario modeled for this risk assessment would mimic this scenario. Earthquakes of this magnitude or higher could lead to massive structural failure of property on soils prone to liquefaction. Building and road foundations would lose load-bearing strength. Injuries could occur from debris, such as parapets and chimneys that could topple or be shaken loose and fall on those walking or driving below. Levees and revetments built on these poor soils would likely fail, representing a loss of critical facilities. An earthquake event of this magnitude located off the coast could cause a significant local tsunami that would further damage structures and jeopardize lives. An earthquake may also cause minor landslides along unstable slopes, which put at risk major roads and highways that act as sole evacuation routes. This would be even more likely if the earthquake occurred during the winter or early spring.

10.7 ISSUES

Important issues associated with an earthquake include the following:

- More information is needed on the exposure and performance of soft-story construction within the planning area.
- It is estimated that over 70 percent of the planning area’s building stock was built prior to 1975, when seismic provisions became uniformly applied through building code applications. Many structures may need seismic retrofits in order to withstand a moderate earthquake. Residential retrofit programs, such as Earthquake Brace+Bolt, may be able to assist in the costs of these efforts.
- Based on the modeling of critical facility performance performed for this plan, a high number of facilities in the planning area are expected to suffer complete or extensive damage from scenario events. These facilities are prime targets for structural retrofits.
- Critical facility owner should be encouraged to create or enhance Continuity of Operations Plans using the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- There are a large number of earthen dams within the planning area. Dam failure warning and evacuation plans and procedures should be reviewed and updated to reflect the dams’ risk potential associated with earthquake activity in the region. The County levees should also be included in any assessments for earthquake risk.
- Earthquakes could trigger other natural hazard events such as dam failures, flood, fire, and landslides, which could severely damage the County.

- A worst-case scenario would be the occurrence of a large seismic event during a flood or high-water event. Levees would fail at multiple locations, increasing the impacts of the individual events.
- Community members are expected to be self-sufficient up to 3 days after a major earthquake without government response agencies, utilities, private-sector services, and infrastructure components. Education programs are currently in place to facilitate development of individual, family, neighborhood, and business earthquake preparedness. Government alone can never make this region fully prepared. It takes individuals, families, and communities working in concert with one another to truly be prepared for disaster.
- After a major seismic event, San Mateo County is likely to experience disruptions in the flow of goods and services resulting from the destruction of major transportation infrastructure across the broader region.

11. FLOOD

11.1 GENERAL BACKGROUND

11.1.1 Types of Flooding in the Planning Area

Four types of flooding primarily affect San Mateo County: riverine, stormwater runoff, flash floods, and coastal floods. The following subsections describe each type.

Riverine Floods

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

- **Inundation**—Inundation occurs when floodwater is present and debris flows through an area not normally covered by water. These events cause minor to severe damage, depending on velocity and depth of flows, duration of the flood event, quantity of logs and other debris carried by the flows, and amount and type of development and personal property along the floodwater's path.
- **Channel Migration**—Erosion of banks and soils worn away by flowing water, combined with sediment deposition, causes migration or lateral movement of a river channel across a floodplain. A channel can also abruptly change location (termed "avulsion"); a shift in channel location over a large distance can occur within as short a time as one flood event.

The frequency and severity of flooding for river systems are based on discharge probability. The discharge probability is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for different discharge levels and storm surge levels. These measurements reflect statistical averages only; it is possible for multiple floods with a low probability of occurrence (such as a 1-percent-annual-chance flood) to occur in a short time period. For riverine flooding, the same flood event can have flows at different points on a river that correspond to different probabilities of occurrence.

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas inundated by the 1-percent-annual-chance flood with flood depths of only 1 to 3 feet. These areas are generally flooded by low-velocity sheet flows of water.

Coastal Floodplains

Coastal floods are characterized by inundation of normally dry lands by ocean waters. Storm surge associated with severe storms, tsunamis, or extreme high tide events can result in shallow flooding of low-lying coastal areas. Storm surge floods typically result in coastal erosion, salinization of freshwater sources, and contamination of water supplies. These floods are also responsible for significant agricultural losses, loss of life, and damage to public and private structures and infrastructure. The San Mateo County coastline extends 55 miles and hosts both residential and agricultural communities. The Pacific Ocean is the most likely source of coastal flooding in the County, although flooding from the San Francisco Bay is also a possibility during significant events.

San Mateo County has mitigated some of its vulnerability to coastal flooding through a series of levees originally installed for salt evaporation ponds in the southeastern part of the County and for flood protection in the north and central parts of the County. These levees were not designed to withstand floods of magnitude greater than the 1-percent-annual-chance flood (San Mateo County Sheriff, 2015).

Stormwater Runoff Floods

Stormwater flooding is a result of local drainage issues and high groundwater levels. Locally, heavy rain, especially during high lunar tide events, may induce flooding within areas other than delineated floodplains or along recognizable channels due to presence of storm system outfalls inadequate to provide gravity drainage into the adjacent body of water. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. Flooding issues of this nature generally occur within areas with flat gradients, and generally increase with urbanization, which speeds accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 1997).

Urban drainage flooding is caused by increased water runoff due to urban development and drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and within other urban areas. These systems utilize a closed conveyance system that channels water away from an urban area to surrounding streams, and bypasses natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development within that area (FEMA 2008).

Flash Floods

The National Weather Service defined a flash flood as follows (NWS, 2009):

> “a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within 6 hours of the causative event (e.g., intense rainfall, dam failure). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters”

Flash floods can tear out trees, undermine buildings and bridges, and scour new channels. In urban areas, flash flooding is an increasingly serious problem due to removal of vegetation and replacement of ground cover with impermeable surfaces such as roads, driveways, and parking lots. The greatest risk from flash floods is occurrence with little to no warning. Major factors in predicting potential damage are intensity and duration of rainfall, and steepness of watershed and streams.

11.1.2 FEMA Regulatory Flood Zones

FEMA defines flood hazard areas through statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on Digital Flood Insurance Rate Maps (DFIRMs), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated both special flood hazard areas (SFHAs) and risk premium zones. DFIRMS identify the following:

- Locations of specific properties in relation to SFHAs
- Base flood (1-percent annual chance flood) elevations at specific sites
- Flood magnitudes in specific areas
- Undeveloped coastal barriers where flood insurance is not available
- Regulatory floodways and floodplain boundaries (1-percent and 0.2-percent annual chance floodplain boundaries).

The SFHA is the land area on a DFIRM covered by floodwaters of the base flood. In SFHAs, National Flood Insurance Program (NFIP) floodplain management regulations must be enforced and purchase of flood insurance is mandatory.

The NFIP defines the base flood elevation as the floodwater elevation during a base flood event (a flood that has a 1-percent chance of occurring in any given year). A structure within a 1-percent annual chance floodplain has a 26-percent chance of undergoing flood damage during the term of a 30-year mortgage. The 1-percent annual chance flood is a regulatory standard adopted by federal agencies and most states to administer floodplain management programs. The 1-percent annual chance flood is used by the NFIP as the basis for insurance requirements nationwide. DFIRMs also depict 0.2-percent annual chance flood designations (500-year events).

DFIRM, FIRMs, and other flood hazard information identify the expected spatial extent of flooding from a 1-percent or 0.2-percent annual chance event, defining specific areas as follows:

- **Zones A1-30 and AE—**SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base flood elevations are shown within these zones.
- **Zone A (Also known as Unnumbered A-zones**)—SFHAs where no base flood elevations or depths are shown because detailed hydraulic analyses have not been performed.
- **Zone AO—**SFHAs subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to shallow sheet flow flooding on sloping terrain.
- **Zone VE, V1-30—**SFHAs along coasts that are subject to inundation by the base flood with additional hazards due to waves with heights of 3 feet or greater. Base flood elevations derived from detailed hydraulic analysis are shown within these zones.
- **Zone B and X (shaded)—**Zones where the land elevation as been determined to be above the base flood elevation, but below the 500-year flood elevation. These zones are not SFHAs.
- **Zones C and X (unshaded)—**Zones where the land elevation has been determined to be above both the base flood elevation and the 500-year flood elevation. These zones are not SFHAs.

Coastal SFHAs are of concern to San Mateo County, particularly along the areas of the coastline at or slightly above sea level. DFIRMS depict two coastal flood hazard zones:

- Zone VE, as described above
- Zone AE, where flood elevation includes wave heights less than 3 feet.

Post-storm field visits and laboratory tests throughout coastal areas of the United States have consistently confirmed that wave heights as low as 1.5 feet can cause significant damage to structures built without consideration of coastal hazards. DFIRMs recently published also include a line showing the limit of moderate wave action (LiMWA), the inland limit of the area expected to receive 1.5-foot or greater breaking waves during the 1-percent annual-chance flood event beyond the coastal VE zones and into the AE zone (Figure 11-1).

Source: FEMA 2014c

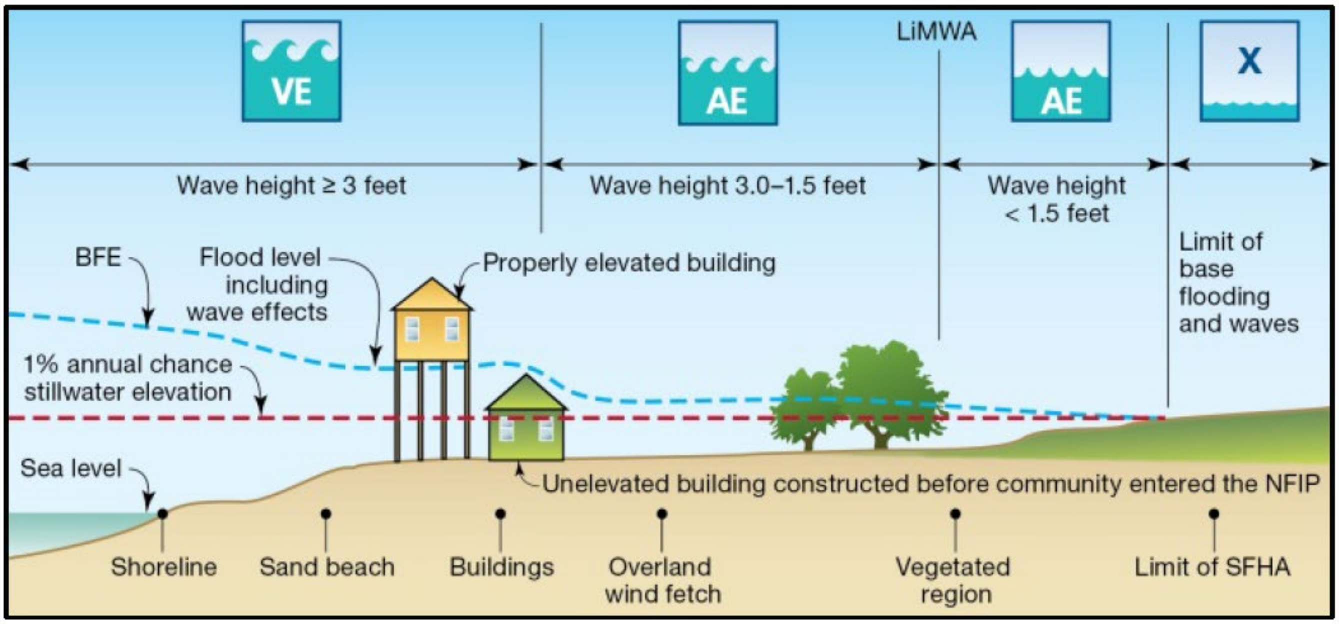


Figure 11-1. Limit of Moderate Wave Action

Addition of LiMWA area to DFIRMs allows communities and individuals to better understand flood risks to their properties. The LiMWA area alerts property owners on the coastal side of the line that being within Zone AE, their properties may be affected by 1.5-foot or higher breaking waves, and may therefore be at significant risk during a 1-percent-annual-chance flood event. While not formally defined in NFIP regulations or mapped as a flood zone, the area between Zone VE and the LiMWA is called the Coastal A Zone. This area is subject to flood hazards associated with floating debris and high-velocity flow that can erode and scour building foundations and, in extreme cases, cause foundation failure (FEMA 2014a).

The current effective DFIRM for the County of San Mateo does not delineate LiMWA areas. Future map updates will include this information and should be used to develop additional coastal flooding mitigation items.

11.1.3 Floodplains

A floodplain is the area adjacent to a river, creek, lake or the ocean that becomes inundated during a flood. Riverine floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt, and/or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

Floodplain Ecosystems and Beneficial Functions

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive, and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

Floodplains have many natural beneficial functions, and disruption of them can have long-term consequences for entire regions. Some well-known, water-related functions of floodplains (noted by FEMA) include:

- Natural flood and erosion control
- Provide flood storage and conveyance
- Reduce flood velocities
- Reduce flood peaks
- Reduce sedimentation
- Surface water quality maintenance
- Filter nutrients and impurities from runoff
- Process organic wastes
- Moderate temperatures of water
- Provide groundwater recharge
- Promote infiltration and aquifer recharge
- Reduce frequency and duration of low surface flows

Areas in the floodplain that typically provide these natural functions are wetlands, riparian areas, sensitive areas, and habitats for rare and endangered species.

Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; riverine floodplain land is fertile and suitable for farming; transportation by water is easily accessible; land is flatter and easier to develop; and there is value placed in ocean views. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels or causing erosion of natural flood protection systems such as dunes. Flood potential can be increased in several ways: reducing a stream's capacity to contain flows; increasing flow rates or velocities downstream; and allowing waves to extend further inland. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

11.1.4 Secondary Hazards

The most problematic secondary hazard for riverine flooding is bank erosion, in some cases more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers, or storm sewers.

11.2 HAZARD PROFILE

11.2.1 Federal Flood Program Participation

National Flood Insurance Program

Table 11-1 lists flood insurance statistics that help identify vulnerability within the planning area. More than 5,200 policies are in force providing more than $1.6 billion in insurance. According to FEMA statistics, flood insurance claims were paid between January 1, 1978, and November 30, 2020, for a total of $10.3 million, an average of $11,580 per claim.

Properties constructed after adoption of a FIRM or DFIRM are considered less vulnerable to flooding because they were constructed after adoption of regulations and codes to decrease vulnerability. Properties built before adoption of a FIRM or DFIRM are more vulnerable to flooding because either they do not meet code or are within hazardous areas. The first flood maps of the planning area became available as early as 1971; however, most FIRMs were not available until the 1980s.

Community Rating System

Five planning partners currently participate in the CRS program. Table 11-2 summarizes the CRS status of each. Many of the mitigation actions identified in this plan are creditable activities under the CRS program. Therefore, successful implementation of this plan offers the potential to enhance the CRS classification.

11.2.2 Principal Flooding Sources

Natural stream channels in rural parts of San Mateo County typically can accommodate average rainfall amounts and mild storm systems; however, severe floods occur in years of abnormally high rainfall or unusually severe storms. During those periods of severe floods, high-velocity floodwaters carry debris over long distances, block stream channels, and create severe localized flooding. To control these floodwaters when they reach more urban areas, the County and its cities have developed various flood control districts and flood improvements, such as culverts, bridges, levees, channel alterations, and underground storm drains (San Mateo County OES, 2015).

Table 11-1. Flood Insurance Statistics

Jurisdiction	Date of Entry	# of Flood Insurance Policies, as of 12/31/2020	Insurance in Force	Total Annual Premiums	Claims, 11/1978 to 11/30/2020	Value of Claims Paid, 11/1978 to 11/30/2020
Atherton	10/28/1977	57	$19,395,000	$27,845	9	$244,589
Belmont	03/09/1982	69	$25,611,000	$128,234	29	$170,678
Brisbane	03/29/1983	36	$17,383,600	$184,229	6	$5,818
Burlingame	09/16/1981	322	$109,626,600	$415,680	82	$774,301
Colma	11/01/1979	3	$2,350,000	$6,454	2	$1,796
Daly City	07/31/1979	50	$7,218,000	$12,998	24	$171,511
East Palo Alto	09/19/1984	836	$228,028,900	$1,041,326	32	$156,763
Foster City	01/07/1977	186	$62,277,000	$80,037	11	$103,098
Half Moon Bay	08/08/1979	81	$27,430,000	$42,461	8	$56,296
Hillsborough	09/01/1981	54	$17,555,300	$27,181	12	$58,359
Menlo Park	02/04/1981	649	$183,085,200	$915,997	29	$219,273
Millbrae	09/30/1981	128	$43,151,200	$106,476	41	$178,560
Pacifica	02/04/1981	289	$86,486,700	$278,981	110	$782,751
Portola Valley	10/17/1978	34	$10,547,700	$43,383	25	$554,142
Redwood City	05/17/1982	497	$180,521,100	$523,496	39	$396,532
San Bruno	03/30/1981	178	$58,206,500	$110,679	22	$218,184
San Carlos	09/15/1977	187	$66,970,700	$373,608	58	$155,215
San Mateo (City)	03/30/1981	1005	$300,202,100	$1,529,198	81	$138,989
S. San Francisco	09/02/1981	236	$83,828,500	$351,014	78	$3,427,156
Woodside	11/15/1979	35	$12,150,000	$18,499	13	$341,827
Unincorporated	07/05/1984	300	$89,936,200	$349,188	178	$2,138,018
Total	**N/A**	**5,232**	**$1,631,961,300**	**$6,566,964**	**889**	**$10,293,856**

Table 11-2. CRS Status of Participating Jurisdictions

Jurisdiction	NFIP Community #	CRS Entry Date	Current CRS Classification	Premium Discount	
				SFHA	Non-SFHA
Burlingame	065019B	5/1/2012	9	5	5
East Palo Alto	060708	10/1/11	7	15	5
Pacifica	060323	5/1/13	7	15	5
San Carlos	060327	5/1/13	9	5	5
San Mateo County	060311	10/1/10	9	5	5

Principal flooding sources for San Mateo County as identified on FEMA flood maps include the following streams and water bodies (FEMA, 2019):

- Alpine Creek
- Belmont Creek
- Butano Creek
- Colma Creek
- Crystal Springs Channel
- Denniston Creek
- El Granada Creek
- Holly Street Channel
- La Honda Creek
- Lomita Channel
- Montara Creek
- Pacific Ocean
- Pescadero Creek
- San Bruno Channel
- San Francisquito Creek
- San Gregorio Creek
- San Vincente Creek
- Woodhams Creek

Over 20 creeks, channels, and water bodies, including those identified as principal flooding sources, were assessed as part of the County's FIS. In addition to the waterways above, the FIS identified areas at risk for potential tsunami inundation. The Cities of Half Moon Bay and Pacifica are both associated with potential tsunami issues (FEMA 2019). Additional information regarding the tsunami hazard is in Chapter 15.

Investigation of San Mateo County's vulnerability to flooding can also include assessments of watershed locations. Every watershed has unique qualities that affect its response to rainfall. San Mateo County contains 34 watersheds, all of which are relatively small and drain into either the Pacific Ocean or San Francisco Bay. Unincorporated areas in the County contain 21 major watersheds. Except for Crystal Springs and San Francisquito, which both drain into the San Francisco Bay, all the rural watersheds drain into the Pacific Ocean (San Mateo County OES 2015).

11.2.3 Principal Flood Problems

The 2019 Flood Insurance Study (FIS) for San Mateo includes a description of the principal flood problems that have been noted for San Mateo County, by flooding source, as summarized in Table 11-3.

Table 11-3. Summary of Flood Problems

Source	Description of the Flood Problem
All Sources	Flooding is predominantly shallow along streams on the bayside of San Mateo County. Spills from channels flow independently through the urbanized areas, usually following streets, and result in flood depths of less than 1 foot. Occasionally, railroad or highway embankments form barriers, resulting in deeper ponding or sheet flow flooding. Flooding on the ocean side of the county is predominantly confined to well-defined riverine valleys, with flood surface extending uniformly across the floodplain
Colma Creek	The Daly City storm drain terminates in a junction structure near the intersection of F Street and El Camino Real. Because the downstream storm drain has only one-half the waterway area of the upstream storm drain, the excess flow is forced from the storm drain through a side channel into the Colma Mobile Home Park on the northwestern side of the intersection, where it ponds.
San Bruno, Crystal Springs, and Lomita Channels	Shallow flooding zones between the Bayshore Freeway and the mainline of the railroad are the result of overland flows from San Bruno Channel and Crystal Springs Channel. These flows merge behind the railroad embankment and eventually cross the railroad tracks as independent flows. Approximately 220 cubic feet per second (cfs) flows into the area north and west of the Crystal Springs Channel and is pumped into the channel at a rate of 35 cfs. The Crystal Springs Channel itself has a capacity of 200 cfs and is adequate for the flows reaching it. Approximately 740 cfs flows into the area south of the Crystal Springs Channel and west of the Bayshore Freeway. This flow moves south until it reaches Lomita Channel, where it is pumped into the Millbrae (High Line) Canal and flows to San Francisco Bay. The Crystal Springs Channel (200-cfs flow) and the Belle Air storm drain (750-cfs flow) merge at San Bruno Avenue and flow northeasterly to San Francisco Bay in the San Bruno Channel (1,000-cfs flow). The shallow flooding zone adjacent to the San Bruno Channel is caused by local runoff.

Source	Description of the Flood Problem
Belmont Creek and Holly Street Channel	Overflows from Belmont Creek in the City of Belmont flow generally toward Francisco Bay. This overland flow can follow numerous routes, and the entire area on the bayside of the railroad tracks is subject to shallow flooding. At the railroad, the overland flow is split, and the greater part is diverted to the east. Additional overflow occurs near Harbor Street and Old County Road at a railroad loading spur. The Bayshore Freeway and Holly Street off-ramp form a barrier to the easterly flow, causing shallow ponding in the Industrial Way area. This ponding has been greatly reduced by recently completed drainage projects.
San Francisquito Creek	San Francisquito Creek overflows at two locations in the City of Menlo Park. The overflow travels east toward the bay along streets leading away from the creek channel. At the Bayshore Freeway, this shallow flooding crosses into the county area and continues toward the bay. There are no other spills from San Francisquito Creek into the county area. Tidal flooding from the bay during the 1-percent annual chance flood can overtop the levee system in the City of East Palo Alto and cause flooding in the residential area adjacent to San Francisquito Creek. Flooding has resulted in this area because of inadequate or nonexistent stormwater facilities.
Montara Creek	Montara Creek is generally confined to its channel, with overtopping at most culvert crossings. The culvert at Harte Street is heavily silted, forcing the water out of the channel and over the road; a few residences are affected. The embankment at State Highway 1 forms a dam, resulting in deep flooding; however, no existing structures are affected.
San Vicente Creek	San Vicente Creek overflows to the north at Etheldore Street, causing shallow flooding through several existing structures adjacent to State Highway 1 before the overflow returns to the channel along Cypress Avenue. Additional flooding occurs near the ocean front because of inadequate culvert capacity.
Denniston Creek	Denniston Creek is contained within a well-defined channel until it reaches State Highway 1, where limited culvert capacity results in shallow overflow and ponding southward behind the highway to a low point near Sonora Avenue, where it flows overland to the ocean. The channel through the developed part of Princeton is overgrown and culverts are of limited capacity; however, the resulting flooding is minimal.
El Granada Creek	El Granada Creek consists of a very shallow channel through the most developed oceanside area of the county. Undersized culverts in the channel In many places cause general flooding of roads and residences near the creek. This flooding is contained by the remnants of the natural floodplain through the community.
Woodhams, La Honda, Alpine, and San Gregorio Creeks	All creeks in the La Honda community flow in well-defined and often steep channels. Flooding occurs across various stream terraces that are adjacent to culverts or channel restrictions. On San Gregorio Creek, a combination of meandering channel and numerous private bridges creates similar terrace flooding situations.
Pescadero and Butano Creeks	Pescadero and Butano Creeks are in a river valley formed by two large drainages. Each creek has a well-defined channel that meanders through a broad floodplain bounded by hills on either side. This floodplain has little gradient and therefore is inundated by overflows from Pescadero Creek and joining flows of Butano Creek. Most of the Town of Pescadero is in this floodplain and is inundated during floods. The U.S. Army Corps of Engineers estimated the cost of damage in Pescadero caused by the December 1955 flood to have been $352,000, including rescue and emergency efforts. The 1998 flood brought record floods to this watershed. Over 6 inches of rain fell over two days and a peak flow of 10,600 cfs was recorded at the USGS gage on Pescadero Creek. High water marks taken after the flood show a flood elevation of 14.6 feet just downstream of the Pescadero Creek Road bridge.
Pacific Ocean	Flooding from the Pacific Ocean at Miramar and Martins Beaches is typically associated with the simultaneous occurrence of very high tides, large waves, and storm swells during winter. Ocean-front development has not been compatible with the natural instability of the shoreline and the intense winter weather. Tsunamis create some of the most destructive natural water waves. Storms from the southwest produce the storm pattern most commonly responsible for the most serious coastal floods. Strong winds and high tides that create storm surges are also accompanied by heavy rains. In some instances, high tides back up river flows, causing flooding at river mouths. In January 1978, storms emanated from a more southerly direction than normal, and some of the better-protected beaches were damaged. Jetties and breakwater barriers were overtopped and, in some cases, undermined. Direct wave damage occurred to many beachfront homes. Accelerated erosion coupled with saturated ground conditions and rain weakened the foundations of homes on the top of beach bluffs. Seawalls and temporary barriers failed to protect beach front properties. The winter of 1983 brought an extremely unusual series of high tides, storm surges, and storm waves, which caused considerable damage along the northern California coast.

11.2.4 Past Events

Table 11-4 lists San Mateo County flood events identified in the NOAA National Centers for Environmental Information (NCEI) Severe Storms Database, which goes back to 1996, as well as previous flood events affecting the County for which federal disaster declarations were issued. Descriptions of some of the most significant local flood events (from NCEI) are presented in the sections that follow.

Table 11-4. History of Flood Events

Date	Event	Locations	Deaths or Injuries	Property Damage
February 5, 1954	Flooding (DR-15)	Countywide	*a*	*a*
December 23, 1955	Flooding (DR-47)	Countywide	*a*	*a*
April 4, 1958	Flooding (DR-82)	Countywide	*a*	*a*
March 6, 1962	Flooding (DR-122)	Countywide	*a*	*a*
February 25, 1963	Flooding (DR-145)	Countywide	*a*	*a*
January 7, 1982	Severe Storms, Flood, Mudslides, High Tide (DR-651)	Countywide	*a*	*a*
February 9, 1983	Coastal Storms, Floods, Slides, Tornadoes (DR-677)	Countywide	*a*	*a*
February 21, 1986	Severe Storms, Flooding (DR-758)	Countywide	*a*	*a*
January 10, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows (DR-1044)	Countywide	*a*	*a*
March 12, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows (DR-1046)	Countywide	*a*	*a*
December 10, 1996	Flood	San Mateo	0	$0
January 1, 1997	Flash Flood	Southwest Portion, Countywide	0	$0
January 2, 1997	Flash Flood	Countywide	0	$0
January 25, 1997	Flash Flood	Countywide	0	$0
February 3, 1997	Flash Flood	Loma Mar	1 Death	$0
February 2, 1998	Flash Flood	Pescadero, East Palo Alto	0	$200,000
February 6, 1998	Flash Flood	Pescadero, East Palo Alto	0	$0
February 7, 1998	Flash Flood	Pescadero, East Palo Alto	0	$0
February 13, 2000	Flash Flood	Pescadero	0	$0
December 31, 2005	Flood	Countywide	0	$5,000,000
January 1, 2006	Flood	Countywide	0	$5,000,000
January 25, 2008	Flash Flood	Moss Beach	0	$100,000
February 16, 2009	Flood	Pescadero	0	$8,000
January 19, 2010	Flood	Ladera	0	$15,000
January 20, 2010	Flood	Pescadero, San Carlos, San Carlos Airport	0	$65,000
December 23, 2012	Flash Flood	Pescadero, Loma Mar	0	$500
December 2, 2014	Flood	Belmont, San Bruno	0	$0
December 11, 2014	Flash Flood, Flood	San Mateo County	0	$505,500
February 6, 2015	Flood	Atherton, West Menlo Park	0	$0
December 10, 2016	Flood	East Palo Alto	0	$0
January 10, 2017	Flood	Sterling Park, North Fair Oaks	0	$0
January 20, 2017	Flood	Burlingame	*a*	*a*

Date	Event	Locations	Deaths or Injuries	Property Damage
February 7, 2017	Flood	San Carlos Apartments	0	$0
February 20, 2017	Flood	Atherton	0	$0
February 21, 2017	Flood	Ladera	0	$0
March 01, 2018	Flood	Sterling Park, Bayshore, Baden	0	$0
April 07, 2018	Flood	San Carlos Apartments, San Mateo, Lomita Park	0	$0
November 23, 2018	Flood	Baden	0	$0
November 29, 2018	Flood	San Carlos Apartments	0	$0
January 06, 2019	Flood	Bayshore, Tanforan	0	$0
January 16, 2019	Flood	Atherton	0	$0
February 13, 2019	Flood	Bayshore	0	$0
February 14, 2019	Flood	Burlingame	0	$0
November 30, 2019	Flood	San Carlos Apartment	0	$0
December 07, 2019	Flood	Sterling Park	0	$0
January 16, 2020	Flood	Belmont, Colma, Henderson, Lomita Park, Bayshore, Atherton	0	$0

a. Death, injury, and damage data not provided in the sources used to identify these events.
Source: NCEI Storm Events Database 2021, FEMA Disaster Declaration website, NBC Bay Area 2014, The Daily Journal 2017

December 10, 1996

Widespread urban flooding was reported throughout the County, and Highway 101 was reportedly underwater as a result of the flooding event.

January 1, 1997

Southwest portions of San Mateo County underwent heavy rainfall of approximately ½ inch per hour for several hours. Ground saturation prevented rainfall absorption. Pescadero Creek reached flood stage by late morning. By 10:00 a.m., La Honda Road was closed due to ground saturation and a resulting mudslide. Butano Creek flooded, closing Pescadero Road.

February 3, 1997

A levee breached along a dry creek bed, Arroyo Mocha. The breach cased damage to roads and property and resulted in the death of an individual. Cascading effects caused flash flooding along San Francisquito Creek and Pescadero Creek.

February 14, 2000

Widespread rain with 24-hour accumulations of more than 5 inches occurred over the area during February 13th into February 14th. Urban and small stream flooding occurred in most counties of the area, including San Mateo. A number of houses in Daly City had to be abandoned and eventually destroyed due to mudslides that resulted from consecutive years of above-average rain.

December 31, 2005

Widespread flooding occurred throughout San Mateo County as a result of small stream overflow and poor drainage. Most damage occurred in East Palo Alto, the City of San Mateo, Daly City, Colma, Brisbane, San Bruno, South San Francisco, and Pacifica. Approximately 3 inches of rain fell on the area over a 24-hour period.

January 20, 2010

A significant storm brought strong winds and heavy rain to the San Francisco and Monterey Bay areas. This storm developed over the Pacific Ocean with a strong parent low pressure based in the Gulf of Alaska. Areas of flooding occurred, causing problems mainly for vehicles. Heavy rain induced Pulgas Creek to overflow its banks and flood some classrooms at Central Middle School in San Carlos. Also, several streets were blocked off in low-lying areas just west of US Highway 101, including Taylor Avenue in San Carlos and parts of Rolison Road in Redwood City. In Atherton, officials closed March Road from Middlefield Road to Fair Oaks Avenue because a creek had begun to flood. Heavy rain caused Harbor Boulevard at the underpass of State Route 82 to flood, submerging a car to the base of its windows. The road was barricaded to stop anyone else from driving into the water. Belmont Creek flooding led to evacuation of a car repair business as 3 inches of water covered the floor.

February 6, 2015

A strong winter storm impacted California following nearly a month and a half of no rain and the driest January on record. The storm brought heavy rain, gusty winds, and damage to trees and power lines, along with some minor flooding of urban areas. Rainfall amounts were heaviest in the mountains, with 5-10 inches or more occurring. Heavy rain resulted in flooding of Southbound US 101 off-ramp in Atherton.

December 2015/January 2016

To mitigate impacts of flooding, the San Mateo County Department of Public Works and cities in the county set up two dozen sites where community members could pick up free sandbags (Patch.com 2016). El Niño rains in January 2016 brought more rain into the Bay Area in two days than during the previous three Januarys combined (Mercury News 2016). In general, San Mateo County avoided severe damage and flooding from the rains. La Honda recorded the largest amount of rainfall in the County, at 1.5 inches. Other than debris, some power outages, and transportation accidents, San Mateo County did not report any major issues. Response personnel for the cities monitored debris build-up, helping to reduce potential events.

March 1, 2018

An upper-level system with a strong cold front moved through the Bay Area. This system brought widespread rainfall causing localized roadway flooding, strong winds, lightning, and small hail. Gusts in the mountains reached 60 mph and hail was seen up to a half-inch in diameter. The bulk of the precipitation and subsequent impacts were seen in early March (National Centers for Environmental Information, 2021).

April 7, 2018

A late season atmospheric river impacted the area in early April. A very moist air mass made landfall across the North Bay before moving southward across the rest of the Bay Area. Enough rain fell to cause minor/nuisance flooding across much of the region. Numerous flood advisories were issued. Storm total rainfall amounts up to 7 inches were reported (National Centers for Environmental Information, 2021).

January 6, 2020

A potent cold front swept through the region on January 16, bringing widespread rain, gusty winds, low elevation snow, and thunderstorms. This system brought caused roadway flooding, downed trees, small hail, and snow at elevations as low as 2,400 feet. Numerous flights were delayed or canceled at San Francisco International Airport (National Centers for Environmental Information, 2021).

11.2.5 Location

Mapped Flood Zones

Flooding in San Mateo County has been documented by gage records, high water marks, damage surveys, and personal accounts. This documentation was the basis for the April 2019 Flood Insurance Study that is incorporated in the current effective DFIRMs. The DFIRMs are the most detailed and consistent data source available for determining flood extent. The April 2019 Flood Insurance Study is the sole source of data used in this risk assessment to map extents and locations of flood hazard areas, as shown on Figure 11-2.

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses more than $1,000
- Two paid losses more than $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. Studies have found that many of these properties are outside any mapped 1 percent annual chance floodplain. The key identifiers for repetitive loss properties are the existence of NFIP insurance policies and claims paid by the policies.

FEMA further designates as severe repetitive loss any NFIP-insured single-family or multi-family residential building for which either of the following is true:

- The building has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000
- At least two separate claims payments (building payments only) have been made under NFIP coverage, with the cumulative amount of claims exceeding the market value of the building.

To qualify as a severe repetitive loss property, at least two of the claims must be within 10 years of each other, and claims made within 10 days of each other are counted as one claim. In determining severe repetitive loss status, FEMA considers the loss history since 1978, or from the building's construction if it was built after 1978, regardless of any changes in the ownership of the building.

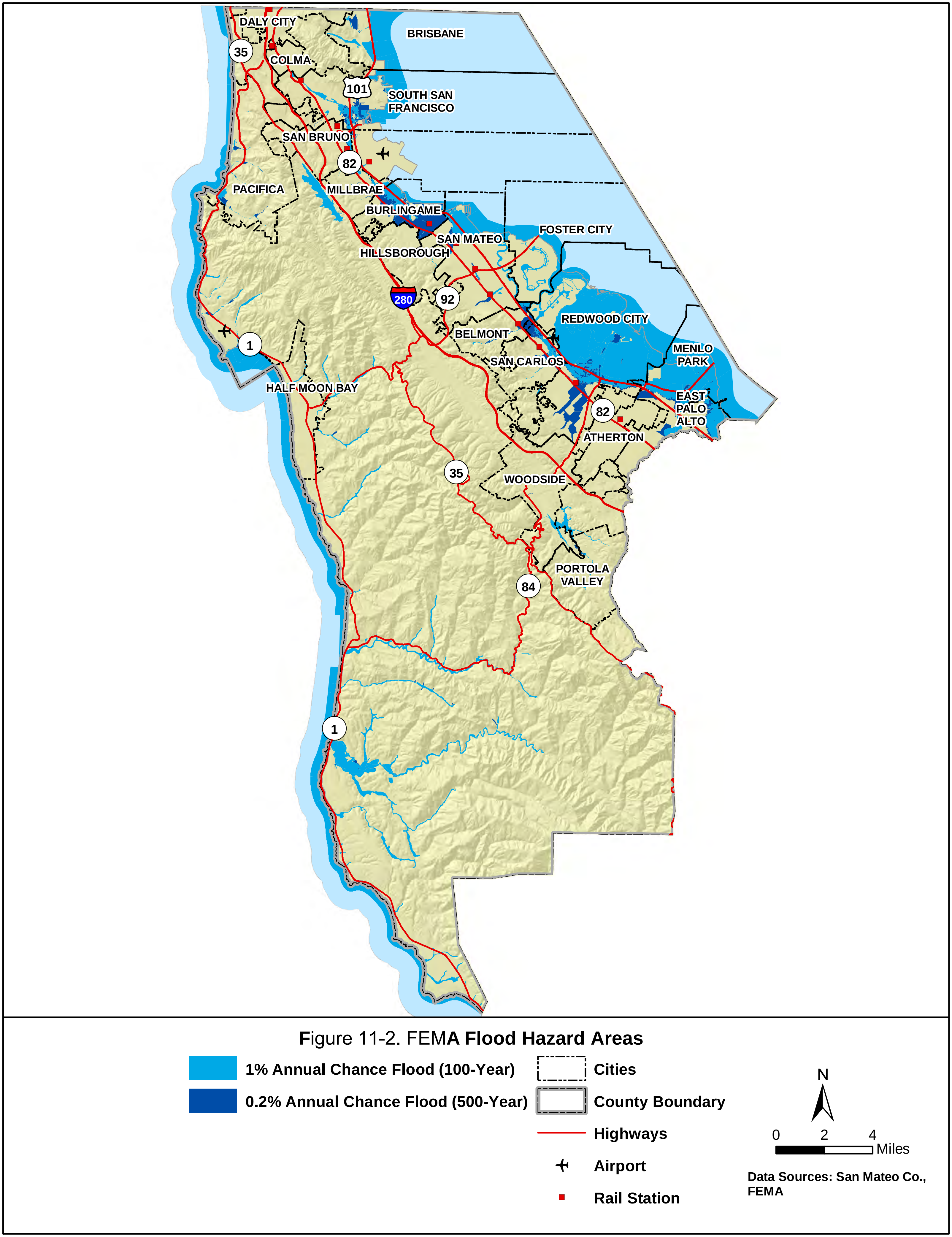


Figure 11-2. FEMA Flood Hazard Areas

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

FEMA's list of repetitive loss properties identifies 15 such properties in the San Mateo County planning area, as of June 15, 2021, as summarized in Table 11-5. These properties likely were flooded by flood events typical for the floodplain reflected in the current mapping.

Table 11-5. Repetitive Loss Properties in San Mateo County

Jurisdiction	Repetitive Loss Properties	Total Number of Losses	Payment Made for Losses			
			Building	Contents	Total	Average per Claim
Daly City	1	4	$48,085	$47,210	$95,296	$23,824
Millbrae	1	4	$49,237	$0	$49,237	$12,309
Portola Valley	1	2	$384,097	$210,900	$594,997	$297,499
South San Francisco	1	5	$131,107	$199,578	$330,685	$66,137
San Mateo County	12	30	$540,985	$271,517	$812,502	$27,083
Total	**16**	**45**	**$1,153,511**	**$729,205**	**$1,882,717**	**$426,852**

Source: June 15, 2021 FEMA Repetitive Loss Summary, FEMA Region IX, Bureau Statistical Agent

FEMA recently changed its policies on providing repetitive loss properties information due to implications of the federal Privacy Act. The "routine use" provision for acquiring the data, which requires certifications on how the data will be used, was not well-defined at the time of this plan update. Repetitive loss data for all planning partners could not be acquired in time for analysis and assessment for this plan. Therefore, the resolution of the repetitive loss data available to support this plan update is limited to property counts only. No location or dates of loss data was available. San Mateo County and its planning partners understand the importance of a thorough analysis of the repetitive flood loss problem. The County and its planning partners will seek to meet FEMA requirements for access to this data through plan implementation. Future updates to this plan will seek to have enhanced resolution for more detailed analysis.

11.2.6 Frequency

San Mateo County has undergone 35 significant flooding events since 1996, most of which have been flash floods. This correlates to a recurrence of 1, or an annual probability of occurrence of 100 percent. Smaller floods may occur more frequently and be categorized under a different hazard event type, typically Severe Weather or Severe Storms. Recurrence intervals and average annual numbers of events in San Mateo County were calculated based on data from 1996 to 2020 in the Storm Events Database. Coastal floods have a 10 percent chance of occurring in any given year, flash floods have a 55.6 percent chance, and other floods have a 40 percent chance of occurrence.

11.2.7 Severity

River Flooding

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity—especially when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment. Flood severity is often evaluated by examining peak discharges. Peak flows used by FEMA to map floodplains within the planning area are listed in Table 11-6.

Table 11-6. Summary of Peak Discharges—San Mateo County

Source/Location	Drainage Area (square miles)	Discharge (cubic feet/second)			
		10-Percent	2-Percent	1-Percent	0.2- Percent
16th Avenue Drainage					
Southern Pacific Railroad Crossing	*d*	*d*	*d*	490	*d*
Highway 101	*d*	*d*	*d*	800	*d*
19th Avenue Drainage Channel					
At South Pacific Railroad Crossing	*d*	*d*	*d*	1,310	*d*
At Delaware Street	*d*	*d*	*d*	1,330	*d*
At Bermuda Drive	*d*	*d*	*d*	1,450	*d*
Highway 101	*d*	*d*	*d*	1,500	*d*
Atherton Creek					
At Railroad	5.0	350[a]	350[a]	350[a, b]	350[c]
Belmont Creek					
At El Camino Real	2.5	570	1,000	1,200	1,400
At Highway 101	2.8	660	1,200	1,400	1,600
Colma Creek					
At F Street	1.7	800	1,200	1,400	1,600
Below Hickey Boulevard Tributary	6.0	1,700	2,900	3,400	4,100
At USGS Gage in Orange Park	10.9	2,400	4,100	4,700	5,700
Below Spruce Branch	12.7	2,500	4,400	5,000	6,100
At San Francisco Bay	16.0	2,900	5,100	5,800	7,000
Cordilleras Creek					
At Alameda de las Pulgas	2.6	400	730	890	1,300
At Stanford Lane	3.1	460	900	1,120	1,700
At El Camino Real	3.3	470	940	1,170	1,800
Old County Road	3.3	470	620[f]	680[e, f]	1,1906
Bayshore Freeway	3.6	525	700[g]	850[g]	1,490[g]
Denniston Creek					
At Reservoir	3.2	700	1,200	1,400	1,800
Near Sheltercove Drive	3.8	780	1,300	1,600	2,000
At Half Moon Bay	4.0	800	1,400	1,600	2,100
Easton Creek					
At Railroad	0.79	260	410	470	540
El Granada Creek					
At Reservoir	0.5	160	250	290	370
At Half Moon Bay	0.6	190	300	340	440
Holly Street Channel					
At Highway 101	0.4	240	370[h]	420[h]	420[h]
Industrial Branch					
At Colma Creek	1.5	490	720	800	970

Source/Location	Drainage Area (square miles)	Discharge (cubic feet/second)			
		10-Percent	2-Percent	1-Percent	0.2- Percent
La Honda Creek					
Upstream of confluence with Woodhams Creek	10.0	1,800	3,100	3,600	4,800
Downstream of confluence with Woodhams Creek	10.9	1,900	3,300	3,800	5,200
At confluence with San Gregorio Creek	11.8	2,100	3,500	4,200	5,500
Laurel Creek					
At Alameda de las Pulgas	*d*	*d*	*d*	970	*d*
At Otay	*d*	*d*	*d*	1,130	*d*
At George Hall School	*d*	*d*	*d*	1,420	*d*
At Highway 101	*d*	*d*	*d*	1,950	*d*
Lomita Channel					
At Railroad[i]	--	--	--	--	--
Mills Creek					
At Railroad	0.52	190	290	330	370
Mills Creek and Easton Creek					
At Highway 101[j]	2.46	750	840	840	840
Montara Creek					
At Riviera Street	0.80	220	360	420	560
At Harte Street	1.30	310	530	620	830
At Pacific Ocean	1.70	380	640	760	1,000
Navigable Slough					
At Colma Creek	0.4	200	270	300	300
Pescadero Creek					
At Pescadero Road east of Town	53.3	7,700	13,900	16,700	20,000
At Pacific Ocean	81.3	11,000	20,000	24,000	29,000
Ralston Creek and Burlingame Creek					
At Railroad	1.65	500	800	930	1,100
Redwood Creek					
At El Camino Real	5.2	1,200	2,11	2,500	3,200
At Broadway	8.8	1,800	3,200	3,800	4,800
At Bayshore Freeway	9.3	1,900	3,300	4,000	5,000
Sanchez Creek					
At Railroad	1.65	500	800	930	1,100
Sanchez Creek, Ralston Creek, and Burlingame Creek					
At Highway 101	4.65	1,100	1,600	1,600	1,600
San Francisquito Creek					
At El Camino Real	40.6	4,350	7,050	8,280	9,850[k]
Upstream of Middlefield Road	41.6	4,350	7,100	8,330	*d*
Downstream of Middlefield Road	41.6	*d*	*d*	6,965	*d*
Downstream of Pope Street	41.6	*d*	*d*	6,250	*d*
At Highway 101	41.7	4,400	6,020[g]	6,060[g]	6,300[g]
San Francisquito Creek—Overflow					
At Middlefield Road	*d*	*d*	*d*	640	*d*

Source/Location	Drainage Area (square miles)	Discharge (cubic feet/second)			
		10-Percent	2-Percent	1-Percent	0.2- Percent
At Pope Street	d	d	d	730	d
Combined Middlefield Road and Pope Street Overflows	d	d	d	1,154	d
South of Highway 101	d	d	d	1,154	d
North of Highway 101	d	d	d	570	d
San Gregorio Creek					
At upstream limit of study	9.3	1,800	3,000	3,500	4,500
Upstream of confluence with La Honda Creek	9.5	1,800	3,000	3,600	4,600
Downstream of confluence with La Honda Creek	21.3	3,300	4,800	6,900	9,300
Downstream of State Highway 84	21.8	3,300	4,800	6,900	9,300
At downstream limit of study	22.4	3,500	6,100	7,200	9,700
San Mateo Creek					
At mouth (City of San Mateo)	d	d	d	1,0177	d
At downstream side of S. Humboldt St. and E. Third Ave.	d	d	d	1,4937	d
400 feet downstream of Crystal Springs Road	33.3	d	d	2,124	d
San Vicente Creek					
At upper study limit	1.4	340	570	660	880
At Etheldore Street	1.7	400	670	780	1,000
At Pacific Ocean	1.9	430	720	840	1,100
Spruce Branch					
At Colma Creek	1.5	540	770	810	830
Woodhams Creek					
At Esmeralda Terrace	0.7	220	340	390	480
At confluence with La Honda Creek	0.9	270	520	480	600

Note: All locations are at mouth unless otherwise noted. Locations do not include jurisdictional boundaries.

a. Capacity of Atherton Creek box culvert
b. 1,750 cfs spilled upstream of study area during the 1-percent annual chance flood event
c. 170 cfs spilled to Redwood City during the 1-percent annual chance flood event
d. Data not available
e. 170 cfs spilled to Redwood City during the 1-percent annual chance flood event
f. Flows reduced due to overflow into San Carlos and Redwood City
g. Flows reduced due to upstream spill
h. Values do not include overland flow from Belmont Creek
i. Inflow to low area west of track; 1-percent annual chance outflow is 170 cfs.
j. Flows limited by culvert capacity, ponding, and pump capacity
k. Value reflects spills from the channel into Palo Alto

Source: San Mateo County FIS, FEMA 2019

Coastal Flooding

The frequency and severity of coastal flooding are based on storm surge height, which is the height of water accounting for waves. The 2019 FEMA FIS for San Mateo County mapped 59 transects along the Pacific Ocean, identifying 10-, 50-, 100- and 500-year still-water elevations for each transect. Table 11-7 summarizes the high, low and mean elevations observed for each return interval along the Pacific Ocean coastline, representing the steady state water depth not accounting for breaking waves. These are the projected elevations of floodwaters in the absence of waves resulting from wind or seismic effects.

Table 11-7. Summary of Still-Water Elevations the Pacific Ocean

	Still-Water Elevation[a] (feet)			
	10-Year	50-Year	100-Year	500-Year
Low	9.1	10.2	10.7	11
Mean	20.2	23.5	24.6	26.9
High	31.3	36.8	38.5	42.7

a. Elevation in 1988 North American Vertical Datum
Source: FEMA Flood Insurance Study Number 06081C0290E, San Mateo County Unincorporated Areas, October 16, 2012

11.2.8 Warning Time

Because of the sequential pattern of weather conditions needed to cause serious flooding, occurrence of a flood without warning is unusual. Warning times for floods can be between 24 and 48 hours. Potential flood warning time depends on the time between the rainfall and the first occurrence of flooding. Flash flooding can be less predictable, but populations in potential hazard areas can be warned in advance of flash flooding danger. The National Weather Service (NWS) issues watches and warnings based on river flow forecasts. NWS uses the following flood extent or severity categories, based on property damage and public threat (NWS, 2011):

- **Minor Flooding**—Minimal or no property damage, but possibly some public threat or inconvenience.
- **Moderate Flooding**—Some inundation of structures and roads near streams. Some necessary evacuations of people and/or transfer of property to higher elevations.
- **Major Flooding**—Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

When a watch is issued, the public should prepare for the possibility of a flood. When a warning is issued, the public is advised to stay tuned to a local radio station for further information and be prepared to take quick action. A warning means a flood is imminent, generally within 12 hours, or is occurring. Local media broadcast NWS warnings. Thresholds for flood warnings on rivers in San Mateo County are as follows:

- Lower Crystal Springs Reservoir at Dam:
- Action state, minor flooding/initial flood stage, and major flood stage data are not available.
- Moderate flooding is 284 feet.
- San Francisquito Creek At Stanford University:
- Action state is 8 feet.
- Moderate flooding is 9.5 feet.
- Minor flooding/initial flood and major flood stages are not available (NWS 2016).

11.3 EXPOSURE

A quantitative assessment of exposure to the flood hazard was conducted using the flood mapping shown in Figure 11-2 and the asset inventory developed for this plan. Population exposure was estimated by calculating the number of buildings in the FEMA-mapped floodplain as a percent of total planning area buildings, and then applying this percentage to the estimated planning area population. Detailed results by municipality are provided in Appendix E; results for the total planning area are presented below.

11.3.1 Population and Property

Table 11-8 summarizes the estimated population living in the mapped flood zones and the estimated property exposure. Figure 11-3 and Figure 11-4 show the county-wide distribution of structures in the mapped flood zones by occupancy class. In both the 1 percent-annual-chance flood zone and the 0.2 percent-annual-chance flood zone, the exposed structures are primarily residential or commercial.

Table 11-8. Exposed Population and Property in Mapped Flood Zones

	1% Annual Chance Flood Zone	0.2% Annual Chance Flood Zone
Population		
Population Exposed	39,298	85,294
% of Total Planning Area Population	5.1%	11%
Acres of Floodplain	30,028	34,501
Property		
Acres of Floodplain	30,028	34,501
% of Total Area	6.31%	7.256%
Number of Buildings Exposed	9,639	21,157
Value of Exposed Structures	$11,207,507,960	$21,588,541,063
Value of Exposed Contents	$10,382,411,224	$18,845,017,220
Total Exposed Property Value	**$21,589,919,184**	**$40,433,558,283**
Total Exposed Value as % of Planning Area Total	*11.2%*	*21.1%*

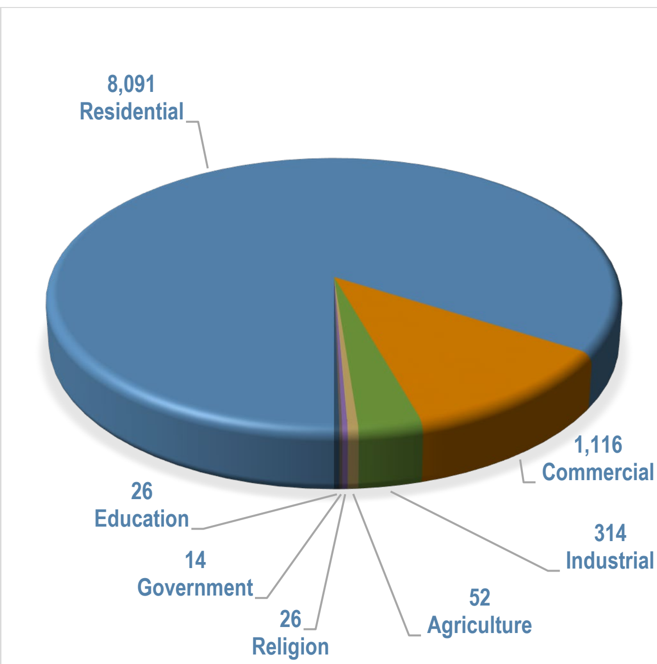


Figure 11-3. Number of Structures by Occupancy Class in the 1 Percent-Annual-Chance Flood Zone

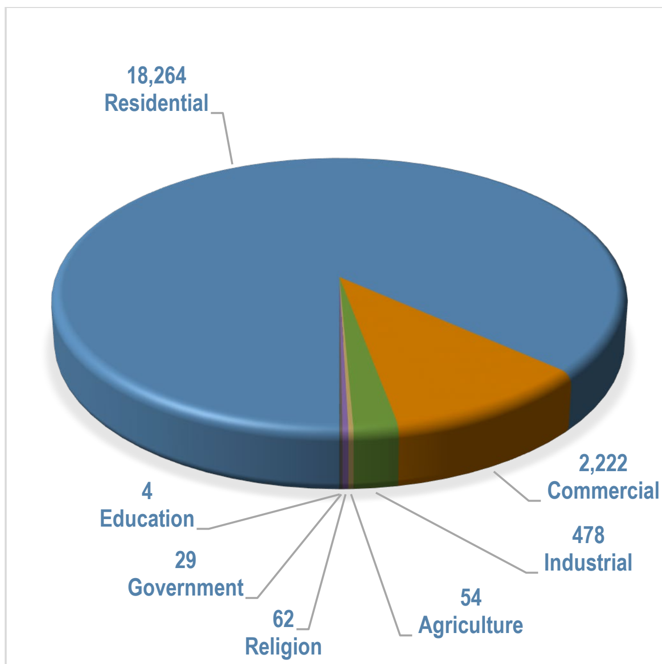


Figure 11-4. Number of Structures by Occupancy Class in the 0.2 Percent-Annual-Chance Flood Zone

11.3.2 Critical Facilities

Critical facilities exposed to the flood hazard represent 20.2 percent (452 facilities) of the total critical facilities in the planning area for the 1-percent-annual-chance flood hazard and 24.7 percent (552 facilities) for the 0.2-percent-annual-chance flood hazard. The breakdown of exposure by facility type is shown in Figure 11-5. Linear infrastructure exposed includes utility lines and roads.

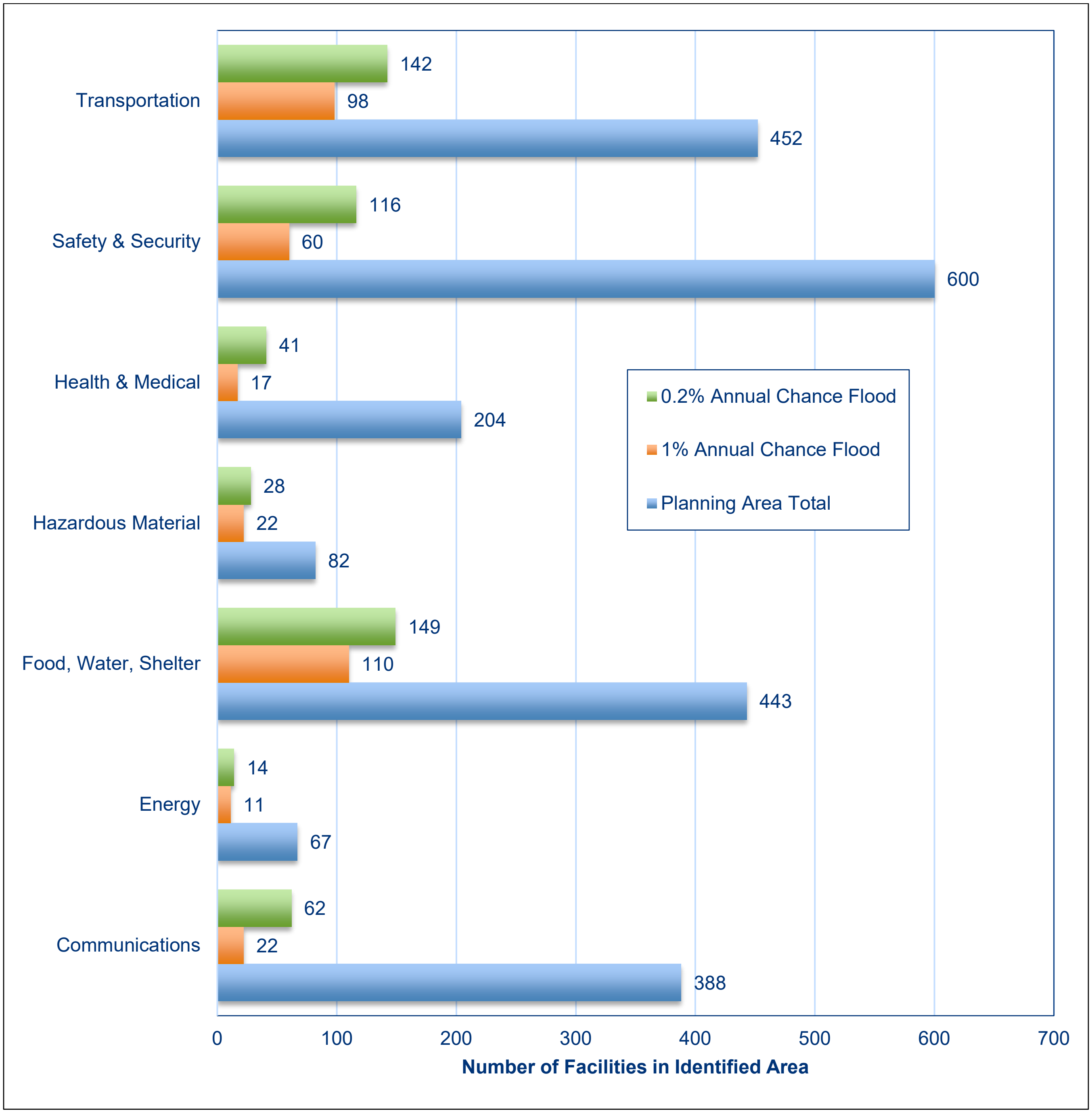


Figure 11-5. Critical Facilities in Mapped Flood Hazard Areas and Countywide

Toxic Release Inventory Reporting Facilities

Toxic Release Inventory (TRI) facilities are known to manufacture, process, store, or otherwise use certain chemicals above minimum thresholds. If damaged by a flood, these facilities could release chemicals that cause cancer or other human health effects, significant adverse acute human health effects, or significant adverse environmental effects (U.S. Environmental Protection Agency [EPA] 2015). During a flood event, containers holding these materials can rupture and leak into the surrounding area, disastrously affecting the environment and community members. One facility within the 1-percent-annual-chance flood zone is a TRI reporting facility.

Roads

The following major roads within the planning area pass through the 1-percent-annual-chance flood zone (100-year floodplain), and thus are exposed to flooding:

- State Highway 1
- State Highway 82
- State Highway 84
- State Highway 92
- State Highway 109
- State Highway 114
- US Highway 101
- Interstate 380

Some of these roads were built above the flood level, and others function as levees to prevent flooding. Still, during severe flood events, these roads can be blocked or damaged, preventing access to some areas.

Bridges

Flooding events can significantly impact road bridges, important because many provide the only ingress and egress to some neighborhoods. An analysis indicated that 62 bridges are within or cross over the 1-percent-annual-chance flood zone (100-year floodplain).

Levees

Historically, levees have been used to control flooding in portions of San Mateo County. The County constructed levees both for flood protection (in the north and central portions of the County) and for salt evaporation ponds (in the southeast portion of the County). The County does not believe these levees could withstand intensities of a 1-percent-annual-chance flood. Additionally, coastal flooding from San Francisco Bay circumvents levees near the Bay, leading to flooding within the residential area next to San Francisquito Creek on the east side of the City. These risk estimates are based on current flood levels and do not account for potential sea level rise, which would exacerbate vulnerability and even further reduce ability of the levees to prevent/control flooding. Details on San Mateo County levees could not be supplemented by the U.S. Army Corps of Engineers National Levee Database. Although the database contains records of the majority of levees within the Corps' system, it does not include records of all levees in the United States, which include the levees in San Mateo County.

Levee failures could place large numbers of people and great amounts of property at risk. Unlike dams, levees do not serve any purpose beyond providing flood protection and (less frequently) recreational space for community members. A levee failure could be devastating, depending on severity of flooding and amount of land development present. In addition to damaging buildings, infrastructure, trees, and other large objects, levee failure can result in significant water quality and debris disposal issues. Severe erosion is also a consideration.

Presence and effects of levee systems in San Mateo County are not reflected on the DFIRM, meaning that areas, structures, and populations vulnerable to failures of those levees cannot be determined. However, because the County estimates that the levees in their current state could not withstand a 1-percent-chance annual flood, reflections of effects of the levees on the DFIRM would not be reliable anyway. The 2016 preliminary DFIRMs do account for estimated sea level rise; however, because not yet finalized, these maps could not be utilized to contribute to vulnerability estimates of flooding within leveed areas. Following approval of the 2016 DFIRMs, San Mateo County will consider the extent to which the levees must be updated as a future mitigation action item, and consider protection from sea level rise. Action may not be considered until the next hazard mitigation plan update, and levee vulnerability will also be explored in further detail.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also triggering localized urban flooding. Floodwaters can enter and thus contaminate drinking water supplies. Sewer systems can back up, spilling wastewater into homes, neighborhoods, rivers, and streams.

11.3.3 Environment

Riparian areas, the zones along the edge of a river or stream that are influenced by or are an influence upon the water body, are particularly exposed to the flood hazard. The exposed environment includes wildlife that relies on riparian areas.

11.4 VULNERABILITY

The vulnerability assessment indicates estimated damage for the 1-percent and 0.2-percent-annual-chance flood hazards. Detailed results by jurisdiction are included in Appendix E; countywide summaries are provided below.

11.4.1 Population

Vulnerable Groups

Vulnerable populations are all populations within the floodplain whose abilities to escape the area before floodwaters arrive are limited. This population includes all categories identified for the SoVI rating (see Section 7.2.2). Impacts on persons and households for the 1-percent and 0.2-percent-annual-chance flood hazards were estimated through the Level 2 Hazus analysis. Countywide results are provided in Table 11-9.

Table 11-9. SoVI Index Population Distribution for the 1-Percent and 0.2-Percent-Annual-Chance Flood

	1% Annual Chance Flood Zone		0.2% Annual Chance Flood Zone	
SoVI Rating	Population Exposed	% of Exposed Population	Population Exposed	% of Exposed Population
Very High	11,700	29.58	14,930	16.8
Relatively High	19,397	49.04	36,802	41.41
Relatively Moderate	1,830	4.63	10,288	11.58
Relatively Low	3,260	8.24	21,220	23.88
Very Low	3,370	8.51	5,637	6.33
Total	**39,557**	**100**	**88,877**	**100**

Displacement and Shelter Needs

Flood impacts on persons and households were estimated for each event through the Level 2 Hazus analysis. Table 11-10 summarizes the results.

Table 11-10. Estimated Flood Impacts on Persons and Households

	Number of Displaced Households	Number of Community members Requiring Short-Term Shelter
1% Annual Chance Flood Zone	17,146	1,158
0.2% Annual Chance Flood Zone	51,178	3,740

Hazus estimated that a FEMA 100-year flood could displace up to 1,965 people, with 75 of those people needing short-term shelter. For a Hazus-generated 500-year flood, it is estimated that up to 6,264 people could be displaced, with 290 needing short-term shelter.

Public Health and Safety

Floods and their aftermath present the following threats to public health and safety:

- **Unsafe food—**Floodwaters contain disease-causing bacteria, dirt, oil, human and animal waste, and farm and industrial chemicals. Their contact with food items, including food crops in agricultural lands, can make that food unsafe to eat. Refrigerated and frozen foods are affected during power outages caused by flooding. Foods in cardboard, plastic bags, jars, bottles, and paper packaging may be unhygienic with mold contamination.
- **Contaminated drinking and washing water and poor sanitation—**Flooding impairs clean water sources with pollutants. The pollutants also saturate into the groundwater. Flooded wastewater treatment plants can be overloaded, resulting in backflows of raw sewage. Private wells can be contaminated by floodwaters. Private sewage disposal systems can become a cause of infection if they or overflow.
- **Mosquitoes and animals—**Floods provide new breeding grounds for mosquitoes in wet areas and stagnant pools. The public should dispose of dead animals that can carry viruses and diseases only in accordance with guidelines issued by local animal control authorities. Leptospirosis—a bacterial disease associated predominantly with rats—often accompanies floods in developing countries, although the risk is low in industrialized regions unless cuts or wounds have direct contact with disease-contaminated floodwaters or animals.
- **Mold and mildew—**Excessive exposure to mold and mildew can cause flood victims—especially those with allergies and asthma—to contract upper respiratory diseases, triggering cold-like symptoms. Molds grow in as short a period as 24 to 48 hours in wet and damp areas of buildings and homes that have not been cleaned after flooding, such as water-infiltrated walls, floors, carpets, toilets and bathrooms. Very small mold spores can be easily inhaled by human bodies and, in large enough quantities, cause allergic reactions, asthma episodes, and other respiratory problems. Infants, children, elderly people and pregnant women are considered most vulnerable to mold-induced health problems.
- **Carbon monoxide poisoning—**In the event of power outages following floods, some people use alternative fuels for heating or cooking in enclosed or partly enclosed spaces, such as small gasoline engines, stoves, generators, lanterns, gas ranges, charcoal or wood. Built-up carbon monoxide from these sources can poison people and animals.
- **Hazards when reentering and cleaning flooded homes and buildings—**Flooded buildings can pose significant health hazards to people entering them. Electrical power systems can become hazardous. Gas

leaks can trigger fire and explosion. 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.

- **Mental stress and fatigue**—People who live through a devastating flood can experience long-term psychological impact. The expense and effort required to repair flood-damaged homes places severe financial and psychological burdens on the people affected. Post-flood recovery can cause, anxiety, anger, depression, lethargy, hyperactivity, and sleeplessness. There is also a long-term concern among the affected that their homes can be flooded again in the future.

Current loss estimation models such as Hazus are not equipped to measure public health impacts such as these. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with them in responding to flood events.

11.4.2 Property

Hazus calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with Hazus.

Table 11-11 summarizes Hazus estimates of flood damage in the planning area. The debris estimate includes only structural debris and building finishes; it does not include additional debris that may result from a flood event, such as from trees, sediment, building contents, bridges, or utility lines. The 110,657 tons of estimated debris from a 1-percent-annual-chance flood event is enough to fill 4,426 25-ton trucks.

Table 11-11. Estimated Impact of a Flood Event in the Planning Area

Damage Type	100-Year Flood	500-Year Flood
Structure Debris (Tons)	110,657	218,401
Buildings Impacted [a]	6,640	11,479
Total Value (Structure + Contents) Damaged	$1,284,385,554	$2,844,179,068
Damage as % of Total Replacement Value	0.7%	1.5%

a. “Impacted” means floodwater projected over the lowest floor.

11.4.3 Critical Facilities

Estimated Damage

Hazus was used to estimate the percent of damage to the building and contents of critical facilities, using depth/damage function curves. The results are summarized in Figure 11-6 and Figure 11-7.

Impacts on Hazardous Materials

During a flood event, containers holding hazardous materials can rupture and leak into the surrounding area. These facilities could release chemicals that cause cancer or other human health effects, significant adverse acute human health effects, or significant adverse environmental effects.

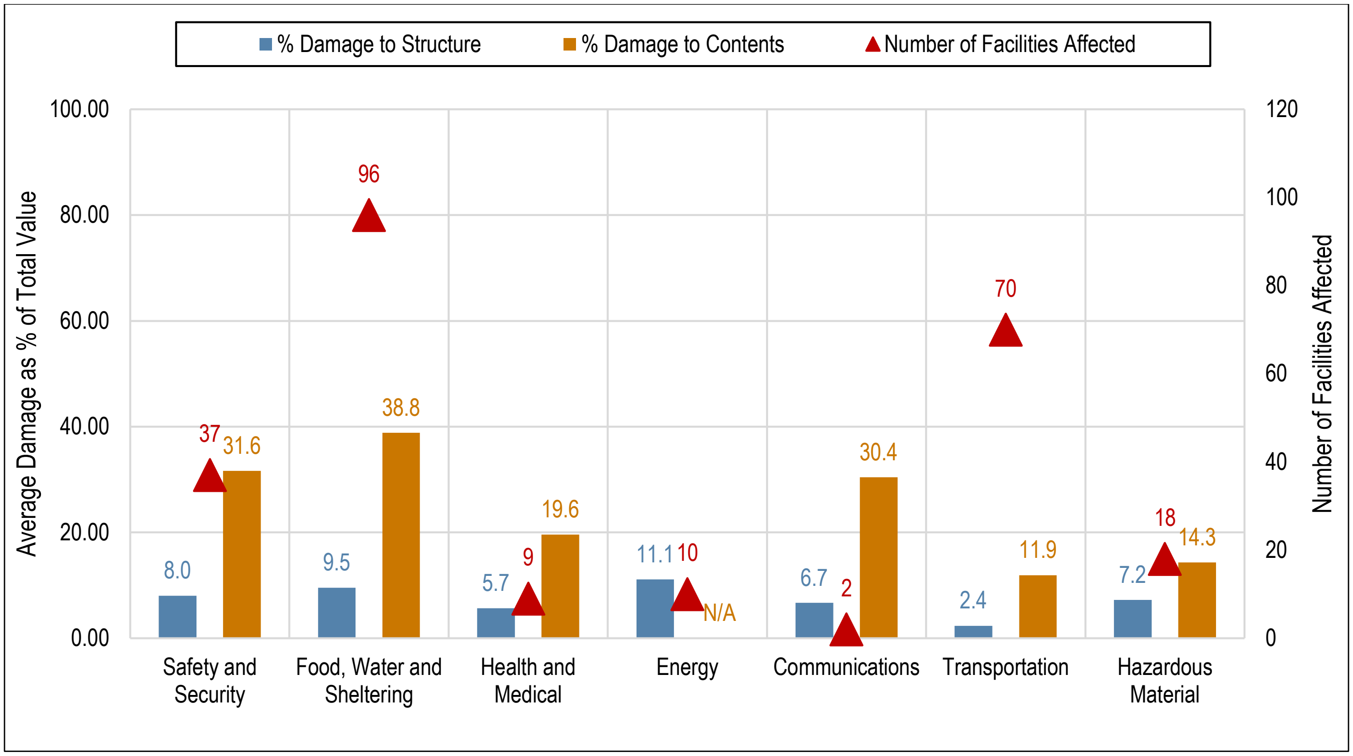


Figure 11-6. Estimated Damage to Critical Facilities from 1% Annual Chance Flood

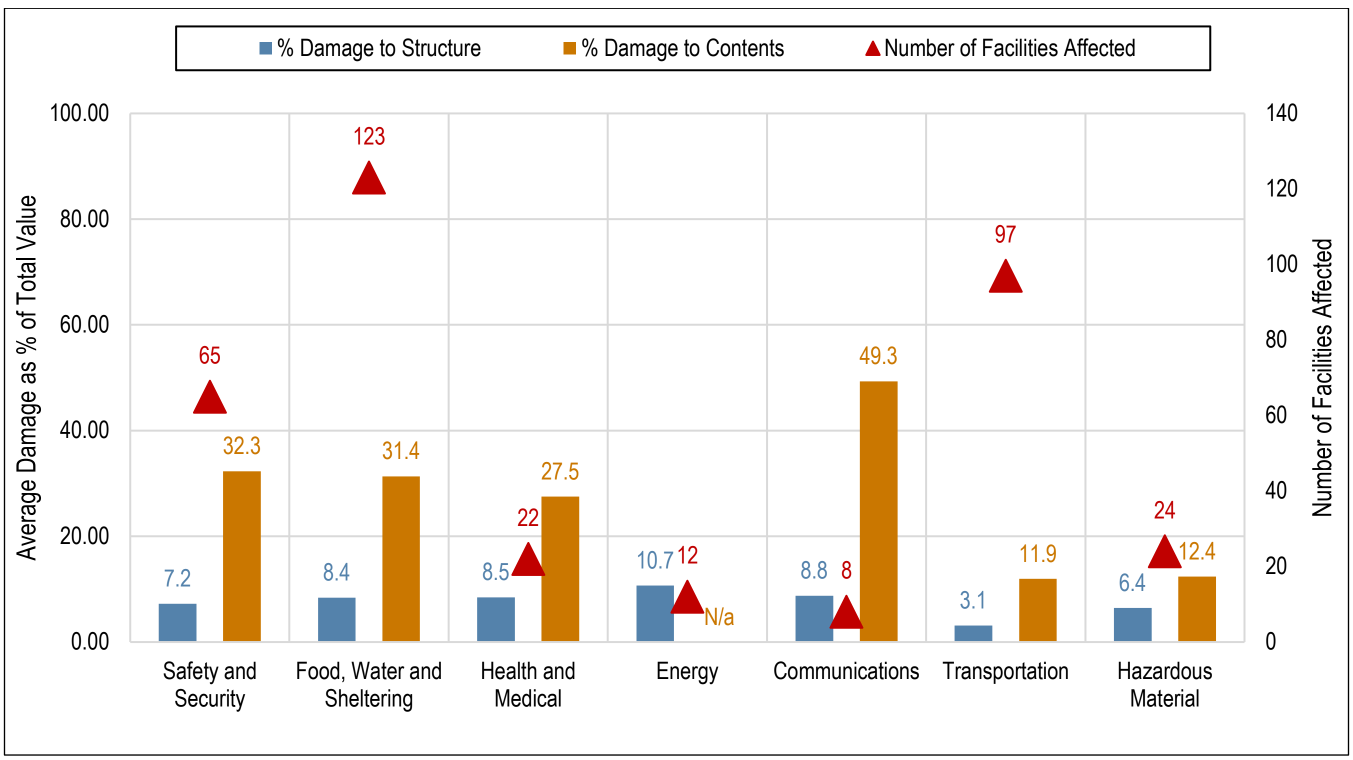


Figure 11-7. Estimated Damage to Critical Facilities from 0.2% Annual Chance Flood

Impacts on Utilities and Infrastructure

Roads that are blocked or damaged can isolate community members and can prevent access throughout the planning area, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Underground utilities can be damaged. Levees can fail or be overtopped, inundating the land that they protect. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams.

11.4.4 Environment

Flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development, such as bridge abutments, levees or logjams from timber harvesting, can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

Many species of mammals, birds, reptiles, amphibians and fish live in the planning area in plant communities that are dependent upon streams, wetlands and floodplains. Wildlife and fish are impacted when plant communities are eliminated or fundamentally altered to reduce habitat. Since water supply is a major limiting factor for many animals, riparian communities are of special importance.

Loss estimation platforms such as Hazus are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

11.5 FUTURE TRENDS IN DEVELOPMENT

Any areas of future growth and development could be impacted by the flood hazard if located within identified hazard areas. The County intends to discourage development within vulnerable areas and/or to encourage higher regulatory standards on the local level.

The County and its planning partners are equipped to handle future growth in flood hazard areas. All municipal planning partners have general plan safety elements that address frequently flooded areas and have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts flood hazard areas. In addition, partners who are participating in good standing in the NFIP have agreed to regulate new development in the mapped floodplain according to standards that equal or exceed those specified under 44 CFR Section 60.3. This will ensure that any development allowed in the floodplain will be constructed such that the flood risk exposure is eliminated or significantly reduced.

Additionally, with 25 percent of municipalities in the County participating in the CRS program, there is incentive to adopt consistent, appropriate, higher regulatory standards in communities with the highest degree of flood risk. All municipal planning partners have committed to maintain their good standing under the NFIP through initiatives identified in this hazard mitigation plan. Communities participating or considering participation in the CRS program will be able to refine this commitment using CRS programs and templates as a guide.

11.6 SCENARIO

Historically, floods have regularly affected San Mateo County. The County can expect noteworthy flooding about once a year, with a flash flood approximately every 2 years. Duration and intensity of heavy winter rains and El Niño storms that cause flooding may increase due to climate change. The floodplains mapped and identified by San Mateo County will continue to take the brunt of these floods. County community members prepare themselves for flooding by seeking and receiving information, and by pursuing mitigation. Impacts of flood events should decrease as the County, local cities, and community members continue to promote and implement hazard mitigation and preparedness.

The worst-case scenario would be a series of heavy rains or storm events during an El Niño event or winter rainy season, particularly if the rains also occur at high tide. These rains could flood numerous areas within a short time. This could overwhelm the response and floodplain management capability within the planning area, as the planning area would be subject immediately to flash flooding and coastal flooding, with subsequent influences on the County's streams. Major roads could be blocked, preventing critical access for many community members and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the event of multi-basin flooding, San Mateo County would not be able to make repairs quickly enough to restore critical facilities and assets.

11.7 ISSUES

The planning team has identified the following flood-related issues relevant to the planning area:

- Accuracy of existing flood hazard mapping by FEMA regarding true flood risk within the planning area is questionable. This is most prevalent within areas protected by levees not accredited by the FEMA mapping process.
- Over 60 percent of the population within the 1 percent annual chance floodplain have either very high or relatively high social vulnerability.
- Extent of flood protection currently provided by flood control facilities (dams, dikes, and levees) is not known due to lack of established national policy on flood protection standards.
- The levee system within the planning area is not consistently adequate to mitigate effects of a 1-percent annual chance flood.
- Risk associated with the flood hazard overlaps risks associated with other hazards such as earthquakes, landslides, and coastal erosion. This provides opportunity to seek mitigation alternatives with multiple objectives that can reduce risks from multiple hazards.
- Land-use practices are not consistent with the scope of regulatory floodplain management within the planning area.
- How climate change will affect flood conditions in San Mateo County is uncertain.
- More information is needed regarding flood risk to support the concept of risk-based analysis of capital projects.
- To determine cost-effectiveness of future mitigation projects, sustained effort is necessary to gather damage reports and historical damage data such as high-water marks on structures.
- Ongoing flood hazard mitigation will require funding from multiple sources.

- A coordinated hazard mitigation effort is necessary among jurisdictions affected by flood hazards within the County.
- Floodplain community members must continue to seek and receive information about flood preparedness and resources available during and after floods.
- The concept of residual risk should be considered in design of future capital flood control projects and should be communicated to community members living in the floodplain.
- Promotion of flood insurance as a means of protecting private property owners from economic impacts of frequent flood events should continue.
- Existing floodplain-compatible uses such as agricultural and open space must be maintained. Pressure is constant to convert these existing uses to more intense uses within the planning area during times of moderate to high growth.
- The economy affects a jurisdiction’s ability to manage its floodplains. Budget cuts and personnel losses can strain resources needed to support floodplain management.

12. LANDSLIDE/MASS MOVEMENTS

12.1 GENERAL BACKGROUND

A landslide is a mass of rock, earth or debris moving down a slope. Landslides may be minor or very large, and can move at slow to very high speeds. Mudslides are rivers of rock, earth, organic matter, and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt.

Landslides in hillside terrain can pose serious hazard to downslope property and structures. They can disrupt roadways and other infrastructure lifelines, destroy private property, and cause flooding, bank erosion, and rapid channel migration. A slide can move rapidly down slopes or through channels, and can strike with little or no warning. It can travel miles from its source, growing as it descends, picking up trees, boulders, cars, and anything else in its path. Although slides behave as fluids, they convey many times the hydraulic force of water due to the mass of material they carry.

In spite of their destructive potential, landslides can serve beneficial functions to the natural environment. They supply sediment and large wood to the channel network and can contribute to complexity and dynamic channel behavior critical for aquatic and riparian ecological diversity.

12.1.1 Landslide/Mass Movement Causes

Slides are caused by a combination of geological and climate conditions and the influence of urbanization. They can be initiated by storms, earthquakes, fires, volcanic eruptions or human modification of the land. Vulnerable natural conditions are affected by human development and the infrastructure that supports it. In some cases, irrigation increases the landslide potential. The following factors can contribute to slide formation:

- Change in slope of the terrain
- Increased load on the land
- Shocks and vibrations
- Change in water content
- Groundwater movement
- Frost action
- Weathering of rocks
- Removing or changing the type of vegetation covering slopes.

While small landslides are frequently a result of human activity, the largest landslides are often naturally occurring phenomena with little or no human contribution. The sites of large landslides are typically areas of previous landslide movement that are periodically reactivated by significant precipitation or seismic events.

12.1.2 Landslide/Mass Movement Types

Common types of slides are shown in Figure 12-1. The most common is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. The largest and most destructive are deep-seated slides, although they are less common than other types.

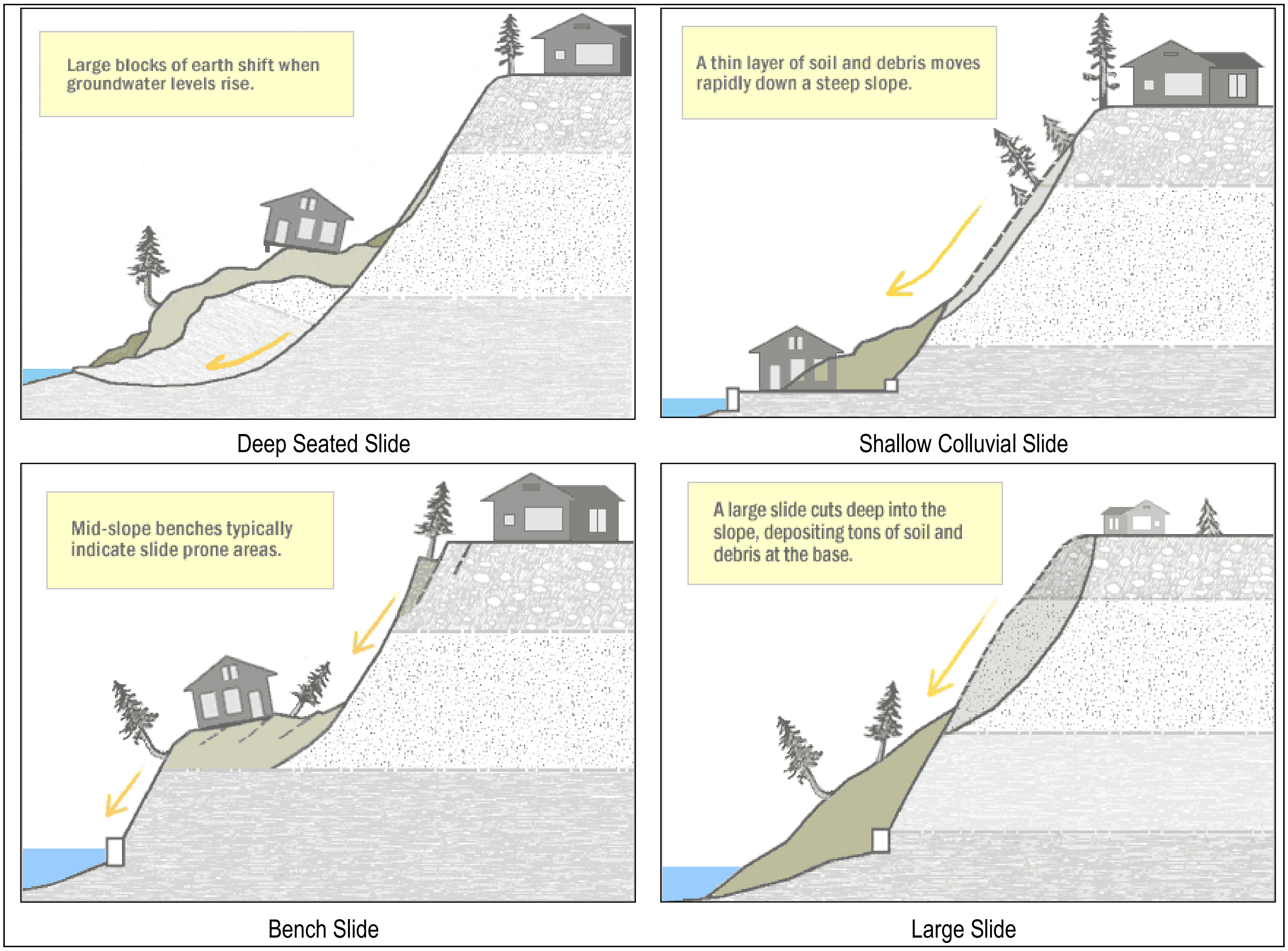


Figure 12-1. Common Types of Landslide

12.1.3 Landslide/Mass Movement Risk Areas

Landslides are typically a function of soil type and steepness of slope. Soil type is a key indicator for landslide potential and is used by geologist and geotechnical engineers to determine soil stability for construction standards. 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 or potential for snow avalanches
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments
- The presence of impermeable soils, such as silt or clay, mixed with granular soils, such as sand or gravel.

The best predictor of where slides might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges. The recognition of ancient dormant landslide sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

12.1.4 Secondary Hazards

Landslides and mass movements that block rivers or streams can contribute to flooding.

12.2 HAZARD PROFILE

12.2.1 Past Events

Landslides have occurred regularly within San Mateo County; one such event led to the deaths of three children in 1982, and several events have required apartment evacuations along coastal bluffs. Table 12-1 lists known landslide events that affected San Mateo County between 1980 and 2020.

Table 12-1. Landslide Events in San Mateo County

Date	Event Type	FEMA Declaration Number	Location
December 19, 1981 – January 8, 1983	Severe Storms, Flood, Mudslides, High Tide	DR-651	San Mateo County
Impacts: Not reported			
January 4, 1982	Landslides, Severe Storm	N/A	San Mateo County (Pacifica and Various)
Impacts: After an intense storm, many small to major landslides occurred in steep sections of the western and northern County, mostly in low population areas. Three children died after a strip of hillside slid hundreds of feet and destroyed two homes in Pacifica. The County recorded millions of dollars in property damage from the landslides.			
January 21 – March 30, 1983	Coastal Storms, Floods, Slides, Tornadoes	DR-677	San Mateo County
Impacts: Not reported			
January 3 – February 10, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	San Mateo County
Impacts: Not reported			

Date	Event Type	FEMA Declaration Number	Location
February 1995	Late Winter Storms (Severe Winter Storms, Flood, Landslide, Mudflows)	1046-DR-CA	San Mateo County
Impacts: All California counties except Del Norte were included in this declaration.			
December 28, 1996 – April 1, 1997	Severe Storms, Flooding, Mud, and Landslides	DR-1155	San Mateo County
Impacts: Not reported			
February 1998	Landslides	N/A	San Mateo County
Impacts: The main slide in La Honda began moving continuously by February 11 and accelerated after a period of rain. Three houses at the head of the slide were red tagged, as were five other houses on or near it. San Mateo County drilled three wells in a road crossing the slide and began pumping wells. The County also dug plastic-lined trenches to facilitate drainage. Seven homes on Esplanade Drive in Pacifica were evacuated after a 30-foot cliff retreated 10 feet to the rear edge of the homes.			
February 2, 1998	El Niño (Flood and Landslides)	DR-1203	San Mateo County (Various Cities)
Impacts: San Mateo County recorded $55 million in damage to public and private properties. La Honda, Moss Beach, Pacifica, Daly City, and Portola Valley listed $38 million in damage. Hundreds of hillsides failed. The pre-existing Polhemus landslide (earth slump) reactivated. Shoreline retreat occurred in Daly City, Pacifica, Tunitas Creek, and Moss Beach.			
Dec. 17, 2005 – Jan. 12, 2006	Winter Storms (Severe Storms, Flood, Mudslides, Landslides)	DR-1628	San Mateo County
Impacts: Damage estimates for the region exceeded $100 million. Three homes were nearly wiped out by mudslides.			
March 29 – April 1, 2006	Spring Storms (Severe Storms, Flood, Landslides, Mudslides)	DR-1646	San Mateo County
Impacts: Damage not available.			
April 1, 2006	Debris Flow	N/A	San Francisco Peninsula Coast
Impacts: The hardest hit areas were water-soaked hillsides in Brisbane, Broadmoor, and El Granada. In total, 83 damage sites were documented throughout San Mateo County. A slide caused Highway 1 at Devil's Slide to be closed for several months.			
April 4, 2006	Debris Flow	N/A	Santa Cruz Mountains (Zone)
Impacts: Heavy and persistent rains in the Santa Cruz mountains during the first half of April caused many landslides. Damage was estimated at nearly $13 million, with at least $6 million charged to county road damage.			
April 22, 2006	Landslide	N/A	Half Moon Bay
Impacts: Landslide downed fiber optic phone lines, leading to phone service outages in several San Mateo County coastal cities.			
December 6, 2014	Landslide	N/A	CA-84 East, between Old La Honda Rd., and Highway 35/Skyline Blvd.
Impacts: A landslide led to a traffic alert for motorists on CA-84 East, where only one lane was open for traffic.			
January 18 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	DR-4305	San Mateo County
Impacts: Not reported			
February 1 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	DR-4308	San Mateo County
Impacts: Not reported			

Sources: ABAG Local Hazard Mitigation Plan 2012, San Mateo County Sheriff 2015, USGS 1998, SFGate 2006, CBS Local 2014, NOAA Severe Storms Database 2016, ABC News 2009, NBC News 2016, KRON 4 2016

Sites of Repeated Landslides

In addition to the one-time events listed in Table 12-1, the following ongoing problem areas have been reported:

- The southwestern portion of the County has experienced repeated damage from debris flows, including the Tunitas Creek, San Gregorio, and Pescadero watersheds. Debris flows are widespread on the natural slopes west of Skyline Ridge. They have been observed in Alpine Road, Crystal Springs, San Bruno Mountain, and Point San Pedro, as well as the County's coastal sea cliffs.

- Highway 1 has been closed by landslides multiple times at Devils Slide. In 1995 and 2006, landslides led to extended closures. The new Tom Lantos Tunnel, opened in March 2013, allows the highway to bypass Devils Slide and reduce vulnerability.

Post-Fire Debris Flows

Wildfire can significantly alter the hydrologic response of a watershed to the extent that even modest rainstorms can produce dangerous flash floods and debris flows. California's first major rainfall event of the winter after the historic 2020 wildfire season prompted evacuation orders and flood watches and warnings for several recent burn areas in the state. The biggest debris-flow impacts were in Monterey County and include major damage along the Big Sur Coast closing Highway 1 indefinitely (Dolan Fire) and damage to numerous homes causing at least one injury (River Fire). Minor home damage occurred in the Bond Fire in Orange County, and small non-destructive debris flows were observed in the CZU Lightning Complex burn area in Santa Cruz and San Mateo Counties. The USGS has extent maps available for each of these events (USGS, 2021).

12.2.2 Location

In 2011, the California Geological Survey used a combination of regional rock strength and slope data to create classes of susceptibility to deep-seated landslides statewide. The analysis assumed that susceptibility to deep-seated landslides is low on very low slopes in all rock materials and increases with slope and in weak rocks. The analysis also factored in locations of past landslides. Figure 12-2 shows the mapped susceptibility classes (none, low, moderate, high, and very high) for San Mateo County.

12.2.3 Frequency

In San Mateo County, landslides typically occur during and after severe storms, so the potential for landslides largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils. Most weather-induced landslides in the county occur in the winter after the water table has risen. Landslides that result from earthquakes can occur at any time. The probability of a landslide in the county in any given year is high. Table 12-1 lists 10 federal disaster declarations related to landslides in the County between 1981 and 2017, an average of one such major event every three or four years.

12.2.4 Severity

Landslides destroy property and infrastructure and can claim human lives. They have the potential of destabilizing the foundation of structures, which may result in monetary loss for community members. Slope failures in the United States result in an average of 25 to 50 lives lost per year (USGS, 2020). Slides can pose a serious hazard to properties on or below hillsides. They can cause block access to roads, which can isolate community members and businesses and delay commercial, public, and private transportation. This can result in economic losses for businesses. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

Historically, landslides in San Mateo County have proven to be very severe, with landslide activity being responsible for at least 14 deaths since 1982 (Bay Area News Group, 2016).

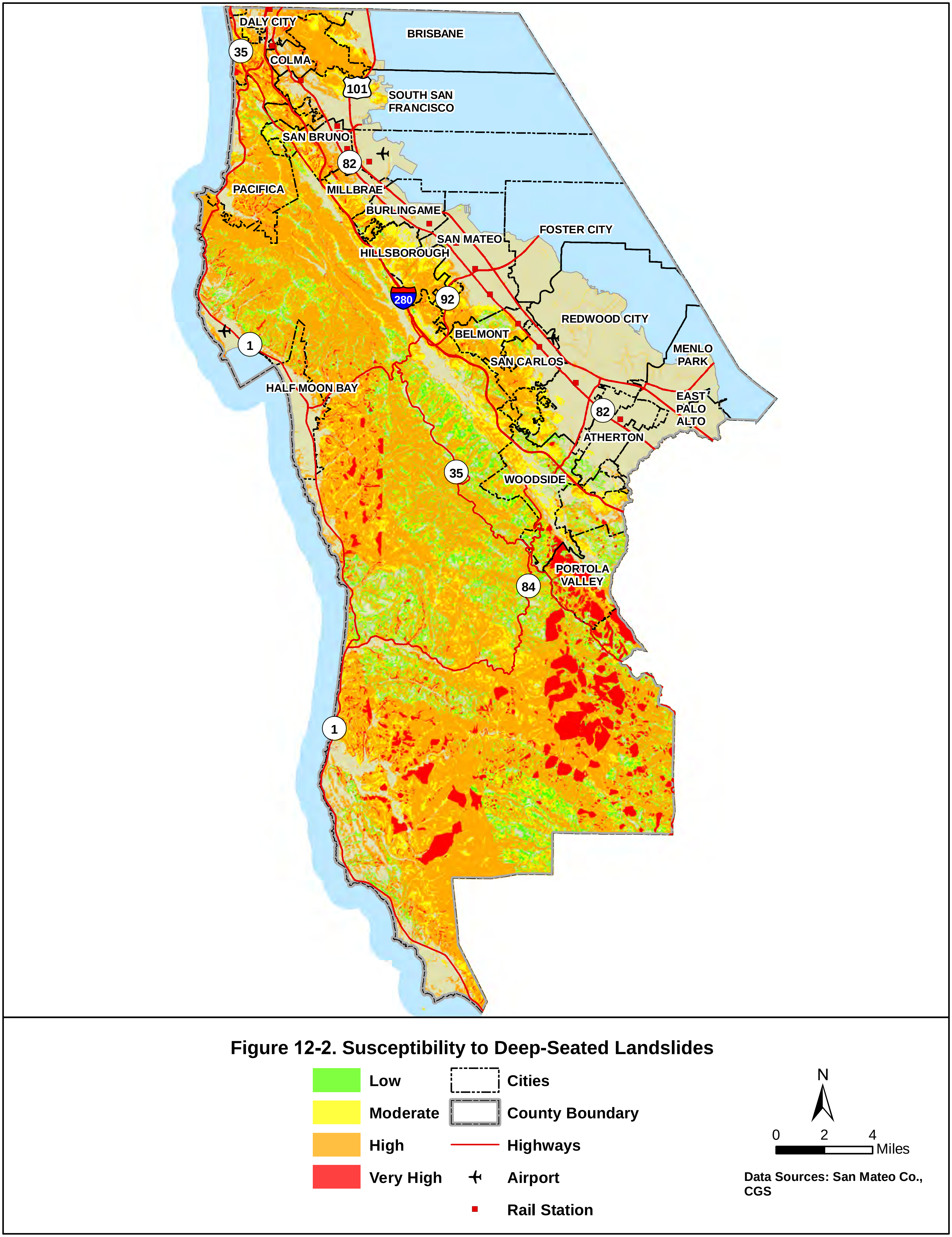


Figure 12-2. Susceptibility to Deep-Seated Landslides

Data Sources: San Mateo Co., CGS

12.2.5 Warning Time

Landslides can occur suddenly or slowly. The velocity of slide may range from a slow creep of inches per year to many feet per second, depending on slope angle, material, and water content. Generally accepted warning signs for landslide activity include the following:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements, or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content)
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows and visible open spaces indicating frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

Some methods used to monitor landslides can provide an idea of the type of slide and the amount of time prior to failure. Assessing the geology, vegetation, and amount of predicted precipitation for an area can help in predictions of what areas are at risk during general time periods. Currently, there is no practical warning system for individual landslides, however. The standard operating procedure is to monitor situations on a case-by-case basis and respond after an event has occurred.

12.3 EXPOSURE

12.3.1 Population and Property

A quantitative assessment of exposure to the landslide hazard was conducted using the landslide susceptibility mapping and the asset inventory developed for this plan, with an emphasis on zones with the highest degree of susceptibility (high and very high risk). Population exposure was estimated by calculating the number of buildings in each hazard area as a percent of total planning area buildings, and then applying this percentage to the estimated planning area population. Table 12-2 summarizes the estimated countywide population living in the mapped landslide susceptibility areas and the estimated property exposure. Detailed results by jurisdiction are provided in Appendix E.

Figure 12-3 shows the occupancy class defined by Hazus for all buildings in three mapped landslide hazard areas. Some building uses are more vulnerable to landslides, such as single-family homes, while others are less vulnerable, such as agricultural land or parks. Residential properties make up 98 percent of this exposure.

Table 12-2. Exposed Population and Property in Mapped Landslide Hazard Zones

	Moderate Landslide Risk (Susceptibility Categories V and VI)	High Landslide Risk (Susceptibility Categories VII, VIII, IX)	Very High Landslide Risk (Susceptibility Category X; Includes existing landslides)
Population			
Population Exposed	103,691	203,952	10,292
% of Total Planning Area Population	13.4%	26.4%	1.3%
Property			
Number of Buildings Exposed	26,392	49,986	2,622
Value of Exposed Structures	$10,299,418,332	$19,743,419,969	$1,120,484,064
Value of Exposed Contents	$7,093,905,932	$13,187,783,453	$843,456,811
Total Exposed Property Value	**$17,393,324,265**	**$32,931,203,421**	**$1,963,940,875**
Total Exposed Value as % of Planning Area Total	*9.1%*	*17.2%*	*1%*

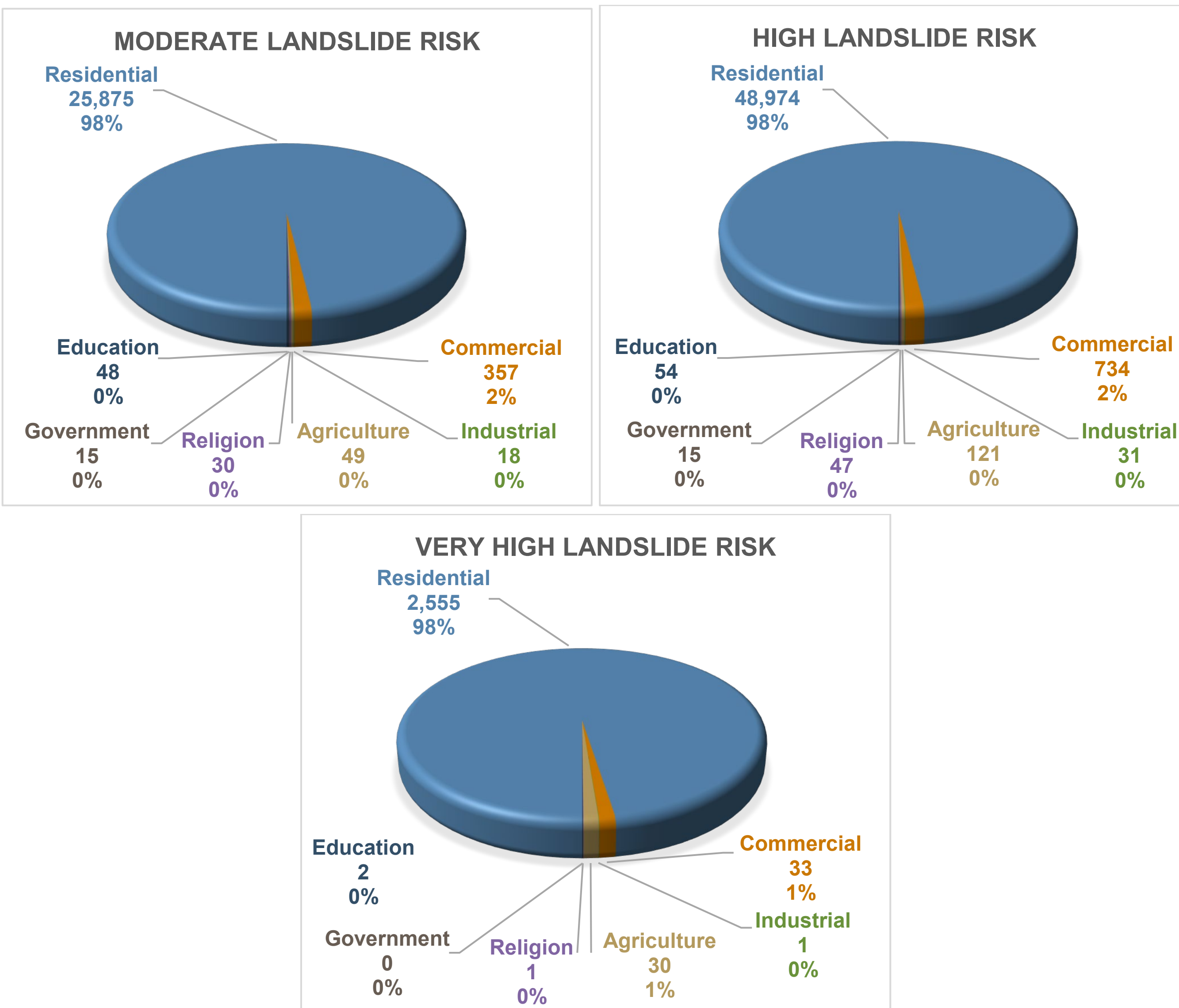


Figure 12-3. Building Occupancy Classes in the Mapped Landslide Hazard Zones

12.3.2 Critical Facilities

The breakdown of exposure of critical facilities by susceptibility class and facility type is shown in Figure 12-4.

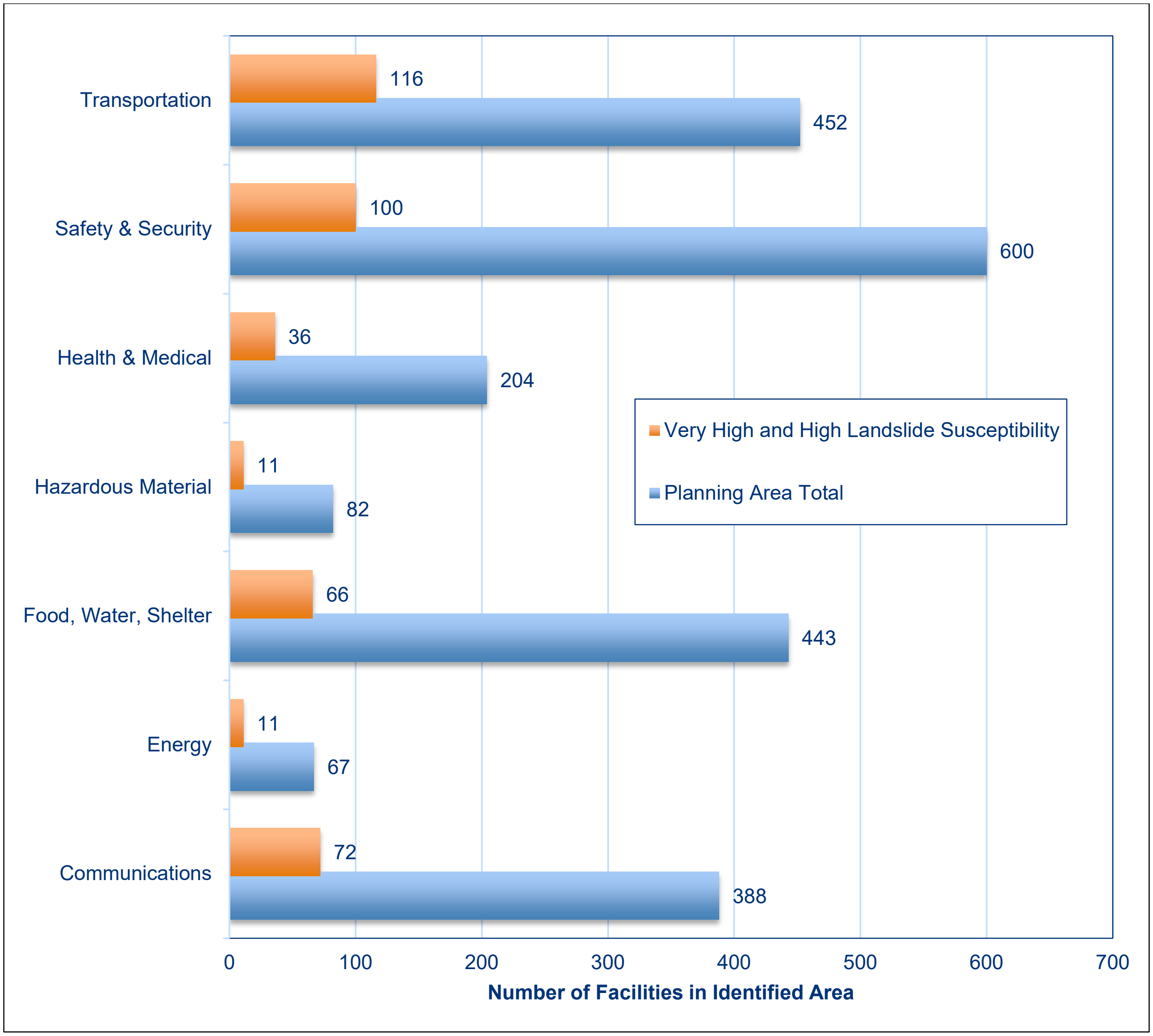


Figure 12-4. Critical Facilities in Mapped Landslide Susceptibility Classes and Countywide

A significant amount of roads, bridges, and utilities can be exposed to landslides. The following major roads intersect mapped landslide hazard areas:

- State Highway 1
- State Highway 92
- Interstate 380
- State Highway 84
- State Highway 82
- US Highway 101
- Interstate 280

There are 26 bridges in San Mateo County with exposure to the landslide hazard. Landslides can knock out bridge abutments or weaken the soil supporting a bridge, obstructing the bridge or making it hazardous for use. Bridges in areas of high landslide risk often provide the only ingress and egress to large areas.

12.3.3 Environment

All natural areas within the high susceptibility zones for landslide are considered to be exposed to the hazard.

12.4 VULNERABILITY

Vulnerability estimates for the landslide hazard are described qualitatively. No loss estimation of these facilities was performed because damage functions have not been established for the landslide hazard.

12.4.1 Population

All people exposed to the landslide hazard are potentially vulnerable to landslide impacts. Populations with access and functional needs as well as elderly populations and the very young are more vulnerable to the landslide hazards as they may not be able to evacuate quickly enough to avoid the impacts of a landslide.

To apply an equity lens to this assessment, an analysis was performed using the SoVI ratings (see Section 7.2.2) of the population living in high or very high landslide susceptibility zones. Detailed results by jurisdiction are in Appendix E. Table 12-3 summarizes results for the overall planning area.

Table 12-3. Distribution of Population Exposed to Landslide Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	49,222	25.84%
Relatively High	48,485	25.46%
Relatively Moderate	52,477	27.56%
Relatively Low	19,557	10.27%
Very Low	20,708	10.87%

12.4.2 Property

Estimates of potential losses associated with landslides were developed representing 1 percent, 10 percent, 30 percent, and 50 percent of the replacement value of structures exposed to the landslide hazard. This allows emergency managers to assess potential economic impact based on assumptions about the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 12-4 shows potential losses in the areas with the highest degree of landslide susceptibility.

Table 12-4. Loss Estimation for Landslide

	Exposed Value	Loss Value	Loss as % of Total Planning Area Replacement Value
Moderate Landslide Susceptibility Zone			
Loss = 1% of Exposed Value	$17.4 billion	$173.9 million	Less than 1%
Loss = 10% of Exposed Value		$1.7 billion	Less than 1%
Loss = 30% of Exposed Value		$5.2 billion	2.72%
Loss = 50% of Exposed Value		$8.7 billion	4.53%
High Landslide Susceptibility Zone			
Loss = 1% of Exposed Value	$32.9 billion	$329.3 million	Less than 1%
Loss = 10% of Exposed Value		$3.3 billion	1.72%
Loss = 30% of Exposed Value		$9.9 billion	5.15%
Loss = 50% of Exposed Value		$16.5 billion	8.58%
Very High Landslide Susceptibility Zone			
Loss = 1% of Exposed Value	$2.0 billion	$19.6 million	Less than 1%
Loss = 10% of Exposed Value		$196.4 million	Less than 1%
Loss = 30% of Exposed Value		$589.2 million	Less than 1%
Loss = 50% of Exposed Value		$982 million	Less than 1%

12.4.3 Critical Facilities

Highly susceptible areas of the county include mountain and coastal roads and transportation infrastructure. Access to major roads is crucial to life-safety after a disaster and can help to provide resilience during response and recovery operations. Landslides have the potential to block roads, isolating all or part of the County. Roadway blockages caused by landslides can create traffic problems, resulting in delays for emergency vehicles and public and private transportation. These blockages could result in economic losses for businesses.

At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available. A more in-depth analysis of the mitigation measures taken by landslide-exposed critical facilities to prevent damage from landslides should be done to determine if they could withstand impacts of a mass movement.

12.4.4 Environment

Natural Resources

Landslides can destroy natural assets that are highly valued by the community:

- Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality.
- Hillsides that provide wildlife habitat can be lost due to landslides.
- Endangered species and their critical habitat in the planning area may be located in landslide hazard areas.

Agricultural and Timber Resources

Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Landslides can have major consequences to such resources, primarily timberland, due to the large percentage of such land in remote locations on steep slopes. Roads accessing timberlands are often susceptible to slides and frequently are contributing factors to landslides. Mass movement activity on these roads can remove them from production.

Cultural Resources

Landslides can destroy cultural resources such as artifacts and structures.

Scenic Resources

San Mateo County features a broad range of scenic resources, including the coastline and Pacific Ocean, mountains, hills, ridgelines, inland water features, forests, agricultural features, and distinctive rural communities. Many of these resources or access routes to them are vulnerable to landslides.

12.4.5 Landslide Management

Landslides can create immediate, critical threats to public safety. Engineering solutions to protect structures on or adjacent to large active landslides are often extremely or prohibitively expensive. Effective landslide management should include the following elements:

- Continuing investigation to identify natural landslides, understand their mechanics, assess their risk to public health and welfare, and understand their role in ecological systems
- Regulation of development in or near existing landslides or areas of natural instability through the San Mateo County Code and city ordinances.
- Preparation for emergency response to landslides to facilitate rapid, coordinated action among San Mateo County, local cities, and state and federal agencies, and to provide emergency assistance to affected or at-risk community members.
- Evaluation of options including landslide stabilization or structure relocation where landslides are identified that threaten critical public structures or infrastructure

12.5 FUTURE TRENDS IN DEVELOPMENT

Land use controls (such as prohibiting development on unstable soils or steep slopes) are the most cost-effective way to prevent loss of life and property. The County and its planning partners are equipped to handle future growth within landslide hazard areas. All municipal planning partners have general plans that address landslide risk areas in their safety elements. All partners have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts landslide hazard areas.

The California Building Standards Code has adopted the International Building Code (IBC) by reference. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions assure that new construction is built to standards that reduce the vulnerability to landslide risk. Building construction and grading activities are subject to County code that require a geotechnical report or slope stability analysis under specific slope conditions. The County requires a site evaluation prior to building plan check. Geologic maps are reviewed during the site evaluation and where building or grading is proposed in areas mapped with landslides, expansive soils, liquefaction potential, or fault rupture hazards, a geotechnical report is required, and design mitigations identified.

12.6 SCENARIO

Major landslides in San Mateo County most typically occur as a result of soil conditions affected by severe storms, groundwater, or human development. The worst-case scenario for landslide hazards in the planning area would generally correspond to a severe storm with heavy rain that caused flooding. Landslides are more likely during the late winter when the water table is high. After heavy rains from November to December, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and as it accumulates on impermeable silt, it will weaken and destabilize the slope. A short intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the weakening of the slope. Gravity, poor drainage, a rising groundwater table, and poor soil exacerbate hazardous conditions.

Landslides are becoming a greater concern as development moves outside of city centers and into areas with less developed infrastructure. Most landslides would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, would be affected. Landslides could affect bridges that pass over landslide-prone ravines and knock out rail service through the County. Road obstructions caused by landslides would create isolation problems for community members and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communications to community members.

Continued heavy rains and flooding would complicate the problem further. As emergency response resources are applied to problems with flooding, it is possible they will be unavailable to assist with landslides across San Mateo County.

12.7 ISSUES

Important issues associated with landslides in the planning area include the following:

- The data and science regarding mapping and assessing landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be re-evaluated.
- Over 50 percent of the population exposed to the combination of very high and high landslide susceptibility have either “very high” or “relatively high” social vulnerability.
- The impact of climate change on landslides is uncertain. If climate change affects atmospheric conditions, the exposure to landslide risks in San Mateo County could increase.
- There are existing homes in landslide risk areas throughout the County. The degree of vulnerability of these structures depends on the codes and standards applied in constructing the structures.
- Future development could lead to more homes in landslide risk areas.
- Landslides may cause negative environmental consequences, including water quality degradation.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards, including earthquake, flooding, and wildfire. The County has an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- As the frequency and severity of wildfires increase in the State of California, the probability for post-fire debris flows will increase within the planning area.

- California's Disclosures in Real Property Transactions law requires disclosure if a property is in a landslide hazard area. Such disclosure is dependent upon knowledge by the seller or the seller's real estate agent or the posting of a landslide hazard map at the offices of the County recorder, County assessor, and County planning agency and a notice identifying the location of the map and any changes to it.
- Coastal bluff erosion is particularly susceptible to ocean wave height and the direction of wave approach. El Niño conditions often result in substantial increases in the of coastal bluff retreat. Roads and residential developments are most exposed to these hazards.

13. SEA LEVEL RISE

13.1 GENERAL BACKGROUND

Sea-level rise is caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers; and the expansion of seawater as it warms. In the past century, global mean sea level has increased by 7 to 8 inches, with human influence the dominant cause of observed atmospheric and oceanic warming. Given current trends in greenhouse gas emissions and increasing global temperatures, sea level rise is expected to accelerate in the coming decades, with scientists projecting an increase in sea level in the San Francisco area by 2100 of anywhere from 1.0 to 10.2 feet (California Natural Resources Agency, 2018).

The most damaging events over the next few decades are likely to be dominated by large El Niño-driven storm events in combination with high tides and large waves. Impacts will generally become more frequent and more severe in the latter half of this century.

13.2 HAZARD PROFILE

San Mateo County is highly vulnerable to the effects of rising sea levels. If left unmanaged, future flooding and coastal erosion could pose considerable risks to life, safety, critical facilities, the County's natural and recreational assets, and the economy. The assessed value of parcels in the project area exposed to near-term (present-day) flooding exceeds $1 billion, and the assessed value of parcels exposed to erosion and flooding in the long term (50–100 years) totals nearly $40 billion. More than 30,000 residential parcels and 3,000 commercial parcels may also be vulnerable in the long term (County of San Mateo, 2018).

Flooding, erosion, and sea level rise directly threaten people and property in the sea level rise hazard areas. They also have indirect effects on all communities in the County, even those on high ground, because assets and infrastructure in the sea level rise areas provide critical services and functions to communities outside these areas. The County is already exposed to coastal flooding when large rain events coincide with high tides on the San Francisco Bay, making it imperative to take steps to reduce risk (County of San Mateo, 2018).

13.2.1 Previous Documents and Resources

County of San Mateo Sea Level Rise Vulnerability Assessment

The County of San Mateo's 2018 *Sea Level Rise Vulnerability Assessment* used best available existing data to assess the County's vulnerability to sea level rise. It supports a sea level rise preparedness strategy that does the following (County of San Mateo, 2018):

- Identifies risks to life and safety

- Recognizes the natural and beneficial functions of the County's natural areas
- Considers impacts and benefits to community populations, especially those with increased vulnerability

The project used sea level rise inundation data from the Our Coast, Our Future tool developed by the U.S. Geological Survey (USGS) and Point Blue, which provided the best available sea level rise data for the County at the time of the report. Three scenarios indicate the projected extent of flooding should the project area experience a 1 percent annual chance storm with or without sea level rise:

- The baseline scenario shows flooding with a 1 percent annual chance storm.
- The mid-level scenario shows flooding with a 1 percent chance annual storm and 3.3 feet of sea level rise.
- The high-end scenario shows flooding with a 1 percent chance annual storm and 6.6 feet of sea level rise.

This report identifies what is vulnerable to sea level rise among built and natural assets, explores public health and risks from cascading impacts, and discusses what these factors mean for policy and planning purposes. Its findings highlight that many of the assets have cross-cutting vulnerabilities (i.e., multiple, and indirect sources of vulnerability) and may have more than one point of exposure to sea level rise (County of San Mateo, 2018).

Our Coast, Our Future

Our Coast, Our Future (OCOF) is a collaborative project focused on providing coastal California resource managers and land use planners locally relevant, online maps and tools to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms. The OCOF incorporates factors such as water levels, wave heights, flooding, and erosion to assess vulnerabilities to sea level rise and storms in the San Francisco Bay and on the outer coast from Half Moon Bay to Bodega Bay. The following are available on the OCOF website:

- Seamless digital elevation model at 2-meter horizontal resolution for the San Francisco Bay Area
- 40 sea level rise and storm scenarios, plus a King Tide scenario for San Francisco Bay, using the USGS Coastal Storm Modeling System
- FAQ and video tutorials, including general project information, geographic coverage, data used, model development, and how to use the flood map
- Interactive maps of flood extent, depth, and duration, wave heights, and current velocity, as well as the option to compare scenarios and view georeferenced King Tide photos
- Online and downloadable data access tailored to end users' information needs.

Adapting to Rising Tides

The Adapting to Rising Tides (ART) program was established in 2010 to identify how current and future flooding along the Alameda County shoreline will affect communities, infrastructure, ecosystems, and economy. It was a project of the San Francisco Bay Conservation and Development Commission, NOAA's Office for Coastal Management, local, regional, state and federal agencies and organizations, and non-profit and private associations.

Since then, the ART program has continued with cross-jurisdictional projects that build local and regional capacity in the San Francisco Bay Area to plan for and implement adaptation responses. The program tests and refines adaptation planning methods to integrate sustainability and decision-making from start to finish and foster collaborations that lead to action on adaptation. Each ART program project provides data, maps and analysis about the assets, asset categories and sectors evaluated.

13.2.2 Past Events

Sea level rise is a dynamic phenomenon that is constantly evolving, the impacts of which are not associated or reported as singular events. It is already affecting Bay Area communities. In the last century, San Francisco Bay water levels have risen 8 inches.

13.2.3 Location

San Mateo County is a peninsula county, meaning it is subject to two types of sea-level rise hazard exposures:

- The eastern side of the County is exposed to the San Francisco Bay, which is more of a closed system.
- The western side of the County is exposed to the Pacific Ocean and the more dynamic sea-level rise conditions associated with wave action.

The inundation areas used for this assessment are a combination of scenarios from OCOF (6.6 feet of Pacific Ocean coastline sea-level rise by 2100, with 100-year storm) and the ART program (9 feet of San Francisco Bay coastline sea-level rise by 2100). Mapped inundation areas were aggregated for a singular sea-level rise assessment. Figure 13-1 shows the extent and location of these combined areas.

13.2.4 Frequency

The probability of sea-level rise inundation in San Mateo County by 2100 is high. The sea-level rise projections for 2100 in the OCOF and ART program scenarios used for this assessment correlate to 0.98 to 1.35 inches per year over the next 80 years. Sea level rise projections are periodically revised as climate models are improved and updated with new data and observations.

13.2.5 Severity

The severity of sea-level rise to the County of San Mateo will become greater over the next 30 to 80 years. The severity could be exacerbated by the following conditions:

- **Daily tidal inundation**—As sea level rises, the amount of land and infrastructure subjected to daily inundation by high tides—also known as increases in mean higher high water—will increase. This would result in increased permanent future inundation of low-lying area.
- **Annual high tide inundation (King Tides)**—King Tides are abnormally high, predictable astronomical tides that occur about twice per year. they are the highest tides that occur each year during the winter and summer when the Earth, moon and sun are aligned. Winter King Tides may be amplified by stormy weather, making them even more significant. King Tides result in temporary inundation associated with nuisance flooding, such as inundation of low-lying roads, boardwalks, and waterfront promenades.
- **Extreme high tide inundation (storm surge)**—When Pacific Ocean storms coincide with high tides, storm surge can elevate Pacific Ocean and San Francisco Bay water levels and produce extreme high tides. Such storm surge events occurred on January 27, 1983, December 3, 1983, February 6, 1998, January 8, 2005, and December 31, 2006. Extreme high tides can cause severe inundation of low-lying roads, boardwalks, and promenades. They can exacerbate coastal and riverine flooding, cause upstream flooding, and interfere with stormwater outfalls.

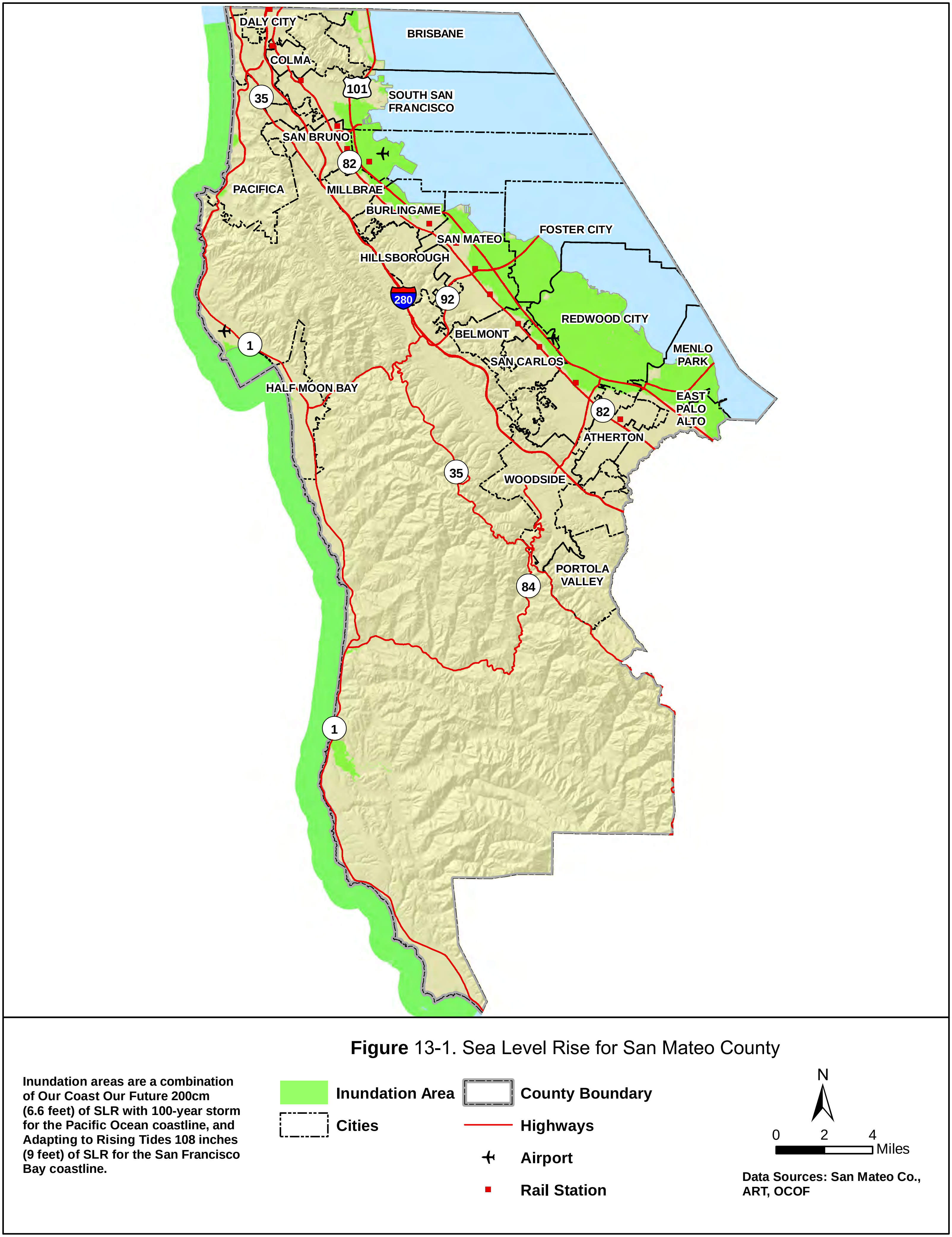


Figure 13-1. Sea Level Rise for San Mateo County

- **El Niño winter storms—**During El Niño winters, atmospheric and oceanographic conditions in the Pacific Ocean produce severe winter storms that bring intense rainfall and storm conditions to the Bay Area. Tides are often elevated 0.5 to 1.0 feet above normal along the coast, and wind setup can elevate water levels even further. Typical impacts include inundation of low-lying roads, boardwalks, and waterfront promenades; storm drain backup; wave damage to coastal structures; and erosion of natural shorelines. El Niño winter conditions prevailed in 1977–1978, 1982–1983, 1997–1998, 2009–2010, and 2015-2016.
- **Ocean swell and wind-wave events (storm waves)—**Pacific Ocean storms and strong thermal gradients can produce strong winds that blow across the ocean and the Bay. When the wind blows over long reaches of open water, large waves can be generated that impact the shoreline and cause damage. Typical impacts include wave damage along the shoreline, particularly to coastal structures such as levees, docks, piers, wharves, and revetments; backshore inundation due to wave overtopping of structures; and erosion of natural shorelines.

In the planning area, the potential for new or prolonged flooding as sea level rises will not be confined to the shoreline. Sea level rise will increase the likelihood of major flood events because higher water levels in tidal creeks and flood control channels will reduce capacity to discharge rainfall runoff. While some creeks and coastal infrastructure already flood when rainstorms coincide with high tides, rising sea levels will increasingly cause flooding during smaller, more frequent rainfall events.

13.2.6 Warning Time

Sea-level rise is not a hazard that requires near-team advance warning to support response and recovery operations. Programs such as the NOAA sea-level rise program are keeping an active watch on the sea-level rise phenomena to keep communities such as San Mateo County informed of the progression. This stream of information will feed programs to help the County to be prepared for and mitigate the long-term impacts from sea-level rise.

13.3 EXPOSURE

A quantitative assessment of exposure to the aggregated sea-level rise inundation area using the ART and OCOF mapping was developed to support the assessment of the sea-level rise hazard. Population exposure was estimated by calculating the number of buildings in each hazard area as a percent of total planning area buildings, and then applying this percentage to the estimated planning area population.

13.3.1 Population and Property

Table 13-1 summarizes the estimated citywide population living in the mapped sea level rise risk areas and the estimated property exposure. Figure 13-2 shows the structure type of buildings in the inundation area. See Appendix E for a detailed breakdown of sea level rise exposure by jurisdiction.

Table 13-1. Exposed Population and Property in Sea-Level Rise Zones

	Aggregate sea-level rise Zone
Population	
Population Exposed	147,577
% of Total Planning Area Population	19.09%
Property	
Number of Buildings Exposed	34,385
Value of Exposed Structures	29,877,430,719
Value of Exposed Contents	25,528,820,493
Total Exposed Property Value	**55,406,251,212**
Total Exposed Value as % of Planning Area Total	*28.87%*

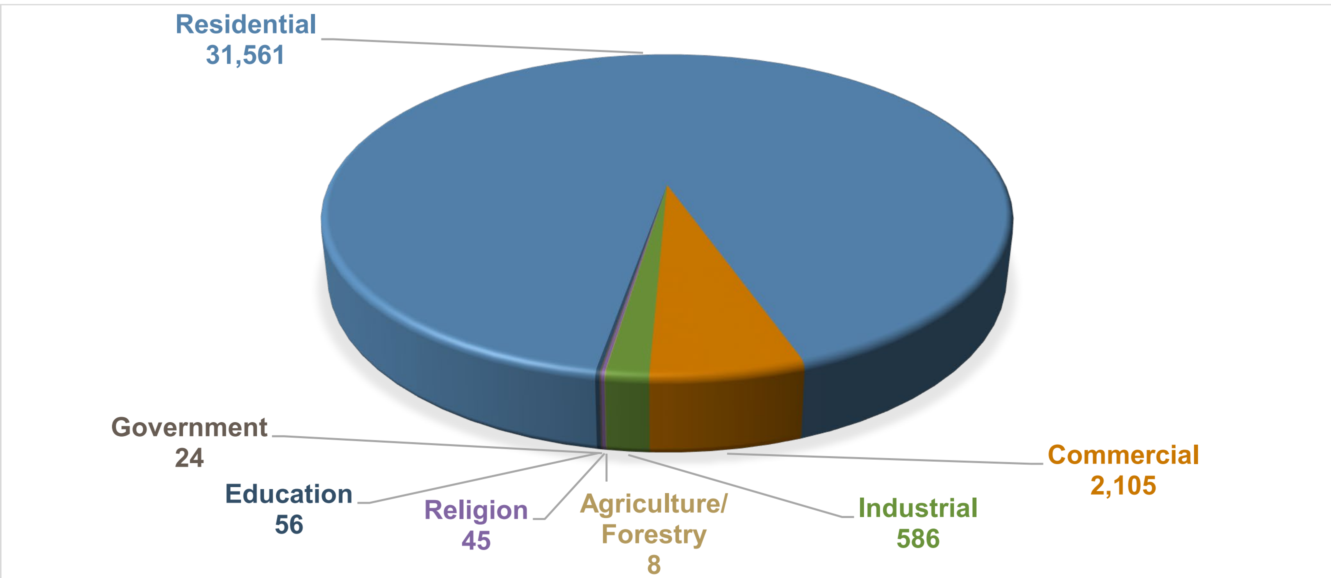


Figure 13-2. Number of Structures within the Sea Level Rise Inundation Area by Occupancy Class

13.3.2 Critical Facilities

Vulnerable assets in the planning area along the Pacific Coast and San Francisco Bay include critical facilities (police stations, hospitals, wastewater treatment plants, and schools), essential regional transportation networks and infrastructure (Bay Area Rapid Transit, Caltrain, Highway 101, State Route 1), and regional natural and recreational assets (Pacifica State Beach, the California Coastal Trail, and the Ravenswood Pond Complex) (County of San Mateo, 2018). The breakdown of critical facilities exposure by sea level rise inundation zone and facility type is shown in Figure 13-3. There are 157 critical facilities exposed to some degree to the aggregated sea level rise inundation area.

13.3.3 Environment

All sea level rise inundation areas are exposed and vulnerable to impacts. Many of the sea-level rise inundation areas include important environmental and natural resources, which are often important elements in nature based sea-level rise and flooding strategies.

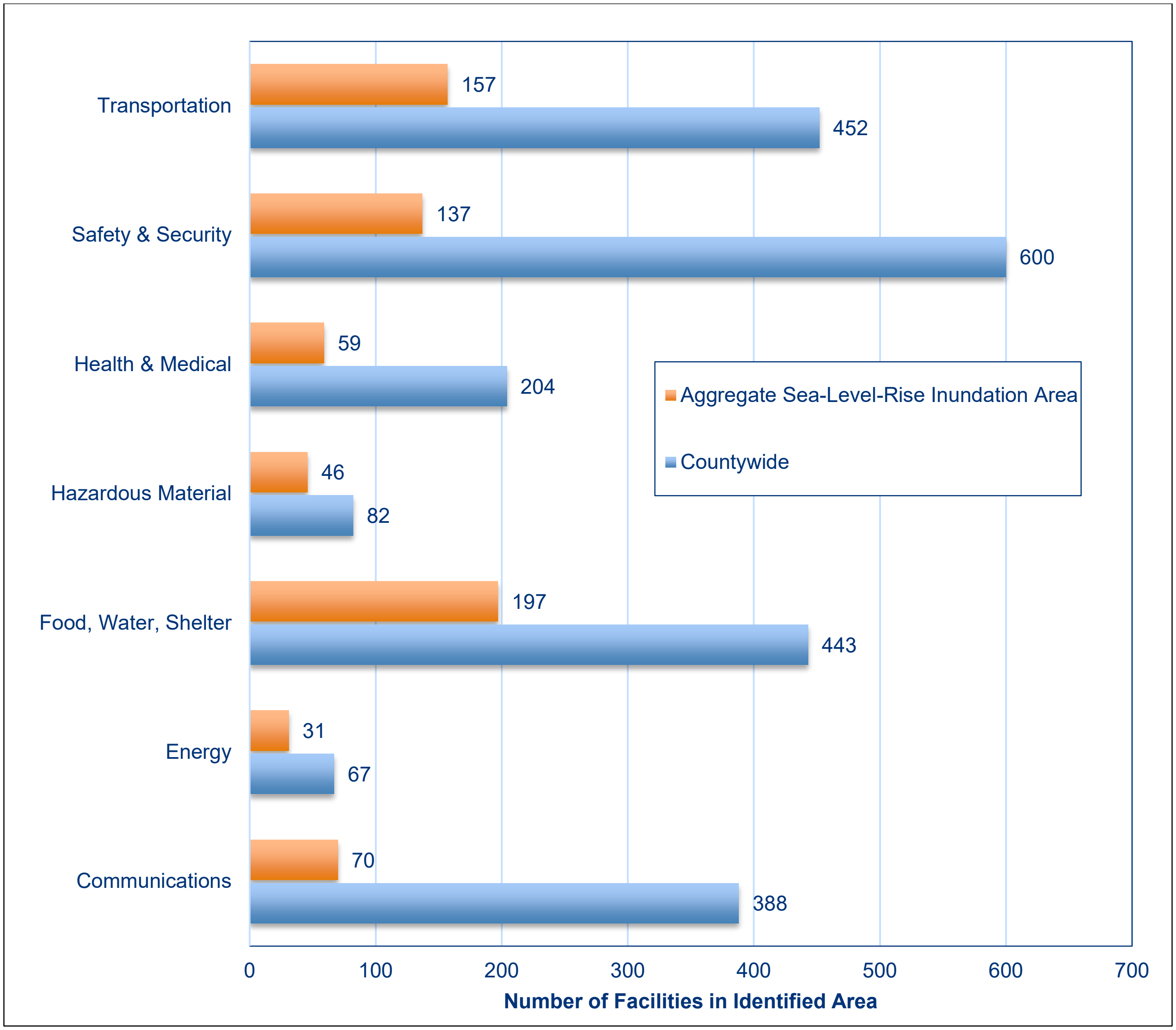


Figure 13-3. Critical Facilities in Mapped Sea-Level-Rise Inundation Areas and Countywide

13.4 VULNERABILITY

13.4.1 Population

All people exposed the sea-level rise hazard are potentially vulnerable to its impacts. To apply an equity lens to this assessment, an analysis was performed using the SoVI ratings (see Section 7.2.2) of the population living in the mapped sea level rise inundation areas. Detailed results by jurisdiction are in Appendix E. Table 13-2 summarizes results for the overall planning area.

Table 13-2. Distribution of Population Exposed to Sea-Level Rise Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	18,425	13.56%
Relatively High	40,980	30.17%
Relatively Moderate	43,456	31.99%
Relatively Low	25,653	18.88%
Very Low	7,336	5.4%

13.4.2 Property

Losses associated with sea-level rise were estimated based on estimated depth of sea-level rise inundation using the depth-damage functions in the Hazus flood model. Mean depths of inundation for all structures exposed to sea-level rise were determined via geospatial analysis. The results are shown in Table 13-3. The average depth above the lowest floor is 5 feet.

Table 13-3. Mean Depths of Flooding for Sea-Level Rise Scenarios

	Mean Depth	Range of Values
San Francisco Bay coast (ART data—108 inches sea-level rise)	7.37 feet	0 – 15.49 feet
Pacific Ocean coast (OCOF coastal data—6.6 ft sea-level rise with 100-yr storm)	2.18 feet	0.03 – 5.41 feet

Based on this average, generic damage curves were averaged by structure type to estimate a percent damage for structures and for contents. The values determined were 39.4 percent and 23.4 percent, respectively. These percent damage curves were then applied to the exposed values for structure and contents, to estimate loss. Table 13-4 shows the resulting loss estimates for the mapped sea level rise inundation zones.

Table 13-4. Loss Estimation for Sea-Level Rise

Buildings Impacted[a]	34,385
Structure Value Damaged	$11,771,707,703
Content Value Damaged	$5,973,743,995
Total Value Damaged	**$17,745,451,699**
Damage as % of Total Value	9.25%

a. "Impacted " means water over the 1st floor of the structure

13.4.3 Critical Facilities

At this time, all critical facilities identified as exposed to the sea level rise hazard are considered vulnerable until more information becomes available. A more in-depth analysis should be done of the mitigation measures taken by the 157 critical facilities exposed to sea level rise to determine if they could withstand impacts of inundation.

13.4.4 Environment

Even a small increase in sea levels can have devastating effects on coastal habitats. It can cause destructive erosion, wetland flooding, aquifer and agricultural soil contamination with salt, and lost habitat for fish, birds, and plants. The sections below describe key environmental impacts associated with sea level rise.

Beaches

Approximately 13 miles of beaches in the County are exposed to sea level rise hazards. Some parts of the County's coastline are eroding faster than others. For example, Surfer's Beach has lost around 140 feet of beach since 1964. In addition to providing essential habitat for local fauna, beaches are an important recreational asset for all County residents. They also provide tourism-related economic benefits (County of San Mateo, 2018).

Animal Species

The County's natural environment supports a wide range of shorebirds, waterfowl, and other terrestrial and aquatic species, including ones listed as threatened or endangered. In particular, the threatened western snowy plover is vulnerable because it requires ground for nesting and its habitat is sensitive to temporary and permanent flooding. As dry ground decreases with sea level rise (assuming no management actions), western snowy plover habitat may become limited. The following species and groups of animals are of particular concern with respect to sea level rise alone (i.e., other climate factors are not considered); they are not listed in order of vulnerability (County of San Mateo, 2018):

- Ashy storm petrel
- Black oystercatcher
- Black rail
- California mussel
- Cassin's auklet
- Cavity nesting birds
- Mole crab
- Ochre sea star
- Red abalone
- Sea palm
- Surface nesting birds
- Western snowy plover

Groundwater

Sea level rise is anticipated to increase the groundwater table and could pose potential vulnerabilities and impacts on groundwater resources in the County, particularly in areas where municipal water supplies depend on groundwater (County of San Mateo, 2018).

Kelp

Eleven acres of kelp forests are present in the County and could be vulnerable to sea level rise. Sea-level rise may affect kelp forest communities through decreased light availability and forced shoreward migration. Sea level rise may also change the shape of the coastline and substrate composition (e.g., rocky versus sandy shores), and thus affect the availability and living conditions of macroalgae and their associated species (County of San Mateo, 2018).

Rocky Intertidal Habitat

Rocky intertidal habitat, such as that at the Fitzgerald Marine Reserve, is identified in *Climate Change Vulnerability Assessment for the North-Central California Coast and Ocean* as moderately sensitive to sea level rise. The habitat is also affected by hard armoring of the coastline and roads that prevent inland migration of beaches. These sensitivities are compounded by other natural and human-related factors, including temperature, invasive species, pH, and pollution (County of San Mateo, 2018).

Wetlands

Wetlands are an important natural asset in the County. They protect the shoreline from flooding and erosion from storms, and they are an important recreational and educational resource to the community. Wetlands contribute to a community's resilience to flooding by providing a storm surge buffer, erosion control, water-quality maintenance, and fish and wildlife habitat.

Wetlands are not very sensitive to temporary inundation, but they are more sensitive to permanent inundation from sea level rise, which could permanently convert them to tidal mudflat. However, wetlands may be able to build up sediment, or accrete at a pace equal to sea level rise (reflective of their adaptive capacity), which would prevent their permanent loss. This accretion would depend on an adequate supply of sediment, the extent to which the shoreline is developed, and how quickly the water level rises. These conditions are affected by human and natural processes upstream of San Francisco Bay and by coastal shoreline management practices on the Coastside.

For example, coastline hardening or infrastructure (such as a jetty) in one place can exacerbate erosion elsewhere. In total, over 7,000 acres of wetlands (more than 80 percent of all wetlands assessed in the project area) could be lost to temporary or permanent flooding or erosion. This area includes the Pillar Point Marsh, Bair Island, and the Ravenswood Pond Complex (County of San Mateo, 2018).

Wetlands also provide flood protection benefits, and sea level rise could lead to a reduction in those benefits as wetlands become converted to mudflats with rising water levels (Hayden et al., 2019).

13.5 FUTURE TRENDS IN DEVELOPMENT

The overall land area of San Mateo County will decrease as sea level rise permanently inundates the County's lowest areas. This will have significant impacts on land use and planning in local communities. Local general plans as well as climate action/adaptation plans in the planning area will guide this future development. State mandates have sought to strengthen land use application in areas impacted by sea level rise. Local general plans should be referenced and cross-referenced with the results of this plan to mitigate future development in areas most vulnerable to sea level rise.

California legislation (such as AB-32,AB-2800, SB-97 and SB-379, described in Chapter 6) equips local governments with planning tools to address sea level rise impacts as future development pressures interface with the sea-level rise hazard areas.

13.6 SCENARIO

Sea levels along the San Mateo County coast will rise over the next 80 years and beyond, and the county and coastal and Bay facing cities will be adversely impacted by that rise. The impacts are already happening and will progress over time. The planning partners are already preparing for these impacts using programs such as the recently completed *Sea-Level Rise Vulnerability Assessment* and other local coastal plans and other current projections customized for the immediate region. Mitigating the impacts from sea-level rise will take resources and tough land use decisions over the next 30 years, starting immediately.

The San Mateo County Flood and Sea Level Rise Resiliency District, known as OneShoreline, is an independent government agency working to make San Mateo County more resilient to the impacts of sea level rise, flooding, and coastal erosion. It was established with funding from the County and 20 incorporated cities within it. In addition to planning, OneShoreline is securing funding for and will build projects that protect communities, enhance the environment, and create recreational opportunities.

13.7 ISSUES

The planning team has identified the following sea-level-rise-related issues:

- The County should consider the adoption of higher regulatory standards to mitigate impacts of sea-level rise on redevelopment.
- The data and science that measure sea-level rise impacts progress rapidly. The County should commit to staying in line with the best available data and science on sea-level rise as it evolves.
- The costs to mitigate impacts from sea-level rise will be extensive and potentially beyond the County's means.
- Risk communication will be crucial to the successful mitigation of this hazard.
- Potential environmental losses include biodiversity and habitat for endangered plant and animal species
- Potential social losses include natural flood protection and natural recreation areas.
- Future permanent inundation of currently dry areas could disrupt local and regional commutes and travel.
- Saltwater intrusion of wastewater treatment plants could disrupt biological treatment process and significantly impede or shut down the treatment process.

14. SEVERE WEATHER

14.1 GENERAL BACKGROUND

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, downbursts, tornadoes, waterspouts, snowstorms, ice storms, and dust storms, among other events. Severe weather is not the same as extreme weather, which refers to unusual weather events at the extremes of the historical distribution for a given area.

The most common severe weather events that have historically impacted the planning area are heavy rains (atmospheric rivers), extreme heat, fog, thunderstorms, tornadoes, and windstorms. Public safety power shutoff (PSPS) events represent a newer weather-related phenomenon in California; they are associated with weather conditions suitable for extreme fire risk. For this risk assessment, the term "severe weather" refers to all these event types in aggregate. They are assessed as a single hazard for the following reasons:

- Records indicate that each of these weather event types has impacted the planning area to some degree, and all have similar frequencies of occurrence.
- None of these weather event types have a clearly defined location, so no quantitative geospatial analysis is available to support exposure or vulnerability analysis; the analyses for this hazard are qualitative.

The following sections provide general descriptions of the local weather types of concern, in alphabetical order.

14.1.1 Atmospheric Rivers

Atmospheric rivers are relatively narrow regions in the atmosphere that are responsible for most of the horizontal transport of water vapor outside of the tropics. Those with the largest amounts of water vapor and the strongest winds can create extreme floods if they stall over watersheds vulnerable to flooding. These events can disrupt travel, induce mud slides, and cause catastrophic damage to life and property. However, not all atmospheric rivers cause damage—most are weak, and simply provide beneficial rain or snow that is crucial to water supply.

14.1.2 Extreme Heat

Extreme heat affects community members' safety and increases community costs and energy generation as it continues (Climate Ready San Mateo County, 2021). Extreme heat events can lead to an increase in heat-related illnesses and deaths, according to the California Department of Public Health's *San Mateo County Profile Climate Change and Health*. They can also cause drought, exacerbate wildfires, and impact water supplies. Frequent losses may be associated with the urban heat island effect and overheating of energy, heating, ventilation, and air conditioning systems. Heat can lead to brownouts or power loss due to impact on local infrastructure – such as the increased demand for air conditioning, rolling blackouts and PSPS events. Extreme heat events may degrade the quality of roadways and railways, resulting in closures and travel delays.

Extreme heat events are among the deadliest weather hazards facing communities. They are the primary weather-related cause of death in the United States. In a 10-year record of weather fatalities across the nation (2006 – 2015), excessive heat claimed more lives each year than floods, lightning, tornadoes, and hurricanes. According to the California Climate Adaptation Strategy, heat waves have claimed more lives in California than all other declared disaster events combined. Older adults, children, and sick or overweight individuals are at greater risk from extreme heat.

Extreme Heat Terminology

- **Extreme Heat:** A period of high heat and humidity with temperatures above 90 ºF for at least two to three days.
- **High-Heat Days:** Days when temperatures exceed 100 °F.
- **Heat Wave:** Five consecutive days when temperatures exceed 100 °F.
- **Cooling Degree Days**: Every degree that the mean daily temperature is above 65 °F. This value is an indicator of how much energy must be expended to keep facilities at a comfortable temperature
- **Urban Heat Island**: Areas that typically lack vegetation (e.g., trees) and have dark, paved surfaces (e.g., parking lots) that absorb more heat and retain it for longer than adjacent, greener areas.

14.1.3 Fog

Fog is a cloud near the ground. Fog forms when air close to the ground can no longer hold all the moisture it contains. This occurs either when air is cooled to its dew point or the amount of moisture in the air increases. Heavy fog is particularly hazardous because it can restrict surface visibility. Severe fog incidents can close roads, cause vehicle accidents and airport delays, and impair the effectiveness of emergency response. Financial losses associated with transportation delays caused by fog have not been calculated in the United States, but it is known to be substantial. Fog can occur almost anywhere during any season and is classified based on how it forms, which is related to where it forms. Certain seasons are more likely to have foggy days or nights based on a number of factors, including topography.

Fog in the Bay Area has different origins depending on the time of year. In the summer, the area is characterized by cool marine air and persistent coastal stratus and fog. In winter, ground fog forms in the moist regions of the Sacramento River Delta and arrives to the region via Suisun and San Pablo Bays and San Francisco Bays on cool easterly drainage winds. While this type of fog is less frequent than summer fogs, it is typically denser and more likely to lead to significantly reduced visibility (Golden Gate Weather Services 2009).

Although fog seems like a minor hazard, it can have significant impacts. The California Highway Patrol (CHP) alone has records of at least four officers whose deaths were indirectly caused by or exacerbated by dense fog and poor visibility (CHP 2016).

14.1.4 Public Safety Power Shutoff

Some combinations of weather conditions—particularly high winds, extreme heat, and low humidity—pose increased risks of wildfire. In 2012, the California Public Utilities Commission ruled that California Public Utilities Code gives electric utilities authority to shut off electric power to protect public safety, since power supply systems have the potential ignite wildfires (California Public Utilities Commission 2021). Such shutoffs are referred to as public safety power shutoff events. Given the long, connected nature of power supply systems, a shutoff event targeted to a small at-risk area can affect a larger area outside the risk zone. The duration of a shutoff is tied directly to the severe weather that triggers it; the shutoff typically ends within 24 hours after the severe weather has passed (Pacific Gas & Electric n.d.).

14.1.5 Thunderstorms

A thunderstorm is a rain event that includes thunder and lightning. A thunderstorm is classified as “severe” when it contains one or more of the following: hail with a diameter of three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado. Approximately 10 percent of the 100,000 thunderstorms that occur nationally every year are classified as severe (National Oceanic and Atmospheric Administration [NOAA] 2014).

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising motion, as can the interaction of warm air and cold air or wet air and dry air) it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool and it condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder. Thunderstorms have three stages (see Figure 14-1):

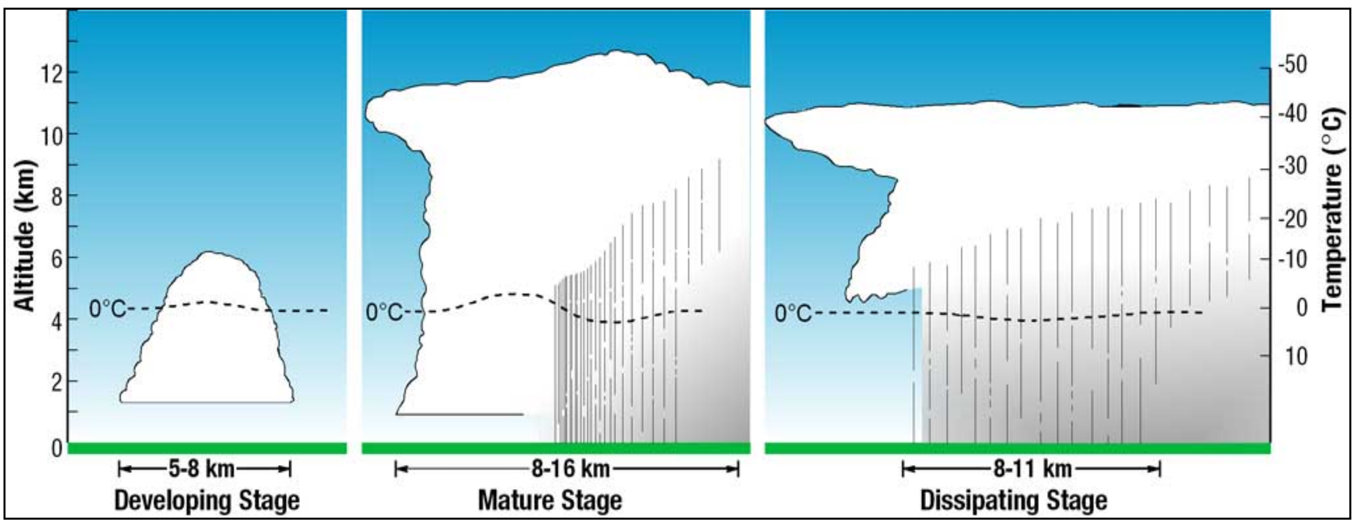


Figure 14-1. The Thunderstorm Life Cycle

- The *developing stage* of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). The cumulus cloud soon looks like a tower (called towering cumulus) as the updraft continues to develop. There is little to no rain during this stage but occasional lightning. The developing stage lasts about 10 minutes.
- The thunderstorm enters the *mature stage* when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, and a downdraft begins (a column of air pushing downward). When the downdraft and rain-cooled air spread out along the ground, they form a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes. The storm occasionally has a black or dark green appearance.

- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the *dissipating stage*. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.

There are four types of thunderstorms:

- **Single-Cell Thunderstorms**—Single-cell thunderstorms usually last 20 to 30 minutes. A true single-cell storm is rare, because the gust front of one cell often triggers the growth of another. Most single-cell storms are not usually severe, but a single-cell storm can produce a brief severe weather event. When this happens, it is called a pulse severe storm.
- **Multi-Cell Cluster Storm**—A multi-cell cluster is the most common type of thunderstorm. The multi-cell cluster consists of a group of cells, moving as one unit, with each cell in a different phase of the thunderstorm life cycle. Mature cells are usually found at the center of the cluster and dissipating cells at the downwind edge. Multi-cell cluster storms can produce moderate-size hail, flash floods, and weak tornadoes. Each cell in a multi-cell cluster lasts only about 20 minutes; the multi-cell cluster itself may persist for several hours. This type of storm is usually more intense than a single cell storm.
- **Multi-Cell Squall Line**—A multi-cell line storm, or squall line, consists of a long line of storms with a continuous well-developed gust front at the leading edge. The line of storms can be solid, or there can be gaps and breaks in the line. Squall lines can produce hail up to golf-ball size, heavy rainfall, and weak tornadoes, but they are best known as the producers of strong downdrafts. Occasionally, a strong downburst will accelerate a portion of the squall line ahead of the rest of the line. This produces what is called a bow echo. Bow echoes can develop with isolated cells as well as squall lines. Bow echoes are easily detected on radar but are difficult to observe visually.
- **Super-Cell Storm**—A super-cell is a highly organized thunderstorm that poses a high threat to life and property. It is similar to a single-cell storm in that it has one main updraft, but the updraft is extremely strong, reaching speeds of 150 to 175 miles per hour. Super-cells are rare. The main characteristic that sets them apart from other thunderstorms is the presence of rotation. The rotating updraft of a super-cell (called a mesocyclone when visible on radar) helps the super-cell to produce extreme weather events, such as giant hail (more than 2 inches in diameter), strong downbursts of 80 miles an hour or more, and strong to violent tornadoes.

Lightning, which occurs in all thunderstorms, is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt." This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000 ºF. The rapid heating and cooling of air near the lightning causes thunder.

In the United States, between 75 and 100 Americans are struck and killed by lightning each year. Lightning also causes forest and brush fires and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, lightning causes more than 26,000 fires in the United States each year. The institute estimates property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects to be in excess of $6 billion per year. Impacts can be direct or indirect. "Lightning sieges" are extreme lightning events in which lightning strikes multiple points at once. In August 2020, an estimated 12,000 lightning strikes caused a set of fires known as the CZU Lightning Complex in San Mateo and Santa Cruz counties (Cal Fire, 2020).

14.1.6 Tornadoes

A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. Tornadoes are often (but not always) visible as a funnel cloud. On a local-scale, tornadoes are the most intense of all atmospheric circulations and wind can reach destructive speeds of more than 300 miles per hour (mph). A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long. Tornadoes can occur throughout the year at any time of day but are most frequent in the spring during the late afternoon. As shown in Figure 14-2, California has a relatively low risk compared to states in the midwestern and southern United States. Tornado severity classified on the Fujita Tornado Damage Scale is shown in Table 14-1.

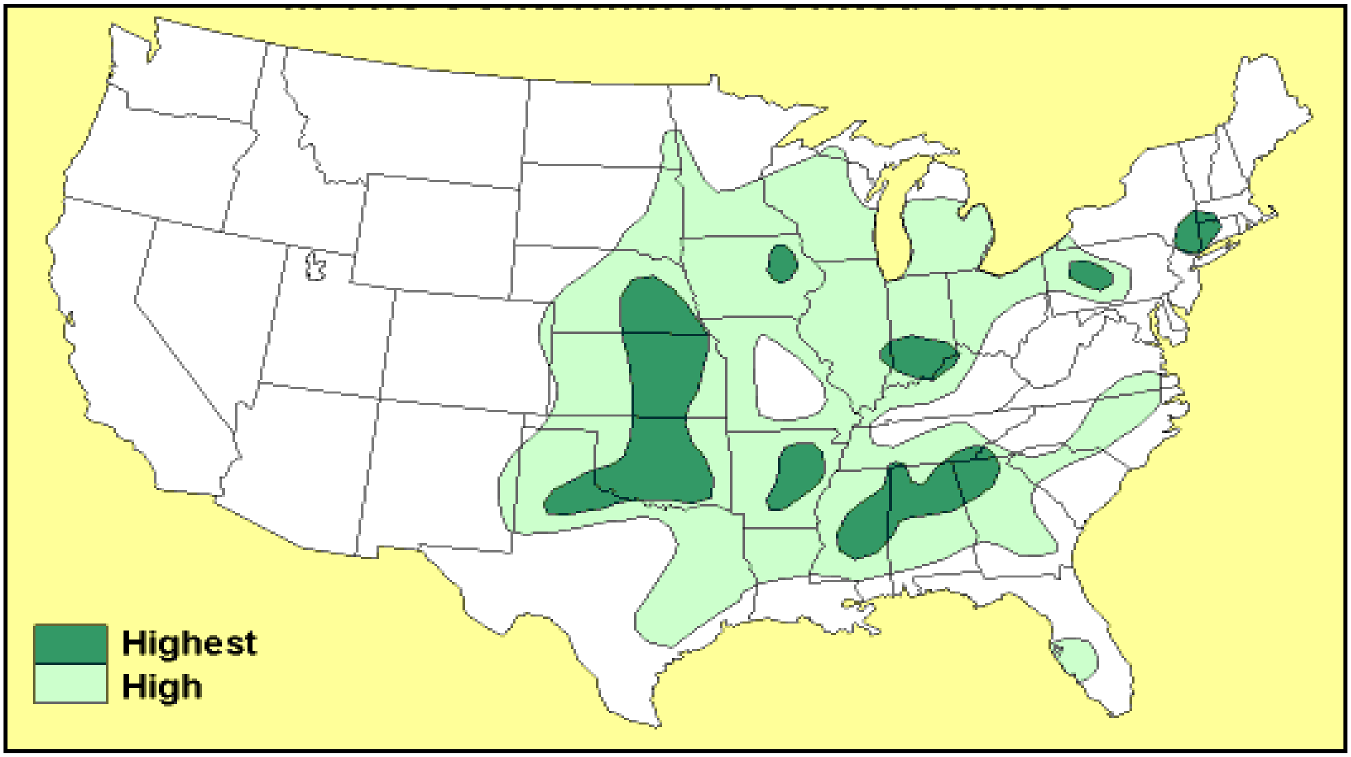


Figure 14-2. Tornado Risk Areas in the Coterminous United States

Table 14-1. Operational Enhanced Fujita Scale

Enhanced Fujita Number	3-Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Source: NOAA, 2018a

14.1.7 Windstorms

Windstorms are generally short-duration events involving straight-line winds or gusts of over 50–60 mph, strong enough to cause property damage. Damage from such winds accounts for half of all severe weather reports in the lower 48 states. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. The Beaufort Wind Chart (Table 14-2) provides terminology and a description of potential wind impacts at different levels (National Severe Storms Laboratory, 2018).

Table 14-2. Beaufort Wind Chart

Beaufort Number	Range (mph)	Terminology	Description
0	0	Calm	Calm. Smoke rises vertically.
1	1-3	Light air	Wind motion visible in smoke.
2	4-7	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	Fresh breeze	Smaller trees sway
6	25-31	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use is difficult.
7	32-38	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	Sever gale	Light structure damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage.
11	64-73	Violent storm	Widespread structural damage.
12	74-95	Hurricane	Considerable and widespread damage to structures.

Source: Lewis, 2018

There are seven types of damaging winds:

- **Straight-line winds**—Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- **Downdraft**—A small-scale column of air that rapidly sinks toward the ground.
- **Downburst**—A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts**—Microbursts are small concentrated downbursts that produce an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy rain at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- **Gust front**—The leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push air above them, forming a shelf cloud or detached roll cloud.

- **Derecho**—A widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.
- **Bow Echo**—A linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, and other damage. Wind speeds as low as 32 mph can cause structural damage, and winds of 100 mph can destroy wood-frame structures. They can also cause direct losses to buildings, people, and vital equipment. There are direct consequences to the local economy resulting from windstorms and the associated physical damage and interrupted services.

Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. As positive and negative forces impact a building’s doors, windows, and walls, the result can be roof or building component failures and considerable structural damage. The effects of winds are magnified in the upper levels of multi-story structures.

Debris carried along by extreme winds can contribute directly to loss of life and indirectly to the failure of protective building envelopes. Falling trees and branches can damage buildings, power lines, and other property and infrastructure. Tree limbs breaking in winds of only 45 mph can be thrown over 75 feet, so overhead power lines can be damaged even in relatively minor windstorm events. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds. Utility lines brought down by summer thunderstorms have also been known to cause fires, which start in dry roadside vegetation. Electric power lines falling down to the pavement create the possibility of lethal electric shock.

Downed trees and power lines, and damaged property also can be major hindrances to emergency response and disaster recovery. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures.

14.1.8 Secondary Hazards

Major riverine or urban flooding can result from heavy rain (see Chapter 11 for more information on flooding). Rain falling on saturated soils on slopes or on areas recently burned by wildfire may lead to landslides (see Chapter 12 for more information on landslides). Lightning during thunderstorms presents a risk of starting a wildfire (see Chapter 16 for more information on wildfires). Storms can also exacerbate existing areas of vulnerability, such as increasing the frequency of erosion along coastal cliffs.

Poor air quality is a secondary impact of extreme weather. During heat waves, the air becomes stagnant and traps emitted pollutants, often resulting in increases in surface ozone. Heat waves and drought also dry out vegetation and provide more fuel for wildfires whose smoke is a serious medical hazard. One type of cold wave also allows air pollution to accumulate (National Centers for Environmental Information, 2021).

14.2 HAZARD PROFILE

14.2.1 Past Events

Appendix F lists past severe weather events in San Mateo County as recorded by NOAA since 1950. Table 14-3 summarizes those for which deaths, injuries, or property damage were reported or a federal disaster declaration was issued.

Table 14-3. Severe Weather Events in San Mateo County Since 1950

Date	Type	Deaths or Injuries	Property Damage	Disaster Declaration #
April 1, 1958	Tornado	0	$825,030	N/A
October 24, 1962	Severe storms	Not reported	Not reported	DR-138
December 19, 1981 – January 8, 1983	Severe storms, flood, mudslides, high tide	Not reported	Not reported	DR-651
January 21 – March 30, 1983	Coastal storms, floods, slides, tornadoes	Not reported	Not reported	DR-677
February 12 – March 10, 1986	Severe storms, flooding	Not reported	Not reported	DR-758
March 10, 1986	Tornado	0	$30	N/A
December 19, 1990 – January 3, 1991	Severe freeze	Not reported	Not reported	DR-894
January 3 – February 10, 1995	Severe winter storms, flooding, landslides, mud flows	Not reported	Not reported	DR-1044
February 13, 1995 – April 19, 1995	Severe winter storms, flooding, landslides, mud flows	Not reported	Not reported	DR-1046
December 28, 1996 – April 1, 1997	Severe storms, flooding, mud, and landslides	Not reported	Not reported	DR-1155
January 2, 1998	Heavy rain	12 Injuries	$0	N/A
January 11, 1998	Heavy rain	1 Death	$0	N/A
February 2 – April 30, 1998	Severe winter storms and flooding	Not reported	Not reported	DR-1203
February 13, 2000	Heavy rain	0	$2,000,000	N/A
October 19, 2004	Thunderstorm wind	0	$50,000	N/A
March 20, 2005	Tornado	0	$800,000	N/A
December 17, 2005 – January 3, 2006	Severe storms, flooding, mudslides, landslides	Not reported	Not reported	DR-1628
February 27, 2006	High wind	1 Death	$0	N/A
March 29 – April 16, 2006	Severe storms, flooding, landslides, mudslides	Not reported	Not reported	DR-1646
February 15, 2009	High wind	0	$25,000	N/A
April 14, 2009	High wind	0	$80,000	N/A
May 2, 2009	Dense fog	0	$25,000	N/A
May 17, 2009	Heat	0	$10,000	N/A
October 13, 2009	High wind	0	$3,400,000	N/A
October 13, 2009	Heavy rain	3 Injuries, 1 Death	$100,000	N/A
January 18, 2010	High wind	0	$230,000	N/A
January 19, 2010	High wind	0	$40,000	N/A
January 20, 2010	High wind	0	$260,000	N/A
January 20, 2010	Thunderstorm wind	1 Injury	$0	N/A
December 28, 2010	High wind	0	$15,000	N/A
February 15, 2011	High wind	0	$150,000	N/A
March 14, 2012	Heavy rain	5 Injuries	$50,000	N/A
November 28, 2012	High wind	0	$1,000	N/A

Date	Type	Deaths or Injuries	Property Damage	Disaster Declaration #
April 8, 2013	Heavy rain	0	$1,000	N/A
January 18 – 23, 2017	Severe winter storms, flooding, and mudslides	Not reported	Not reported	DR-4305
February 1 – 23, 2017	Severe winter storms, flooding, and mudslides	Not reported	Not reported	DR-4308
September 1, 2017	Excessive heat	3	Not reported	N/A

Sources: NOAA, 2021; San Francisco CBS Local, 2014; Patch.Com, 2011, 2015, Banjo.com, 2014, ABC30.com, 2011; Inside the Bay Area, 2010

14.2.2 Location

Severe weather events have the potential to happen anywhere in San Mateo County. Communities in low-lying areas next to streams or lakes are more susceptible to flooding. Regions near San Francisco Bay are more likely to experience fog. Wind events are most damaging to areas that are heavily wooded. PSPS events can occur anywhere reliant electrical power from an outside source.

Extreme Heat

Climate Ready San Mateo County has created an interactive tool that includes climate scenarios for extreme heat, showing average temperatures and average number of high heat days per year across the county (County of San Mateo Office of Sustainability, 2021). The countywide temperature distribution for a base year (1995) is shown in Figure 14-3. Highest temperatures are found in the urban lowlands along the south Bay shore and in an area extending southeast from the coastline between Pescadero and San Gregorio. Temperatures are cooler along the mountain ridge extending northwest to southeast across the center of the county.

Windstorms

All of San Mateo County is subject to high winds from thunderstorms, tornadoes, and other severe weather events. According to the FEMA Winds Zones of the United States map (Figure 14-4), San Mateo County is located in Wind Zone I, where wind speeds can reach up to 130 mph. The map indicates the strength of windstorms in the United States, and the general location of the most wind activity. This is based on 40 years of tornado data and 100 years of hurricane data, collected by FEMA.

Tornadoes

Tornadoes have been documented in every state in the United States, and on every continent with the exception of Antarctica. Approximately 1,200 tornadoes occur in the United States each year, with the central portion of the country experiencing the most. Tornadoes can occur at any time of the year, with peak seasons at different times for different states (National Severe Storms Laboratory, 2015). As noted earlier, the State of California and San Mateo County have a lower risk for tornados than elsewhere in the country. Tornado risk within the County is fairly equal across the region; historical tornado events have been documented on both the bayside and coastal region of the County. Community members near the Pacific Ocean or the San Francisco Bay (as opposed to the central area of the County) may be at a slightly higher risk for tornados; however, historical data is not sufficiently exhaustive enough to confirm this potential trend. Tornadoes are usually localized; however, severe thunderstorms can result in conditions favorable to the formation of numerous or long-lived tornadoes.

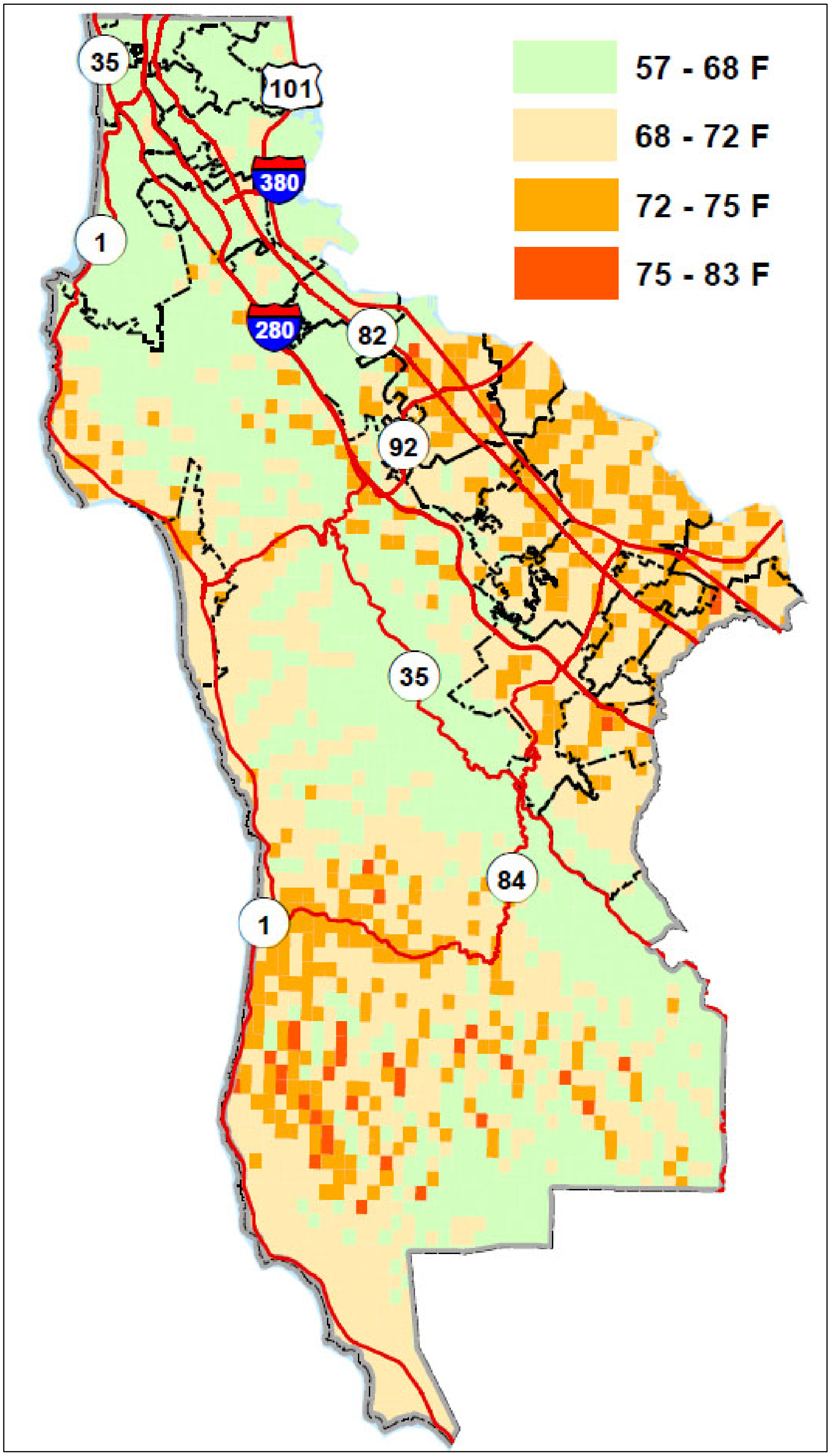


Figure 14-3. Average High Temperature Across San Mateo County in 1995

Source: FEMA 2010

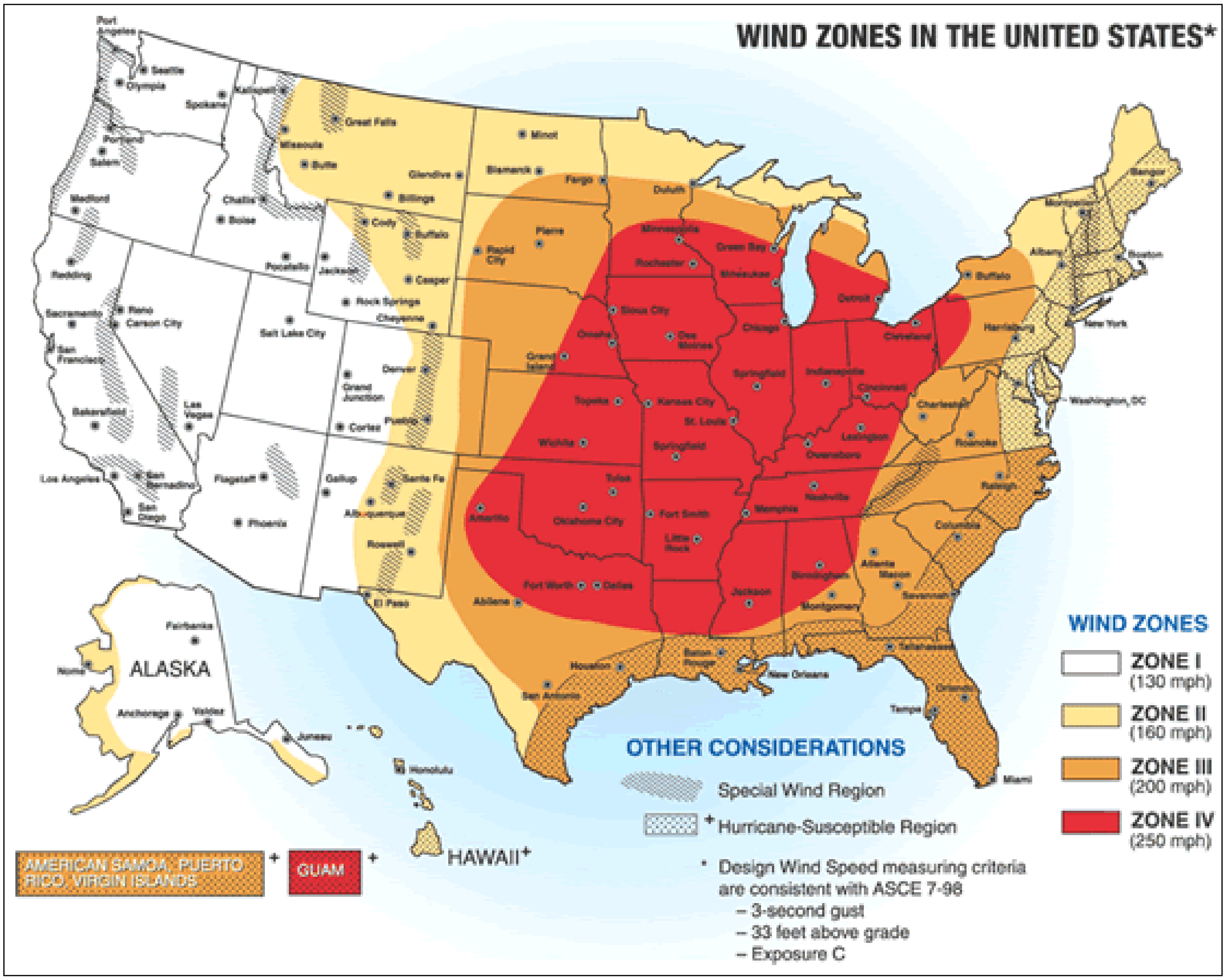


Figure 14-4. Wind Zones in the United States

Fog

The Pacific, Atlantic Canada, and New England coastlines, along with the valleys and hills in the Appalachian Mountains, are the areas most prone to fog on the North American continent (Keller 2008). San Mateo County, therefore, is more likely to experience fog than many other parts of the country.

Additionally, the Bay Area, including San Mateo County, has a unique topography that when combined with the California climate and nearby bay/maritime resources, creates multiple microclimates. Microclimates are small but distinct climates within a larger area. Temperature differences of as much as 10 to 20ºF can be found only miles apart in the Bay Area, and those differences can grow significantly from one end of the region to another. In spring 2001, Half Moon Bay documented temperatures in the 50s while Antioch in Contra Costa County had temperatures of around 100ºF (SF Gate 2001).

Microclimates are significant in the case of fog events because certain cities in the County may experience fog, while only a few miles away, clear skies predominate. Western breezes may bring fog from the ocean, but it will be blocked from passing certain points by mountainous ridges. Even the type of fog in microclimates may vary; some regions are more prone to experience radiation fog, while others only receive a canopy of high fog. This is usually based on the proximity of the location to mountains, ridges, fault lines, and water sources, among other factors.

Heavy Rain

The frequency of heavy rain events remained fairly consistent between 1910 and the 1980s; however, it has risen substantially since then (EPA 2015). Certain locations have noted more significant increases in heavy rain events than others. Most notably, the Northeast and Midwest have experienced the greatest changes, although the Southeast, Great Plains, Northwest, Alaska, and Southwest have also noted increases (Tompkins 2014). Although San Mateo County experiences heavy rain events, it is at a reduced level compared to other parts of the country.

Thunderstorms

Thunderstorms affect relatively small localized areas, rather than large regions like winter storms and extreme temperature events. Thunderstorms can strike in all regions of the United States; however, they are most common in the central and southern states. The atmospheric conditions in these regions of the country are ideal for generating these powerful storms. It is estimated that there are as many as 40,000 thunderstorms each day worldwide. The most thunderstorms are seen in the southeast United States, with Florida having the highest incidences (80 to over 100 thunderstorm days each year). San Mateo County can experience an average of 10 thunderstorm days each year (NWS 2010).

The entire extent of San Mateo County is exposed to some degree of lightning hazard, though exposed points of high elevation have significantly higher frequency of occurrence. As noted earlier, lightning instances in the County have only been associated with other storm events and not as a standalone hazard.

14.2.3 Frequency

All Events

The planning area can expect to experience adverse impacts from some type of severe weather event at least annually. Using the historical data presented in Appendix F, recurrence probabilities for the primary local types of severe weather events are as shown in Table 14-4.

Table 14-4. Recurrence Probabilities for Severe Weather Events

Severe Weather Event	Time Frame (Years)	# of Events over Timeframe	Recurrence Interval	% Annual Chance
Heavy Rain (Atmospheric River)	70	18	233 years	0.43
Extreme Heat	14	5	32 years	3
Fog	70	8	601 years	0.17
Public Safety Power Shutoffs	*3	*7	1 years	100
Thunderstorms	70	23	175 years	0.57
Tornados	70	4	1,132 years	0.09
Windstorms	70	118	1 year	100

Based on PG&E Statistics for the Bay Area

High-Heat Days

All of San Mateo County is projected to experience more high-heat days (above 100 °F) in the future. Air temperatures are expected to increase by 5 °F by 2070 due to climate change. Climate Ready developed extreme heat models using data from Cal Adapt and the California Department of Water Resources. The data were analyzed to identify changes between a baseline year of 1995 and projected changes due to climate change over a 35-year period (through 2030) and a 75-year period (through 2070). The heat-specific datasets were integrated into a model that assessed how temperature increases would negatively impact communities, key infrastructure, and facilities across the County.

Table 14-5 shows the average number of high-heat days by jurisdiction as observed in 1995 (baseline year) and projected for 2030 and 2070. Modeling suggests the average number of high heat days will increase for many jurisdictions across the county, some by as many as four days.

Table 14-5. High-Heat Days per Year in San Mateo County

	High-Heat Days per Year		
	1995	2030	2070
Atherton	2	3	6
Belmont	1	2	4
Brisbane	1	1	1
Burlingame	1	1	1
Colma	1	1	1
Daly City	1	1	1
East Palo Alto	2	3	6
Foster City	2	3	6
Half Moon Bay	1	2	3
Hillsborough	1	1	2
Menlo Park	2	3	6
Millbrae	1	1	1
North Fair Oaks*	2	3	6
Pacifica	1	1	1
Pescadero*	2	3	5
Portola Valley	1	2	4
Princeton	1	2	3
Redwood City	2	3	6
San Bruno	1	1	1
San Carlos	2	3	5
San Mateo City	1	2	4
South San Francisco	1	1	1
Woodside	2	3	5
Unincorporated County	1	2	3
Average	**1**	**2**	**3**

*Unincorporated San Mateo County

The greatest changes in number of high heat days from 1995 to 2070 are projected to occur in Atherton, East Palo Alto, Foster City, Menlo Park, North Fair Oaks, and Redwood City. Impacts in these areas could be especially severe if all six days of high heat occurred consecutively, resulting in a heat wave. On average countywide, the average number of high-heat days is expected to increase from one per year in 1995 to three per year in 2070. Figure 14-5 shows the distribution of high heat days projected for 2030 and for 2070 in San Mateo County due to climate change.

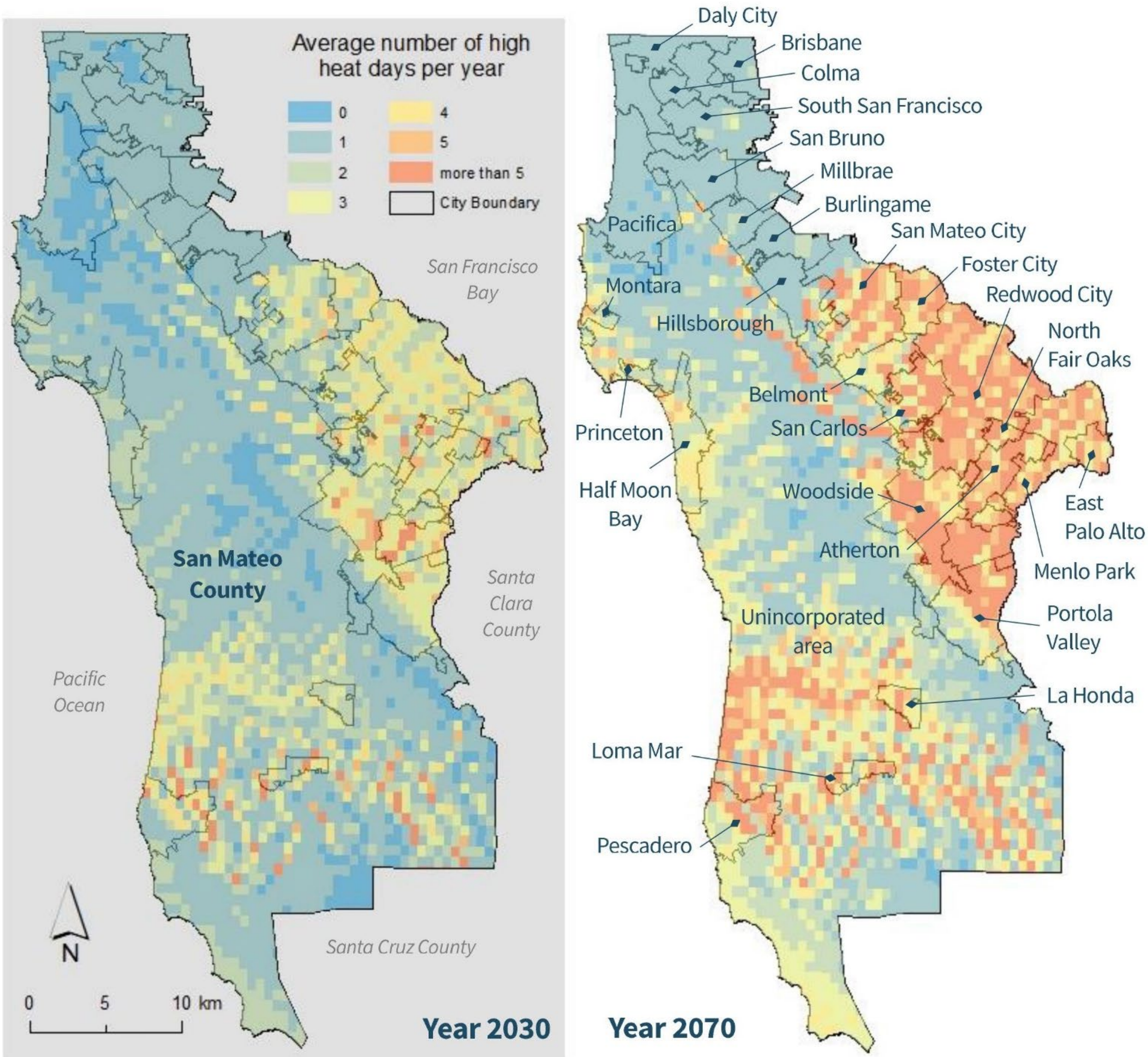


Figure 14-5. Extreme Heat Projections for San Mateo County

14.2.4 Severity

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon but can occur, especially in extreme heat events. Roads may become impassable due to flooding, downed trees, or a landslide. Power lines may be downed due to high winds, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury. Physical damage to homes and facilities can be caused by wind or flooding.

Extreme Heat

Extreme heat can be dangerous to anyone without proper hydration or cooling, and can trigger health conditions, such as heat exhaustion, heat stroke and respiratory problems. One reason for this is that higher temperatures contribute to the build-up of harmful air pollutants. The impacts of heat are higher for vulnerable populations, including elderly, children, pregnant women, people with disabilities, outdoor and agricultural workers, and homeless people. Extreme heat has disproportionate impacts on socially vulnerable communities, on individuals who do not live or work in climate-controlled conditions (i.e., farm and outdoor workers), who rely on public or multi-modal means of transportation like walking or biking, or that have pre-existing medical conditions or disabilities.

Extreme heat can adversely impact transportation infrastructure, such as causing the softening and expansion of asphalt surfaces, resulting in buckling, potholed and rutted roads. Impacts on roadways and rail lines can lead to closures and travel delays in the short term and accelerate the breaking down of infrastructure in the long term.

Sustained temperatures above 100°F may cause train tracks to expand, resulting in the buckling of rail lines and the derailing of trains. Several factors determine whether speed restrictions will be placed on a commuter railway during an extreme heat event, including the duration of high air temperatures, the resulting temperature of the metal tracks, the exposure of the tracks to direct sun, and the compression of the tracks by running trains. BART and Caltrain cannot operate at full capacity during high heat events due to risks such as the buckling of railway networks that may result in train derailment or the malfunction of track and signal sensors, resulting in route closures or delays. The reduced quality of roadways may impact bus routes, while the duration riders can wait at bus stops may increase by extreme heat, increasing exposure of commuters to high temperatures. Extreme heat can impact resident’s ability to bike to work, causing increased pressure on public transportation.

Windstorms

Windstorms can be a frequent problem in the planning area and have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the National Weather Service (NWS) is for a one-minute average; gusts may be 25 to 30 percent higher. Lower wind speeds typical in the lower valleys are still high enough to knock down trees and power lines and cause other property damage. Higher elevations in the County can experience much higher winds under more varied conditions.

Tornadoes

Tornadoes are potentially the most dangerous of local storms, but they are not common in the planning area. If a major tornado were to strike within the populated areas of the County, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings may be damaged or destroyed. Because the County has never experienced a tornado more severe than an EF1, however, such severity is unlikely.

Heavy Rain (Atmospheric Rivers)

Heavy rain in San Mateo County can have significant impacts, including crop damage, soil erosion, and increased risk of flood. Stormwater runoff from heavy rains can also impair water quality by washing pollutants into water bodies (EPA 2015). Soil erosion, particularly along the coast, is a significant concern for San Mateo County, and is further explored in the landslide and flood hazard profiles.

Thunderstorms

Thunderstorms carry the same risks as heavy rain events, and depending on the type of storm, they can also serve as breeding grounds for tornados, lightning, and heavy winds, increasing risk of injury and property damage (Keller 2008).

Lightning severity is typically investigated for both property damage and life safety (injuries and fatalities). The number of reported injuries from lightning is likely to be low, and County infrastructure losses can equate to up to thousands of dollars each year. The relationship of lighting to wildfire ignitions in the County increases the significance of this hazard. There are no recorded instances of lightning appearing alone (without a storm) in San Mateo County, and any lightning damage is likely to be compounded by other storm damage.

PSPS Events

The total costs of a PSPS event are not limited to the amount spent by the executing utility; they also encompass the societal harm that comes from losing electricity, which is more challenging to quantify. For residential customers, costs could come from replacing spoiled food, losing air conditioning (particularly for vulnerable populations), emotional distress, etc. For commercial and industrial customers, the main cost comes from lost revenue and production, but also includes the costs of installing backup power. Hospitals may rely on backup generation, and municipal governments might have to coordinate responses without power. When choosing to de-energize, the utility is choosing to create a controlled "disaster" in lieu of risking a larger, uncontrollable line-sparked wildfire, for which they would be liable. These conflicting interests between individual customers, public safety, and fiscal solvency have forced utilities to make difficult choices beyond those typically expected for an electric company (Wharton University, 2020).

14.2.5 Warning Time

Meteorologists can often predict the likelihood of a severe storm or other severe weather event. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time. The San Francisco Bay Area Weather Forecast Office of the NWS monitors weather stations and issue watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

14.3 EXPOSURE AND VULNERABILITY

All people and property and the entire environment of the planning area are exposed to some degree to the severe weather hazard.

14.3.1 Population

The most common problems associated with severe weather events are immobility and loss of utilities. Although all populations in the planning area are exposed to severe weather events, some populations are more vulnerable. Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and community members living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding. In general, populations who lack adequate shelter during severe weather events, those who are reliant on sustained sources of power in order to survive, and those who live in isolated areas with limited ingress and egress options are the most vulnerable.

To apply an equity lens to this assessment, an analysis was performed using the SoVI ratings (see Section 7.2.2) of the entire planning area population. Detailed results are in Appendix E and are summarized for the overall planning area in Table 14-6.

Table 14-6. Distribution of Population Exposed to Severe Weather Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	133,222	18.54%
Relatively High	192,062	26.73%
Relatively Moderate	175,116	24.37%
Relatively Low	118,629	16.51%
Very Low	99,422	13.85%

Socially vulnerable communities may be particularly at risk of extreme heat due to increased prevalence of preexisting health conditions and greater reliance on public transportation, and because they tend to live urban areas with limited vegetation, exposing them more acutely to the stresses of heat. In addition to living in hotter neighborhoods, socially vulnerable communities tend to face barriers adapting to extreme heat events, such as the increased cost of operating an in-home air conditioning unit at a higher level or for an extended period of time, or they may lack access to a cooling center. In addition, socially vulnerable communities may not be able to afford to cool work or living spaces or may be forced to choose between air conditioning and necessities like food and rent. People with limited English proficiency, people with disabilities and older adults may be more vulnerable as they may not receive heat outreach information and emergency notifications due to language or other accessibility obstacles. Extreme heat-related illnesses and fatalities are preventable if adequately prepared for.

14.3.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. The most common impacts of specific weather event types on property are as follows:

- **Windstorm**—Mobile homes can be seriously damaged by wind gusts over 80 mph, even if they are anchored (National Severe Storms Laboratory, 2018). Properties at higher elevations or on ridges may be more prone to wind damage. Falling trees can result in significant damage to structures.
- **Tornado**—A major tornado could cause widespread damage to property in the planning area, but such an event is unlikely.
- **Fog**—Fog is not likely to damage property, with the exception of motor vehicles that get into accidents because of poor visibility.
- **Heavy Rain**—Damage from heavy rain in the planning area is most likely to be related to secondary hazards accompanying the event, such as flooding or landslides
- **Thunderstorms**—Damage from thunderstorms in the planning area is most likely to be related to secondary hazards accompanying the event, such as flooding, landslides or damaging winds. If lightning directly strikes a building, it may cause substantial damage and may even set the structure on fire.

No modeling is available for quantitative loss estimations for the severe weather hazard. Instead, loss estimates were developed representing 1 percent, 3 percent and 5 percent of the replacement value of exposed structures:

- Loss of 1 percent of planning area replacement value—$1.9 billion
- Loss of 3 percent of planning area replacement value—$ 5.7 billion
- Loss of 5 percent of planning area replacement value—$9.6 billion

14.3.3 Critical Facilities

All critical facilities are vulnerable during severe weather events, especially those that lack backup power generation capabilities. When facilities supplying power to planning area land line telephone systems are frequently disrupted, significant issues arise with communication in the planning area. In addition, some facilities are particularly vulnerable to specific types of severe weather events:

- **Windstorms**—Facilities located near trees or power lines that are likely to fall are also vulnerable. Roads and other transportation infrastructure could be blocked by downed trees or other debris.
- **Tornado**—Critical facilities in the direct path of a tornado would be particularly vulnerable.
- **Heavy Rain or Thunderstorm**—Facilities located in areas prone to localized or major flooding are vulnerable. Transportation systems are vulnerable to disruption from secondary hazards such as flooding or landslides.
- **Extreme Heat**—Transportation systems are vulnerable to the impacts of extreme heat on facility function.

14.3.4 Environment

The environment is highly vulnerable to severe weather events. Natural habitats such as streams and trees exposed to the elements during a severe storm risk major damage. Prolonged rains can saturate soils and lead to slope failure. Flood events caused by severe weather can produce river channel migration or damage riparian habitat. Storm surges can erode beachfront bluffs and redistribute sediment loads.

14.4 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe weather events. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partners are well equipped to deal with future growth and the associated impacts of severe weather.

Many of the impacts associated with severe weather hazards can be addressed through proactive planning and the use of best available information in making land use decisions. San Mateo County achieves this goal through the implementation of its Shared Vision. Participating cities can incorporate these concerns into their general plans. Implementation of these guidelines and goals, along with other programs such as building code enforcement, public information, and early warning, will help San Mateo County manage the likely impacts of severe weather as the County expands and grows.

14.5 SCENARIO

Impacts of severe weather can be significant, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds accompanied by thunderstorms. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Significant erosion and landslides along the coast may occur, further increasing the vulnerability of community members living right on the edge of coastal cliffs. Flooding and landslides could obstruct roads and bridges, isolating community members. Fog after the storm, resulting from the heavy moisture still in the area, could increase traffic accidents as visibility worsens.

14.6 ISSUES

Severe local storms are probably the most common widespread hazard. They affect large numbers of people in the planning area when they occur. Severe storms can quickly overwhelm city and county resources. Community members should be prepared for these types of storms: family plans should be developed, disaster kits should be put in homes, workplaces, schools and cars, and every family member should be taught how to shut off household utilities. Initiating early dismissal from schools and business is an effective mitigation measure and should be encouraged.

Severe weather cannot be prevented, but measures can be taken to mitigate the effects. Critical facilities can be hardened to prevent damage during an event. The secondary effect of flooding can be addressed through decreasing runoff and water velocity. Important issues associated with severe weather in the San Mateo County planning area include the following:

- Redundancy of power supply throughout the planning area must be evaluated to better understand what areas may be vulnerable.

- Although primarily thought of as an urban area, the County has a larger physical land mass containing rural communities and must also consider the needs of these community members (as well as their possible isolation during storm events).
- Public education on dealing with the impacts of severe weather needs to continue to be provided so that community members can be better informed and prepared for severe weather events. In particular, fog should be considered, since fog may be downplayed despite its potential for transportation accidents.
- Debris management (downed trees, etc.) must be addressed, because debris can impact the severity of severe weather events, requires coordination efforts, and may require additional funding.
- The effects of climate change may result in an increase of heavy rain or more intense storm events and will likely lead to increased temperatures and changes in overall precipitation amounts.
- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe winter weather effects.
- Urban forest management programs should be evaluated to help reduce impacts from forest-related damages.

15. TSUNAMI

15.1 GENERAL BACKGROUND

A tsunami is a series of high-energy waves that radiate outward like pond ripples from an area where a generating event occurs, arriving at shorelines over an extended period. Tsunamis can be induced by earthquakes, landslides, and submarine volcanic explosions (see Figure 15-1). Tsunamis are typically classified as local or distant, depending on the location of their source in comparison to where waves occur:

- The waves nearest to the generating source represent a local tsunami. Such events have minimal warning time, leaving few options except to run to high ground after a strong, prolonged local earthquake. Damage from the tsunami adds to damage from the triggering earthquake due to ground shaking, surface faulting, liquefaction, and landslides.
- The waves far from the generating source represent a distant tsunami. Distant tsunamis may travel for hours before striking a coastline, giving a community a chance to implement evacuation plans if a warning is received.

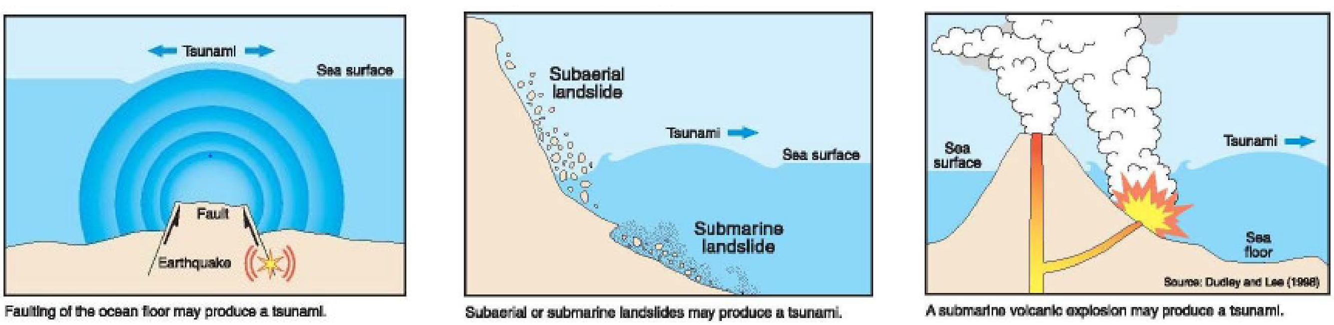


Figure 15-1. Common Sources of Tsunamis

In the open ocean, a tsunami may be only a few inches or feet high, but it can travel with speeds approaching 600 miles per hour. As a tsunami enters the shoaling waters near a coastline, its speed diminishes, its wavelength decreases, and its height increases greatly. At the shoreline, tsunamis may take the form of a fast-rising tide, a cresting wave, or a bore (a large, turbulent wall-like wave). The bore phenomenon resembles a step-like change in the water level that advances rapidly (from 10 to 60 miles per hour). The first wave is usually followed by several larger and more destructive waves.

15.1.1 Factors Affecting Tsunami Impact

The configuration of the coastline, the shape of the ocean floor, and the characteristics of advancing waves play important roles in the destructiveness of the waves. Bays, sounds, inlets, rivers, streams, offshore canyons, islands, and flood control channels may alter the level of damage. Offshore canyons can focus tsunami wave energy, and islands can filter the energy. A tsunami wave entering a flood control channel could reach a mile or more inland, especially if it enters at high tide. The orientation of the coastline determines whether the waves strike head-on or are refracted from other parts of the coastline. A wave may be small at one point and much larger at others. The inundation area for a tsunami event is often described as runup as illustrated in Figure 15-2.

Source: UNESCO, Retrieved from Different Directions: Tsunami, n.d.

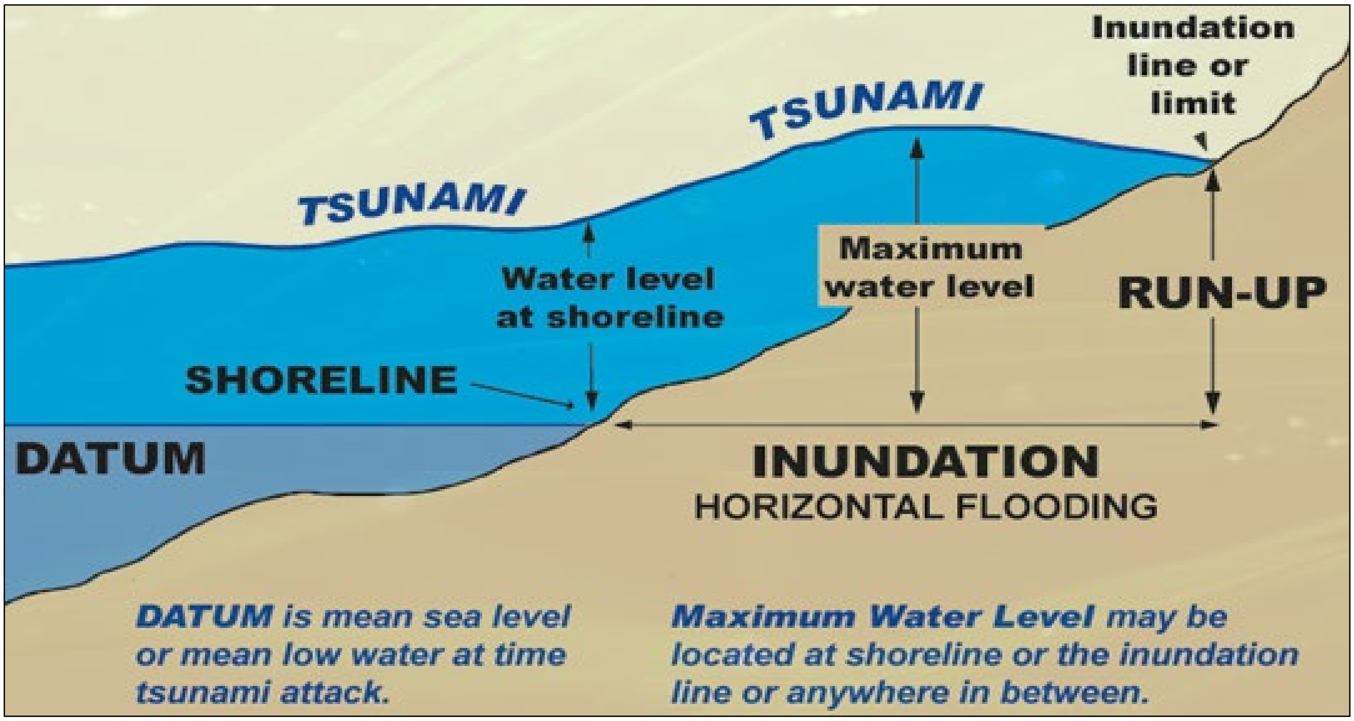


Figure 15-2. Runup Distance and Height in Relation to the Datum and Shoreline

15.1.2 Secondary Hazards

Seiches are a potential secondary hazard from tsunamis. Seiches are standing waves oscillating in a body of water, and they can form in any enclosed or semi-enclosed body of water, including San Francisco Bay. They typically result from strong winds and rapid changes in atmosphere pressure, which push the water from one end of the enclosure to the other. When the wind stops, the water rebounds to the other side and then continues to oscillate for hours or days. Tsunamis, earthquakes, and severe storm fronts can also cause seiches.

The destructive potential associated with seiches is exemplified through one from 1844, where a 22-foot seiche in Lake Erie breached a 14-foot sea wall, killed 78 people, and dammed the ice to the extent that the Niagara Falls temporarily stopped flowing (NOAA 2015). While seiches are not as common in the San Francisco Bay as they are in the Great Lakes, bayside communities should still be mindful of this potential hazard and recommend community members avoid close proximity to the bay for several days after a tsunami.

15.2 HAZARD PROFILE

15.2.1 Past Events

Table 15-1 lists known tsunami events that have struck the County or one of its jurisdictions since 1859. The California Department of Conservation maintains a list of tsunamis in the state, including San Francisco or other Bay Area entities. Some tsunamis have struck San Francisco or other parts of the Bay Area but not San Mateo County; those events were not identified in Table 15-1.

Table 15-1. Tsunami Events in San Mateo County

Date	FEMA Declaration		Description
	Number	San Mateo County Designated?	
September 24, 1859	N/A	N/A	A tsunami originating in Northern California hit Half Moon Bay, with a waves 4.6 meters high.
April 1, 1946	N/A	N/A	An M-7.3 earthquake in the East Aleutian Islands (Alaska) triggered a tsunami that struck California. Wave heights of 2.6 meters were recorded in Half Moon Bay.
May 22, 1960	N/A	N/A	An M-9.5 earthquake in Central Chile triggered a tsunami that reached San Mateo County. Wave heights of 1.2 meters were recorded in Pacifica.
March 28, 1964	N/A	N/A	An M-9.2 earthquake off the Gulf of Alaska triggered a tsunami that reached San Mateo County. Wave heights of 1.4 meters were recorded in Pacifica. The tsunami arrived in San Francisco 5 hours and 6 minutes after the triggering event.
February 27, 2010	N/A	N/A	An M-8.8 earthquake in Central Chile triggered a tsunami that reached San Mateo County. Wave heights of 0.6 meter were recorded in Half Moon Bay.
March 11, 2011	DR-1968	No	A magnitude 8.9 earthquake near Honshu, Japan generated a tsunami significantly affecting California on March 11, 2011. Wave heights were recorded at 0.7 meters in Half Moon Bay and 1 meter in Pacifica. The tsunami damaged six boat slips and three docks, and snapped a wooden piling at the Berkeley Marina.

Sources: FEMA, NOAA Storm Events Database, California Department of Conservation

More than 80 tsunamis have been recorded or observed in California, according to state records; however, many of these events were small and led to little or no damage. All tsunamis from the past century have been distant, not local. That is, they have all resulted from earthquakes far across the Pacific basin (as opposed to earthquakes near the American coastline). The most noteworthy tsunamis in California include:

- **January 26, 1700 (Local Tsunami)**—An estimated M-9 earthquake ruptured the entire length of the Cascadia Subduction Zone, causing tsunami waves up to 50 feet in parts of northern California. Scientists have reconstructed the event from geologic evidence and oral Native American histories, as well as Japanese documents describing a tsunami that hit Japan’s coastline that same day.
- **December 21, 1812 (Local Tsunami)**—A tsunami struck the Santa Barbara and Ventura coastlines not long after an earthquake was felt in the area. The tsunami inundated lowland areas and damaged local ships. Some debate exists as to whether the tsunami was earthquake-induced or the result of a submarine landslide triggered by the earthquake.
- **April 1, 1946 (Distant Tsunami)—**An M-8.8 earthquake in the Aleutian Islands generated a tsunami that caused damage along the coast of California, including flooding more than 1,000 feet inland in Half Moon Bay.

- **March 28, 1964 (Distant Tsunami)—**An M-9.2 earthquake in Anchorage, Alaska, generated a tsunami that struck the Pacific Northwest and northern California. Twelve people were killed in California, and a surge approximately 20-feet high flooded 29 city blocks of Crescent City.
- **March 11, 2011 (Distant Tsunami)**—An M-9.0 earthquake in Tohuku, Japan generated a moderate tsunami in California. While the tsunami did not cause significant flooding, it did lead to one death and more than $100 million in damages to 27 harbors statewide. The most significant damage occurred in Crescent City and Santa Cruz.

15.2.2 Location

The California Department of Conservation maintains detailed tsunami inundation maps for San Mateo County and other parts of the State. These maps are generated through computer modeling of the areas most likely to be affected by a tsunami event and serve as an important preparedness tool. The tsunami hazard areas identified in the mapping are based on a suite of tsunami sources, both local and distant, and does not, therefore, represent risk from a single sources event. Tsunami risk areas are shown in Figure 15-3.

15.2.3 Frequency

The frequency of tsunamis is related to the frequency of the events that cause them, so it is similar to the frequency of seismic or volcanic activities or landslides. Generally, four or five tsunamis occur every year in the Pacific Basin, and those that are most damaging are generated in the Pacific waters off South America rather than in the northern Pacific.

Based on risk factors for the County and past occurrences, it is highly likely that tsunamis will continue to strike the coastline in San Mateo County. Tsunami probabilities are tied to earthquake and other geologic events; however, not all earthquakes or submarine landslides will trigger a tsunami.

15.2.4 Severity

A tsunami's size and speed, as well as the coastal area's form and depth, affect the impact of the tsunami. At some locations, the advancing turbulent wave front will be the most destructive part of the tsunami wave. In other situations, the greatest damage will be caused by the outflow of water back to the sea between crests, sweeping away items on the surface and undermining roads, buildings, bulkheads, and other structures. This outflow action can carry enormous amounts of highly damaging debris, resulting in further destruction. Ships and boats, unless moved away from shore, may be forced against breakwaters, wharves, and other craft, or be washed ashore and left grounded after the withdrawal of the seawater (National Tsunami Hazard Mitigation Program, 2001).

15.2.5 Warning Time

Warning System

The tsunami warning system for the Pacific Ocean evolved from a program initiated in 1946. It is a cooperative effort involving 26 countries with numerous seismic stations, water level stations and information distribution centers. The National Weather Service operates two information distribution centers: The Pacific Tsunami Warning Center in Ewa Beach, Hawaii; and the National Tsunami Warning Center covering the California coast in Palmer, Alaska. The warning centers issue tsunami watches, warnings, and advisories. A watch is issued when a large earthquake has occurred far away from the region and the threat is still being determined.

Figure 15-3. Tsunami Risk Areas for San Mateo County

Data Sources: San Mateo Co., CGS

A warning is issued when damaging tsunami waves inundating dry land are expected. An advisory is issued when tsunami waves less than 1 meter high and dangerous strong currents will occur in harbors. The warning system is activated when a Pacific basin earthquake of magnitude 6.5 occurs or an earthquake is widely felt along the North American coast. When this occurs, the following sequence of actions occurs:

- Data is interpolated to determine epicenter and magnitude of the event.
- If the earthquake is of the right type, depth, magnitude, and is far away from California coast, a TSUNAMI WATCH is typically issued for the California coastline.
- A TSUNAMI WATCH is upgraded to a TSUNAMI WARNING if tsunami wave heights are forecast to be 1 meter or larger. A TSUNAMI ADVISORY is issued if tsunami wave heights are forecast to be 0.3 meters to less than 1 meter.
- Tsunami travel times are calculated, and the warning is transmitted to disseminating agencies who relay it to the public.
- The National Tsunami Warning Center will cancel/expire watches, warnings, or advisories if tide gauges and buoys indicate no significant tsunami was generated or if tsunami waves no longer meet the criteria for at least 3 hours.

This system is not considered to be effective for communities close to the tsunami source, because the first wave would arrive before the data can be processed and analyzed, and communications systems may be impacted by the precipitating event. In this case, strong ground shaking would provide the first warning of a potential tsunami and evacuations should begin immediately.

Visible Indications

Tsunamis are difficult to detect in the open ocean; with waves generally less than 3 feet high. The first visible indication of an approaching tsunami may be either a rise or drop in water surface levels (National Tsunami Hazard Mitigation Program, 2001):

- A drop in water level (draw down) can be caused by the trough preceding the advancing, large inbound wave crest. Rapid draw down can create strong currents in harbor inlets and channels that can severely damage coastal structures due to erosive scour around piers and pilings. As the water's surface drops, piers can be damaged by boats or ships straining at or breaking their mooring lines. The vessels can overturn or sink due to strong currents, collisions with other objects, or impact with the harbor bottom.
- The advancing tsunami may initially arrive as a strong surge increasing the sea level. This can be similar to the rising tide, but the tsunami surge rises faster and does not stop at the shoreline. Even if the wave height appears to be small, 3 to 6 feet for example, the strength of the accompanying surge can be deadly. Waist-high surges can cause strong currents that float cars, small structures, other debris, and hazardous materials. Boats and debris are often carried inland by the surge and left stranded when the water recedes.

Estimated Travel Times

The NOAA National Center for Environmental Information website provides maps that show estimated travel times to coastal locations for various tsunami-generating events. Figure 15-4 shows one example of the travel time for a tsunami generated in Aburatsu, Japan to reach the planning area—approximately 11 hours.

Source: National Centers for Environmental Information, 2018c

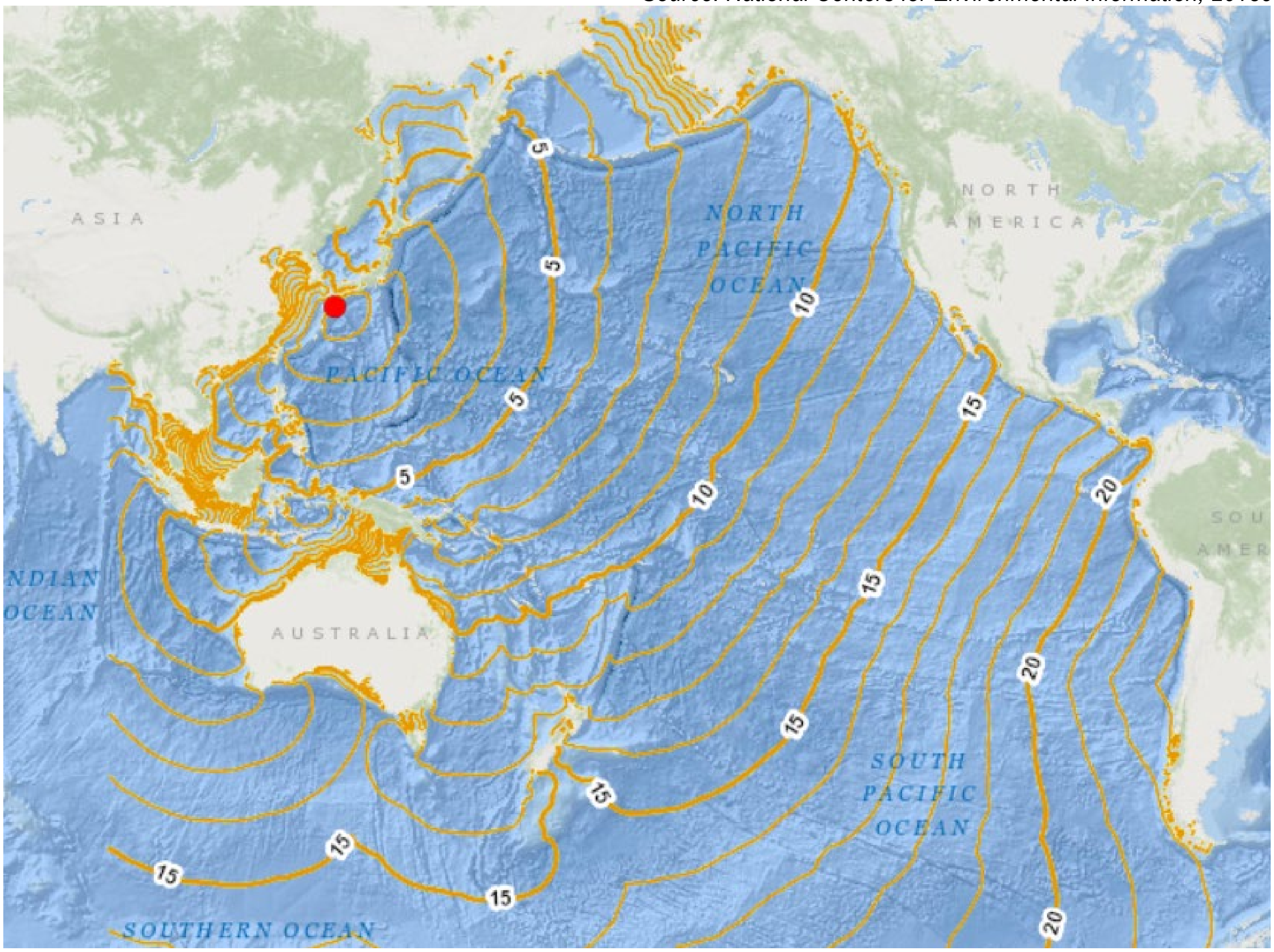


Figure 15-4. Potential Tsunami Travel Times in the Pacific Ocean, in Hours

15.3 EXPOSURE

Exposure and vulnerability to tsunami hazard were assessed by overlaying the mapped inundation area in Figure 15-3 with planning area features including general building stock and critical facilities. Detailed results by jurisdiction are included in Appendix E; countywide summaries are provided below.

15.3.1 Population and Property

Table 15-2 summarizes the estimated population living in the evaluated tsunami inundation areas and the estimated property exposure. Figure 15-5 shows the structure type of buildings in the inundation area. Residential properties make up 88 percent of this exposure.

Table 15-2. Exposed Population and Property in Evaluated Tsunami Inundation Areas

Population	
Population Exposed	12,085
% of Total Planning Area Population	1.6%
Property	
Acres of Inundated Area	80,060
Number of Buildings Exposed	4,083
Value of Exposed Structures	$3,713,391,742
Value of Exposed Contents	$3,130,163,691
Total Exposed Property Value	**$6,843,555,434**
Total Exposed Value as % of Planning Area Total	*3.6%*

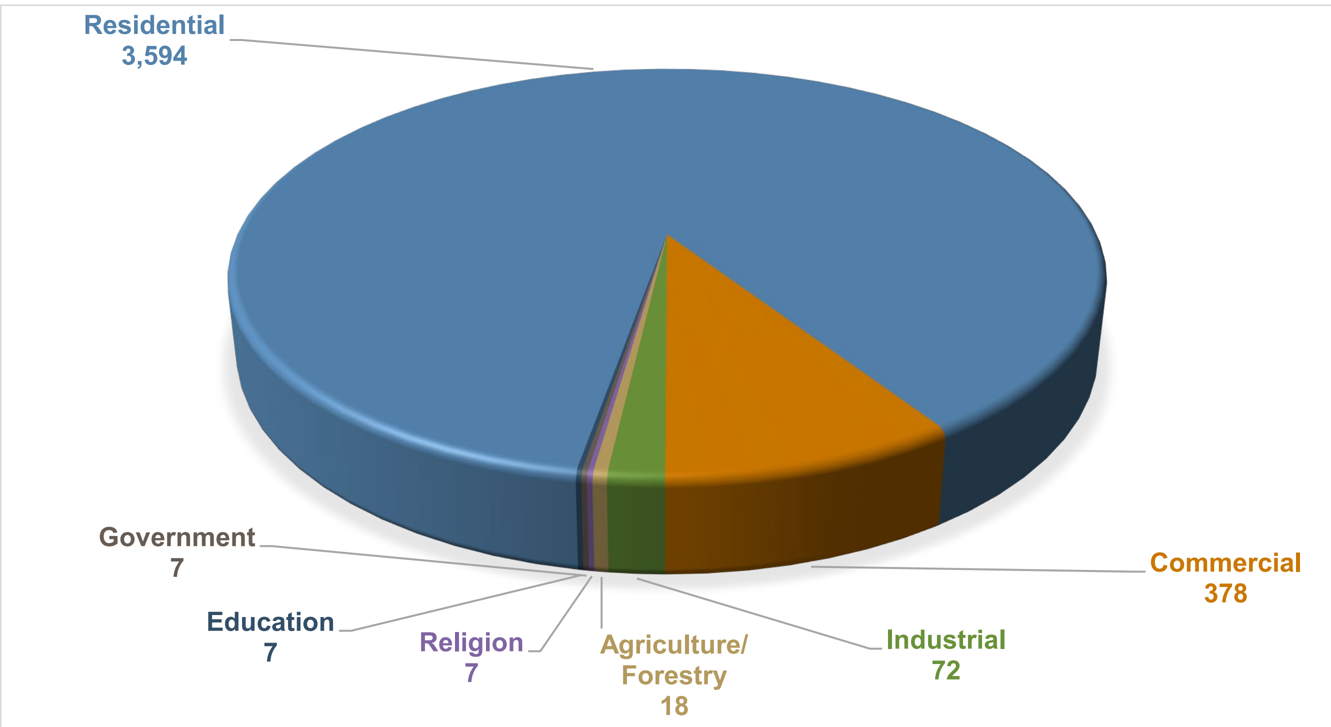


Figure 15-5. Number of Structures within the Tsunami Inundation Area by Occupancy Class

15.3.2 Critical Facilities

Figure 15-6 shows critical facilities located in the tsunami inundation zone by facility type. The total count of critical facilities in the inundation zone (191) represents 8.5 percent of the planning area total of 2,236.

Hazardous Material Facilities

The planning area includes two structures in the tsunami hazard areas that contain hazardous materials. Containers holding these materials can rupture and leak into the surrounding area during a tsunami event, having a disastrous effect on the environment as well as community members.

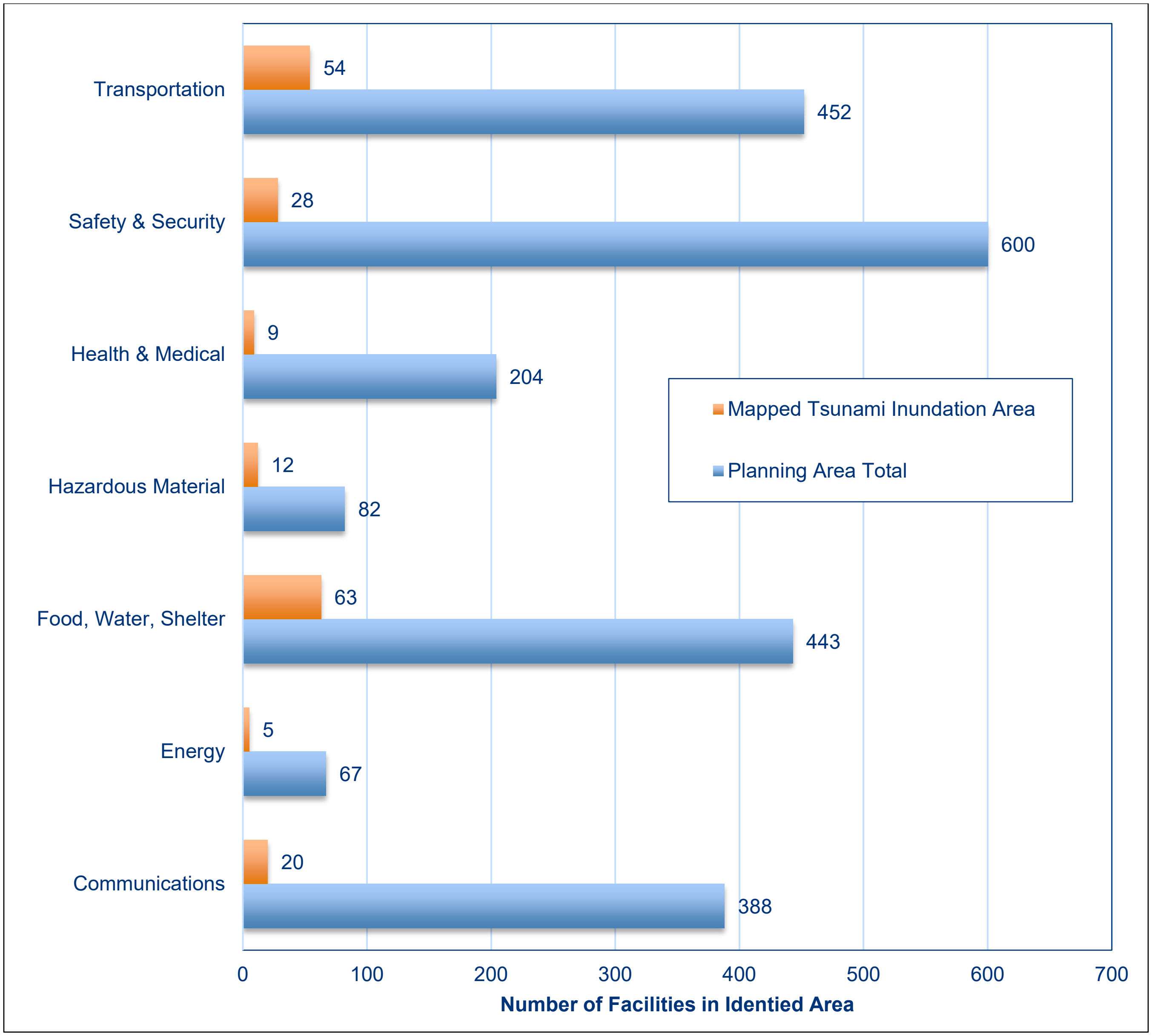


Figure 15-6. Critical Facilities in Tsunami Inundation Zones and Countywide

Roads

Roads are the primary resource for evacuation to higher ground before and during a tsunami. Blocked or damaged roads can prevent access or cause isolation for community members and emergency service providers. Geospatial analysis indicates the following major roads pass through the tsunami inundation areas and may be exposed to the tsunami hazard:

- State Highway 1
- State Highway 92
- US Highway 101

Bridges

Geospatial analysis identified 11 bridges that would be exposed to the tsunami hazard. Bridges exposed to tsunami events can be extremely vulnerable because of the forces transmitted by the wave run-up and by the impact of debris carried by the wave action.

Water/Sewer/Utilities

Water and sewer systems can be affected by the flooding associated with tsunami events. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can enter drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastes to spill into homes, neighborhoods, rivers and streams. The forces of tsunami waves can damage aboveground utilities by knocking down power lines and radio/cellular communication towers. Power generation facilities can be severely impaired by both the impact of the wave action and the inundation of floodwaters.

15.3.3 Environment

All waterways and beaches would be exposed to the effects of a tsunami; inundation of water and introduction of foreign debris could be hazardous to the environment. All wildlife inhabiting the area also is exposed.

15.4 VULNERABILITY

15.4.1 Population

Vulnerable populations are all populations within the tsunami inundation areas that are incapable of escaping the area before floodwaters arrive. An analysis was performed using Hazus and the SoVI ratings (see Section 7.2.2) of the population living in the mapped tsunami inundation areas. Detailed results by jurisdiction are in Appendix E. Table 15-3 summarizes results for the overall planning area.

Table 15-3. Distribution of Population Exposed to Tsunami Hazard by SoVI Rating

	Population Living in Exposed Areas Having the SoVI Rating Shown	
SoVI Rating	**Number of People**	**% of Total Exposed Population**
Very High	452	4.16%
Relatively High	911	8.39%
Relatively Moderate	4,229	38.98%
Relatively Low	5,258	48.47%
Very Low	0	0

Additional countywide results of the Hazus analysis are as follows:

- Number of displaced households = 7,362
- Number of people requiring short-term shelter = 415

15.4.2 Property

Property Impacted

The impact of tsunami waves and the scouring associated with debris that may be carried in the water could be damaging to all structures along beaches, low-lying coastal areas, tidal flats, and river deltas. The most vulnerable are those in the front line of tsunami impact and those that are structurally unsound. The Hazus analysis indicated that 73 percent of the exposed structures (2,978 structures) would be impacted by the modeled scenario event.

Damage Estimates

Table 15-4 summarizes Hazus estimates of tsunami damage in the planning area. The estimated damage value is associated with the tsunami wave only; it does not include additional damage that may occur as a result of debris battering structures as the tsunami wave rushes in and out of the inundation area or fires caused by an earthquake and tsunami event. The debris estimate includes only structural debris and building finishes; it does not include additional debris that may result from a tsunami event, such as from boats, trees, sediment, building contents, bridges, or utility lines.

Table 15-4. Estimated Impact of a Tsunami Event in the Planning Area

Structure Debris (tons)	31
Buildings Impacted[a]	2,978
Structure Value Damaged	$785,192,914
Content Value Damaged	$803,298,822
Total Value Damaged	**$1,588,491,736**
Damage as % of Total Value	0.8%

a. "Impacted" assumes floodwater over lowest finished floor

Structures that were built to current floodplain regulations in the tsunami inundation area may have some level of protection, particularly if they were built to withstand wave action. In the unincorporated County, an estimated 79 percent of the housing units were built before the County entered the National Flood Insurance Program and began enforcing floodplain regulations (U.S. Census, 2019). It is unknown how many of these structures are located in tsunami inundation areas. In addition to structure damage, ships moored at piers and in harbors often are swamped and sunk or are left battered and stranded high on the shore.

15.4.3 Critical Facilities

Damage Estimates

Figure 15-7 shows the estimated damage to critical facilities from a tsunami event. The average amount of damage to structures, measured as a percentage of total value, ranges from 5 to 36 percent of total value and average damage to contents ranges from 15 to 100 percent, depending on critical facility category.

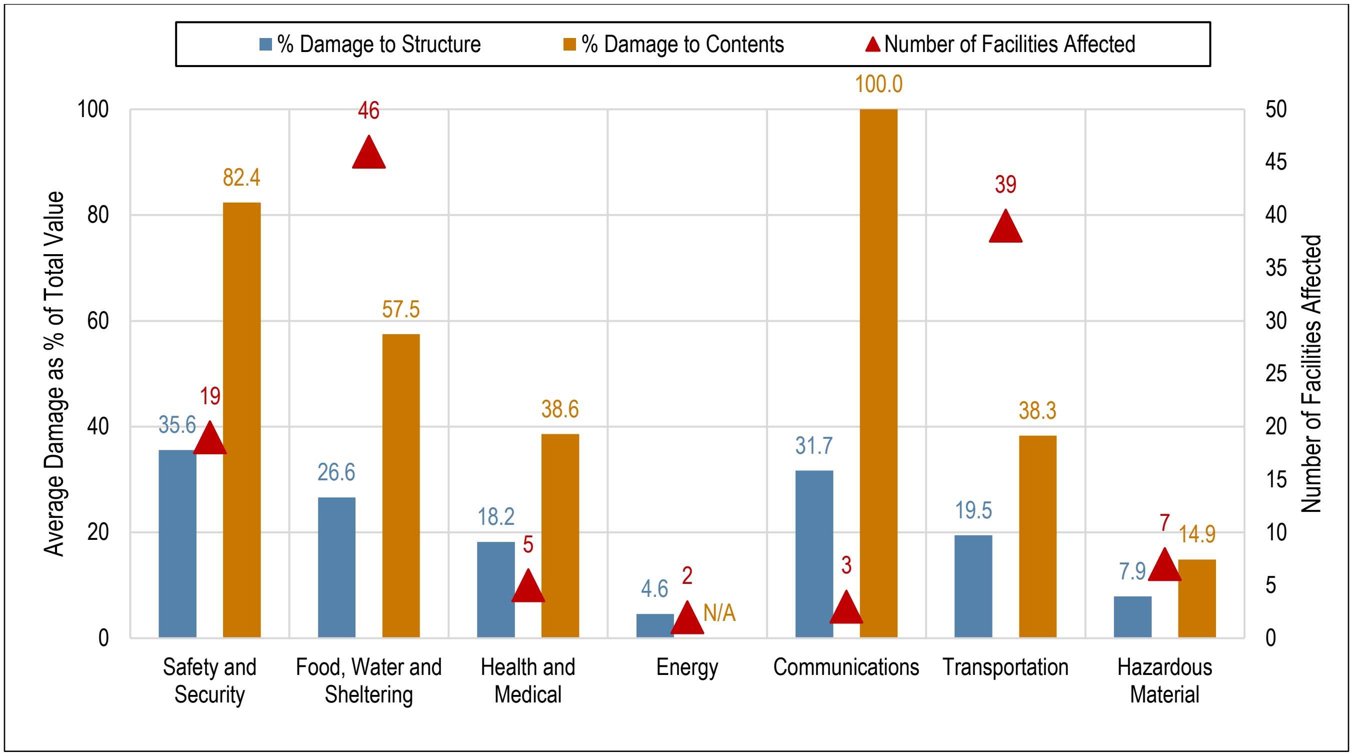


Figure 15-7. Critical Facility Damage in the Tsunami Inundation Zone

Vulnerable Infrastructure

In addition to the vulnerable critical facilities identified by the Hazus analysis, the following infrastructure is also generally vulnerable to damage:

- **Water Proximate Infrastructure**—Breakwaters and piers collapse, sometimes because of scouring actions that sweep away their foundation material and sometimes because of the sheer impact of the tsunami waves.
- **Flood Control Systems**—Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from tsunami events, also causing localized urban flooding.
- **Utility Systems—**Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing waste to spill into homes, neighborhoods, rivers, and streams. Tsunami waves can knock down power lines and radio/cellular communication towers. Power generation facilities can be severely impacted by wave action and by inundation from floodwater.

15.4.4 Environment

Environmental impacts on local waterways and wildlife would be most significant in areas closest to the point of impact. Areas near gas stations, industrial areas and facilities storing hazardous materials are vulnerable. The vulnerability of aquatic habit and associated ecosystems in low-lying areas close to the coastline is high. Tsunami waves can carry destructive debris and pollutants that can have devastating impacts on all facets of the environment. Millions of dollars spent on habitat restoration and conservation in the planning area could be wiped out by one significant tsunami. A tsunami event has the potential to alter the shoreline, depending on the force of the run-up.

Most environmental and ecological impacts from tsunamis derive from direct damage from the waves, which can physically remove vegetation and wildlife, increase sediment load, and smother vegetation that is not physically carried away. Other environmental impacts from tsunamis include chemical changes from saltwater intruding into freshwater sources; eutrophication (enrichment) of water from increased runoff; and decomposition of vegetation, wildlife, rotting property (boats or buildings) and unrecovered remains. Non-biodegradable waste, such as plastics, can lead to a buildup in marine debris, and toxic wastes, if inadequately stored, may be released into the environment. Lastly, exotic wildlife may be introduced or may escape into the local ecosystem.

15.5 FUTURE TRENDS IN DEVELOPMENT

The County and its planning partners are equipped to handle future growth within tsunami inundation areas. The inundation maps provided by the California Department of Conservation offer jurisdictions a way to guide development away from tsunami-prone areas. Additionally, all partners have committed to integrating their general plans to this hazard mitigation plan. By coordinating their general plans, municipalities and the County will be better able to make wise land use decisions as future growth impacts tsunami hazard areas.

New standards for building designs in Alaska, Washington, Oregon, California, and Hawaii that account for tsunami loads and effects have recently been adopted by the American Society of Civil Engineers (ASCE 7-16, Chapter 6), referenced in the International Building Code (IBC 2018), and included California's state building code (2019 State of California Building Code Appendix M). This will help to promote structures more resilient to the impacts from tsunami as new development occurs within identified tsunami risk areas.

15.6 SCENARIO

The tsunami scenario with the greatest potential impact on the planning area is a tsunami triggered by a major seismic event along the Cascadia subduction zone. Historical records suggest that tsunami wave heights on the order of 15 to 60 feet could be generated by a Cascadia subduction event (see Figure 15-8). The most destructive tsunami will be associated with a local source Cascadia event and will be preceded by strong ground shaking. Significant damage will result from the ground shaking, tsunami wave forces, and impacts associated with debris. A major tsunami event in the region would have devastating impacts on the people, property, and economy of the planning area.

A tsunami from a more local earthquake, such along the San Andreas fault, might be less severe than a Cascadia subduction event. Tsunamis are less commonly associated with strike-slip faults such as the San Andreas system. However, a local source tsunami presents a high risk to people, as there would not be time to initiate evacuation; the first surge could arrive in as little as 10 minutes. Strong ground shaking preceding the tsunami could damage buildings, communications and electric utility infrastructure, roads, and bridges, further impairing the community's ability to evacuate safely.

15.7 ISSUES

The planning team has identified the following issues related to the tsunami hazard for the planning area:

- To truly measure and evaluate the probable impacts of tsunamis on planning, hazard mapping based on probabilistic scenarios must continue to be updated regularly. The science and technology in this field are emerging. Accurate probabilistic tsunami mapping will need to be a key component for tsunami hazard mitigation programs to be effective.

Source: National Centers for Environmental Information, 2018

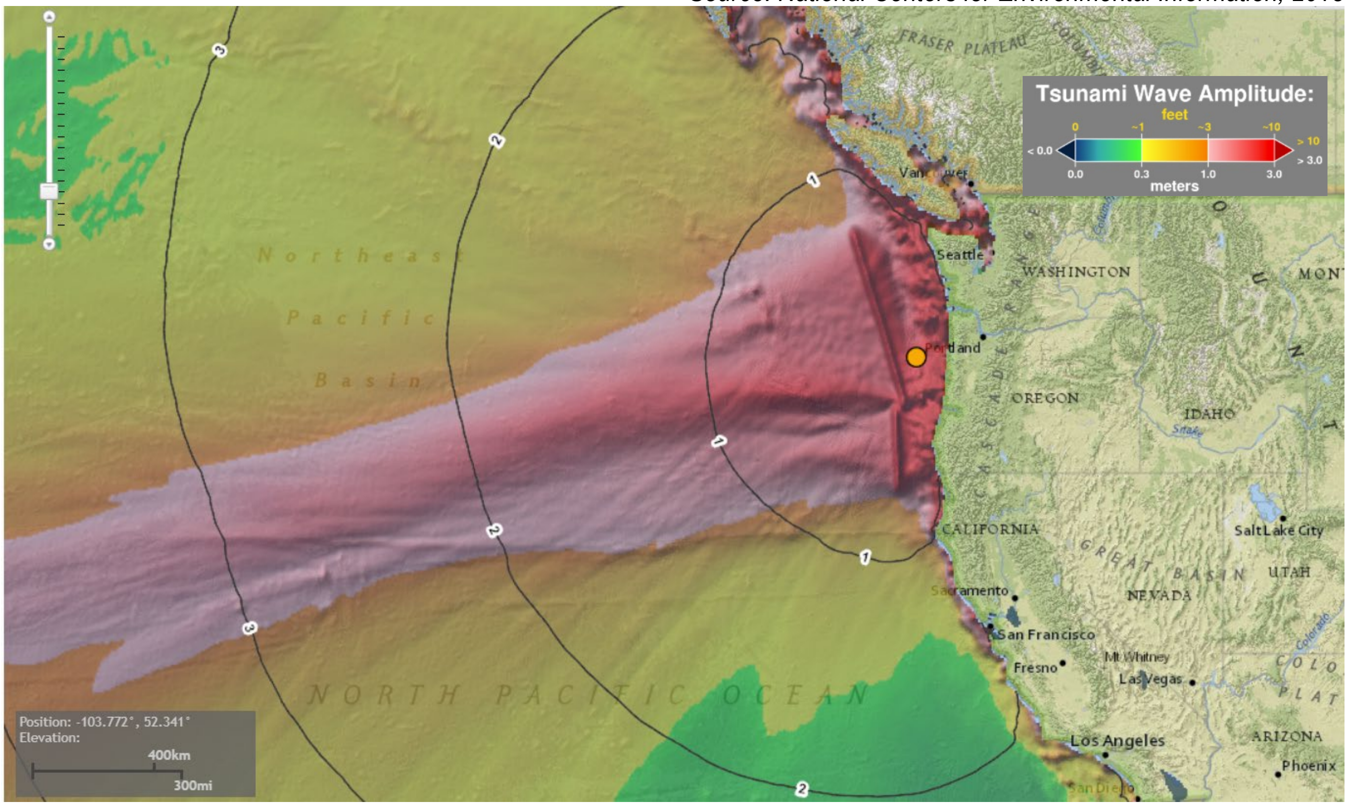


Figure 15-8. 1700 Cascadia Subduction zone Earthquake Tsunami Event

- Present building codes and guidelines do not adequately address the impacts of tsunamis on structures. Planning partners, especially the Cities of Half Moon Bay and Pacifica, should review their building code and consider requirements for tsunami-resistant construction standards in vulnerable areas.
- As tsunami warning technologies evolve, the tsunami warning capability within the planning area will need to be enhanced to provide the highest degree of warning to planning partners with tsunami risk exposure.
- Special attention will need to be focused on the vulnerable communities in the tsunami zone and on hazard mitigation through public education, outreach, and warning capabilities. This issue may be especially important for visitors to San Mateo County.
- Risk from tsunami inundation is not subject to the State of California real estate disclosure law at this time.
- Structures in the planning area built before the cities and County entered the NFIP may not be designed to resist tsunami forces.
- With future impacts from climate change, the issue of sea level rise may become an important consideration as probable tsunami inundation areas are identified through future studies.

16. WILDFIRE

16.1 GENERAL BACKGROUND

A wildfire is any uncontrolled fire on undeveloped land that requires fire suppression. Wildfires can occur naturally and are important to many ecosystem processes, but most are started by people.

16.1.1 CAL FIRE Wildfire Mapping

Fire Hazard Severity Zones

CAL FIRE has modeled and mapped wildfire hazard zones using a computer model that designates moderate, high or very high fire hazard severity zones (FHSZ). 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. Fire behavior is based on factors such as the following (CAL FIRE, 2017a):

- **Fuel**—Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees, and above the ground in tree canopies. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite. Trees killed or defoliated by forest insects and diseases are more susceptible to wildfire.
- **Weather**—Relevant weather conditions include temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere. When the temperature is high, relative humidity is low, wind speed is increasing and coming from the east (offshore flow), and there has been little or no precipitation so vegetation is dry, conditions are very favorable for extensive and severe wildfires. These conditions occur more frequently inland where temperatures are higher and fog is less prevalent.
- **Terrain**—Topography includes slope and elevation. The topography of a region influences the amount and moisture of fuel; the impact of weather conditions such as temperature and wind; potential barriers to fire spread, such as highways and lakes; and elevation and slope of landforms (fire spreads more easily uphill than downhill).

FIRE HAZARD SEVERITY AS DETERMINED BY CAL FIRE

CAL FIRE classifies areas of the state as having a moderate, high, or very high fire hazard, based on how a fire would behave in a given area and the probability of flames and embers threatening buildings.

For wildland areas, the FHSZ model uses burn probability and expected fire behavior based on weather, fuel (the vegetation in the area), 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 the area burning. Scores of smaller areas are then averaged over larger zones that encompass them.

The model 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 serve as sites for new spot fires within the urban core and spread to adjacent structures. The model refines the zones to characterize fire exposure mechanisms that cause ignitions to structures. Significant land-use changes need to be accounted for through periodic model updates. Detailed discussions of the zones and how they are developed are available on the CAL FIRE website (CAL FIRE, 2012 and 2012a).

Wildfire Protection Responsibility Areas

Hundreds of agencies have fire protection responsibility for wildland and wildland-urban interface (WUI) fires in California. Local, state, tribal, and federal organizations have primary legal (and financial) responsibility for wildfire protection. In many instances, two fire organizations have dual primary responsibility on the same parcel of land —one for wildfire protection, and the other for structural or "improvement" fire protection. According to the *2013 California State Hazard Mitigation Plan*, this layering of responsibility and resulting dual policies, rules, practices, and legal ordinances can cause conflict or confusion. To address wildfire jurisdictional responsibilities, the California state legislature in 1981 adopted Public Resource Code Section 4291.5 and Health and Safety Code Section 13108.5 establishing the following responsibility areas:

- **Federal Responsibility Areas (FRAs)—**FRAs are fire-prone wildland areas that are owned or managed by a federal agency such as the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Department of Defense. Primary financial and rule-making jurisdictional authority rests with the federal land agency. In many instances, FRAs are interspersed with private land ownership or leases. Fire protection for developed private property is usually not the responsibility of the federal land management agency; structural protection responsibility is that of a local government agency.
- **State Responsibility Areas (SRAs)**—SRAs are lands in California where CAL FIRE has legal and financial responsibility for wildfire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRAs are defined as lands that meet the following criteria:
  - Are county unincorporated areas
  - Are not federally owned
  - Have wildland vegetation cover rather than agricultural or ornamental plants
  - Have watershed or range/forage value
  - Have housing densities not exceeding three units per acre.
  - Where SRAs contain built environment or development, the responsibility for fire protection of those improvements (non-wildland) is that of a local government agency.
- **Local Responsibility Areas (LRAs)—**LRAs include land in cities, cultivated agriculture lands, and non-flammable areas in unincorporated areas, and lands that do not meet the criteria for SRA or FRA. LRA fire protection is typically provided by city fire departments, fire protection districts, and counties, or by CAL FIRE under contract to local governments. LRAs may include flammable vegetation and WUI areas where the financial and jurisdictional responsibility for improvement and wildfire protection is that of a local government agency.

16.1.2 State Codes and Policies for Mitigating the Fire Hazard

Urbanization tends to alter the natural fire regime and can lead to expansion of urbanized areas into wildland areas. State and local policies and regulations require landowners to carry out activities such as maintaining defensible space and reducing vulnerability to damage or loss from wildfire. The most important policies and regulations related to residential wildfire safety in California are as follows:

- **General Plan Safety Element Review: Government Code 65302.5—**The Board of Forestry and Fire Protection must provide recommendations to a local jurisdiction's general plan safety element at the time that the general plan is being amended. Board recommendations include goals and policies that provide for contemporary fire-prevention standards for the jurisdiction. This is not a direct and binding fire-prevention requirement for individuals.
- **Sprinkler Systems: California Residential Code, Chapter 3, Section R313—**All new dwellings, dwelling units, and one- and two-family townhomes must be equipped with an automatic fire-sprinkler system that can protect the entirety of the dwelling. Dwellings and homes constructed prior to January 1, 2011, that do not have a sprinkler system may be retrofitted, but it is not required.
- **Fire Safety Standards: California Public Resources Code 4290 and 14 California Code of Regulations (CCR) 1270—**These regulations govern roads, driveway width, clearance, turnarounds, signing, and water related to fire safety throughout California. Public Resources Code 4290 is typically enacted through regulation at the county level, as described below.
- **Wildland-Urban Interface Building Standards: California Government Code 51189—**The Office of the State Fire Marshal is required to create building standards for wildfire resistance. Construction of buildings in the wildland-urban interface must use fire-resistant materials to save life and property. As of 2011, the standards relevant to fire-safe construction for all new structures in the SRA are the California Building Code, Chapter 7A (for commercial construction) and the California Residential Code, Chapter 3, Section R327 (for residential construction).
- **State Responsibility Area: Public Resources Code 4102, 4125-4229 and 14 CCR 1220**—These statutes and regulations establish the locations where CAL FIRE has the financial responsibility for preventing and suppressing fires. These designations define financial arrangements for fire protection services and establish the locations where fire safe and defensible space laws or regulations apply.
- **Hazardous Fire Areas: Public Resources Code 4251-4255 and 14 CCR 1200—**These laws and regulations allow petitioners to the Board of Forestry and Fire Protection or CAL FIRE to establish hazardous fire areas, providing for area closures and other restrictions for fire prevention.
- **Defensible Vegetation Clearing Around Structures: Public Resources Code 4291/14 CCR 1299—** Public Resources Code 4291 regulates fuel management around a property. It states that a person who owns or controls a building or structure in or adjoining to forest, brush, or grass covered lands shall follow certain guidelines outlined in the code. At least 100 feet of defensible space is required. The owner of the property is liable for making these changes to protect habitable structures. The 100 feet is separated into two zones, with the closer zone, 30 feet out from the structure, being managed more intensively.

16.1.3 Secondary Hazards

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

16.2 HAZARD PROFILE

16.2.1 Ecology

Ecosystems in the planning area include several that are susceptible to wildfire (*Santa Cruz County/San Mateo County Community Wildfire Protection Plan*, 2018):

- Dense second-growth redwood and mixed conifer forests typically having forest floor accumulations of litter and downed woody material
- Coastal scrub communities consisting of low vegetation up to 6 feet in height, typically occurring on coastal hills and bluffs
- Wind-swept summits
- Scrub vegetation that is dense and difficult to pass through
- Flammable, environmentally sensitive northern maritime chaparral communities in isolated areas on southwest facing slopes and at higher elevations, 12 to 20 feet tall and impenetrable at maturity, adapted to and dependent upon periodic crown fires
- Grasslands in rural San Mateo County, especially in areas of upland grazing.

Due to local topography, fuels (forest, chaparral, and grasslands vegetation) and weather conditions, San Mateo and Santa Cruz Counties are conducive to periodic large wildfire events. According to a 2010 survey of counties in the western United States by the Headwaters Economics Institute, San Mateo County has 39 square miles of WUI area, with 33 percent of it having homes. There are 14,704 homes in San Mateo County in the WUI. This represents 5.4 percent of all residences in the county.

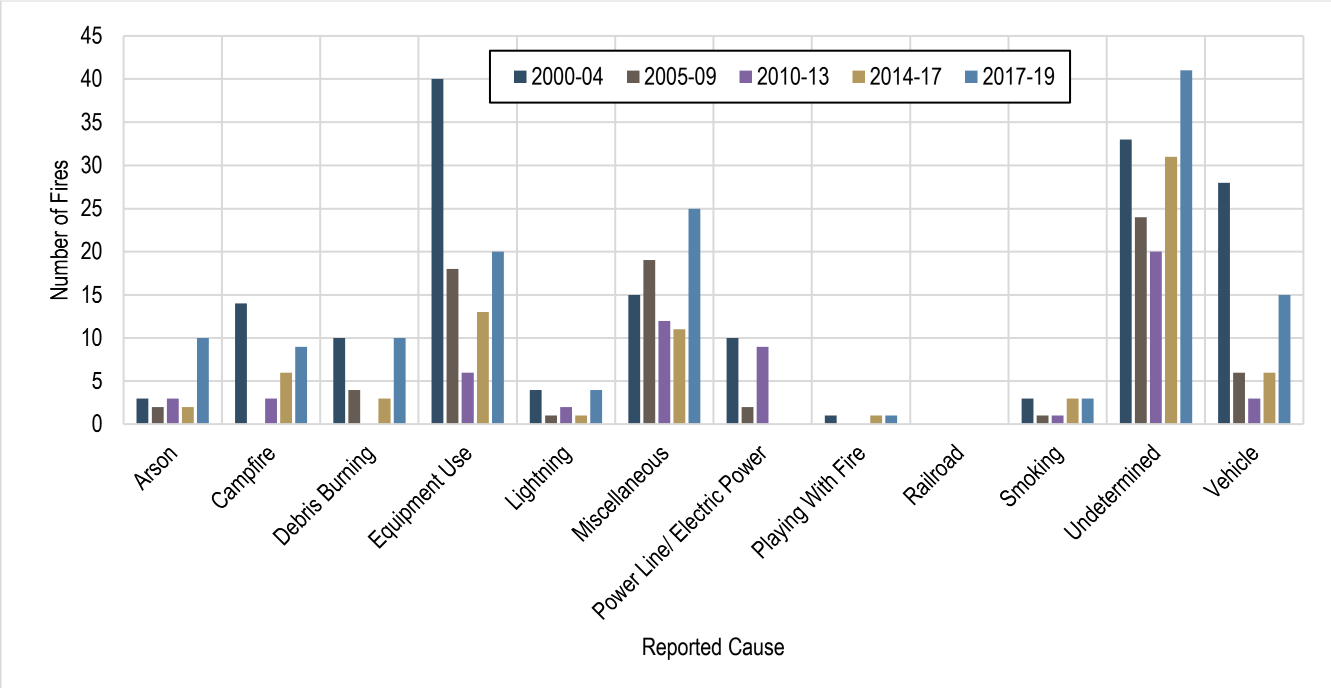
16.2.2 Past Events

While San Mateo County has a prolific fire history, few of its fires have caused sufficient damage to trigger a state or federal disaster declaration. Notable fires of record are the November 1929 fire near Montara that destroyed 25 homes, a church, and cattle, and the August 2020 CZU Lightning Complex in Santa Cruz and San Mateo Counties, caused by a reported 12,000 bolts of lightning.

Two federal disaster declarations related to wildfire have included San Mateo County:

- Declaration DR-65 (Wildfires), December 29, 1956
- Declaration DR-4558 (Wildfires; CZU Lightning Complex), August 16 – September 26, 2020

CAL FIRE maintains statistics on historical wildfire activity through its annual reporting (Redbooks). Wildfire statistics include state and county information, cause and size, acres burned, and dollar damage, among other details. Figure 16-1 shows the wildfire activity for San Mateo County between 2000 and 2019, the most recent annual report available. CAL FIRE has Redbooks available for every year back through 1942.



Note: from 2016 on, data for San Mateo County is combined with data for Santa Cruz County.

Figure 16-1. CAL FIRE Wildfire Activity Statistics for San Mateo County

Figure 16-2 shows the Fire History for fires larger than 10 acres within Santa Cruz and San Mateo County identified in the 2018 *Santa Cruz/San Mateo County Community Wildfire Protection Plan*.

16.2.3 Location

Figure 16-3 shows the very high FHSZ and other severity zones for LRA and SRA for San Mateo County. These maps are the basis for this wildfire risk assessment. City-level very high FHSZ maps are also available on CAL FIRE's website for Belmont, Half Moon Bay, Hillsborough, Portola Valley, Redwood City, San Carlos, San Mateo, and Woodside.

The geography, weather patterns, and vegetation in the Bay Area provide ideal conditions for recurring wildfires. Especially vulnerable are the SRA between Shelter Cove, Moss Beach, Half Moon Bay, Sky Londa, and Crystal Springs Lake. The southern half of the County is mostly rated as moderate or high, with some very high sections, including in La Honda. LRA rated as very high include land immediately west of Crystal Springs Lake, land near Woodside and Sky Londa, and land about halfway between Half Moon Bay and Moss Beach. Very high LRA are adjacent to very high-risk SRA.

16.2.4 Frequency

Based on risk factors for the County and past occurrences, it is highly likely that wildfires will continue to occur in San Mateo County. Wildfires are influenced by both weather and human activities. Based on its history of past events, San Mateo County has a high chance of a wildfire in any given year. The most common causes of wildfires, based on the most recent past events, will be "undetermined," equipment use, miscellaneous, and power line/electric power.

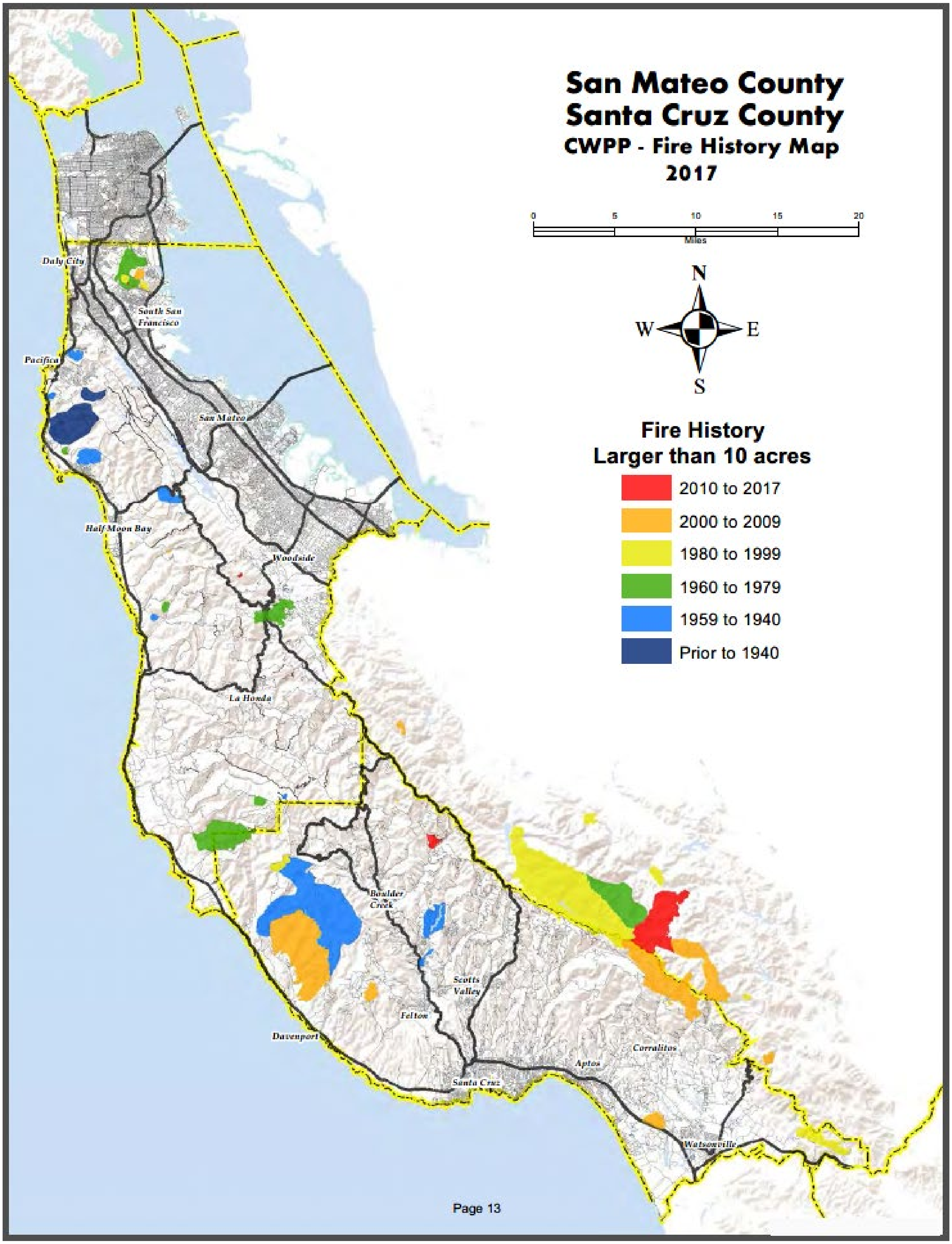


Figure 16-2. Fire History Larger than 10 Acres, Santa Cruz and San Mateo Counties

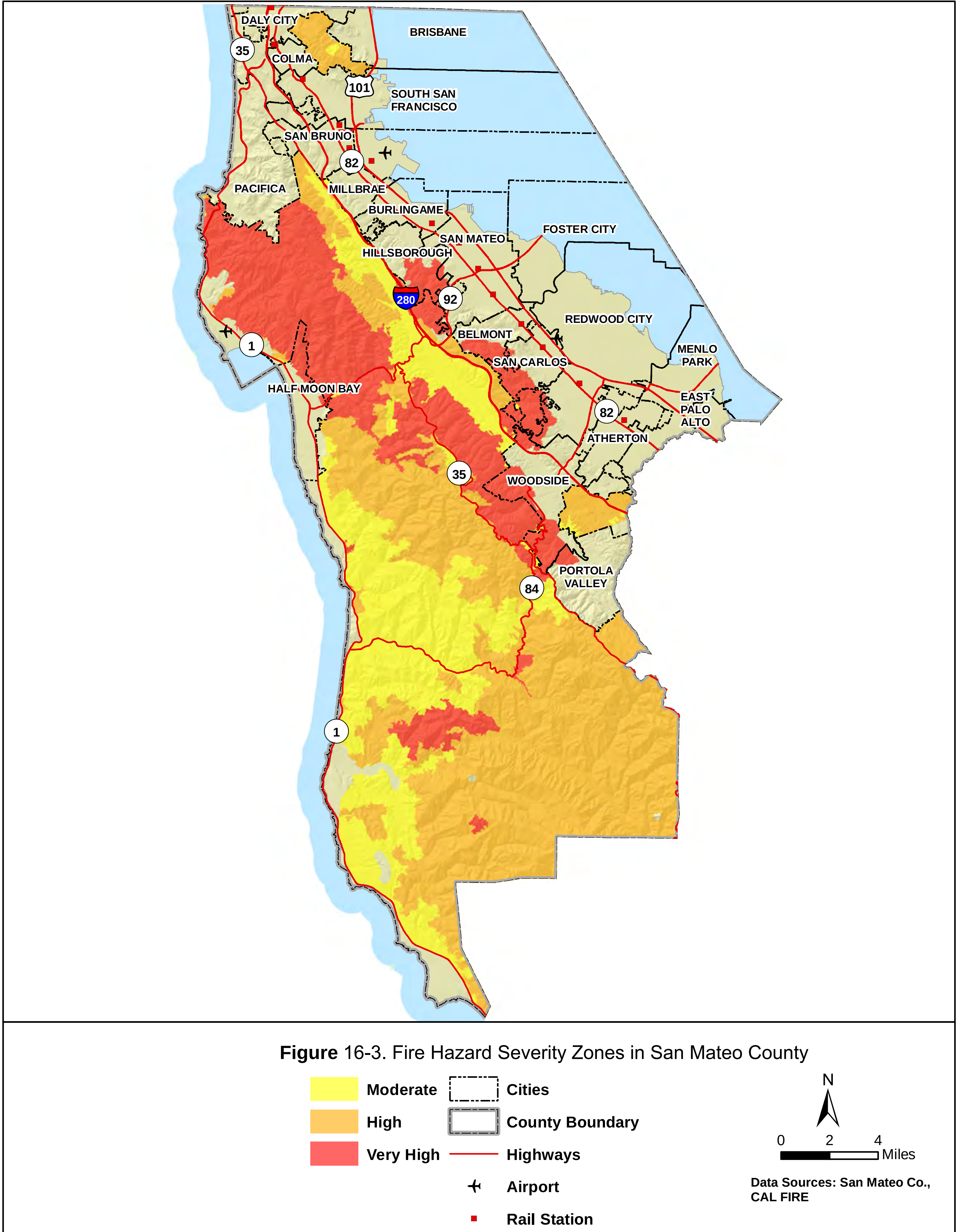


Figure 16-3. Fire Hazard Severity Zones in San Mateo County

16.2.5 Severity

The most recent deadly fire in San Mateo County was the CZU Lightning Complex fires, which burned in San Mateo and Santa Cruz County starting on August 16, 2020. This fire destroyed 1,490 structures, damaged 140 others, and caused 1 injury and 1 fatality (Cal Fire, 2020). Fires burned in both Butano and Big Basin Redwoods state parks, where a number of historic buildings were destroyed, including the visitor's center at Big Basin. The total acreage burned was 86,509. CAL FIRE tracks the deadliest, largest, and most destructive wildfires that have occurred in the state, with the lists last updated in late April 2021. The CZU Lightning Complex fire is listed as the 12th most destructive California wildfire (Cal Fire, 2021).

Although San Mateo County has not had many major wildfire events, nearby Alameda County has demonstrated some worst-case scenario fires that could occur in other Bay Area counties. The October 1991 Oakland/Berkeley Hills "Tunnel Fire" was the most damaging fire and the second most deadly fire in California at the time it occurred. This WUI fire resulted in 25 lives lost, including a fire battalion chief and an Oakland police officer, 148 people injured, and 2,900 structures destroyed. The blaze started from a grass fire in the Berkeley Hills and burned 1,600 acres. The estimated private property loss was $1.7 billion at the time, according to the Insurance Information Institute.

16.2.6 Warning Time

Wildfires are mostly caused by humans, intentionally or accidentally. There is no way to predict when one might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, community members may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

16.3 EXPOSURE

A quantitative assessment of exposure to the wildfire hazard was conducted using the hazard mapping shown in Figure 16-3 and the asset inventory developed for this plan. Population exposure was estimated by calculating the number of buildings in the mapped hazard areas as a percent of total planning area buildings, and then applying this percentage to the estimated planning area population. Detailed results by municipality are provided in Appendix E; results for the total planning area are presented below.

16.3.1 Population and Property

Table 16-1 summarizes the estimated population living in the moderate-high and high wildfire hazard zones and the estimated property exposure. In addition to the populations living in wildfire risk areas, people working or recreating in resource lands, such as hikers, are exposed to the wildfire risk. Firefighting crews are exposed as they work to combat fires and to protect property. All county community members are potentially exposed to the health-related impacts of reduced air quality from wildland fires.

Table 16-1. Exposed Population and Property in Mapped Wildfire Hazard Zones

	Very High-High Wildfire Hazard Zone	Moderate Wildfire Hazard Zone
Population		
Population Exposed	43,282	2,000
% of Total Planning Area Population	5.6%	0.3%
Property		
Number of Buildings Exposed	12,511	727
Value of Exposed Structures	$6,336,441,287	$1,030,006,736
Value of Exposed Contents	$4,436,672,332	$895,582,972
Total Exposed Property Value	**$10,773,113,620**	**$1,925,589,708**
Total Exposed Value as % of Planning Area Total	*5.6%*	*1%*

Figure 16-4 and Figure 16-5 show the county-wide distribution of structures in the mapped wildfire hazard zones by occupancy class. In both the moderate-high and high hazard zones, the exposed structures are primarily residential or commercial, with other occupancy classes making up less than 1 percent of the total number of exposed structures.

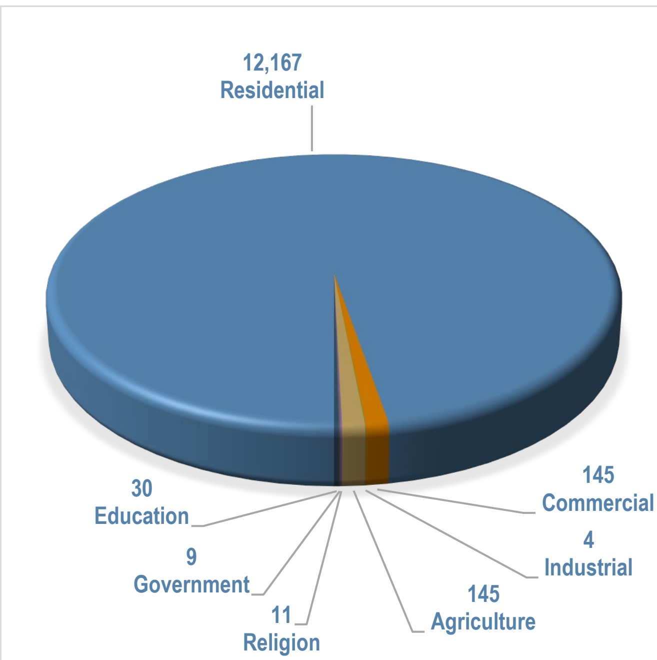


Figure 16-4. Number of Structures by Occupancy Class in the Very High-High Wildfire Hazard Area

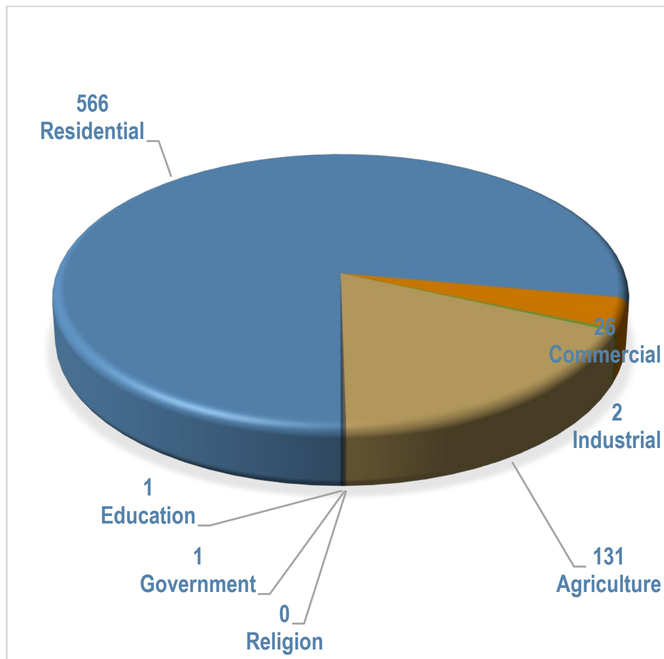


Figure 16-5. Number of Structures by Occupancy Class in the Moderate Wildfire Hazard Area

16.3.2 Critical Facilities

Critical facilities in the very high and high wildfire hazard severity zones represent 9.5 percent of the total critical facilities in the planning area. The breakdown of exposure by facility type is shown in Figure 16-6.

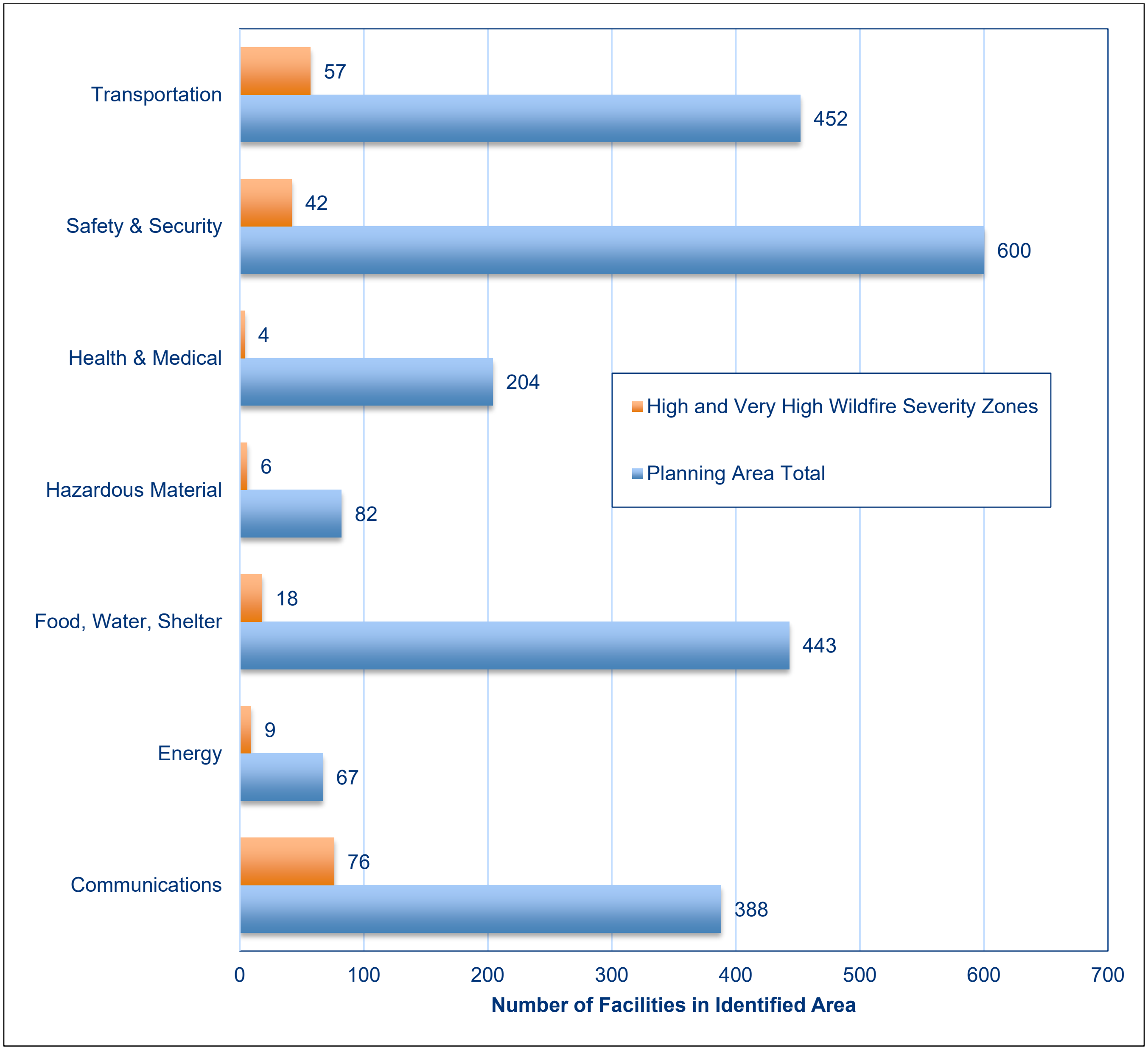


Figure 16-6. Critical Facilities in Mapped Fire Hazard Severity Zones and Countywide

Currently there are six hazardous material containment sites identified in high or very high wildfire severity zones. During a wildfire event, containers with these materials could rupture because of the excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition, they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most road and railroads would be without damage except in the worst scenarios. Power poles are the most at risk to wildfire because most are made of wood and susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion.

16.3.3 Environment

All natural resources and habitats in mapped fire hazard severity zones are exposed to the risk of wildfire.

16.4 VULNERABILITY

16.4.1 Population

All people exposed to the wildfire hazard are potentially vulnerable to wildfire impacts. Persons with access and functional needs, the elderly and very young may be especially vulnerable to a wildfire if there is not adequate warning time for them to evacuate if needed. In addition, people outside the mapped risk areas are susceptible to health hazards associated with smoke and air pollution from wildfires, especially sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases. In addition, wildfires threaten the health and safety of those fighting the fires.

An analysis was performed using Hazus and the SoVI ratings (see Section 7.2.2) of the population living in high or very high fire hazard severity zones. Detailed results by jurisdiction are in Appendix E. Table 16-2 summarizes results for the overall planning area.

Table 16-2. Distribution of Population Exposed to Wildfire Hazard by SoVI Rating

SoVI Rating	Population Living in Exposed Areas Having the SoVI Rating Shown	
	Number of People	% of Total Exposed Population
Very High	0	0
Relatively High	3,400	9.16%
Relatively Moderate	8,287	22.32%
Relatively Low	6,345	17.09%
Very Low	19,099	51.43%

16.4.2 Property

All property exposed to the wildfire hazard is vulnerable. Structures that were not constructed to standards designed to protect a building from a wildfire may be especially vulnerable. As of 2008, California State Building code requires minimum standards be met for new buildings in fire hazard severity zones. Most housing in the planning area—84 percent—was built prior to this code requirement (U.S. Census, 2018). It is unknown how many of these structures are in fire hazard zones.

Estimates were developed to indicate the loss that would occur if wildfire damage were equal to 10, 30 or 50 percent of the exposed property value, as summarized in Table 16-3. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure.

Table 16-3. Loss Estimates for Fire Hazard Severity Zones

	Exposed Value	Loss Value	Loss as % of Total Planning Area Replacement Value
Moderate FHSZ			
Loss = 1% of Exposed Value	$1.9 Billion	$83,256,446	0.04%
Loss = 10% of Exposed Value		$832,564,462	0.43%
Loss = 30% of Exposed Value		$2,497,693,386	1.30%

	Exposed Value	Loss Value	Loss as % of Total Planning Area Replacement Value
Loss = 50% of Exposed Value		$4,162,822,310	2.17%
High FHSZ			
Loss = 1% of Exposed Value	$2.4 Billion	$24,474,690	0.01%
Loss = 10% of Exposed Value		$244,746,900	0.13%
Loss = 30% of Exposed Value		$734,240,700	0.38%
Loss = 50% of Exposed Value		$1,223,734,500	0.64%
Very High FHSZ			
Loss = 1% of Exposed Value	$8.3 Billion	$19,255,897	0.01%
Loss = 10% of Exposed Value		$192,558,971	0.10%
Loss = 30% of Exposed Value		$577,676,912	0.30%
Loss = 50% of Exposed Value		$962,794,854	0.50%

16.4.3 Critical Facilities

Critical facilities not built to fire protection standards, utility poles and lines, and facilities containing hazardous materials are most vulnerable to the wildfire hazard. Most roads would not be damaged except in the worst scenarios, although roads and bridges can be blocked by debris or other wildfire-related conditions and become impassable. Additionally, heavy vehicle traffic during incidents and in post-fire recovery and rebuild can have significant impact on road surfaces. The following critical facilities are located in very high and high severity zones and their vulnerability could complicate response and recovery efforts during and following an event:

- **Hazardous Materials and Fuel Storage**—During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition, they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.
- **Communication Facilities**—If these facilities are damaged and become inoperable, it would exacerbate already difficult communication in the planning area.

16.4.4 Environment

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, affecting the types, structure, and spatial extent of native vegetation. However, in some circumstances it can also cause severe environmental impacts, such as the following:

- **Damaged Fisheries**—Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- **Soil Erosion**—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- **Spread of Invasive Plant Species**—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.

- **Disease and Insect Infestations**—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- **Destroyed Endangered Species Habitat—**Wildfire can have negative consequences for endangered species by degrading their habitat.
- **Soil Sterilization**—Some wildfires burn so hot that they can sterilize the soil. Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost.
- **Reduced Timber Harvesting**—Timber can be destroyed and lead to smaller available timber harvests.
- **Reduced Agricultural Resources—**Wildfire can have disastrous consequences on agricultural resources, removing them from production and necessitating lengthy restoration programs.
- **Damaged Cultural and Historical Resources**—The destruction of cultural and historic resources may occur, scenic vistas can be damaged, and access to recreational areas can be reduced.

Parks and recreational areas in San Mateo County have greater vulnerability to wildfires than do more developed regions. San Bruno Mountain Park, a landmark of local and regional significance, is one of the more noteworthy of this type of area. It stands as an open-space island amid the peninsula's urban northern end of the Santa Cruz Mountain Range. Its ridgeline has numerous slopes exceeding 50 percent and elevations from 250 feet to over 1,300 feet. Fourteen species of rare or endangered plants, along with numerous endangered and threatened butterflies, make their home on San Bruno Mountain. The San Bruno Mountain State and County Park Master Plan, last updated in 2001, recommends development of a fire management plan to cover fire management policies and procedures, public education, reduction of the existing heavy fuel load, and how to best utilize fire for the enhancement of endangered species' habitats (San Mateo County 2001).

16.5 FUTURE TRENDS IN DEVELOPMENT

Urbanization tends to alter the natural fire regime and can lead to expansion of urbanized areas into wildland areas. Placement of additional housing in the wildland/urban interface areas located in high or very high relative fire hazard zones can increase the fire threat, particularly in historical fire corridors. Development in these areas can burden existing fire protection services, particularly in areas dependent on volunteer firefighters.

The expansion of development into high wildfire hazard areas can be managed with strong land use and building codes. The planning area is well equipped with these tools, and this planning process has asked each planning partner to assess its capabilities with regards to the tools. As San Mateo County experiences future growth, it is anticipated that the exposure to this hazard will remain as assessed or even decrease over time due to these capabilities.

Most of the homes in San Mateo County's WUI areas were constructed before 2008, when California's WUI Building Code (California Code Chapter 7A) went into effect. This code requires ignition-resistant building materials in WUI areas. Structures built before it took effect and those without adequate vegetation management are at higher risk to wildland fire ignition.

The State of California has enacted significant legislation that attempts to manage and mitigate wildfire risk. Appendix C provides a summary of this legislation, much of which will have an impact on future development that interfaces a wildfire hazard severity zone. In addition, the planning partners' general plans include policies that address managing development in relative fire hazard zones. The planning area is well equipped with these tools, and this planning process has asked each planning partner to assess its capabilities with regards to the tools. As the planning area experiences future growth, it is anticipated that the exposure to this hazard will remain as assessed or even decrease over time due to these capabilities.

16.6 SCENARIO

A major wildfire in the planning area might begin with a wet spring, adding to fuels already present on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lightning storm could trigger a multitude of small isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers could be deep in forested areas. Fires that start in flat areas move slower, but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Suppression resources would be redirected from protecting the natural resources to saving more remote subdivisions.

The worst-case scenario would include an active fire season throughout the American west, spreading resources thin. Firefighting teams would be exhausted or unavailable. Many federal assets would be responding to other fires that started earlier in the season.

To further complicate the problem, heavy rains could follow, causing flooding and landslides and releasing tons of sediment into rivers, permanently changing floodplains and damaging sensitive habitat and riparian areas. Such a fire followed by rain could release millions of cubic yards of sediment into streams for years, creating new floodplains and changing existing ones. With the forests removed from the watershed, stream flows could easily double. Floods that could be expected every 50 years may occur every couple of years. With the streambeds unable to carry the increased discharge because of increased sediment, the floodplains and floodplain elevations would increase.

16.7 ISSUES

The major issues for wildfire are the following:

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation actions such as defensible space and advance identification of evacuation routes and safe zones.
- Wildfires could cause landslides as a secondary natural hazard.
- Climate change could affect the wildfire hazard.
- Future growth into interface areas should continue to be managed.
- Area fire districts need to continue to train on wildland-urban interface events.
- Vegetation management activities—This issue would include enhancement through expansion of the target areas as well as additional resources.
- Regional consistency of higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.

- Firefighters in remote and rural areas are faced with limited water supply and lack of hydrant taps. Rural areas are adapting to these conditions by developing a secondary water source. Areas that once were considered rural could become urban with incorporation and annexation, coupled with development
- Expand certifications and qualifications for fire department personnel.
- Ensure that all firefighters are trained in basic wildfire behavior, basic fire weather, and that all company officers and chief level officers are trained in the wildland command and strike team leader level.

17. CLIMATE CHANGE

17.1 GENERAL BACKGROUND

17.1.1 What is Climate Change?

Climate, consisting of patterns of temperature, precipitation, humidity, wind and seasons, plays a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. “Climate change is a long-term change in the average weather patterns that have come to define Earth’s local, regional and global climates. These changes have a broad range of observed effects that are synonymous with the term. Changes observed in Earth’s climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth’s atmosphere, raising Earth’s average surface temperature (NASA, 2021)

The well-established worldwide warming trend of recent decades and its related impacts are caused by increasing concentrations of carbon dioxide and other greenhouse gases in the earth’s atmosphere. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. Carbon dioxide is the most commonly known greenhouse gas; however, methane, nitrous oxide and fluorinated gases also contribute to warming. Emissions of these gases come from a variety of sources, such as the combustion of fossil fuels, agricultural production, and changes in land use. According to the National Aeronautics and Space Administration (NASA), carbon dioxide concentrations measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen dramatically since then, surpassing 400 ppm in 2013 for the first time in recorded history (see Figure 17-1).

17.1.2 How Climate Change Affects Hazard Mitigation

Climate change is already affecting the people, property, economy, and ecosystems of the planning area in a variety of ways and will continue to do so. The most important effect for the development of this plan is that climate change will have a measurable impact on the occurrence and severity of natural hazards.

An essential aspect of hazard mitigation is predicting the likelihood of future hazard events. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of, for example, floods are used to estimate future frequencies: if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

Source: NASA, 2020

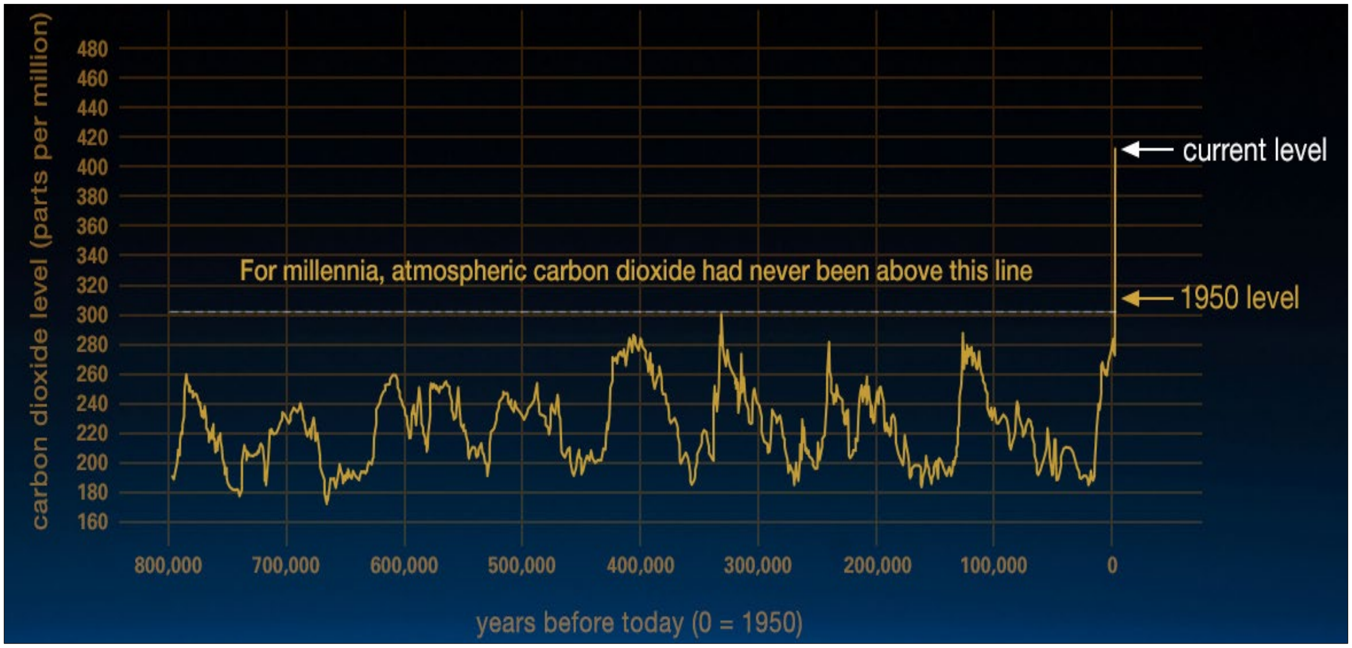


Figure 17-1. Global Carbon Dioxide Concentrations Over Time

For hazards that are affected by climate change, the assumption that future behavior will be equivalent to past behavior is not valid if climate conditions are changing and therefore accelerating or amplifying natural hazard frequency and intensity. As flooding is generally associated with precipitation frequency and quantity, for example, the frequency of flooding will not remain constant if broad precipitation patterns change. The California 4th Climate Assessment predicts high year-to-year variability with prominent "booms" and "busts" resulting in very wet and very dry years. Specifically, as hydrology changes, storms currently considered to be the 100-year flood might strike more often than their name suggests, leaving many communities at greater risk and introducing risk to communities that historically have been considered low risk.

The risks of landslide, severe storms, and wildfire are all impacted by climate change. For this reason, an understanding of the relationship between climate change and the efforts to mitigate natural hazards is critical. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis.

17.1.3 Current Indicators of Climate Change

Global Indicators

The major scientific agencies of the United States—including NASA and the National Oceanic and Atmospheric Administration (NOAA)—have presented evidence that climate change is occurring. NASA summarizes key evidence as follows (NASA, 2020b):

- **Global Temperature Rise**—The planet's average surface temperature has risen about 1.62 ºF since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Most of the warming occurred in the past 35 years, with the five warmest years on record taking place since 2010.

- **Warming Oceans**—The oceans have absorbed much of this increased heat, with the top 2,300 feet of ocean showing warming of more than 0.4 ºF since 1969.
- **Shrinking Ice Sheets**—The Greenland and Antarctic ice sheets have decreased in mass. Greenland lost an average of 286 billion tons of ice per year between 1993 and 2016, and Antarctica lost about 127 billion tons of ice per year during the same time period. The rate of Antarctica ice mass loss has tripled in the last decade.
- **Glacial Retreat**—Glaciers are retreating almost everywhere around the world—including in the Alps, Himalayas, Andes, Rockies, Alaska and Africa.
- **Decreased Snow Cover**—Satellite observations reveal that the amount of spring snow cover in the Northern Hemisphere has decreased over the past five decades and that the snow is melting earlier
- **Sea Level Rise**—Global sea level rose about 8 inches in the last century. The rate in the last two decades is nearly double that of the last century and is accelerating slightly every year.
- **Declining Arctic Sea Ice**—Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades
- **Extreme Events**—The number of record high temperature events in the United States has been increasing since 1950, while the number of record low temperature events has been decreasing. The U.S. has also witnessed increasing numbers of intense rainfall events.
- **Ocean Acidification**—Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.

California Indicators

Monitoring and research efforts across California have generated data that describe changes already underway in the state. Notable examples across the state include the following (Office of Environmental Health Hazard Assessment, 2020):

- Dissolved oxygen in Southern California coastal waters is declining
- In the last four years, Lake Tahoe’s waters warmed at a rate about 10 times faster than the long-term rate.
- Since 1950, the northern Sierra Nevada showed an overall snowpack decline of 7.4 inches.
- Unusually warm waters occurred in the Pacific Ocean in 2014-2015, leading to widespread impacts on marine life. This marine heat wave first appeared as a large area of exceptionally high sea surface temperatures in the Gulf of Alaska in November 2013 and later extended along the entire west coast of North America.
- The surface area of seven Sierra Nevada glaciers has decreased dramatically since the beginning of the 20th century. In 2014, the size of these glaciers ranged from 14 to 52 percent of their 1903 area.
- Since 1906, the fraction of annual snowmelt runoff that flows into the Sacramento River between April and July has decreased by about 9 percent.
- Compared to the 1930s, forests across much of California today have lower densities of large trees, and higher densities of small trees. Water stress, which increases in a warming climate, poses a greater risk to large trees than to small trees.
- Annual tree mortality in California forests increased in 2014, and steep increases in mortality followed in subsequent years; the highest number, 62 million tree deaths, was recorded in 2016.

- Heat-related deaths and illnesses in California increased dramatically in 2006 following a record-breaking heat wave. At least 140 deaths occurred between July 15 and August 1. Deaths related to this heat wave were largely attributed to elevated nighttime temperatures.
- The number of acres burned by wildfires statewide has been increasing since 1950. Large fires affecting 1,000 acres or more account for most of the area burned each year.

San Mateo County and Bay Area Indicators

The California Climate Assessment, led by the Governor's Office of Planning and Research, California Natural Resources Agency, and the State of California Energy Commission, has produced nine regional climate impact and adaptation solution reports. San Mateo County is covered in the San Francisco Bay Area Region. Notable examples of climate impacts in San Mateo County and the broader Bay Area Region include the following (California 4th Climate Assessment; San Francisco Bay Area Report, 2019):

- Overall, the Bay Area's average annual maximum temperature increased by 1.7 °F from 1950 to 2005.
- Several studies suggest that coastal fog along the California coast is less frequent than before.
- Sea level in the Bay Area has risen over 8 inches in the last 100 years.
- The 2015-2016 El Niño, one of the three largest in the historical record, resulted in winter wave energy that was over 50 percent larger than the typical winter in the Bay Area, driving significant outer coast beach erosion.
- The 2012-2016 California drought led to the most severe moisture deficits in the last 1,200 years and a 1-in-500-year low in Sierra snowpack. The record low snowpack resulted in $2.1 billion in economic losses and 21,000 jobs lost in the agricultural and recreational sectors statewide and exacerbated an ongoing trend of groundwater overdraft.

17.1.4 Projected Future Impacts

Climate change projections contain inherent uncertainty, largely derived from the fact that they depend on future greenhouse gas emission scenarios. Generally, the uncertainty in greenhouse gas emissions is addressed by the presentation of differing scenarios: low-emissions or high-emissions scenarios. In low-emissions scenarios, greenhouse gas emissions are reduced substantially from current levels. In high-emissions scenarios, greenhouse gas emissions generally increase or continue at current levels. Uncertainty in outcomes is generally addressed by averaging a variety of model outcomes. Despite this uncertainty, climate change projections present valuable information to help guide decision-making for possible future conditions.

Global Projections

The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, project that Earth's average temperatures will raise between 2.5ºF and 10ºF by over the next 100 years (NASA, 2020). Some research has concluded that every increase of 2ºF in average global average temperature can have the following impacts (NRC, 2011):

- 3 to 10 percent increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks
- 200 to 400 percent increases in the area burned by wildfire in parts of the western United States
- 5 to 10 percent decreases in stream flow in some river basins

- 5 to 15 percent reductions in the yields of crops as currently grown.

Sea level is rising at increasing rates due to global warming of the atmosphere and oceans and melting of the glaciers and ice sheets. Rising sea level and projections of stronger and more frequent El Niño events and tropical cyclones in waters surrounding Hawai'i all indicate a growing vulnerability to coastal flooding and erosion. While the IPCC's "business as usual" scenario, in which greenhouse gas emissions continue at the current rate of increase, predicts up to 3.61 feet of global sea level rise by 2100 (IPCC 2019), other observations and projections suggest that these ranges do not capture the full range of physically plausible global average sea level rise over the 21st century (NOAA, 2017). The National Climate Assessment completed by NOAA suggested that sea levels could rise as much as 8.2 feet by the end of the century if rapid loss of Antarctic ice occurred (U.S. Global Change Research Program, 2018). Figure 17-2 shows the projected rate of global sea level rise under different greenhouse gas scenarios (NOAA 2017).

Source: NOAA, 2021

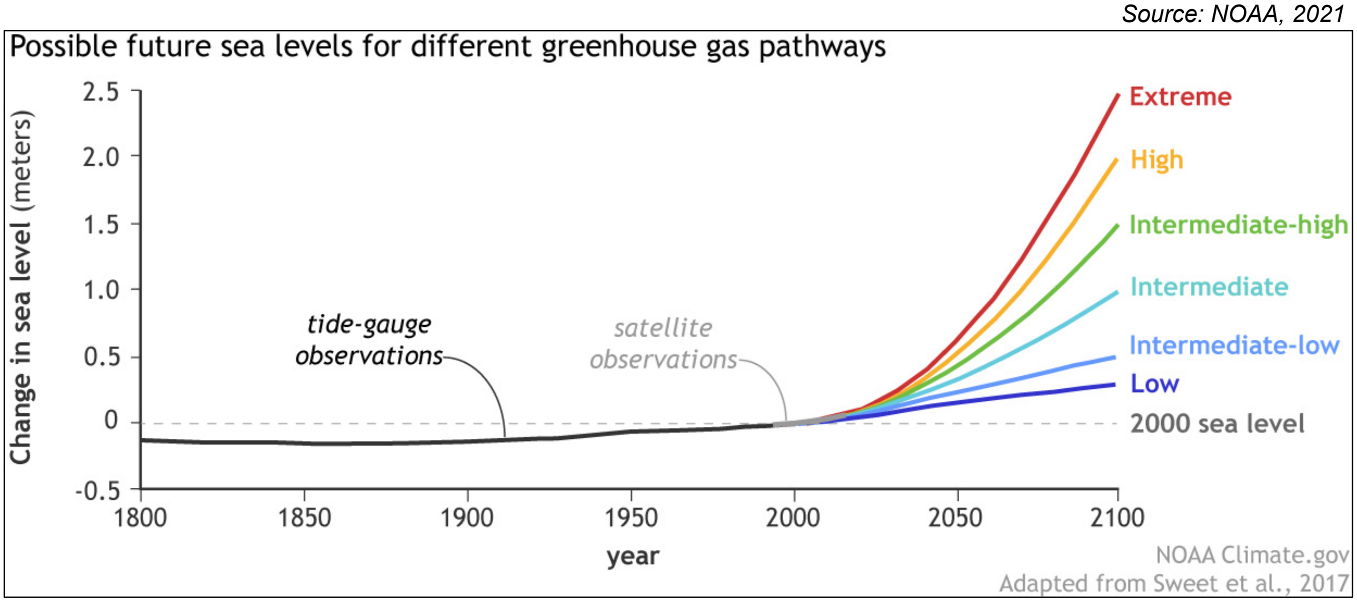


Figure 17-2. Possible Future Sea Levels for Different Greenhouse Gas Pathways

Projections for California and San Mateo County

The 2018 *California 4th Climate Assessment* outlines the following top climate change impact concerns for the state of California:

- **Wildfires**—Climate change will make forests more susceptible to extreme wildfires. By 2100, if greenhouse gas emissions continue to rise, one study found that the frequency of extreme wildfires burning over 25,000 acres would increase by nearly 50 percent, and that average area burned statewide would increase by 77 percent by the end of the century. In areas with the highest fire risk, wildfire insurance is estimated to see costs rise by 18 percent by 2055 and the fraction of property insured would decrease.
- **Sea-Level Rise**—A new model estimates that, under mid to high sea-level rise scenarios, 31 to 67 percent of Southern California beaches may completely erode by 2100 without large-scale human interventions. Statewide damage could reach nearly $18 billion from inundation of residential and commercial buildings under 20 inches of sea-level rise, which is close to the 95th percentile of potential sea-level rise by the

middle of this century. A 100-year coastal food, on top of this level of sea-level rise, would almost double the costs.

The assessment’s 2019 San Francisco Bay Area Report outlines the following climate change impact concerns for San Mateo County and its surrounding region:

- Even with substantial global efforts to reduce greenhouse gas emissions, the Bay Area will likely see a significant temperature increase by mid-century
- Precipitation in the Bay Area will continue to exhibit high year-to-year variability with very wet and very dry years. The Bay Area’s largest winter storms will likely become more intense, and potentially more damaging, in the coming decades.
- Future increases in temperature, regardless of whether total precipitation goes up or down, will likely cause longer and deeper California droughts, posing major problems for water supplies, natural ecosystems, and agriculture.
- Even with high levels of emissions reductions, research suggests that at least 6 feet of sea level rise is inevitable over the next several centuries due to the lag of sea level rise in response to increasing global temperatures.
- Bay Area public health is threatened by a number of climate-related changes, including more extreme heat events, increased air pollution from ozone formation and wildfires, longer and more frequent droughts, and flooding from sea level rise and high-intensity rain events.
- High levels of socioeconomic inequity in the Bay Area create large differences in the ability of individuals to prepare for and recover from heat waves, foods, and wildfires. Financial resources as well as improved social structures are important to enhance community resilience and reduce these disparities.
- Heat waves pose increased health risks due to urban heat islands and lack of local experience and cooling infrastructure (air conditioning) in bayside cities. These risks are compounded for low-income communities.
- The future climate of the Bay Area will become less suitable for evergreen forests—redwoods and Douglas fir—and more favorable for heat-adapted vegetation such as chaparral shrub land.
- The most threatening effect of climate change to Bay Area wildlife is the impact of rising sea levels on wetlands because of the limited potential for wetlands to move inland and become established. At the same time, less rainfall, more summer heat, and increased drought will hurt amphibians and reptiles, while heat and wildfires may negatively affect upland birds, mammals, amphibians, and reptiles.
- Future land use decisions will significantly influence the Bay Area’s efforts to address climate change, affecting building and transportation energy, urban water demand, and wildfire ignitions. For example, the critical lack of affordable housing in the core of the region is forcing households further south, north, and inland, with negative consequences on energy and the environment.

Cal-Adapt, a publicly available resource that offers information on how climate change might affect local communities, provides visualization tools that present the most current data available whenever possible. The Local Climate Change Snapshot tool allows the Cal-Adapt data to be customized by location. The output report includes data reflecting modeled historical data, observed data, medium emissions data (RCP 4.5), and high emissions data (RCP 8.5). Climate change projections present valuable information to help guide decision-making for possible future conditions. The following sections summarize information presented by Cal-Adapt for San Mateo’s local climate snapshot.

Precipitation

California's climate varies between wet and dry years. Research suggests that for much of the state, wet years will become wetter and dry years will become drier. Dry years are also likely to be followed by dry years, increasing the risk of drought. While it is not expected that California will see average annual precipitation changing significantly in the next 50 to 75 years, precipitation will likely be delivered in more intense storms and within a shorter wet season. Figure 17-3 displays the anticipated maximum daily precipitation amount for each year through 2100.

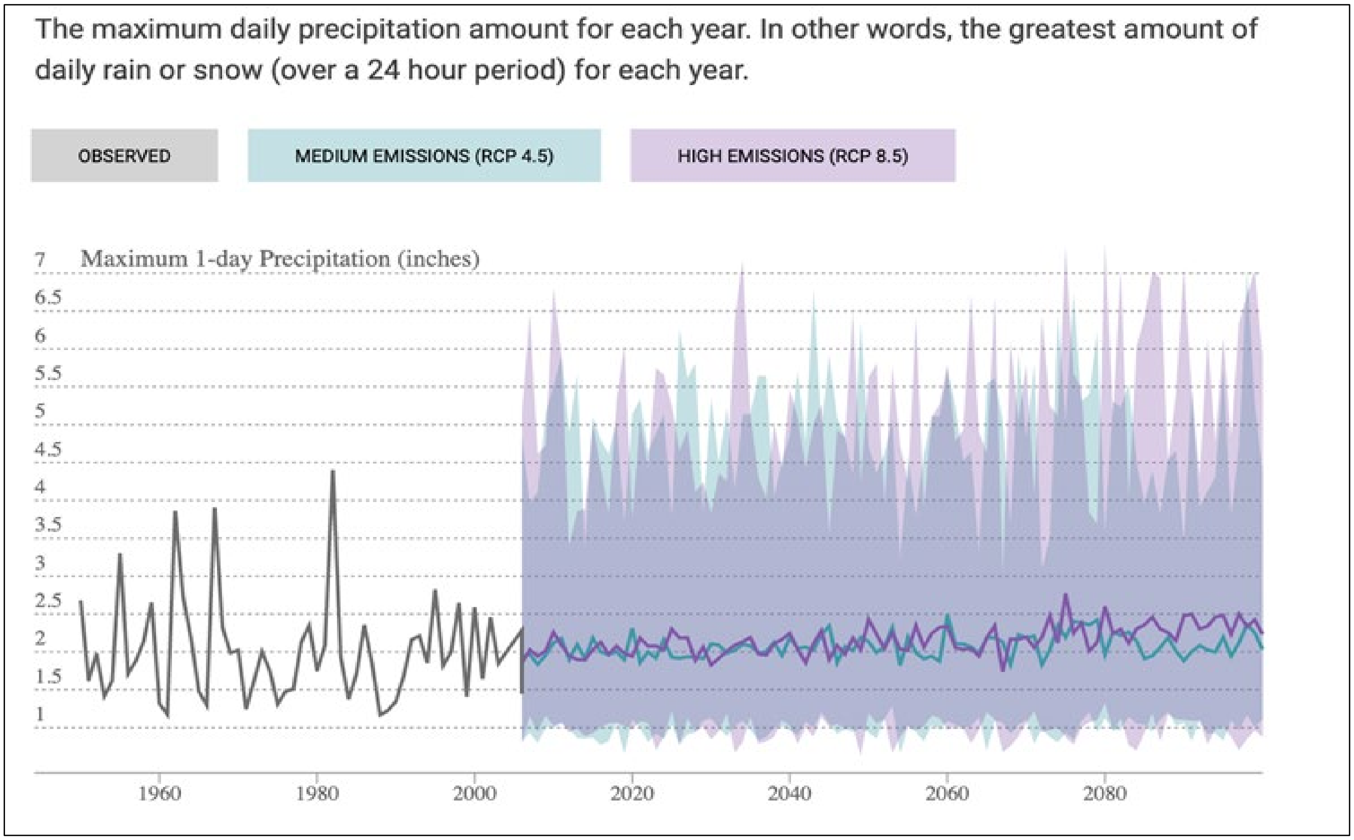


Figure 17-3. Maximum 1-Day Precipitation in San Mateo County

Temperature

Overall temperatures are projected to rise in California throughout this century. While the entire state will experience temperature increases, local impacts will vary greatly, with many communities and ecosystems already experiencing the effects of rising temperatures. Figure 17-4 displays the anticipated number of high-heat days through 2100.

Snowpack

If heat-trapping emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. How much snowpack will be lost depends in part on future precipitation patterns, the projections for which remain uncertain.

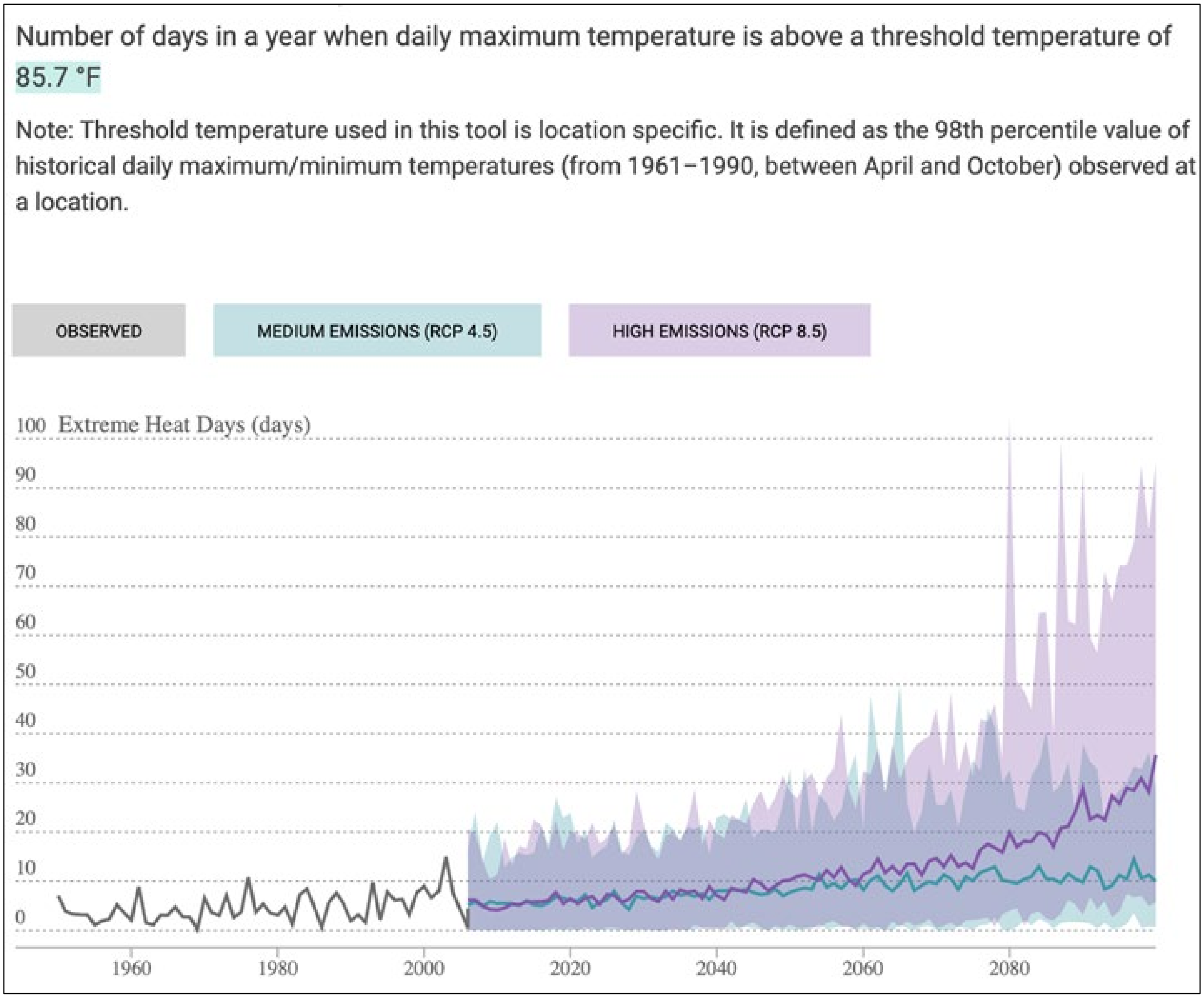
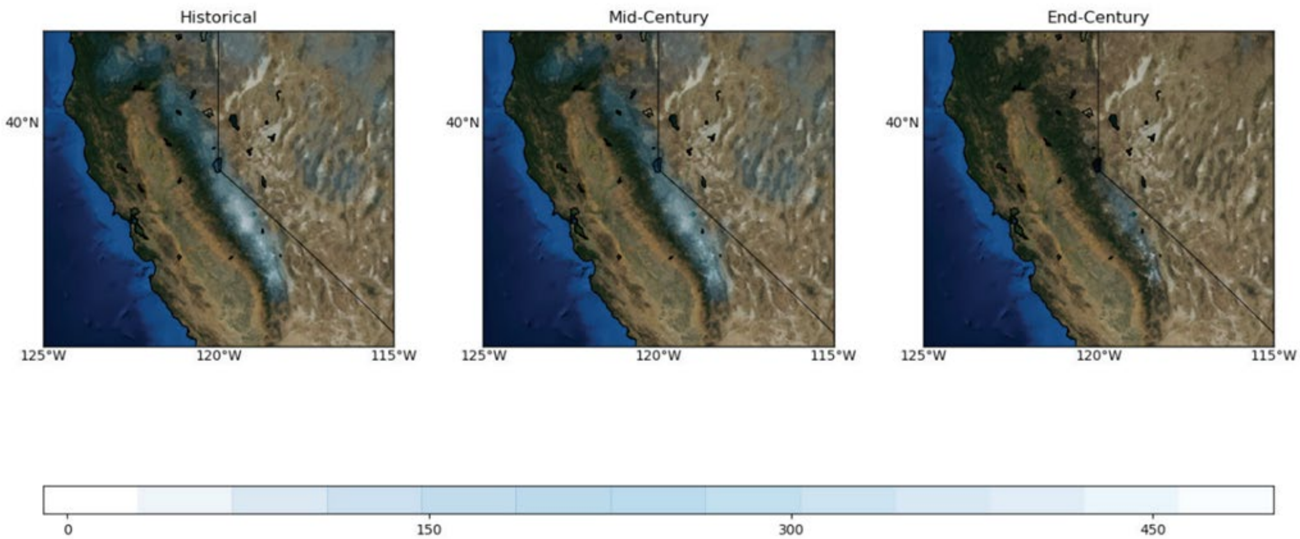


Figure 17-4. High-Heat Days in San Mateo County

Even under wetter climate projections, the loss of snowpack would pose challenges to water managers, hamper hydropower generation, and nearly eliminate skiing and other snow-related recreational activities. The San Francisco Bay Area will experience direct impacts from a reduction in snowpack. Under a high emissions scenario, average Sierra Nevada snowpack is projected to decline by nearly 20 percent in the next two or three decades, 30 to 60 percent by mid-century, and over 80 percent by late century. Figure 17-5 displays historical, mid-century, and end century projected Sierra Nevada snowpack.

Sea Level Rise

Global models indicate that California will see substantial sea level rise during this century, with the exact magnitude depending on such factors as global emissions, the rate at which oceans absorb heat, melting rates and movement of land-based ice sheets, and local coastal land subsidence or uplift. See Chapter 13 for the complete profile of sea-level rise as a hazard of concern under this risk assessment



The figure highlights a new variable-resolution global climate model simulation of average winter snowpack in the California Sierra Nevada over a historical period (left), at mid-century (middle) and at end-century (right) under a business-as-usual emissions scenario (Rhoades et al. 2018). Units are mm of snow water equivalent (SWE) averaged over the winter months of December, January and February (DJF). Source: Adapted from Figure 8.2 in the National Climate Assessment 4 by Hari Krishnan at Lawrence Berkeley National Laboratory

Figure 17-5. Average Winter Snowpack in the Sierra Nevada, Model Simulation

Wildfire

The frequency, severity and impacts of wildfire are sensitive to climate change and to many other factors, such as development patterns, wind patterns, and pest infestations. Therefore, it is difficult to project specific effects of climate change on wildfires. As recent years have shown, 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. Figure 17-6 displays the anticipated annual average area burned through 2100.

17.1.5 Responses to Climate Change

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to impact communities in coming decades. Generally, climate change discussions encompass two separate but inter-related considerations: mitigation and adaptation. The term “mitigation” can be confusing because its meaning changes across disciplines:

- Mitigation in emergency management—as generally addressed in this hazard mitigation plan—is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters.
- Mitigation in climate change discussions is defined as a human intervention to reduce impacts on the climate system. It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

In this chapter, mitigation is used as defined by the climate change community. In the other chapters of this plan, mitigation is primarily used in an emergency management context.

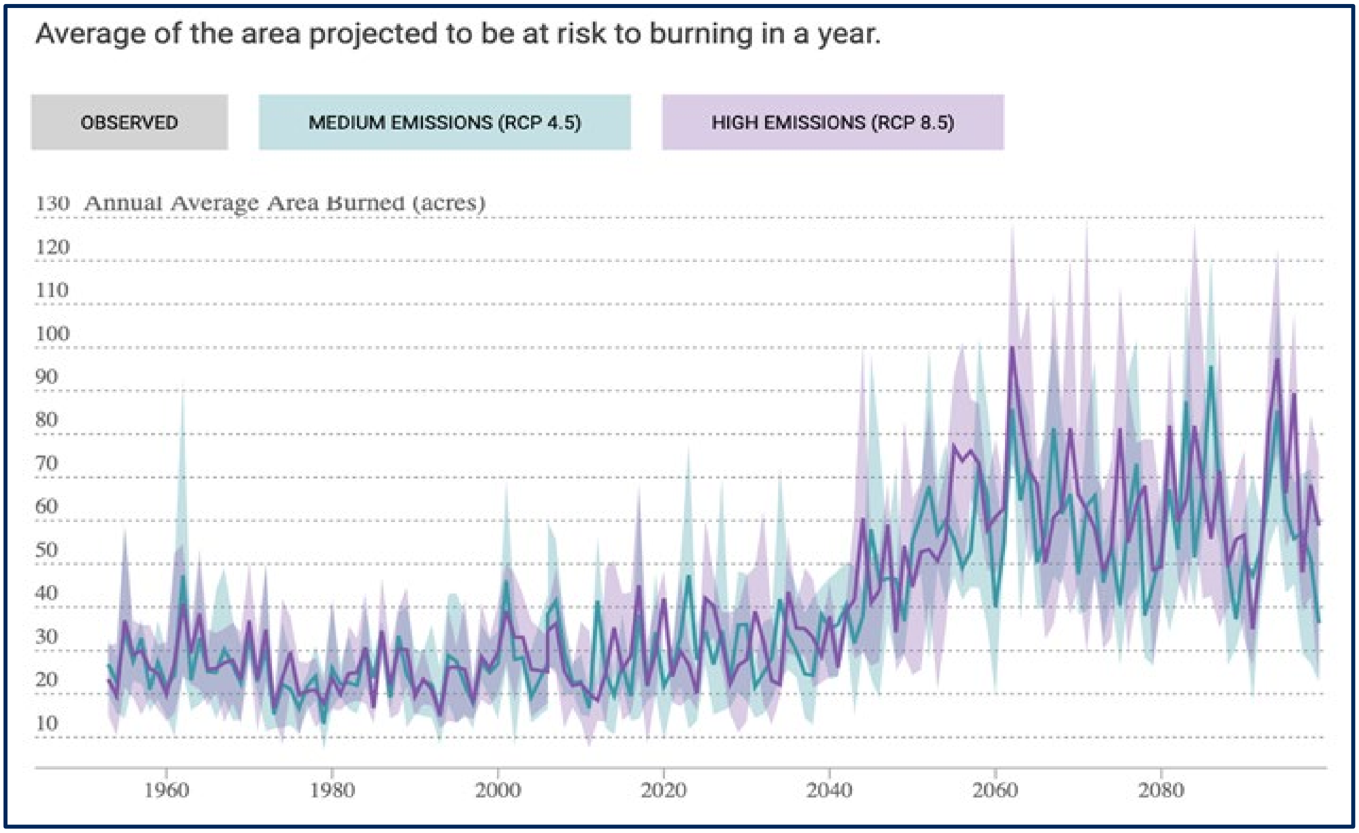


Figure 17-6. Annual Average Area Burned, Model Simulation

Adaptation refers to adjustments in natural or human systems in response to the actual or anticipated effects of climate change and associated impacts. These adjustments may moderate harm or exploit beneficial opportunities. Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives and actions can both reduce greenhouse gas emissions and support adaptation to likely future conditions.

Societies across the world are facing the need to adapt to changing conditions associated with natural disasters and climate change. Farmers are altering crops and agricultural methods to deal with changing rainfall and rising temperature; architects and engineers are redesigning buildings; planners are looking at managing water supplies to deal with droughts or flooding.

Adaptive capacity goes beyond human systems, as some ecosystems are able to adapt to change and to buffer surrounding areas from the impacts of change. Forests can bind soils and hold large volumes of water during times of plenty, releasing it through the year; floodplains can absorb vast volumes of water during peak flows; coastal ecosystems can hold out against storms, attenuating waves and reducing erosion. Other ecosystem services—such as food provision, timber, materials, medicines and recreation—can provide a buffer to societies in the face of changing conditions. Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall strategy to help people adapt to the adverse effects of climate change. This includes the sustainable management, conservation and restoration of specific ecosystems that provide key services.

Assessment of the current efforts and adaptive capacity of the planning partners participating in this hazard mitigation plan are included in the jurisdiction-specific annexes in Volume 2.

17.2 IMPACTS ON HAZARDS OF CONCERN

The following sections provide information on how each identified hazard of concern for this planning process may be impacted by climate change and how these impacts may alter current exposure and vulnerability to these hazards for the people, property, critical facilities, and the environment in the planning area.

17.2.1 Dam Failure

Climate Change Impacts on the Hazard

The *California Fourth Climate Change Assessment* identifies expected changes to rainfall and winter storm patterns. On average, changes in California's annual precipitation levels are not expected to be dramatic; however, the increase in frequency and intensity for the largest storms (atmospheric rivers) may pose increasing risks to San Mateo County critical facilities, including dams. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard.

If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. According to the California Department of Water Resources, flood flows on many California rivers have been record-setting since the 1950s. This means that water infrastructure, such as dams, have been forced to manage flows for which they were not designed. The California Division of Dam Safety has indicated that climate change may result in the need for increased safety precautions to address higher winter runoff, frequent fluctuations of water levels, and increased potential for sedimentation and debris accumulation from changing erosion patterns and increases in wildfires. According to the Division, climate change also will impact the ability of dam operators to estimate extreme flood events (California Department of Water Resources, 2008).

Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures, leading to the need for dam spillways to be designed to handle larger volumes of water over long time periods.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the dam failure hazard resulting from climate change:

- Population—Population exposure and vulnerability to the dam failure hazard will likely increase as a result of climate change.
- Property—Property exposure and vulnerability to the dam failure hazard will likely increase as a result of climate change.
- Critical facilities—The exposure and vulnerability of critical facilities are likely to change as result of climate change. Dam owners and operators are sensitive to the risk and may need to alter maintenance and operations to account for changes in the hydrograph, increased frequency of atmospheric river events and increased sedimentation.

- Environment—The exposure and vulnerability of the environment to dam failure is likely to change as a result of climate change. Ecosystem services may be used to mitigate some factors that could increase the risk of design failures, such as increasing the natural water storage capacity in watersheds above dams.

17.2.2 Drought

Climate Change Impacts on the Hazard

Future increases in temperature, regardless of whether total precipitation goes up or down, will likely cause longer and deeper California droughts, posing major problems for water supplies, natural ecosystems, and agriculture. Global and local water resources are already experiencing the following stresses without climate change:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure.

With a warmer climate, droughts could become more frequent, more severe, and longer lasting. The 2012-2016 California drought led to the most severe moisture deficits in the last 1,200 years and a 1-in-500 year low in Sierra snowpack. Consecutive years of low or no snowpack are especially worrisome (California 4th Climate Assessment, SF Bay Region, 2019).

It is expected that San Mateo County's precipitation patterns will continue to exhibit high year-to-year variability - "booms and busts" - with very wet and very dry years. Meaning, there is ample opportunity for multiple, consecutive very dry years. The California 4th Climate Assessment for the SF Bay Region predicts, under a high emissions scenario, average Sierra Nevada snowpack is likely to decline by nearly 20% in the next 2-3 decades, 30% to 60% in mid-century, and by over 80% in late century.

By addressing current stresses on water supplies and by building a flexible, robust program, the County will be able to respond more adeptly to changing conditions and to survive dry years.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the drought hazard resulting from climate change:

- Population—Population exposure and vulnerability to drought are likely to change as a result of climate change. It is expected that greater numbers of people may need to engage in behavior change, such as water saving efforts, to offset expected increasing drought conditions. Broad public health concerns are important considerations and likely impacts, such as limited access to clean water sources.
- Property—Property exposure and vulnerability may increase as a result of increased drought resulting from climate change, although this would most likely occur in non-structural property such as agriculture

and landscaping. It is unlikely that structure exposure and vulnerability would increase as a direct result of drought, although secondary impacts of drought, such as wildfire, may increase and threaten structures.

- Critical facilities—Critical facility exposure and vulnerability are unlikely to increase as a result of increased drought resulting from climate change. Still, critical facility operators may need to be more sensitive to changes in drought patterns and alter standard management practices and actively manage resources, particularly in water-related service sectors
- Environment—The vulnerability of the environment may increase as a result of increased drought resulting from climate change. Prolonged or more frequent drought resulting from climate change may stress ecosystems in the region, which include many special-status species.

17.2.3 Earthquake

Climate Change Impacts on the Hazard

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity, according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms or heavy precipitation may experience liquefaction or an increased propensity for slides during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events and impact the people and property nearby.

Exposure, Sensitivity and Vulnerability

Because impacts on the earthquake hazard are not well understood, increases in exposure and vulnerability of local resources are not able to be determined.

17.2.4 Flood

Climate Change Impacts on the Hazard

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Scientists project greater storm intensity with climate change, resulting in more direct runoff and flooding. High frequency flood events in particular will likely increase with a changing climate. What is currently considered a 1-percent-annual-chance also may strike more often, leaving many communities at greater risk. Going forward, model calibration must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted.

Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain areas to contribute to peak storm runoff. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

The *California 4th Climate Assessment* predicts that intense atmospheric rivers will occur more frequently as mean temperatures rise.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the flood hazard resulting from climate change:

- Population and Property—Population and property exposure and vulnerability may increase as a result of climate change impacts on the flood hazard. Runoff patterns may change, resulting in flooding in areas where it has not previously occurred.
- Critical facilities—Critical facility exposure and vulnerability may increase as a result of climate change impacts on the flood hazard. Runoff patterns may change, resulting in risk to facilities that have not historically been at risk from flooding. Changes in the management and design of flood protection critical facilities may be needed as additional stress is placed on these systems. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.
- Environment—The exposure and vulnerability of the environment may increase as a result of climate change impacts on the flood hazard. Changes in the timing and frequency of flood events may have broader ecosystem impacts that alter the ability of already stressed species to survive.

17.2.5 Landslide

Climate Change Impacts on the Hazard

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature is likely to affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. Each these factors would increase the probability of landslides. In Bay Area hills, the risk of landslides is a function of the interaction between precipitation, soil conditions, and seismic activity. Climate change creates increased likelihood of extreme precipitation and wildfire events; both create increased risk of slope failures for the coming century. (California 4th Climate Assessment, 2019).

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the landslide hazard resulting from climate change:

- Population and Property—Population and property exposure and vulnerability would be likely to increase because of climate change impacts on the landslide hazard. These events may occur more frequently and may see increases to the size of the hazard area itself.
- Critical facilities—Critical facility exposure and vulnerability would be likely to increase due to climate change impacts on the landslide hazard. Critical facility owners and operators may experience more frequent disruption to service provisions resulting from landslide hazards. For example, transportation systems may experience more frequent delays if movements blocking these systems occur more frequently.
- Environment—Exposure and vulnerability of the environment would be likely to change because of climate change. More frequent movements and volume in river systems may impact water quality and sediment and have negative impacts on stressed species.

17.2.6 Sea Level Rise

Climate Change Impacts on the Hazard

Climate change is expected to have a large effect on sea level rise. Warming ocean temperatures cause water to expand, with a resulting rise in sea level. Sea level also rises as increasing temperatures melt polar ice caps at an increasingly expedited rate. Sea level rise will likely result in non-rain flood conditions, as well as the extension of tsunami inundation areas further into San Mateo County communities. Infrastructure systems that support San Mateo County businesses and communities will also likely be impacted as rising sea levels expose infrastructure to salt water.

Exposure, Sensitivity and Vulnerability

As land area in San Mateo County continues to experience inundation by sea level rise over the next several decades, exposure and vulnerability to sea level rise are highly likely to increase for population, property, critical facilities, and the environment. Changes to the sea level rise hazard from climate change will likely result in greater economic vulnerability in a larger number of communities, businesses, and economic centers in San Mateo County, as well as their supporting infrastructure systems. Sea level rise inundation will also impact the property value of many properties, as coast-side and bay-side areas of the County experience sea level rise inundation.

17.2.7 Severe Weather

Climate Change Impacts on the Hazard

Climate change presents a challenge for managing severe weather risks. According to the U.S. National Climate Change Assessment (2018), the United States saw twice as many high temperature records as low temperature records over the previous two decades. At the same time, heavy rainfall events are becoming more frequent and more severe. The increase in average surface temperatures will likely lead to more intense heat waves. Heat waves and the number of high-heat days are already increasing in San Mateo County. According to Cal-Adapt, high-heat days are likely to increase from a historical average of 4 days annually in San Mateo County to 11 to 20 days by the end of the century. This would be coupled with an increase in heat waves and warm nights.

Climate change impacts on other severe weather events such as thunderstorms and high winds are still not well understood.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the severe weather hazard resulting from climate change:

- Population and Property—Population and property exposure and vulnerability would be likely to increase as a direct result of climate change impacts on the severe weather hazard. Severe weather events will likely occur more frequently, therefore most likely increasing exposure and vulnerability at the same time. Secondary impacts, such as the extent of localized flooding, may increase, impacting greater numbers of people and structures.
- Critical facilities—Critical facility exposure and vulnerability would be likely to increase as a result of climate change impacts on the severe weather hazard. Critical facility owners and operators may experience more frequent disruption to service provision. For example, more frequent and intense storms may cause more frequent disruptions in power service.
- Environment—Exposure and vulnerability of the environment would be likely to increase as a result of climate change impacts on the severe weather hazard. More frequent storms and heat events and more intense rainfall may place additional stress on already stressed systems.

17.2.8 Tsunami

Climate Change Impacts on the Hazard

The impacts of global climate change on tsunami probability are unknown. Some scientists say that melting glaciers could induce tectonic activity, inducing earthquakes that result in tsunamis. Other scientists have indicated that underwater avalanches (also caused by melting glaciers), may result in tsunamis. Even if climate change does not increase the frequency with which tsunamis occur, it may result in more destructive waves. As sea levels continue to rise, tsunami inundation areas would likely reach further into communities than current mapping indicates.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the severe weather hazard resulting from climate change:

- **Population, Property, and Critical Facilities—**Population, property, and critical facility exposure and vulnerability to the tsunami hazard may increase as a result of climate change related sea level rise. As sea levels rise, tsunami impact areas may reach into parts of the community that were previously believed to be outside of the tsunami risk area. This reach will depend on the size of the tsunami, the local topography, and the extent of sea level rise.
- **Environment—**Exposure and vulnerability of the environment to tsunamis may be impacted by the effects of climate change. In particular, sea level rise could alter the shape of existing shoreline, putting different structures and ecosystems closer to the shoreline and potential tsunami impacts. These assets

would not have the same protection against tsunamis due to a shorter time period to adapt. Additionally, ice crust melt could lead to a rise of the earth's crust, especially at higher latitudes, causing more submarine landslides and a greater vulnerability to tsunamis.

17.2.9 Wildfire

Climate Change Impacts on the Hazard

Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation.

Changes in climate patterns may impact the distribution and perseverance of insect outbreaks that create dead trees (increase fuel). When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Climate change may also increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Exposure, Sensitivity and Vulnerability

The following summarizes changes in exposure and vulnerability to the wildfire hazard resulting from climate change:

- Population, Property and Critical facilities—Wildfire risk in San Mateo County is expected to more than double by the end of the century and increase nearly 100 percent at mid-century. As a result, it is likely that exposure and vulnerability to the wildfire hazard will increase as a result of climate change. The application and enforcement of codes and standards to mitigate the risks from wildfire hazards could help to decrease this risk as development moves into existing wildfire hazard areas.
- Environment—It is possible that the exposure and vulnerability of the environment will be impacted by changes in wildfire risk due to climate change. Natural fire regimes may change, resulting in more or less frequent or higher intensity burns. These impacts may alter the composition of the ecosystems in areas in and surrounding planning area. If more acres are burned every year, wildlife may be more stressed as the suitable habitat is lost.

17.3 ISSUES

The major gaps in current knowledge and understanding about how climate change will impact San Mateo County's hazards are the following:

- Planning for climate change related impacts can be difficult due to inherent uncertainties in projection methodologies.
- Average temperatures are expected to continue to increase in the planning area, which may lead to a host of primary and secondary impacts, such as an increased incidence of heat waves.
- Expected changes in precipitation patterns are still poorly understood and could have significant impacts on the water supply and flooding in the planning area.
- Some impacts of climate change are poorly understood, such as potential impacts on the frequency and severity of earthquakes, thunderstorms, and tsunamis.

- Heavy rain events may result in inland stormwater flooding after stormwater management systems are overwhelmed.
- Permanent and temporary inundation resulting from sea level rise has the potential to impact portions of the population and assets in the planning area.
- There are many unknowns to living with wildfire in a changing climate. Continued research and modeling are necessary to better understand the impacts of climate change on the fire environment throughout the planning area and to inform adaptation strategies
- Climate change has the potential to impact the following:
  - The vulnerability of municipal and on-site water supplies
  - The severity of wildfires and acres burned
  - The adequacy of access and evacuation routes
  - Long response times for limited fire suppression resources
  - Heat wave duration coupled with wildfire smoke, especially as they affect disadvantaged populations unlikely to have air conditioning.

18. OTHER HAZARDS OF INTEREST

The hazards of concern assessed in Chapters 8 through 17 and rated and ranked in Chapter 19 are those that present significant risks in the planning area. Additional hazards, both natural and human-caused, were identified by the Steering Committee as having some potential to impact the planning area, but at a much lower risk level than the hazards of concern. These other hazards are identified as hazards of interest.

The sections below provide short profiles of each hazard of interest, including qualitative discussion of their potential to impact San Mateo County. No formal risk assessment of these hazards was performed, and no mitigation initiatives have been developed to address them. However, all planning partners for this plan should be aware of these hazards and should take steps to reduce the risks they present whenever it is practical to do so.

18.1 PUBLIC HEALTH AND PANDEMIC

18.1.1 Overview

According to the World Health Organization, a pandemic involves the worldwide spread of a new disease. While an epidemic remains limited to one city, region, or country, a pandemic extends beyond national borders and can become a worldwide occurrence. Authorities consider a disease to be an epidemic when the number of people with the infection is higher than the forecast number within a specific region. If an infection becomes widespread in several countries at the same time, it may turn into a pandemic. A new virus strain or subtype that easily transmits between humans can cause a pandemic. Bacteria that become resistant to antibiotic treatment may also be behind the rapid spread.

Pandemics occur when new diseases develop the ability to spread rapidly. Humans may have little or no immunity against a new virus. Often, a new virus cannot spread between animals and people, but if it mutates it may start to spread easily, and a pandemic may result. Seasonal flu epidemics generally occur because of a viral subtype that is already circulating among people. Novel subtypes, on the other hand, generally cause pandemics. These subtypes will not previously have circulated among humans. A pandemic affects a higher number of people and can be more deadly than an epidemic. It can also lead to social disruption, economic loss, and general hardship on a wider scale (Medical News Today, 2020).

The severity of disease outbreaks and pandemics vary. Respiratory diseases show strong seasonal patterns varying substantially from summer to winter. Transmission rates depend on local weather and environment, and case fatality rates (CFRs) depend on local conditions such as care system quality and capacity, and the general health and immunity of the local population.

Diseases with Potential to Pose Public Health Hazards

The California Department of Public Health has identified the conditions described in Table 18-1 as human diseases that could contribute to a serious epidemic in the state.

Table 18-1. Naturally Spread Diseases Seen in California

Description	Examples	
Animal Transmitted		
These are diseases that are transmitted to humans by domestic or non-domestic animals.	• Brucellosis (undulant fever) • Campylobacteriosis • Cat scratch disease • Cryptosporidiosis • Escherichia coli (E. coli) • Giardiasis • Middle Eastern Respiratory Syndrome (MERS) • Plague	• Psittacosis (ornithosis, parrot fever) • Q Fever • Rabies • Ringworm • Salmonellosis • Toxoplasmosis • Tularemia
Bloodborne		
Viruses, bacteria and parasites that can be carried in blood and cause disease are known as bloodborne pathogens. Transmission of these diseases may be from direct blood contact, needle sticks, intravenous drug use, sexual behavior, insects or other vectors.	• Ebola • Hepatitis C • Malaria	
Community-Acquired Infections		
Community-acquired infections are infections that are contracted outside of a hospital (or are diagnosed within 48 hours of admission) without any previous health care encounter.	• Adenovirus • Bed Bugs • Body Lice • Campylobacteriosis • Conjunctivitis (pink eye) • Common cold viruses • Enterovirus, non-polio • Hand, foot, and mouth disease • Head Lice ('ukus) • Impetigo • Influenza (flu) • Invasive Group A Streptococcus (necrotizing fasciitis) • Legionnaires' Disease/Pontiac Fever	• Methicillin-Resistant Staphylococcus Aureus (MRSA) • Norovirus • Pinworm disease • Respiratory syncytial virus • Ringworm • Scabies • Smallpox • Staphylococcus aureus • Strep throat/scarlet fever • Streptococcus, Group B • Tularemia • Viral meningitis
Foodborne		
Foodborne diseases can be spread when food becomes contaminated with fecal matter containing bacteria, viruses, or parasites. This contamination can happen at a farm, manufacturing plant, restaurant, or home. Foodborne diseases usually result in gastrointestinal illness, which can include symptoms such as diarrhea, vomiting, nausea, stomachache, and fever. People who are ill with a foodborne disease can give the infection to others, so proper hygiene and hand washing practices are essential to limit the spread of disease. People experiencing gastrointestinal symptoms should not prepare or handle food for others.	• Amebiasis • Angiostrongyliasis (rat lungworm) • Anisakiasis • Botulism • Brucellosis (undulant fever) • Campylobacteriosis • Cholera • Ciguatera fish poisoning • Cryptosporidiosis • Cyclosporiasis • Escherichia coli (E. coli)	• Giardiasis • Listeriosis • Norovirus • Salmonellosis • Scombroid • Shigellosis • Tularemia • Typhoid Fever • Vibriosis • Yersinia enterocolitica

Description	Examples
Influenza	
Influenza is an infectious viral disease of birds and mammals commonly transmitted through airborne aerosols such as coughing or sneezing. Symptoms are chills, headache, fever, nausea, muscle pain and occasionally pneumonia.	Flu pandemics in the late 19th and 20th centuries: • Russian flu • 1918 Spanish flu • Asian flu • Hong Kong flu • A/H1N1 or the swine flu. Avian flu strains H5N1 and H7N9 caused human deaths but did not escalate to pandemic proportions.
Mosquito-Transmitted	
Mosquito-borne diseases are not an immediate threat in Hawai'i because travelers are usually vaccinated (yellow fever) or disease spread requires an infected animal to travel all the way from the mainland (West Nile virus). Some mosquito-transmitted diseases (e.g., malaria or Japanese encephalitis) are not likely to ever be a threat because the mosquito species that spread them are not found in Hawai'i. However, travelers should be aware of these diseases and where they occur in the world so they may protect themselves.	
Respiratory Viruses	
Respiratory viruses are responsible for influenza-like illness. They can also cause the common cold. The virus that caused the Covid-19 pandemic is a respiratory virus. People at high risk (those with certain underlying conditions, the elderly, the very young, and pregnant women) can develop severe illness that results in hospitalization or death. The best way protection is proper hygiene and avoiding contact with sick individuals. The best way for those who are infected to protect others is to cover their nose and mouth when sneezing and coughing, use good hand hygiene, and stay home from work or school.	• Adenovirus • Coronaviruses • Influenza • Parainfluenza • Parvovirus B19 • Respiratory Syncytial Virus • Rhinovirus (Common Cold) • Measles • Pertussis (whooping cough)
Waterborne Diseases	
Diseases caused by micro-organisms transmitted in water can be spread while bathing, washing, drinking water, or eating food exposed to contaminated water.	• Cholera • Giardiasis • Legionnaires' Disease /Pontiac Fever • Leptospirosis • Typhoid Fever • Vibriosis
Sexually Transmitted Disease	
HIV/AIDS, chlamydia, gonorrhea, and syphilis are the predominant sexually transmitted infections handled by the Hawai'i State Department of Health Harm Reduction Services Branch, whose responsibilities include awareness, prevention, and control of these infections.	• Chlamydia • Genital warts • Gonorrhea • Hepatitis A, B, and C • Herpes • Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) • Human papillomavirus • Syphilis • Zika

Responses to Public Health Emergencies

A disease with a high CFR may require a suppressive strategy (i.e. quarantine, or lockdown), whereas when CFR is low, either naturally or because of available interventions such as vaccines, a mitigation strategy is likely to be more effective at reducing total deaths will resulting in substantially less economic damage (Davies, 2020).

Contact tracing is a public health practice that health departments use to identify and notify people who have been exposed to someone with an infectious disease. Public health workers reach out to these exposed people to tell them that they've been in close contact with an infected person and to give them information and support to help them keep themselves and their loved ones safe. Public health departments have used contact tracing for decades to fight the spread of infectious diseases like measles, tuberculosis, syphilis, and HIV (California Department of Public Health, 2021).

There is not much warning time for health or pandemic events. The most commonly relied upon warning signal is the appearance of early cases of a disease within a population. The Health Alert Network is the CDC's primary method of sharing cleared information about urgent public health incidents with public information officers; federal, state, territorial, tribal, and local public health practitioners; clinicians; and public health laboratories. The Health Alert Network collaborates with federal, state, territorial, tribal, and city/county partners to develop protocols and stakeholder relationships that will ensure a robust interoperable platform for the rapid distribution of public health information (Centers for Disease Control and Prevention, 2021b).

Climate Change Impacts on the Hazard

Climate change is expected to have an impact on health hazards. Projected increases in hot days and extreme heat events will increase the risk of heat-associated deaths. Air quality impacts and drier conditions may exacerbate respiratory and cardiovascular conditions through greater concentrations of pollution and allergens. Prolonged droughts from climate change can also affect the quality of drinking water (Centers for Disease Control and Prevention, 2021).

The *California 4th Climate Assessment* finds that Bay Area public health is threatened by a number of climate-related changes, including more extreme heat events, increased air pollution from ozone formation and wildfires, longer and more frequent droughts, and flooding from sea level rise and high-intensity rain events. Heat waves alone pose increased health risks due to urban heat islands and lack of local experience and cooling infrastructure (air conditioning) in bayside cities. These risks are compounded for low-income communities.

18.1.2 Application to San Mateo County

San Mateo County, like the rest of the United States, was included in the March 2020 FEMA major disaster declaration for the COVID-19 coronavirus pandemic. As of June 2021, the total cases in the county were 42,438, with much of the explosion of cases occurring in the late months of 2020 and early months of 2021 (San Mateo County Health, 2021). During the COVID-19 pandemic, San Mateo County Health Department partnered with Qualtrics on creating web-based surveys to aid in case investigation and contact tracing processes (San Mateo County Health, 2021a).

San Mateo County also dealt with effects from the 1918 Spanish Flu pandemic. Camp Fremont in Menlo Park reported the first death in September 1918. By December of that year, 131 community members had died of the flu (McGovern, 2020).

The Health Alert Center for San Mateo County allows community members to view all alerts and emergencies put out by the County Health Department (San Mateo County Health, 2021b).

18.2 TERRORISM

Terrorism is the use of force or violence against persons or property in violation of criminal laws for purposes of intimidation, coercion, or ransom. Terrorists often use threats to accomplish the following (Federal Emergency Management Agency, 2021):

- Create fear among the public.
- Try to convince community members that their government is powerless to prevent terrorism.
- Get immediate publicity for their causes.

Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear, and radiological weapons. High-risk targets for acts of terrorism include military and civilian government facilities, international airports, large cities, and high-profile landmarks. Terrorists might also target large public gatherings, water and food supplies, utilities, and corporate centers. Terrorists can spread fear by sending explosives or chemical and biological agents through the mail (Federal Emergency Management Agency, 2021).

The San Mateo County Sheriff's Homeland Security Division works daily to prepare and protect community members from a range of threats. These threats include terrorism, natural disasters, hazardous materials, global disease outbreaks and other emergencies. These operations are carried out 24/7 through the Area Office of Emergency Services and the Emergency Services Bureau (San Mateo County Sheriff, 2021).

18.3 CYBER ATTACKS

Cyber-attacks are malicious attempts to access or damage a computer or network system. Cyber-attacks can lead to loss of money or the theft of personal, financial, and medical information that can damage personal reputation and safety. Cyber-attacks can fall under the definition of terrorism if they are large enough in scale to cause widespread social and economic impacts (Ready.gov, 2021).

In December 2019 the Grand Jury of the Superior Court of California sent an online survey to public entities in San Mateo County. More than 25 of the public entities responding reported that they have been a victim of one or more ransomware attacks (malware designed to encrypt files on a device). Experts agree that there will be more attempts to violate the integrity of local governments' electronic infrastructure (San Mateo Court, 2019).

18.4 COMMUNICATION FAILURE

The failure of communication systems is widely known to occur in almost all extreme conditions. The breakdown of telecommunications infrastructure, whether complete or partial, causes inefficiency and delays in emergency relief efforts and response, which leads to loss of life and preventable injuries. Due to increasing dependence upon communication systems during extreme events, the risk of communication failure is high, despite increasing immunity and protection of these means against disasters, harsh environments, and calamities. An extreme event situation with a severely disrupted telecommunications infrastructure amplifies chaos and uncertainty. Poor communications between responders can severely hamper assessment and relief efforts and prevent affected populations from connecting with responders and relatives (El Khaled and Mcheick, 2019).

The Public Safety Communications Command Staff of San Mateo County directly reports to the Communications Center Director. The assistant director and three managers head up the Operations Division, which is comprised of all Communications Center operations and its staff. Each manager is assigned a functional area of expertise—personnel, police, or fire/emergency medical services operations and communications (County of San Mateo Public Safety Communications, 2021).

18.5 HAZARDOUS MATERIALS RELEASE

The improper leak, spillage, discharge, or disposal of hazardous materials or substances (such as explosives, toxic chemicals, and radioactive materials) poses a significant threat to human health and safety, campus property, and the surrounding environment.

Hazardous material releases may be caused by a range of incidents, including an industrial or transportation accident, or deliberate criminal act. They can also occur as a result of or in tandem with natural hazard events such as earthquakes and other geologic hazards, floods, windstorms, and winter storms. In addition to causing additional life safety threats, these compound hazard events can greatly complicate and hinder response efforts and result in major environmental impacts. The large-scale release of hazardous materials in combination with events such as flooding or windstorms can increase the spread of contamination threat zones to large geographic areas and amplify the potential long-term impacts on human and ecological health (Planning for Hazards, 2021).

The Unified Hazardous Waste and Hazardous Materials Management Regulatory Program was established in 1993 to protect public health and safety, restore and enhance environmental quality, and sustain economic vitality. San Mateo County Environmental Health Services was designated by the State Secretary for Environmental Protection in 1996 as the Certified Unified Program Agency for San Mateo County. A complete list of active and inactive hazardous waste regulated facilities is now available on the County's Open Data site. The list is updated monthly. Site-specific information can be found on the State's Regulated Site Portal. This site includes activities related to hazardous materials and waste, state and federal cleanups, impacted ground and surface waters, and toxic materials. It is maintained by the California Environmental Protection Agency and the information is updated monthly (San Mateo County Health, 2021).

18.6 PIPELINE AND TANK FAILURE

On September 9, 2010, a natural gas pipeline owned by Pacific Gas & Electric exploded in the Crestmoor neighborhood of San Bruno. Eight people were killed, at least 50 were injured, and at least 38 homes were destroyed in the explosion (Fox News, 2010).

An equipment failure involves a pipeline component or device other than pipe. Sometimes a part on a piece of equipment fails resulting in a release of hazardous materials, and sometimes the piece of equipment itself fails to perform its function properly, resulting in a release. The following are typical types of equipment that can be involved:

- **Pumps and Compressors**—Pumps and compressors are used to move hazardous liquid and natural gas through pipelines.
- **Meters and metering equipment**—Meter stations are used on pipelines to measure the amount of product being received or delivered. Many pieces of specialized equipment in addition to the meters themselves are required at these facilities.
- **Remote or manually operated block and control valves**—Pipelines contain numerous valves of many types, both on the pipeline itself and at stations, terminals, and tank farms.
- **Relief valves and other overpressure control devices**—These devices are installed on a pipeline to prevent rupture of the pipeline due to unexpected pressure surges.
- **Tanks**—Most pipeline systems include numerous aboveground storage tanks to store hazardous liquids. Tanks are equipped with level gauges that warn operators that the tank is near its maximum capacity.

Instrumentation can fail and tanks can overfill, resulting in a spill of hazardous liquid to the environment. While extremely rare, catastrophic failures of storage tanks themselves have occurred.

- **Miscellaneous Components and Devices**—Flanges, fittings, couplings, instrument tubing, gauges, thermowells, samplers, and chemical analyzers are among the pipeline components that can seep or leak (or very occasionally rupture).

Regulations require that operators inspect mainline and other critical valves, inspect and test relief valves, and inspect breakout tanks periodically. Additionally, regulations require certain mitigative measures to be in place should a leak occur. For example, should a leak occur at a storage tank, the containment surrounding one or more tanks must have a free volume equivalent to the capacity of the largest tank. Facilities housing pumps must have alarm systems that warn of the buildup of hydrocarbons within the enclosed space. Regulations require that operators perform rigorous risk assessments of their most critical pipeline facilities in order to fully understand potential failure modes, likelihoods, and consequences, and to establish appropriate preventive and mitigative activities (U.S. Department of Transportation, 2021).

18.7 AIRCRAFT INCIDENTS

Aircraft incidents are occurrences associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and the time all such persons have disembarked, and in which any person suffers death or serious injury or the aircraft receives substantial damage (Cornell Law School, 2021).

On July 6, 2013, Asiana Airlines Flight 214 from Incheon International Airport in South Korea, a Boeing 777-200ER, crashed on final approach into San Francisco International Airport. Of the 307 people on board, 3 died and 187 were injured, 49 of them seriously. Among the seriously injured were four flight attendants who were thrown onto the runway while still strapped in their seats when the tail section broke off after striking the seawall short of the runway (National Transportation Safety Board, 2014).

19. PLANNING AREA RISK RANKING

A risk ranking was performed for the hazards of concern described in this plan. This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. The risk ranking was conducted via facilitated brainstorming sessions with the Steering Committee. Estimates of risk were generated with data from Hazus using methodologies promoted by FEMA. Additionally, to support the social equity lens for this plan update, a social vulnerability ranking factor and weighting was established to support planning partners wishing to apply an equity lens to their risk ranking and project identification and prioritization.

19.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a factor determined by the likelihood of annual occurrence, based on past hazard events in the area:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

Figure 19-1 summarizes the probability assessment for each hazard of concern for this plan. The probability factor is the same for the baseline ranking and the equity lens ranking.

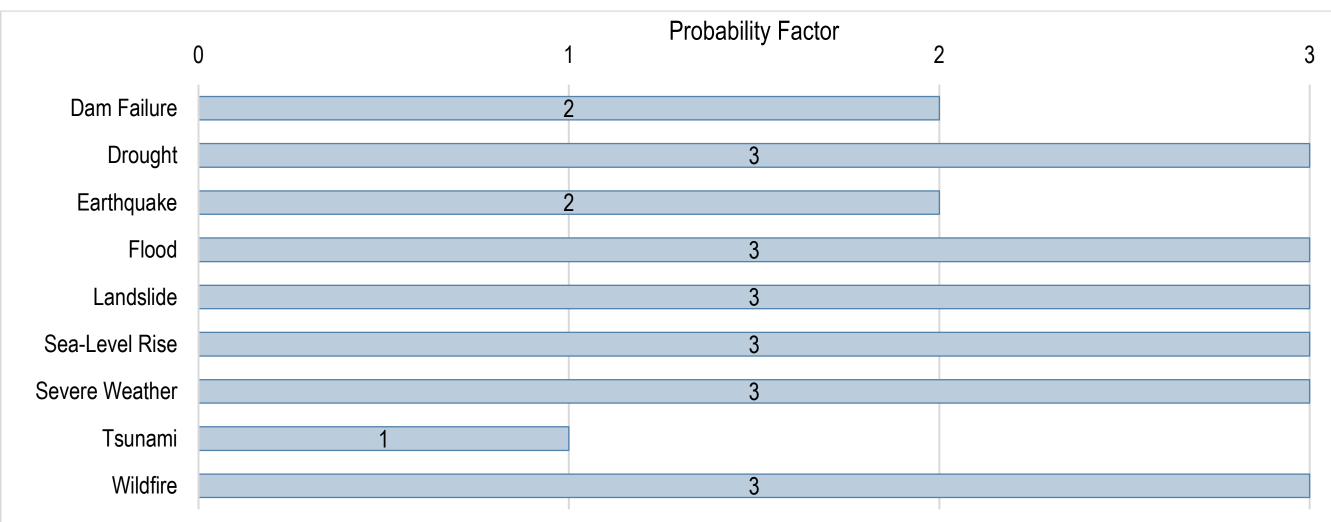


Figure 19-1. Probability Factors for Hazards of Concern

19.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. The rating of this impact assumes, for simplicity and consistency, that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. Planners can use an element of subjectivity when assigning values for impacts on people. Impact factors for people were assigned as follows:
  - High—50 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—25 percent to 49 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—25 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- **Property**—Values were assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—30 percent or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
  - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard (Impact Factor = 2)
  - Low—14 percent or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)
- **Economy**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of the property exposed to the hazard. For some hazards, such as wildfire, landslide and severe weather, vulnerability was considered to be the same as exposure due to the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for the earthquake and flood hazards using Hazus.
  - High—Estimated loss from the hazard is 20 percent or more of the total assessed property value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total assessed property value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 9 percent or less of the total assessed property value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the operations was given a weighting factor of 1. Figure 19-2 and Figure 19-3 summarize the unweighted and weighted impact factors, respectively, for each hazard.

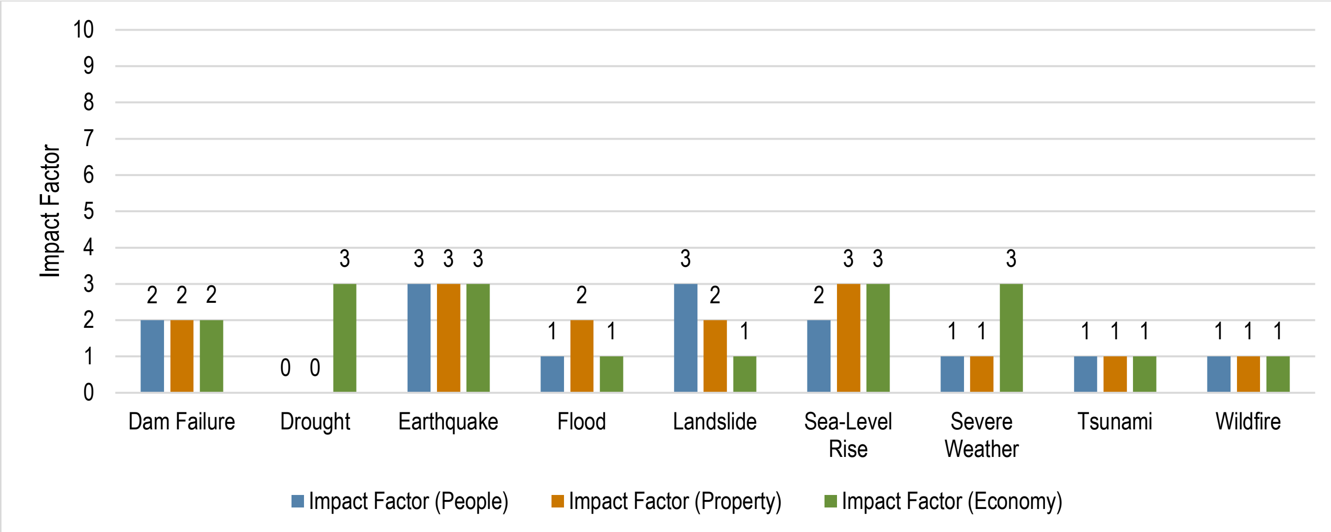


Figure 19-2. Impact Factors for Hazards of Concern

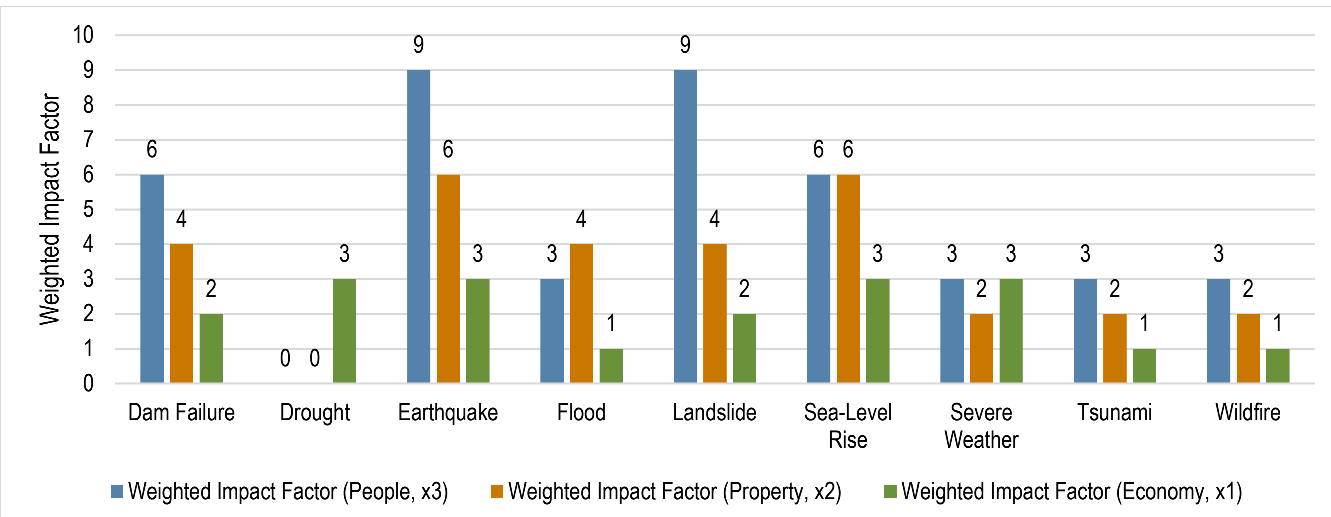


Figure 19-3. Weighted Impact Factors for Hazards of Concern

19.3 EQUITY LENS APPLICATION

For the equity lens risk ranking, the "impact on people" factor was enhanced using FEMA's social vulnerability index (SoVI). For each hazard, an impact factor was assigned for each of the five SoVI classifications, and the total impact on people was calculated as the sum of those factors. For each SoVI classification, the impact factor was determined by the percentage of exposed population within that classification. The maximum impact factor was assigned if the percentage exceeds the exposed-population threshold for that classification; otherwise, the minimum impact factor was assigned. For higher SoVI classifications, the maximum and minimum impact factors are higher and the exposed-population thresholds are lower, as shown in Table 19-1. The weighting factor for impact on people with an equity lens is the same as for the baseline impact on people (3). The results of the ranking of impacts applying the equity lens are shown in Figure 19-4 and Figure 19-5, with and without the weighting factors.

Table 19-1. Equity Lens Impact Factors for Impacts on People

SoVI Classification	Exposed-Population Threshold[a]	Maximum Impact Factor	Minimum Impact Factor
Very High	15%	5	4
Relatively High	25%	4	3
Relatively Moderate	35%	3	2
Relatively Low	50%	2	1
Very Low	75%	1	0
No Impact[b]	0	0	0

a. Classification score is based on whether the percent of population exposed to the hazard in the SoVI classification (relative to the total exposed population) exceeds the threshold. If so, then the maximum impact factor is assigned; otherwise, the minimum impact factor is assigned.
b. No impact is defined as the entire planning area having no population exposed to the hazard.

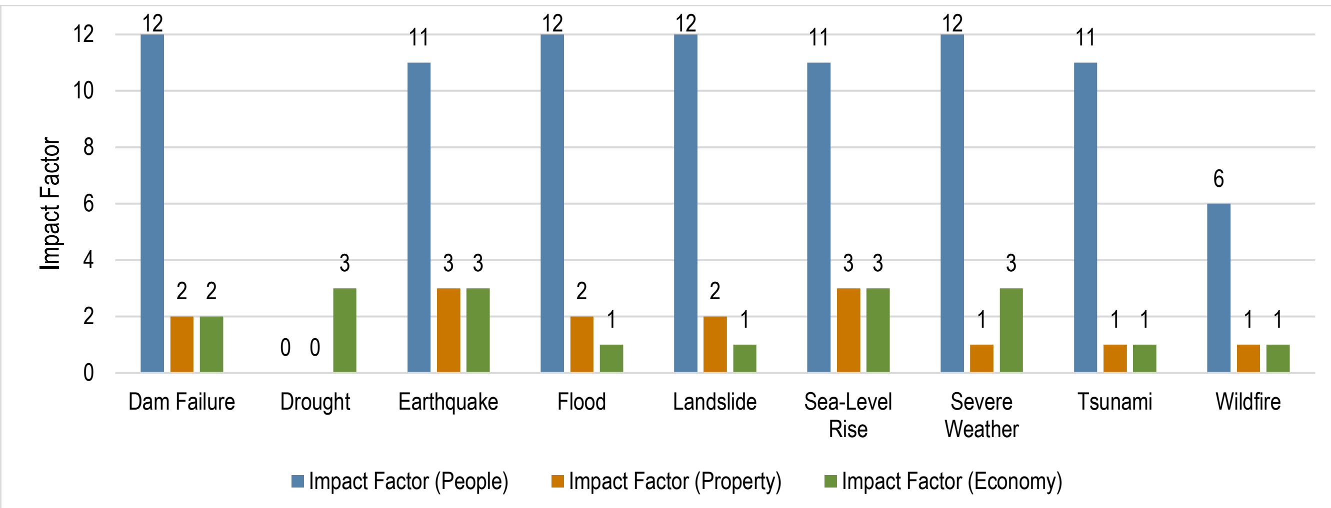


Figure 19-4. Impact Factors for Hazards of Concern with Equity Lens

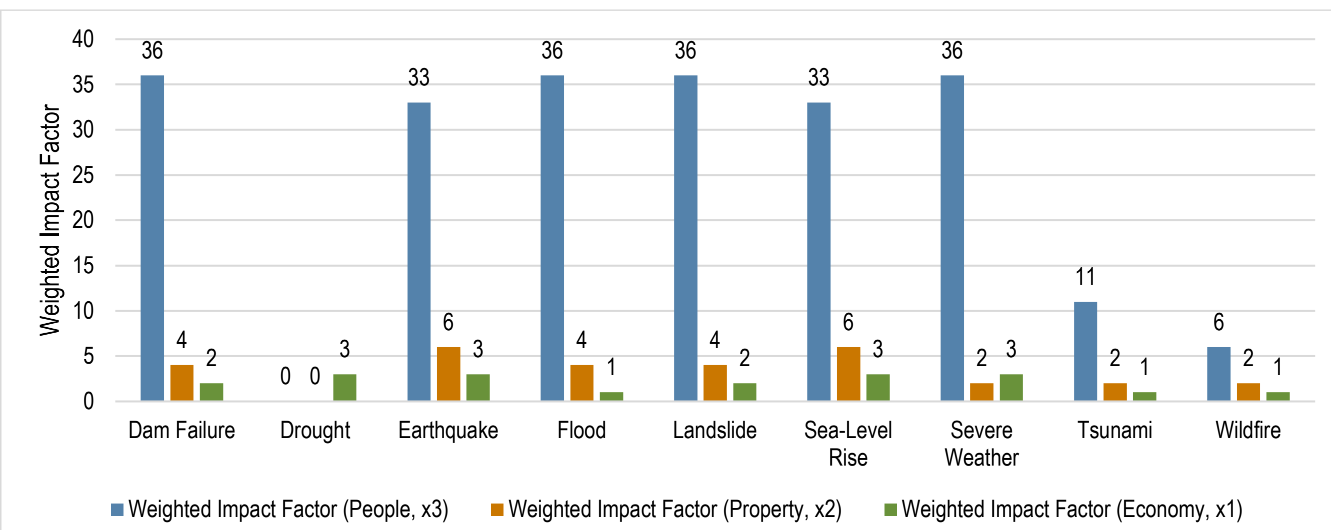


Figure 19-5. Weighted Impact Factors for Hazards of Concern with Equity Lens

19.4 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property, and operations, as summarized in Figure 19-6 and Figure 19-7. Based on these ratings, a priority of high, medium, or low was assigned to each hazard. Figure 19-8 and Figure 19-9 show the hazard risk ranking.

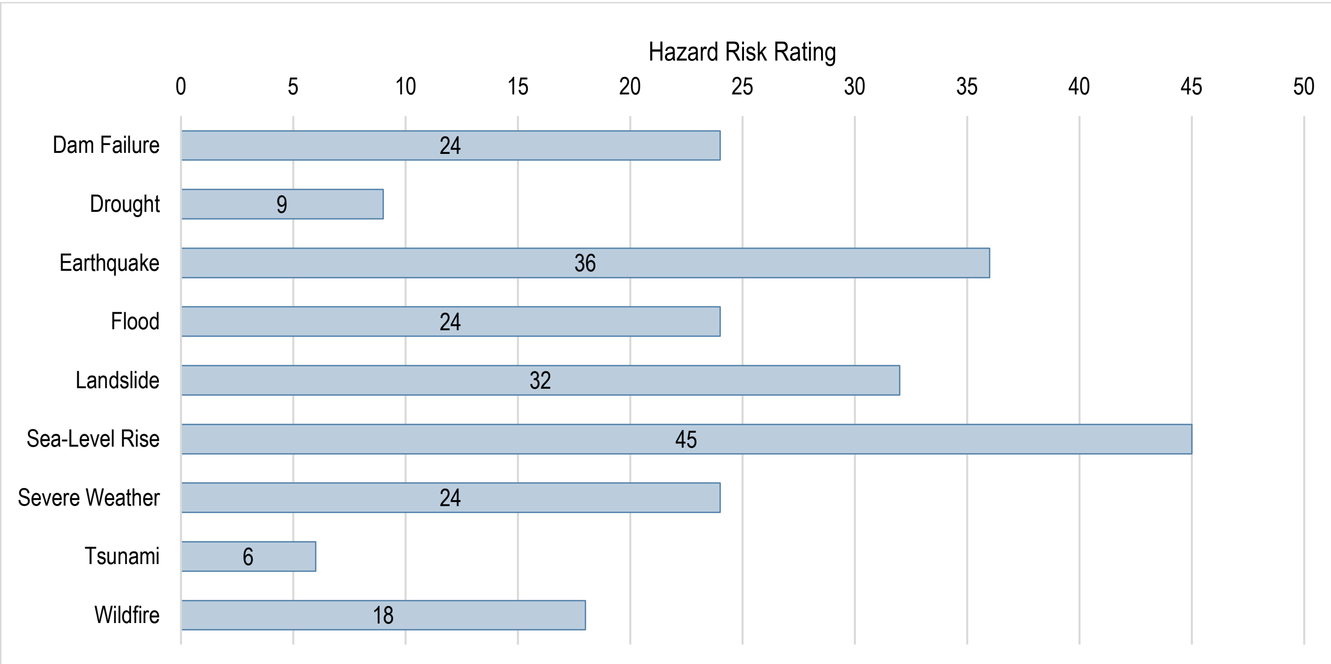


Figure 19-6. Total Risk Rating for Hazards of Concern (Baseline)

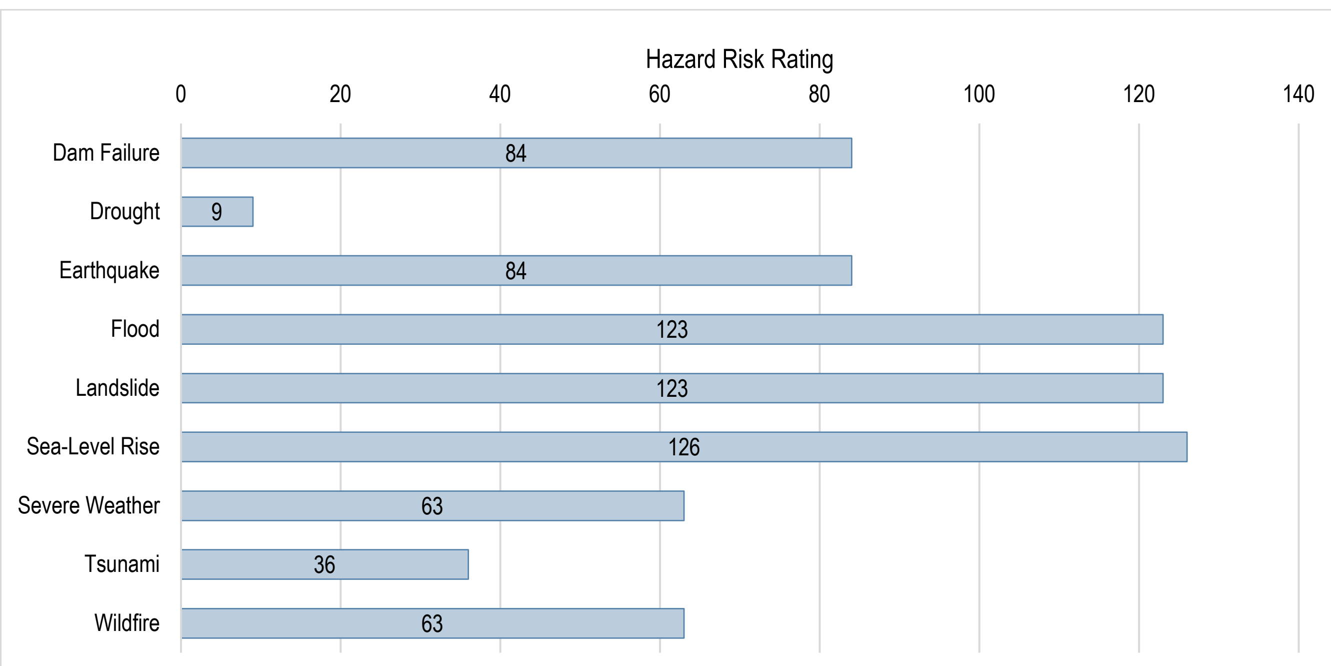


Figure 19-7. Total Risk Rating for Hazards of Concern (Equity Lens)

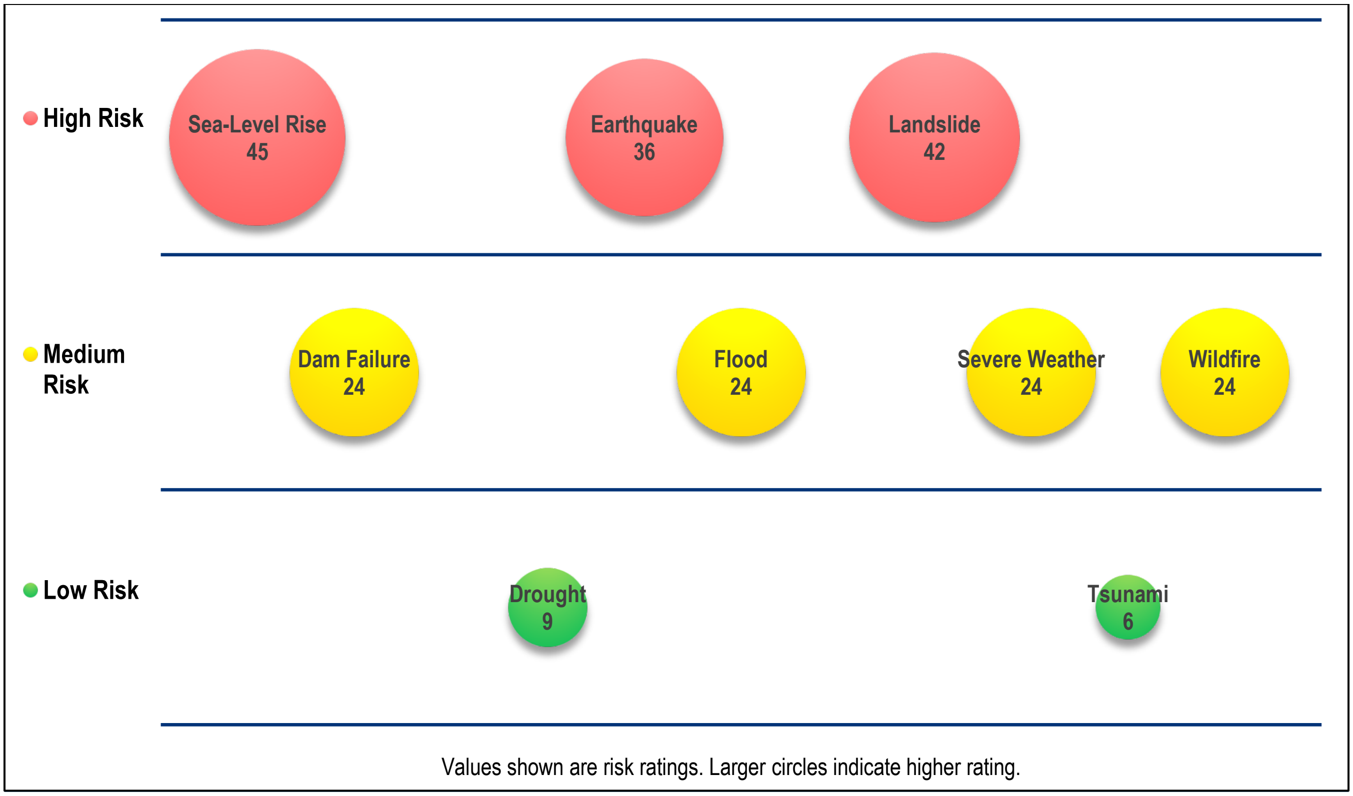


Figure 19-8. Hazard Risk Ranking (Baseline)

Figure 19-9. Hazard Risk Ranking (Equity Lens)

Part 3. MITIGATION PLAN

20. MISSION STATEMENT, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee reviewed the guiding principle, goals, and objectives from the previous hazard mitigation plan for San Mateo County. It was determined that the previous plan's guiding principle, goals, and objectives still reflect community priorities and the results of the risk assessment. Therefore, only minor changes were made, to clarify intent and meaning.

The guiding principle, goals, objectives, and actions in this plan all support each other. Goals were selected to support the guiding principle. Objectives were selected that met multiple goals. Actions (presented in Chapter 22) were prioritized based on their ability to meet multiple objectives.

20.1 GUIDING PRINCIPLES

A guiding principle focuses the range of objectives and actions to be considered. A guiding principle is not a goal because it does not describe a hazard mitigation outcome and it is broader than a hazard-specific objective. The guiding principles for the *San Mateo County Multijurisdictional Local Hazard Mitigation Plan* are as follows:

- Provide a dynamic, actionable approach to hazard planning that integrates with other planning mechanisms to enhance or support hazard mitigation.
- Invite and enhance the public's awareness and understanding of hazards and their input on hazard prioritization and mitigation.
- Create a decision-making tool for policy and decision makers.
- Prioritize multi-benefit actions that reduce risk to vulnerable communities, protect those most at risk, and advance equity, including across racial, ethnic, and rural/urban lines.
- Promote compliance with state and federal program requirements.
- Ensure inter-jurisdictional coordination on hazard mitigation activities.
- Integrate the concepts of climate change into the hazard mitigation planning process.
- Support economic viability, including for those who are most economically vulnerable, after a hazard event.
- Ensure a safe, respectful, non-discriminatory, and inclusive response to hazard events.

20.2 GOALS

The following are the mitigation goals for this plan:

- Protect life and property, including protecting the health and safety of communities.

- Engage the whole community to better understand the hazards of the region and ways to reduce their personal vulnerability to those hazards.
- Promote hazard mitigation as an integrated public policy and as a standard business practice.
- Integrate climate change strategies to increase resiliency of community lifelines (critical facilities) from the impact of climate change.
- Protect and preserve the environment.
- Develop and implement hazard mitigation strategies that use public funds in an efficient and cost-effective way.
- Develop hazard mitigation strategies that eliminate disparities and provide access to quality services for all unserved, underserved, under-resourced, and ineffectively serviced individuals and families.
- Improve community emergency management capability.

The effectiveness of a mitigation strategy is determined by how well these goals are achieved.

20.3 OBJECTIVES

Each selected objective meets multiple goals, serving as a stand-alone measurement of the effectiveness of a mitigation action, rather than as a subset of a goal. The objectives also are used to help establish priorities. The objectives are as follows:

1. Improve understanding of the locations, potential impacts, and linkages among threats, hazards, vulnerability, and measures needed to protect life, safety, and health.
2. Establish and maintain partnerships among all levels of government, the private sector, community groups, and institutions of higher learning that improve and implement methods to protect life and property.
3. Conduct culturally competent and transparent community outreach activities that:
    a. Increase stakeholder awareness and understanding of hazard risk, mitigation options, and preparedness strategies
    b. Enable community members to inform risk assessment and ranking, prioritization of mitigation actions and implementation measures and investments
    c. Are clear on how they incorporate input throughout the process by providing regular reports.
4. Prevent or reduce mitigation-related disparities affecting under-served and under-represented communities through plans, investments, and engagement.
5. Develop and provide updated information about threats, hazards, vulnerabilities, climate change, and mitigation strategies to state, regional, and local agencies, as well as private-sector and community groups.
6. Encourage incorporation of hazard mitigation measures into repairs, major alterations, new development, and redevelopment practices, especially in socially vulnerable communities.
7. Promote and implement hazard mitigation plans and projects based on best available data and science that are consistent with state, regional, and local climate action and adaptation goals, policies, and programs.
8. Advance community resilience through preparation, adoption, and implementation of state, regional, and local hazard mitigation plans and projects.

9. Encourage life and property protection measures for all communities, with particular attention to socially vulnerable communities that have less capacity to adapt or to strengthen structures and community lifelines (critical facilities) located in hazard areas.
10. Actively promote effective coordination of regional and local hazard mitigation planning and action among state agencies, cities, counties, special districts, tribal organizations, councils of governments, community-led planning efforts, metropolitan planning organizations, and regional transportation organizations to create resilient and sustainable communities.
11. Improve systems that provide warning and emergency communications, including evaluation of their inclusiveness and accessibility.
12. Build the capacity of the County, the planning partners, and community-based organizations to ensure effective and meaningful engagement throughout the process and equitable outcomes of hazard mitigation action efforts.
13. Retrofit, purchase, and/or relocate structures in high hazard areas, and consider appropriate redevelopment policies in areas known to be repetitively damaged that will maximize public benefits and reduce negative impacts, particularly in socially vulnerable communities.
14. Where feasible, identify and implement strategies that use nature-based solutions.

21. MITIGATION BEST PRACTICES

21.1 MITIGATION BEST PRACTICES

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use by the planning partners, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). One catalog was developed for each hazard of concern evaluated in this plan (except sea level rise, for which mitigation measures are presented in the following section on adaptive capacity). The catalogs present alternatives that are categorized in two ways:

- By who would have responsibility for implementation:
  - Individuals (personal scale)
  - Businesses (corporate scale)
  - Government (government scale).
- By what the alternative would do:
  - Manipulate the hazard
  - Reduce exposure to the hazard
  - Reduce vulnerability to the hazard
  - Build local capacity to respond to or prepare for the hazard.

Hazard mitigation actions recommended in this plan were selected from an analysis of the alternatives presented in the catalogs. Some actions were developed independently by planning partners. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the established goals and objectives, and are generally within the capabilities of the planning partners to implement. They provide a list of what could be considered to reduce risk from natural hazards. Not all actions listed are feasible for this plan. Planning partners selected actions based their ability to implement the action. Actions in the catalog that are not included in partners' action plans were not selected for one or more of the following reasons:

- The action is not feasible.
- The action is already being implemented.
- The planning partner does not have the capability to implement the action.
- There is an apparently more cost-effective alternative.
- The action does not have public or political support.

The catalogs for each hazard are presented in Table 21-1 through Table 21-8.

Table 21-1. Alternatives to Mitigate the Dam Failure Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Relocate out of dam failure inundation areas • **Reduce vulnerability:** ❖ Elevate home to appropriate levels • **Build local capacity:** ❖ Learn about risk reduction for the dam failure hazard ❖ Learn the evacuation routes for a dam failure event ❖ Educate yourself on early warning systems and the dissemination of warnings	• **Manipulate the hazard:** ❖ Remove dams ❖ Harden dams • **Reduce exposure:** ❖ Replace earthen dams with hardened structures • **Reduce vulnerability:** ❖ Flood-proof facilities within dam failure inundation areas • **Build local capacity:** ❖ Educate employees on the probable impacts of a dam failure ❖ Develop a continuity of operations plan	• **Manipulate the hazard:** ❖ Remove dams ❖ Harden dams • **Reduce exposure:** ❖ Replace earthen dams with hardened structures ❖ Relocate critical facilities out of dam failure inundation areas ❖ Consider open space land use in designated dam failure inundation areas • **Reduce vulnerability:** ❖ Adopt higher floodplain standards in mapped dam failure inundation areas ❖ Retrofit critical facilities within dam failure inundation areas • **Build local capacity:** ❖ Map dam failure inundation areas ❖ Enhance emergency operations plan to include a dam failure component ❖ Institute monthly communications checks with dam operators ❖ Inform the public on risk reduction techniques ❖ Adopt real-estate disclosure requirements for the re-sale of property located within dam failure inundation areas ❖ Consider the probable impacts of climate change in assessing the risk associated with the dam failure hazard ❖ Establish early warning capability downstream of listed high hazard dams ❖ Consider the residual risk associated with protection provided by dams in future land use decisions

Table 21-2. Alternatives to Mitigate the Drought Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Drought-resistant landscapes ❖ Reduce water system losses ❖ Modify plumbing systems (through water saving kits) ❖ For homes with on-site water systems: increase storage, utilize rainwater catchment • **Build local capacity:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Drought-resistant landscapes ❖ Reduce private water system losses ❖ Support alternative irrigation techniques to reduce water use and encourage use of climate-sensitive water supplies ❖ For businesses with on-site water systems: increase storage, utilize rainwater catchment • **Build local capacity:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ Groundwater recharge through stormwater management ❖ Develop a water recycling program ❖ Increase "above-the-dam" regional natural water storage systems • **Reduce exposure:** ❖ Identify and create groundwater backup sources • **Reduce vulnerability:** ❖ Water use conflict regulations ❖ Reduce water system losses ❖ Distribute water saving kits ❖ increase conventional storage that is filled during high-flow periods • **Build local capacity:** ❖ Public education on drought resistance ❖ Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers ❖ Develop drought contingency plan ❖ Develop criteria "triggers" for drought-related actions ❖ Improve accuracy of water supply forecasts ❖ Modify rate structure to influence active water conservation techniques ❖ Consider the probable impacts of climate change on the risk associated with the drought hazard

Table 21-3. Alternatives to Mitigate the Earthquake Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate outside of hazard area (off soft soils) • **Reduce vulnerability:** ❖ Retrofit structure (anchor house structure to foundation) ❖ Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) ❖ Build to higher design • **Build local capacity:** ❖ Practice "drop, cover, and hold" ❖ Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event ❖ Keep cash reserves for reconstruction ❖ Become informed on the hazard and risk reduction alternatives available. ❖ Develop a post-disaster action plan for your household	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate or relocate mission-critical functions outside hazard area where possible • **Reduce vulnerability:** ❖ Build redundancy for critical functions and facilities ❖ Retrofit critical buildings and areas housing mission-critical functions • **Build local capacity:** ❖ Adopt higher standard for new construction; consider "performance-based design" when building new structures ❖ Keep cash reserves for reconstruction ❖ Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility. ❖ Develop a continuity of operations plan	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate critical facilities or functions outside hazard area where possible • **Reduce vulnerability:** ❖ Harden infrastructure ❖ Provide redundancy for critical functions ❖ Adopt higher regulatory standards • **Build local capacity:** ❖ Provide better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (e.g., tax incentives, information) ❖ Include retrofitting and replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components such as pipe, power line, and road repair materials ❖ Develop and adopt a continuity of operations plan ❖ Initiate triggers guiding improvements (such as <50% substantial damage or improvements) ❖ Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. ❖ Develop a post-disaster action plan that includes grant funding and debris removal components.

Table 21-4. Alternatives to Mitigate the Flood Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure:** ❖ Locate outside of hazard area ❖ Elevate utilities above base flood elevation ❖ Use low-impact development techniques • **Reduce vulnerability:** ❖ Raise structures above base flood elevation ❖ Elevate items within house above base flood elevation ❖ Build new homes above base flood elevation ❖ Flood-proof structures • **Build local capacity:** ❖ Buy flood insurance ❖ Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event	• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure:** ❖ Locate critical facilities or functions outside hazard area ❖ Use low-impact development techniques • **Reduce vulnerability:** ❖ Build redundancy for critical functions or retrofit critical buildings ❖ Provide flood-proofing when new critical facilities must be located in floodplains • **Build local capacity:** ❖ Keep cash reserves for reconstruction ❖ Support and implement hazard disclosure for sale of property in risk zones. ❖ Solicit cost-sharing through partnerships with others on projects with multiple benefits.	• **Manipulate the hazard:** ❖ Maintain drainage system ❖ Institute low-impact development techniques on property ❖ Dredging, levee construction, and providing regional retention areas ❖ Structural flood control, levees, channelization, or revetments. ❖ Stormwater management regulations and master planning ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff • **Reduce exposure:** ❖ Locate or relocate critical facilities outside of hazard area ❖ Acquire or relocate identified repetitive loss properties ❖ Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. ❖ Adopt land development criteria such as planned unit developments, density transfers, clustering ❖ Institute low impact development techniques on property ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff ❖ Preserve undeveloped and vulnerable shoreline ❖ Restore existing flood control and riparian corridors • **Reduce vulnerability:** ❖ Harden infrastructure, bridge replacement program ❖ Provide redundancy for critical functions and infrastructure ❖ Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. ❖ Stormwater management regulations and master planning. ❖ Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on downstream communities ❖ Facilitate managed retreat from, or upgrade of, the most at-risk areas ❖ Require accounting of sea level rise in all applications for new development in shoreline areas ❖ Implement Assembly Bill 162 (2007) requiring flood hazard information in local general plans • **Build local capacity:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) ❖ Incorporate retrofitting or replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Consider participation in the Community Rating System ❖ Maintain and collect data to define risks and vulnerability ❖ Train emergency responders ❖ Create an elevation inventory of structures in the floodplain ❖ Develop and implement a public information strategy ❖ Charge a hazard mitigation fee ❖ Integrate floodplain management policies into other planning mechanisms within the planning area. ❖ Consider the probable impacts of climate change on the risk associated with the flood hazard ❖ Consider the residual risk associated with structural flood control in future land use decisions ❖ Enforce National Flood Insurance Program requirements ❖ Adopt a Stormwater Management Master Plan ❖ Develop an adaptive management plan to address the long-term impacts of sea level rise

Table 21-5. Alternatives to Mitigate the Landslide Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Minimize vegetation removal and the addition of impervious surfaces. • **Reduce exposure:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) • **Reduce vulnerability:** ❖ Retrofit home • **Build local capacity:** ❖ Institute warning system, and develop evacuation plan ❖ Keep cash reserves for reconstruction ❖ Educate yourself on risk reduction techniques for landslide hazards	• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope • **Reduce exposure:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) • **Reduce vulnerability:** ❖ Retrofit at-risk facilities • **Build local capacity:** ❖ Institute warning system, and develop evacuation plan ❖ Keep cash reserves for reconstruction ❖ Develop a continuity of operations plan ❖ Educate employees on the potential exposure to landslide hazards and emergency response protocol.	• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope • **Reduce exposure:** ❖ Acquire properties in high-risk landslide areas. ❖ Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas. • **Reduce vulnerability:** ❖ Adopt higher regulatory standards for new development within unstable slope areas. ❖ Armor/retrofit critical facilities against the impact of landslides. • **Build local capacity:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas: better land controls, tax incentives, information ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Educate the public on the landslide hazard and appropriate risk reduction alternatives. ❖ Consider the probable impacts of climate change on the risk associated with the landslide hazard

Table 21-6. Alternatives to Mitigate the Severe Weather Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Insulate house ❖ Provide redundant heat and power ❖ Insulate structure ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) • **Build local capacity:** ❖ Trim or remove trees that could affect power lines ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio. ❖ Obtain an emergency generator.	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Relocate critical facilities (such as power lines) underground ❖ Reinforce critical facilities (such as power lines) to meet performance expectations ❖ Install tree wire • **Build local capacity:** ❖ Trim or remove trees that could affect power lines ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources.	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Develop an urban heat island reduction program that includes an urban forest program or plan • **Reduce vulnerability:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Designate snow routes and strengthen critical road sections and bridges • **Build local capacity:** ❖ Support programs such as "Tree Watch" that proactively manage problem areas through use of selective removal of hazardous trees, tree replacement, etc. ❖ Establish and enforce building codes that require all roofs to withstand snow loads ❖ Increase communication alternatives ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors. ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public ❖ Consider the probable impacts of climate change on the risk associated with the severe weather hazard ❖ Review and update heat response plan in light of climate change (heat events) projections

Table 21-7. Alternatives to Mitigate the Tsunami Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ Apply personal property mitigation techniques to your home such as anchoring your foundation and foundation openings to allow flow though. • **Build local capacity:** ❖ Develop and practice a household evacuation plan ❖ Educate yourself on the risk exposure from the tsunami hazard and ways to minimize that risk ❖ Understand tsunami warning signs and signals	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate structure or mission critical functions outside of hazard area whenever possible • **Reduce vulnerability:** ❖ Mitigate personal property for the impacts of tsunami • **Build local capacity:** ❖ Develop and practice a corporate evacuation plan ❖ Educate employees on the risk exposure from the tsunami hazard and ways to minimize that risk	• **Manipulate the hazard:** ❖ Build wave abatement structures (e.g. the “Jacks” looking structure designed by the Japanese) • **Reduce exposure:** ❖ Locate structure or functions outside of hazard area whenever possible ❖ Harden infrastructure for tsunami impacts ❖ Relocate identified critical facilities located in tsunami high hazard areas • **Reduce vulnerability:** ❖ Adopt higher regulatory standards that will provide higher levels of protection to structures built in a tsunami inundation area ❖ Utilize tsunami mapping to guide development away from high risk areas through land use planning • **Build local capacity:** ❖ Use probabilistic tsunami mapping and land use guidance from the state when published ❖ Provide incentives to guide development away from hazard areas ❖ Improve the tsunami warning and response system ❖ Provide community members with tsunami inundation maps ❖ Join NOAA’s Tsunami Ready program ❖ Develop and communicate evacuation routes ❖ Enhance the public information program to include risk reduction options for the tsunami hazard

Table 21-8. Alternatives to Mitigate the Wildfire Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry overgrown underbrush and diseased trees • **Reduce exposure:** ❖ Create and maintain defensible space around structures ❖ Locate outside of hazard area ❖ Mow regularly • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and provide water on site ❖ Use fire-resistant building materials ❖ Create defensible spaces around home • **Build local capacity:** ❖ Employ techniques from the National Fire Protection Association's Firewise USA program to safeguard home ❖ Identify alternative water supplies for fire fighting ❖ Install/replace roofing material with non-combustible roofing materials and implement other strategies to harden homes from embers and flame impingement	• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees • **Reduce exposure:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and infrastructure and provide water on site ❖ Use fire-resistant building materials ❖ Use fire-resistant plantings in buffer areas of high wildfire threat. • **Build local capacity:** ❖ Support Firewise USA community initiatives. ❖ Create /establish stored water supplies to be utilized for firefighting.	• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees ❖ Implement best management practices on public lands • **Reduce exposure:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area ❖ Enhance building code to include use of fire resistant materials in high hazard area. • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Use fire-resistant building materials ❖ Use fire-resistant plantings in buffer areas of high wildfire threat. ❖ Consider higher regulatory standards (such as Class A roofing) ❖ Establish biomass reclamation initiatives ❖ Reintroduce fire (controlled or prescribed burns) to fire-prone ecosystems ❖ Manage fuel load through thinning and brush removal ❖ Establish integrated performance standards for new development to harden homes. • **Build local capacity:** ❖ More public outreach and education efforts, including an active Firewise USA program ❖ Possible weapons of mass destruction funds available to enhance fire capability in high-risk areas ❖ Identify fire response and alternative evacuation routes and establish where needed ❖ Seek alternative water supplies ❖ Become a Firewise USA community ❖ Use academia to study impacts/solutions to wildfire risk ❖ Establish/maintain mutual aid agreements between fire service agencies ❖ Develop, adopt, and implement integrated plans for mitigating wildfire impacts in wildland areas bordering on development ❖ Consider the probable impacts of climate change on the risk associated with the wildfire hazard in future land use decisions ❖ Establish a management program to track forest and rangeland health ❖ Provide incentives to for existing structures to be hardened against wildfire.

21.2 ADAPTIVE CAPACITY

Adaptive capacity is defined as "the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences" (IPCC, 2014b). This term is typically used while discussing climate change adaptation; however, it is similar to the alternatives presented in the tables for building local capacity. In addition to hazard-specific capacity building, the following list provides general alternatives that planning partners considered to build capacity for adapting to both current and future risks (Cal EMA, et al., 2012a and 2012b):

- Incorporate climate change adaptation into relevant local and regional plans and projects.
- Establish a climate change adaptation and hazard mitigation public outreach and education program.
- Build collaborative relationships between regional entities and neighboring communities to promote complementary adaptation and mitigation strategy development and regional approaches.
- Establish an ongoing monitoring program to track local and regional climate impacts and adaptation strategy effectiveness.
- Increase participation of low-income, immigrant, non-English-speaking, racially and ethnically diverse, and special-needs community members in planning and implementation.
- Ask local employers and business associations to participate in local efforts to address climate change and natural hazard risk reduction.
- Conduct a communitywide assessment and develop a program to address health, socioeconomic, and equity vulnerabilities.
- Focus planning and intervention programs on neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.
- Use performance metrics and data to evaluate and monitor the impacts of climate change and natural hazard risk reduction strategies on public health and social equity.
- Develop coordinated plans for mitigating future flood, landslide, and related impacts through concurrent adoption of updated general plan safety elements and local hazard mitigation plans.
- Update safety elements to reflect existing hazards and projected climate change impacts on hazards.
- Implement general plan safety elements through zoning and subdivision practices that restrict development in floodplains, landslide, and other natural hazard areas.
- Identify and protect locations where native species may shift or lose habitat due to climate change impacts (sea level rise, loss of wetlands, warmer temperatures, drought).
- Collaborate with agencies managing public lands to identify, develop, or maintain corridors and linkages between undeveloped areas.
- Promote economic diversity.
- Incorporate consideration of climate change impacts as part of infrastructure planning and operations.
- Conduct a climate impact assessment on community infrastructure.
- Identify gaps in legal and regulatory capabilities and develop ordinances or guidelines to address those gaps.
- Identify and pursue new sources of funding for mitigation and adaptation activities.

- Hire new staff or provide training to current staff to ensure an adequate level of administrative and technical capability to pursue mitigation and adaptation activities.

22. RECOMMENDED PLANNING-AREA-WIDE ACTIONS

22.1 RECOMMENDED MITIGATION ACTIONS FOR ALL PARTNERS

The Core Planning Team reviewed the catalogs of hazard mitigation alternatives and selected planning-area-wide actions to be included in a hazard mitigation action plan for all planning partners. The selection of area-wide actions was based on the risk assessment of identified hazards of concern and the defined hazard mitigation goals and objectives. Table 22-1 lists the recommended hazard mitigation actions that make up the action plan.

Table 22-1. Action Plan—Countywide Mitigation Initiatives

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
CW-1: Continue to maintain a multilingual and culturally appropriate website that will house the multijurisdictional local hazard mitigation plan, progress reports and all components of the plan's maintenance strategy to provide planning partners and the public with ongoing access to the plan and its implementation.							
New and Existing	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	2, 3, 4, 5, 9, 10, 12	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing
CW-2: Continue to leverage/support/enhance multilingual and culturally appropriate, ongoing, regional public education and awareness programs, such as SMCAlert, ZoneHaven, and CERT, as a method to educate the public on risk, risk reduction, and community resilience.							
New and Existing	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	2, 3, 4, 5, 9, 10, 11, 12	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing
CW-3: Provide technical support and coordination for available grant funding opportunities to the planning partnership.							
New and Existing	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing
CW-4: Develop a standardized GIS dataset for modeling hazards and impacts for regional and jurisdictional assessment purposes. Implement a program to digitally map historical hazard events and future hazard events and impacts.							
New	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	1, 2, 5, 6, 7, 12	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing
CW-5: Develop a multilingual and culturally appropriate business outreach program, in concert with existing business organizations and planning partners, to educate businesses on risk and risk reduction and to identify policies and programs to help businesses become more resilient.							
New and Existing	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	2, 3, 4, 5, 9, 10, 12	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing
CW-6: Develop model policy templates to assist with coordinated development and implementation of resiliency policies, such as the Safety Elements.							
New	Dam Failure, Drought, Earthquake, Flood, Landslide, Severe Weather, Sea-Level Rise, Tsunami, Wildfire	1, 2, 5, 6, 7, 12	San Mateo County	Planning Partners	Low	Operating Budgets	Ongoing

The timeframe indicated in the table is defined as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs.

Additional jurisdiction-specific action plans for each planning partner are included in the partner annexes in Volume 2 of this hazard mitigation plan.

22.2 AREA-WIDE ACTION PLAN PRIORITIZATION

The actions recommended in the action plan were prioritized based on the following factors:

- Cost and availability of funding
- Benefit, based on likely risk reduction to be achieved
- Number of plan objectives achieved
- Timeframe for project implementation
- Eligibility for grand funding programs

Two priorities were assigned for each action:

- A high, medium, or low priority for implementing the action
- A high, medium, or low priority for pursuing grant funding for the action.

The sections below describe the analysis of benefits and costs and the assignment of the two priority ratings.

22.2.1 Benefit and Cost

The action plan must be prioritized according to a benefit/cost analysis of the proposed actions (44 CFR, Section 201.6(c)(3)(iii)). For this hazard mitigation plan, a qualitative benefit-cost review was performed for each action by assigning ratings for benefit and cost as follows:

- Cost:
  - **High**—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - **Medium**—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - **Low**—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.
- Benefit:
  - **High—**Action will provide an immediate reduction of risk exposure for life and property.
  - **Medium—**Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - **Low—**Long-term benefits of the action are difficult to quantify in the short term.

To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial. This is not the detailed level of benefit/cost analysis required for some FEMA hazard-related grant programs. Such analysis would be performed at the time a given action is being submitted for grant funding.

22.2.2 Implementation Priority

Implementation priority ratings were assigned as follows:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years), once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
- **Low Priority**—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.

22.2.3 Outside Funding Pursuit Priority

Outside funding pursuit priority ratings were assigned as follows:

- **High Priority**—An action that meets identified funding eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for funding from an outside local government source.
- **Medium Priority**—An action that meets identified outside funding source eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting any outside funding source eligibility requirements.

22.2.4 Social Equity Priority

For planning partners that chose to apply an equity lens to their prioritization scheme, the following parameters were established:

- **High Priority**—The mitigation action is designed to reduce harm to multiple socially vulnerable groups in the County from one or more of the hazards identified in the hazard mitigation plan.
- **Medium Priority**— The mitigation action is designed to reduce harm to a single socially vulnerable population in the County from at least one hazard identified in the hazard mitigation plan.
- **Low Priority**— The mitigation action fails to advance social equity in any measurable way in the County

22.2.5 Prioritization Summary for Countywide Actions

Table 22-2 lists the priority of each action.

Table 22-2. Mitigation Action Priority

Action #	# of Objectives Met	Benefit	Cost	Do Benefits Equal or Exceed Costs?	Is Action Eligible for an Outside Funding Source?	Can Action be Funded Under Existing Programs/ Budgets?	Implementation Priority	Outside Funding Pursuit Priority	Equity Priority
CW-1	7	Medium	Low	Yes	Unknown	Yes	High	Low	High
CW-2	8	Medium	Low	Yes	Unknown	Yes	High	Low	High
CW-3	14	Medium	Low	Yes	Unknown	Yes	High	Low	High
CW-4	7	Medium	Low	Yes	Unknown	Yes	High	Low	High
CW-5	7	Medium	Low	Yes	Unknown	Yes	High	Low	High
CW-6	7	Medium	Low	Yes	Unknown	Yes	High	Low	High

22.3 CLASSIFICATION OF AREA-WIDE MITIGATION ACTIONS

Each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Table 22-3 shows these classifications. Mitigation types used for this categorization are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform community members and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resiliency**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea level rise or urban heat island effect.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

Table 22-3. Analysis of Mitigation Actions

Hazard	Actions That Address the Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education and Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resiliency	Community Capacity Building
High Risk Hazards								
Sea Level Rise	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Earthquake	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Landslide	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Medium Risk Hazards								
Dam Failure	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Flood	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Severe Weather	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Wildfire	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Low Risk Hazards								
Drought	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6
Tsunami	CW-4, CW-6		CW-1, CW-2, CW-5					CW-1, CW-2, CW-3, CW-4, CW-6

23. PLAN ADOPTION AND IMPLEMENTATION

23.1 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing bodies of the jurisdictions requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multijurisdictional plans, each jurisdiction requesting approval must document that is has been formally adopted. This plan will be submitted for a pre-adoption review to Cal OES and FEMA Region IX prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan. DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners can be found in Appendix G of this volume.

23.2 PLAN MAINTENANCE STRATEGY

Plan maintenance is the formal process for achieving the following:

- Ensuring that the hazard mitigation plan remains an active and relevant document and that the planning partnership maintains its eligibility for applicable funding sources
- Monitoring and evaluating the plan annually and producing an updated plan every five years
- Integrating public participation throughout the plan maintenance and implementation process
- Incorporating the mitigation strategies outlined in the plan into existing planning mechanisms and programs, such as any relevant comprehensive land-use planning process, capital improvement planning process, and building code enforcement and implementation.

To achieve these ends, a hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A method and schedule for monitoring, evaluating, and updating the mitigation plan within a 5-year cycle
- An approach for how the community will continue public participation in the plan maintenance process.
- A process by which local governments will incorporate the requirements of the mitigation plan into other planning mechanisms when appropriate

Table 23-1 summarizes the plan maintenance strategy.

Table 23-1. Plan Maintenance Matrix

Task	Approach	Timeline	Lead Responsibility	Support Responsibility
Monitoring	Prepare status updates and action implementation tracking as part of annual progress reporting.	Annually after the adoption and final approval of the plan by FEMA.	San Mateo County DEM	Designated point of contact for each planning partner
	As grant opportunities present themselves, consider options to pursue grants to fund actions identified in this plan	As grants become available	San Mateo County DEM	Designated point of contact for each planning partner
Annual Progress Reporting	Review the status of previous actions as submitted by the monitoring task lead and assess the effectiveness of the plan; compile the annual progress report; assess appropriate action for preparing next hazard mitigation plan update.	Annually after final plan approval by FEMA, or upon a major disaster or a comprehensive update to a general plan	San Mateo County and all planning partners	Designated point of contact for each planning partner
CRS Subcommittee	Review and approve the annual progress reports for the CRS participating communities within the planning partnership	Annually	• Burlingame • East Palo Alto • Pacifica • San Carlos • San Mateo County	San Mateo County DEM
Plan Update	Reconvene the planning partners, at a minimum, every 5 years to guide a comprehensive update to review and revise the plan.	Every 5 years or upon comprehensive update to general plan or major disaster	The governing body for all planning partners covered by this plan	Designated point of contact for each planning partner
Continuing Public Involvement	Provide the public access to the implementation of this plan, principally through the plan website. https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan	Annually	San Mateo County DEM	All planning partners will provide a link to County's hazard mitigation plan website on their own websites
Plan Integration	Integrate relevant information from hazard mitigation plan into other plans and programs where viable as opportunities arise	Ongoing	The governing body for all planning partners covered by this plan	Designated point of contact for each planning partner

23.2.1 Plan Implementation and Monitoring

San Mateo County Department of Emergency Management (DEM) will be the agency responsible for monitoring the plan, and each partner will track the status of all mitigation actions in its own action plan. Staff or departments with primary responsibility are identified in each jurisdictional annex (see Volume 2).

23.2.2 CRS Subcommittee

Under FEMA's Community Rating System (CRS) program, communities can receive CRS credit for hazard mitigation plans that meet criteria established under the program. A key element of that credit is annual progress reporting and the review process used for the annual progress report. CRS Activity 510 credit criteria specify that the annual evaluation report must be prepared by the same planning committee that prepared the plan or by a successor committee with a similar membership charged with plan monitoring and implementation evaluation.

A CRS Subcommittee will be formed that will assume the responsibility of reviewing and preparing the progress report in a format suitable to meet CRS documentation requirements. The principal role of the CRS Subcommittee will be to review the annual progress report and provide input to San Mateo County DEM on possible enhancements to be considered at the next update, while preparing the documentation needed for each CRS community's annual recertification. Since the progress reporting and the oversight committee are CRS requirements, it was the direction of the Steering Committee for this update that the responsibility for meeting those requirements should fall to the planning partners that are currently participating in the CRS program:

- Burlingame
- East Palo Alto
- Menlo Park
- Pacifica
- San Carlos
- San Mateo County

The makeup of the subcommittee will at a minimum, include representation from these CRS participating communities, led by San Mateo County.

Future plan updates will be overseen by a new steering committee similar to the one that participated in this update process, so keeping an interim subcommittee intact will provide a head start on future updates.

23.2.3 Annual Progress Report

A Maintenance Working Group will be created that consists of participating planning partners. The Maintenance Working Group will convene a bi-annual meeting to evaluate the progress on the action plan over a six-month and 12-month performance period. This review will include items such as the following:

- Summary of any hazard events that occurred during the performance period and impact of these events on the planning area
- Review of mitigation success stories
- Review of continued public involvement
- Brief discussions about why targeted strategies were not completed
- Reevaluation of the action plan to establish if the timeline for projects needs to be amended
- Recommendations for new projects
- Changes in or potential for new funding options
- The impact of any other planning programs or initiatives that involve hazard mitigation

Participating partners will be responsible for forwarding this information for the Maintenance Working Group to include in a formal report on the plan's progress. The Maintenance Working Group will prepare a progress report during the 2021-2022 planning period. This report will be retained by the County DEM, with copies forwarded to planning partners, Cal OES, and Tetra Tech. This report should be used as follows:

- The reporting period will cover a 12-month period from September 1, 2021 through August 31, 2022 and annually every year following until August 31, 2025. Only four annual progress reports will be prepared; an updated plan will be prepared for the fifth year, rather than a progress report.

- The plan implementation lead (DEM) will send out reminder emails to all planning partners no later than three months before the due date.
- Planning partners will submit their status updates and sections of the annual report no later than one month prior to the due date.
- The plan maintenance lead will prepare the annual report, including planning partner information, no later than one month following the progress reporting due date.
- DEM will be responsible for ensuring that the report is posted to the County's hazard mitigation website.
- The report will describe public outreach and engagement made during the reporting period.
- The Maintenance Working Group will use the information in the annual report to identify projects of interest for the following year and to apply for mitigation or resiliency grants.
- The Maintenance Working Group will present to the County Board of Supervisors and will provide the information to the planning partners for them to provide to their governing bodies to inform them of the progress of mitigation and resiliency efforts implemented during the reporting period.

Annual progress is not a requirement of 44 CFR, but it may enhance the planning partners' opportunity for grant funding. Failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA; it may jeopardize its opportunity to partner and leverage funding opportunities with other planning partners. The Maintenance Working Group will follow up with planning partners that do not participate in the annual reporting as deemed necessary by the San Mateo County DEM.

23.2.4 Plan Update

The plan maintenance process includes a schedule for monitoring and producing an updated plan every five years. Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6.d.3). The planning partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A presidential disaster declaration that impacts the planning area
- A hazard event that causes loss of life
- An update of the County or participating city's general plan

This plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current. It will not be the intent of future updates to develop a completely new hazard mitigation plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plans will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the general plan).
- The draft update will be sent to appropriate agencies and organizations for comment.

- The public will be given an opportunity to comment on the update prior to adoption.
- Planning partners’ governing bodies will adopt their portions of the updated plan.

23.2.5 Continuing Public Involvement

The public will continue to be apprised of the plan’s progress through the San Mateo County DEM website, including providing copies of annual progress reports on the website. All planning partners have agreed to provide links to the County hazard mitigation plan website on their individual jurisdictional websites to increase avenues of public access to the plan. The County has agreed to maintain the hazard mitigation plan website. This site will house the final plan and serve as a one-stop site for information regarding the plan, the partnership and plan implementation.

Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

StoryMap

ArcGIS StoryMaps are a story authoring web-based application for sharing maps in the context of narrative text and other multimedia content. They allow the public to interface with property-specific information on risk identified by a local hazard mitigation plan. A StoryMap that was constructed during the course of this plan update process will be used to support the implementation of the plan by providing the public continuing access to the plan and its maintenance process. The StoryMap will remain with the County and continue as a template to support visual and data-based communication about the hazards relevant to San Mateo County.

Following the completion of the plan update process, the Story Map will be released to the public and promoted through social media and the project website. It will include risk assessment results for all relevant hazards, an interactive hazard mapping tool, and a report function to produce comprehensive hazard exposure summaries for any given property, block, or defined area. The Story Map expanded opportunities for public outreach and the ways in which members of the public could interact with hazard data as the hazard mitigation plan update was underway. Figure 23-1 shows a page from the StoryMap for the *San Mateo County Multijurisdictional Local Hazard Mitigation Plan*.

23.2.6 Incorporation into Other Planning Mechanisms

The mitigation actions recommended in this plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this update was prepared.

The general plans of the County and the city planning partners are considered to be integral parts of this plan. The County and partner cities, through adoption of general plans and zoning ordinances, have planned for the impact of natural hazards. The hazard mitigation plan update provided the County and the cities with an opportunity to review and expand on policies contained within these planning mechanisms. The planning partners used their general plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the community members of the San Mateo County. An update to a general plan may trigger an update to the hazard mitigation plan.

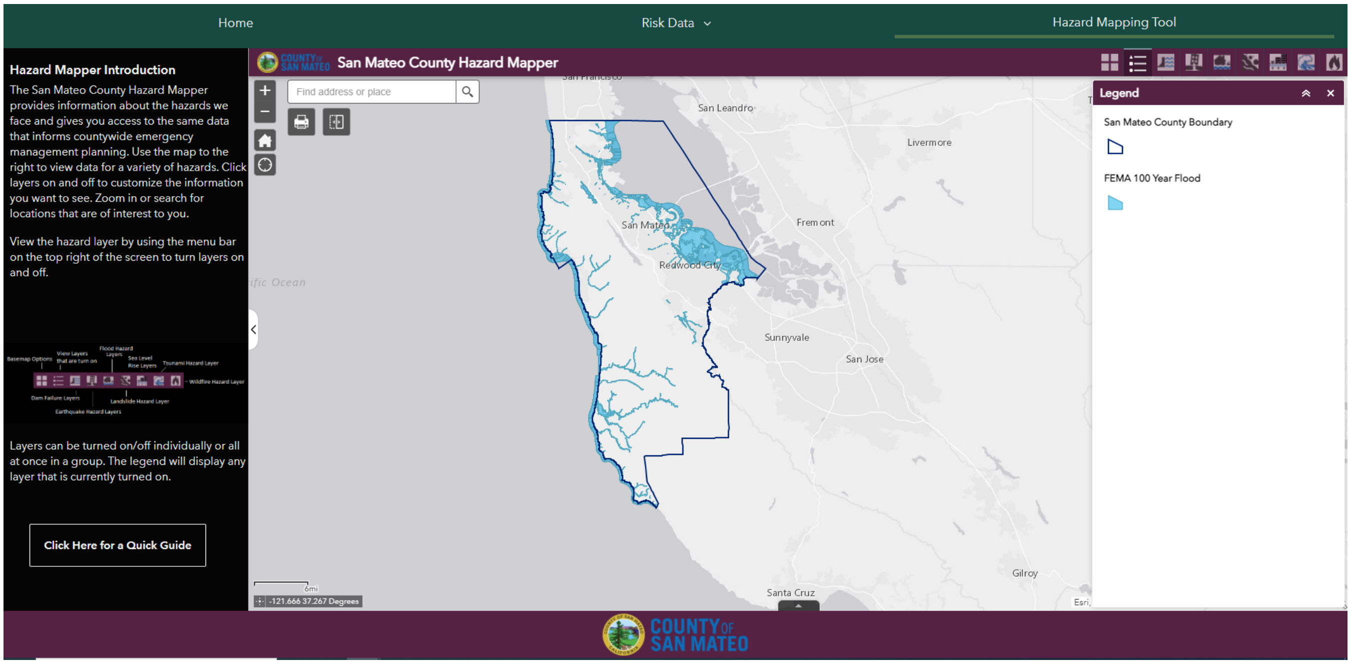


Figure 23-1. Example Story Map Cover Page

All municipal planning partners support the creation of a linkage between the hazard mitigation plan and their individual general plans by identifying a mitigation action as such and giving that action a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan may include the following:

- Emergency response plans
- Training and exercise of emergency response plans
- Debris management plans
- Recovery plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Community wildfire protection plans
- Comprehensive flood hazard management plans
- Resiliency plans
- Community Development Block Grant Disaster Recovery action plans
- Public information/education plans.

Some action items do not need to be implemented through regulation. Instead, they can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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2021 Multijurisdictional Local Hazard Mitigation Plan

Appendix A. Hazard Mitigation Planning Equity Recommendations

Recommendations for Addressing Equity in Hazard Mitigation Planning

Background Report for the San Mateo County Multijurisdictional Local Hazard Mitigation Plan 2021 Update

This report was prepared by the San Mateo County Office of Sustainability, Planning and Building, and the County Manager's Office with support of the MJLHMP Core Planning Team.

Recommendations for Addressing Equity in Hazard Mitigation Planning

San Mateo County Multijurisdictional Local Hazard Mitigation Plan (MJLHMP) 2021 Update

Purpose Statement

San Mateo County is in the process of updating the 2016 Local Hazard Mitigation Plan, which is a regional and cross-jurisdictional effort to plan for the reduction of risk from natural and man-made disasters. Hazard mitigation planning seeks to protect life and property, prevent harm to communities and strengthen infrastructure so it can withstand hazards and climate impacts. The more effectively we plan to mitigate hazards now, the more we reduce impacts on our communities as well as our response and recovery time, increasing our resilience. Socially vulnerable communities are hit hardest during disasters and need the most support to recover (Jerolleman 2019). San Mateo County also faces new hazards, as the impacts of climate change place an increasing number of communities at risk and multi-hazard situations are further complicated by the COVID pandemic, requiring new strategies. The Federal Emergency Management Agency (FEMA) is increasingly encouraging jurisdictions to think through inequities in their areas and to support vulnerable communities through more equitable hazard mitigation planning guidance (FEMA 2020).

This report supports the County and Annex Partners by offering tools, actionable examples, and an overview of when and how to incorporate equity considerations throughout the process of updating the County's Multijurisdictional Local Hazard Mitigation Plan (MJLHMP) to better address risks to vulnerable populations. Furthermore, this report provides a roadmap to implement the MJLHMP's equity and community engagement principles, goals and objectives.

PART 1: Equity in the Context of Hazard Mitigation

There are many approaches to defining and evaluating equity, but at its core, equity is about everyone getting what we need to survive and thrive. According to the World Health Organization (WHO), *equity* is the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically. It is also a process of addressing historic and current inequities to strive for greater equality. There is an extensive field of practice related to equity and planning processes, climate equity and disaster equity. There are increasing efforts focused on Hazard Mitigation and equity including efforts from The Natural Hazards Center at University of Colorado at Boulder, National Association for the Advancement of Colored People (NAACP), and the Institute for Diversity and Inclusion in Emergency Management.

The Bay Area Climate Adaptation Network (BayCAN) Equity Working Group's Equitable Adaptation Guide (Salz et al. 2020) states that "*Equity* ensures fair outcomes, treatment, and opportunities for all people, ensuring everyone gets what they need to enjoy full, healthy lives. It is the process of reducing disparities that are systematically associated with social advantage/disadvantage." The first step to integrate equity into hazard mitigation is recognizing that disparities in health outcomes, inequities in living conditions, and lack of political power place many low income communities, people of color, people with disabilities, pregnant women, and historically disadvantaged people, among others, at greater risk of hazards and limits their capacity to adapt, respond and recover.

FEMA's *Guide to Expanding Mitigation* highlights how local governments can partner with communities to strive for equity in hazard mitigation, including the planning and project development process. The guide recommends taking a "Whole Community" approach and involving historically underserved populations in the planning and decision-making processes, and also recommends the inclusion of those with access and functional needs, businesses, faith-based and community organizations, nonprofit groups, schools, academia, media outlets, and all levels of government, including state, local, tribal, territorial, and federal partners that have a shared responsibility in emergency preparedness and mitigation.

When incorporating equity and inclusion approaches it is optimal to work with leaders of the groups that you are seeking to better include. Particularly with a highly structured planning process like the MJLHMP it is important to communicate that your jurisdiction is seeking to *increase* inclusion or *incorporate more* equitable approaches. Equity and inclusion can mean different things to communities and government entities, so it is important both to implement the most inclusive practices possible in your situation while not overpromising and disappointing your partners.

What is Social Vulnerability?

FEMA's National Risk Index defines *social vulnerability* as the susceptibility of social groups to the adverse impacts of hazards, including disproportionate death, injury, loss, or disruption of livelihood. In addition, FEMA's Guide to Expanding Mitigation adds that social vulnerability can influence an individual's or group's ability to prepare, respond, cope, or recover from an event.

They note that heightened vulnerability may be compounded by deficiencies in infrastructure and conclude that "While not predictive, understanding where populations have increased vulnerability and exposure to natural hazards can help emergency managers take actions to lessen impacts to these communities before an event or distribute needed recovery dollars after an event."

More locally, Climate Ready SMC defines *socially vulnerable communities* as "Populations with increased vulnerability to climate impacts due to existing inequities. Examples include people whose disabilities are not accommodated, people who live in more polluted neighborhoods and people whose race, religion or sexual orientation is targeted for discrimination."

San Mateo County Coastline

1.2 Understanding Social Vulnerability in Your Jurisdiction

Each jurisdiction (county, city or special district) either has or serves socially vulnerable populations. FEMA recognizes that the following populations may be disproportionately impacted by disasters:

- Underserved communities with a low socioeconomic status
- People of color
- Tribal and first nation communities
- Women
- Members of the LGBTQ+ community
- Individuals experiencing homelessness or displacement
- Rural communities
- Elderly and youth
- People with limited English proficiency
- Service workers and migrant laborers
- People with limited cognitive or physical abilities
- Institutionalized populations (in prisons and nursing homes)
- Renters

Social vulnerability exists in every part of San Mateo County, even in our most affluent and relatively homogenous communities. Below are some examples of how a member of a socially vulnerable group may face barriers, increased risks and unique challenges from hazards and disasters:

Examples of how social vulnerability increases risks from hazards

- Undocumented immigrants may not feel safe accessing shelters or relief, as was the case during the North Bay Fires. Transgender people may be refused shelter appropriate to their gender.
- Communities of color and/or transgender people may not feel safe seeking help from police.
- Members of the Muslim and/or Jewish community who follow strict prayer and dietary practices may not feel comfortable accessing shelters or emergency food supplies.
- Indigenous community members may feel that culturally essential areas or resources are not being prioritized for mitigation.
- Low-income people may not be able to afford air filtration devices, generators, air conditioners, or to replace spoiled food resulting from power outages.
- Informal workforce and outdoor workers may not be included if sheltering in place is necessary while they are working at an employer’s work place or home.

Disruption of access to basic needs

- Transit dependent populations will need assistance to evacuate rapidly.
- Community members who depend on food from formal and informal food banks may not be able to access adequate food if a disaster or hazard disrupts food distribution.
- Community members may be unable to access their go to resources such as their faith community and community organizations with cultural, linguistic and accessibility competencies.

1.3 Sources of Social Vulnerability Data in San Mateo County and Nationwide

The Community Vulnerability Index (CVI) is an initiative of the County Manager's Office which aims to demonstrate the geographical distribution of the overall vulnerability of the residents of the county based on census tract level data (2010-2016) from United States Census Bureau's American Community. Indicators include:

- No Health Insurance Coverage
- Education – High School or Higher
- Supplemental Security Income
- Gross Rent as a Percentage of Income – Households Spending 35% or More
- Poverty
- Unemployment
- Disability

CREDIT: HALF MOON BAY REVIEW

Figure 1. List of helpful data mapping tools and resources related to social vulnerability:

CDC Social Vulnerability Index:

CDC Social Vulnerability Index (CDC SVI) uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters. The census variables includes factors such as poverty, lack of vehicle access, and crowded housing. https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

CalEnviroScreen 3.0

A screening tool that identifies communities most affected by and vulnerable to the effects of sources of pollution & population-based disparities. Aggregates state-wide environmental, health, and socioeconomic information to produce scores for every census tract in the state. When overlaid with climate impact and hazards exposure data, can provide insight into built and environmental exposure factors that contribute to vulnerability.

Get Healthy San Mateo County:
http://www.gethealthysmc.org/data

California Healthy Places Index:
https://healthyplacesindex.org/

San Mateo County Climate Ready Viewer:
https://gis.smcgov.org/apps/climateready/

CCHVIz:

The Climate Change & Health Vulnerability Indicators for California provides tools to better understand people and places that are more susceptible to adverse health impacts associated with climate change, specifically extreme heat, wildfire, sea level rise, drought, and poor air quality.

APEN Mapping Resilience Report

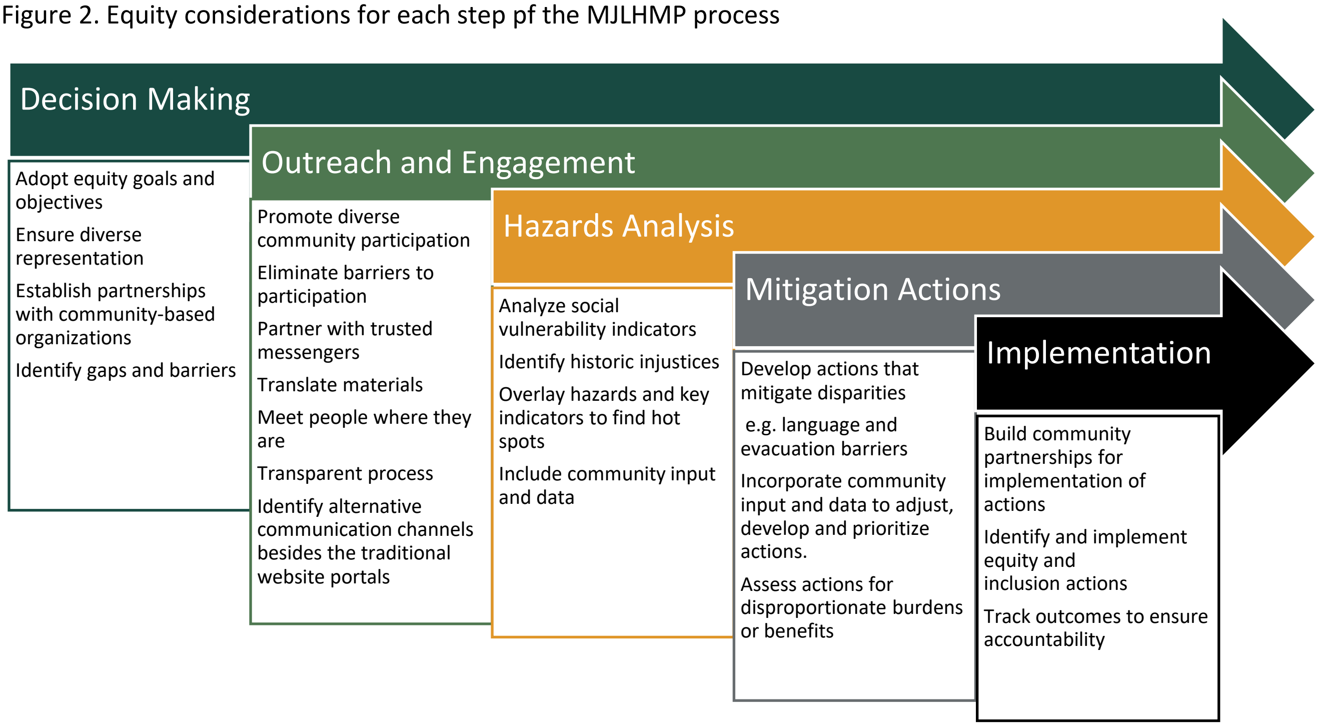
The report contains a grid comparing 40 mapping frameworks and their indicators on pages 58 and 59.

TIP: Look for data at the block group level to see more detailed local nuances such as this SMC Community Affairs Census Map.

1.4 Framework to Integrate Equity into the MJLHMP Process

While San Mateo County does not yet have a comprehensive equity framework, the County has incorporated equity into the [SMC Recovery Initiative](), the County's response to COVID-19. In many ways, hazard mitigation strives to prevent impacts that response and recovery efforts address so much of the recovery framework is applicable to LHMP planning. The following framework was adapted from the Recovery Initiative for the use of planning partners to incorporate equity into the MJLHMP process.

Figure 2. Equity considerations for each step pf the MJLHMP process



Using an equity lens is new for most of us. It can be difficult to identify ways to operationalize equity in to a structured public planning process. The following grid provides detailed examples of equity considerations and recommended actions tailored for different aspects of the LHMP process.

Table 1. Examples of how to use an equity lens in hazard mitigation planning

Framework	Equity Considerations	Recommended Actions
Decision Making and Solutions: MJLHMP and Annex Pre-Planning and management	○ Who sits at the decision-making table? ○ Are there systematic barriers to participation in the planning process? ○ How will community and stakeholders be involved, and mutual communication be established? ○ Scan for gaps – are needs of key socially vulnerable groups addressed?	✓ Establish equity principles and objectives to guide the MJLHMP process. ✓ Include community-based leaders on the MJLHMP Steering Committee including in plan development and review to identify gaps and opportunities for action. ✓ Establish partnerships with community-based organizations to inform process, identify actions, and foster mutual communication. ✓ Plan for integrating community feedback into plan update.

Accountability, Communication and Community Engagement	○ How to include and deliver outcomes for those underrepresented in decision making or most affected by inequities? ○ How will we be accountable to the community from planning process throughout implementation? ○ *See guidelines on Part #2 of report*	✓ Use American Community Survey data and work with community-based organizations to identify who is in your community. ✓ Implement specific engagement for hard to reach, socially vulnerable and traditionally underserved populations. ✓ Implement mechanisms to report back to community members about how their input was addressed.
Understanding Data: Hazard analysis and risk assessment	○ How does inequity increase the impact of the hazard or climate impact? ○ How will race, ethnicity, gender identity, income, languages spoken, disability, age, or medically sensitive people be affected by a disaster or climate impact? Are any of these groups concentrated in high risk areas? ○ Did we miss anything because we are not familiar with day to day life or what it is like to experience a disaster in a socially vulnerable community? ○ *See guidelines on Part #3 of the report and refer to Appendix A for details on the approach to be used by Tetra Tech for the MJLHMP 2021 update.*	✓ Engage with community stakeholders to Identify socially vulnerable neighborhoods and population groups and assure that locally-relevant hazards, risks and social vulnerability are included in the analysis. ✓ Analyze social vulnerability, hazards and climate data together (required by SB379). ✓ Consider race, ethnicity, gender identity, income, languages spoken, disability, age, medically sensitive people, especially regarding the individual or group's ability to prepare for, survive and recover from a disaster or climate impact. ✓ Assess long-standing and multi-generational inequities, e.g. redlining, underinvestment, hazardous waste sites. ✓ Consider ways to measure cost of risks and hazards beyond property value, which undervalues the impact of asset loss to socially vulnerable communities.
Burdens and Benefits: Drafting mitigation measures and updating the plan	○ Would low-income households or communities of color experience a disproportionate burden? Will affluent communities receive disproportionate benefit? ○ Have historical inequities led to more substantial infrastructure needs in some communities? ○ Will the proposed measures result in displacement of vulnerable community members?	✓ Evaluate past mitigation measures and adjust or add to them to be more equitable and address gaps and new risks affecting vulnerable populations. ✓ Incorporate previously developed community solutions when possible. ✓ Update approach to hazards which have increased in severity and are hitting socially vulnerable community members hard, such as fire, pandemic, heat, smoke related to wildfires, and power outages. ✓ Identify physical barriers and old/lack-of infrastructure in vulnerable and underserved communities. ✓ Involve community-based organizations in evaluation of benefits and burdens.
Next Steps: Throughout and at the end of the process	○ How can barriers to inclusion be addressed so the process can be more thorough and inclusive now and in the future?	✓ Leverage existing and build new relationships with community leaders and stakeholders to support equity and inclusion efforts. ✓ Act responsively when equity considerations are identified.

PART 2: Using an Equity Lens for Hazard Mitigation Community Engagement

Effective outreach and community engagement increases buy-in and support for the MJLHMP process. FEMA's Hazard Mitigation Planning Handbook identifies these as key components of successful outreach:

SUCCESSFUL OUTREACH

- Informs and learns about hazards, climate impacts, local risk and social vulnerability
- Invites interested parties to contribute their views and ideas for mitigation
- Identifies conflicts and incorporates different perspectives and priorities early in the process
- Secures data an input that improves overall quality and accuracy of the plan
- Ensures transparency and builds trust
- Maximizes opportunities for implementation through greater consensus and acceptance
- Identifies and eliminates barriers to participation and assures hard to reach and traditionally underserved communities can access the process

Many planning processes traditionally have used a set of traditional engagement methods, including English-language surveys, workshops and presentations. These forms of engagement are often are hard to access for the general public and especially so for socially vulnerable communities. All cities in San Mateo County have populations that are hard to reach or who have difficulty accessing these engagement methods. Examples include residents that can't access online resources, older adults, youth, people with disabilities, residents with limited education or literacy, residents who face differential treatment due to their race, ethnicity, religion or other social characteristic, such as low income. Below are strategies to increase inclusivity and collect a more thorough set of input through accessibility and inclusion practices.

Trail Work at Memorial Park in San Mateo County

2.1 Hard to Reach Community Engagement Strategies

BUILD PARTNERSHIPS AND TRUST

- ☑ Attend existing community meetings and partner with local organizations and leaders.
- ☑ Reach out to colleagues in other departments or partner organizations that work with hard to reach communities more frequently such as parks and recreation, libraries, community centers and faith organizations.
- ☑ Be prepared for potential existing community frustrations; route community concerns unrelated to the MJLHMP to the appropriate parties.
- ☑ The San Mateo County Office of Sustainability can provide support to MJLHMP planning partners by being a resource for questions about equity and inclusion tools and approaches, and to facilitate connection to community organizations to strengthen capacity to engage hard to reach populations.
- ☑ Prioritize socially vulnerable communities in areas at high risk for hazards and climate impacts.
- ☑ Hire or provide resources to community-based organizations in your jurisdiction who have existing relationships to lead or support engagement efforts when possible. Collaboration between subject matter and community experts is an optimal way to tailor engagement methods and materials.

CULTURALLY APPROPRIATE COMMUNICATION

- ☑ Review material for accessible language and consider disability access. Will the terms mean the same thing they mean to topical specialists as they do to different types of audiences? Consider education level needed to access the information.
- ☑ Bridge from plan to real life community concerns by learning about key community issues in advance and then talking about the plan in terms that are resonant to the community. Community leaders or elected officials are familiar with community concerns and can assist you in framing communication.
- ☑ Provide locally, culturally, linguistically appropriate community engagement that will resonate with each hard to reach population in your community.
- ☑ Community members may not understand what we mean by hazard or climate impact, so give examples: “the plan seeks to prevent harm from fire, flood, earthquake, pandemic, etc.”
- ☑ Examples must be relevant to the audience or inclusive of the audience. Assume participants will include some that can’t afford to pay for insurance or other mitigation measures.

PART 3: Integrating Social Vulnerability into Hazards Analysis and Considerations for Mitigation Planning

It is important to understand which individuals, populations, and communities will be most impacted by a hazard in order to reduce risk and create equitable outcomes. The following section discusses the hazards that have the potential to affect San Mateo County and indicators of social vulnerability specific to each hazard. The hazards currently addressed in the 2016 San Mateo County LHMP include Climate Change, Dam Failure, Drought, Earthquakes, Flood, Landslide, Severe Weather, Tsunami, Wildfire, and several Human-Caused Hazards. The 2021 San Mateo County LHMP will likely also include Health and Pandemics as well as Heat under the Extreme Weather hazard category.

Tetra Tech, the consultant providing support with the SMC MJLHMP update, has developed a detailed approach for integrating social vulnerability data into the hazard analysis, as explained in detail on Appendix A. San Mateo County planning partners are encouraged to choose this enhanced protocol for risk ranking that integrates social vulnerability data (Appendix A), which will also screen each mitigation action they identify for equity considerations. This approach was successfully utilized on the City of Portland's Hazard Mitigation Plan.

DEFINITIONS

"Hazard" is an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural losses, damage to the environment, interruption of business, or other types of harm or loss (Cal OES 2018).

"Risk" is the potential for damage or loss created by the interaction of hazards with assets such as buildings, infrastructure, or natural and cultural resources (Cal OES 2018).

"Vulnerability" is the level of exposure of human life and property to damage from natural and human-made hazards. For buildings and other structures, "vulnerability" means susceptibility to damage given the inherent characteristics of a particular structure (Cal OES 2018).

3.1 Vulnerability Indicators Applicable to All Hazards:

- **Income:** Low income populations are often more exposed to nature disasters (Bousta et al. 2017) and have fewer financial resources to prepare and recover from disasters. Low-income neighborhoods also have compounding challenges such as higher impact of COVID (essential workers and density), historic underinvestment in infrastructure, zoning which allows or has allowed greater air, water and soil pollution or hazardous waste, greater likelihood of being in a flood zone, and a greater likelihood of being exposed to greater heat impacts (mid to South County).
- **Race and Ethnicity:** According to a literature review in the Journal Disasters (Fothergill et. al, 1999) **"...**racial and ethnic communities in the US are more vulnerable to natural disasters, due to factors such as language, housing patterns, building construction, community isolation and cultural insensitivities."
- **Children and youth:** Youth are dependent on adults for many things and tend to be highly dependent on their phones.
- **Older adults:** Older adults may depend on paratransit and need electricity for medications and health devices.

- **People with disabilities:** Some people with disabilities require electrical power for devices that perform life and death functions such as assisting breathing.
- **People in poor health or with chronic diseases**: For example, the Environmental Protection Agency (EPA) has identified key populations "sensitive" to wildfire smoke including people with asthma and cardiovascular disease. People who require dialysis or insulin face post-disaster challenges.
- **Limited English proficiency or linguistic isolation:** Non-English speakers may not understand emergency alerts unless local authorities provide information/alerts in all locally spoken languages.
- **Pregnant women:** American College of Obstetricians and Gynecologists (ACOG) identifies continuation of prenatal care as a priority, including sites that are prepared to offer care post-disaster and communication to women in the third trimester (ACOG 2010).
- **Women:** According to ACOG, "Women involved in disasters are also at an increased risk for sexual assault and should be provided a safe and secure environment in evacuation shelters." (ACOG, 2010)
- **Lack of vehicle access/transit dependent:** Transit-dependent populations will require assistance during an evacuation and maybe unable to evacuate rapidly. Children, older adults, and people with a disability are more likely to be transit-dependent.
- **People who are unhoused:** Unhoused people face hazards and disasters without any protections, may not be able to access needed services and shelter, and may not receive alerts.
- **Undocumented Immigrants:** Undocumented immigrants may not feel safe accessing shelters or relief.
- **Political disenfranchisement:** Consideration should be given to continuity of access to voting for those displaced by disaster or who lose their documentation in a disaster.
- **LGBTQQI:** For example, transgender youth may face unique challenges and need tailored support in a disaster situation as documented by this news report (Compton 2017). Shelter infrastructure may be organized in a way that excludes or endangers transgender people.
- **Rural Communities:** Rural areas can face increased risks from older infrastructure and are less likely to receive recovery. Cost-benefit analyses can be biased in favor of densely populated areas (Jerollman 2021).
- **Unincorporated communities:** Areas with substandard infrastructure that have pockets of vulnerable Black Indigenous People of Color (BIPOC) communities in them.

Climate Change

Climate change will intensify the impacts of many of the other hazards listed below, and therefore shares the same indicators of vulnerability.

Dam Failure

In San Mateo County dam failures could impact already socially vulnerable communities in some parts of the County. Dam Failure is an uncontrolled release of impounded water due to structural deficiencies in a dam, which can be catastrophic to human life and property downstream. While no dam failures have previously occurred in San Mateo County, 13 of the 21 dams in the County could endanger lives and property in the case of a failure. While the entire population within a dam failure inundation zone is considered exposed and vulnerable, the most vulnerable include economically disadvantaged and the population over age 65 (San Mateo County 2016). Dams were designed to withstand expected levels of pressure from water; with increasing precipitation due to climate change could increase water pressure beyond planned tolerances (New York Times, 2020).

Drought

Drought is the cumulative impacts of several dry years on water users, which can include deficiencies in surface and subsurface water supplies, and effects on health, wellbeing, and quality of life. San Mateo County has experienced four significant droughts in the last 45 years, and droughts are likely to continue to occur in San Mateo County (San Mateo County 2016). Drought can lead to farmworker job loss (Mcclurg 2015), food insecurity (Mbow 2017), and can impact communities reliant on groundwater for drinking water.

Earthquakes

An earthquake is the shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates. California is seismically active because it sits on the boundary between two of the earth's tectonic plates. The last significant seismic event recorded in the San Mateo vicinity, occurred in 1989 during the San Andreas Loma Prieta Earthquake. Two groups who are particularly vulnerable to earthquake hazards are low income households and people over 65 years of age (San Mateo County 2016).

Flood

A flood is the inundation of normally dry land resulting from the rising and overflowing of a body of water. Heavy rains are the most frequent cause of flooding within San Mateo County jurisdictions, although coastal jurisdictions may also undergo flooding as a result of high winds, high tides, storm surge, and tsunami events (San Mateo County 2016). Additional indicators of vulnerability to flooding include:

- Poor housing quality
- Lack of housing affordability
- Housing tenure
- Communities with industrial/hazardous sites
- Communities with older infrastructure
- Previously redlined communities
- Lack of green spaces and vegetation
- Increased impermeable surfaces
- Limited number of roadways

Landslide/Mass Movements

According to the U.S. Geological Survey (USGS), the term "landslide" includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides and mudslides can be initiated by storms, earthquakes, fires, or human modification of the land. Landslides have occurred regularly within San Mateo County and can pose a serious hazard to properties on or below hillsides. Landslides can result in the destruction of foundations, offset of roads, breaking of underground pipes, or overriding of downslope property and structures.

Severe Weather/Extreme Weather

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes atmospheric rivers, extreme heat, extreme cold, lightning sieges, poor air quality, among other events. Indicators of vulnerability to extreme heat include:

- Outdoor workers & farmworkers
- Residents living in older homes
- People who are unhoused
- People susceptible to health impacts from poor air quality
- Lack of air conditioning
- Deforestation and lack of green spaces and tree cover
- Lack of basic information on what to do during high heat days and smoky days
- Lack of community shelters or resiliency hubs for cooling and smoke relief
- Lack of a local or county/district emergency plan being in place
- Lack of access to affordable health care
- Paved surfaces and urban heat island effect

Tsunami

A Tsunami is a series of traveling ocean waves of extremely long wavelength, usually caused by displacement of the ocean floor and typically generated by seismic or volcanic activity or by underwater landslides. In the past California has been struck by several minor tsunamis and several major tsunamis and San Mateo County specifically has been struck by several minor tsunamis. The populations most vulnerable to the tsunami hazard are the elderly, disabled, and very young who reside or recreate near beaches, low-lying coastal areas, tidal flats, and stream or river deltas that empty into oceangoing waters. Visitors recreating in or around inundation areas would also be vulnerable, as they may not be as familiar with residents or appropriate responses to a tsunami or ways to reach higher ground.

Wildfire (& Air Quality)

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for significant damage to life and property exists in areas designated as wildland-urban interface (WUI) areas, where development is adjacent to densely vegetated areas. Based on risk factors for the County and past occurrences, it is highly likely that wildfires will continue to occur in San Mateo County. Additional indicators of vulnerability to wildfire include:

- Electricity-dependent populations
- People susceptible to health impacts of air pollution
- Poor housing quality
- Workers in the informal economy
- Lack of green spaces and vegetation
- Industry/hazardous site

Figure 3: Example of overlapping social and wildfire risks in San Mateo County. The image below shows a concentration of very low income (as defined by US HUD for SMC) households in gray within the boundary of the San Gregorio Large Fire Potential Scenario in pink based on SMC Climate Ready modeling. Low income community members could encounter a variety of distinctive challenges in a fire scenario due to lack of funds to address both evacuation and basic needs.

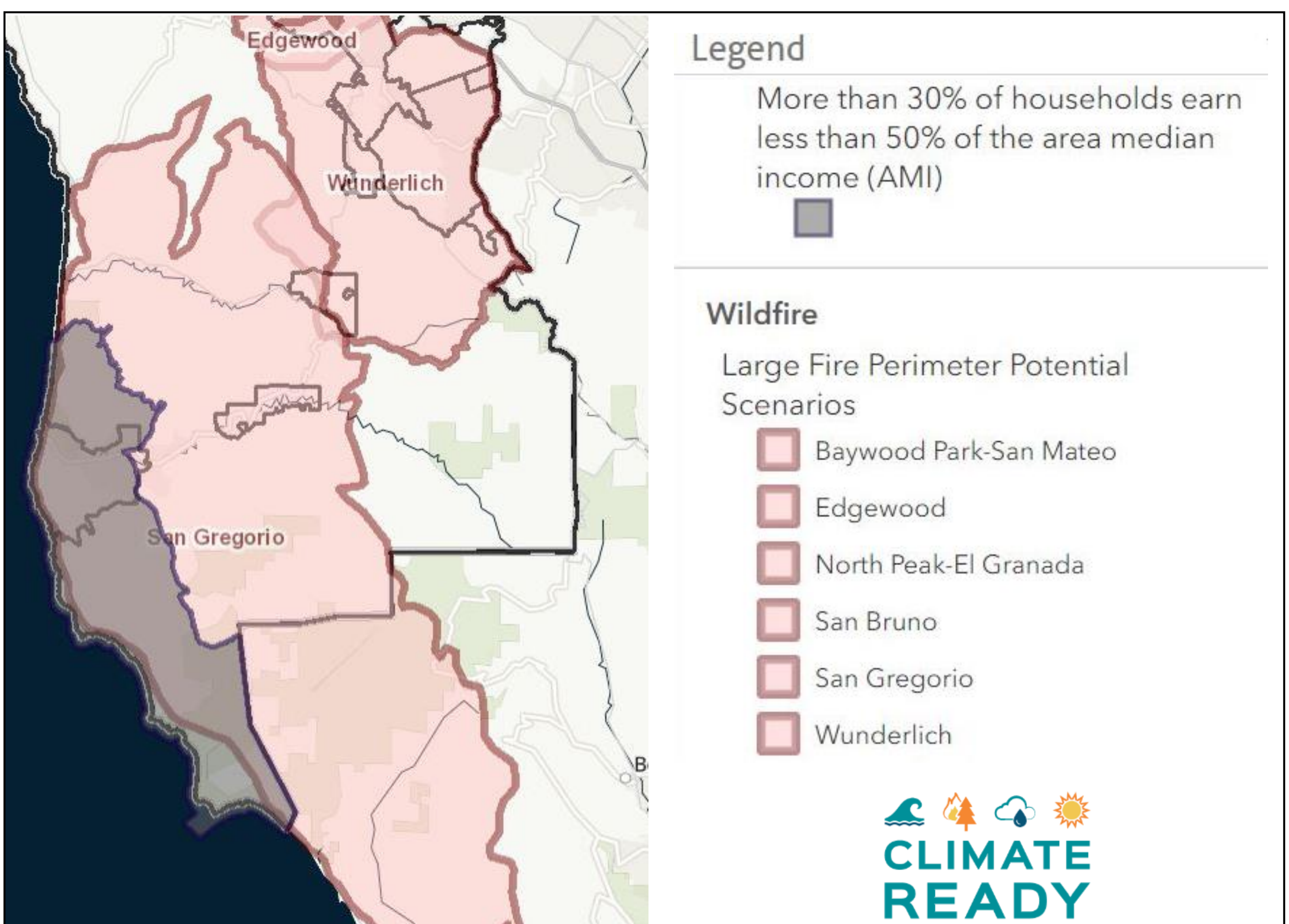
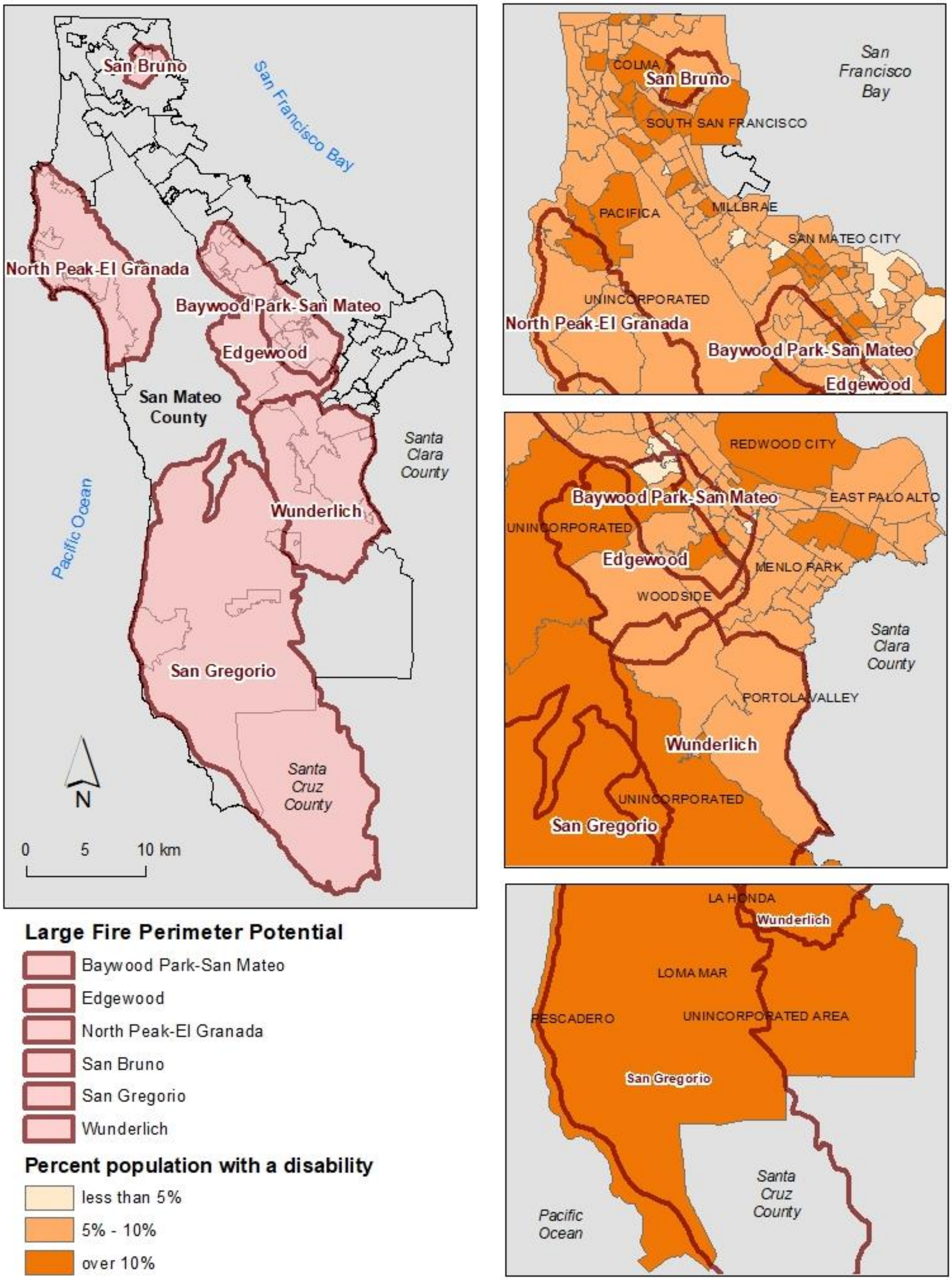


Figure 4: Example of overlapping wildfire risks, based on modelling from [Climate Ready SMC](), and population with disabilities in San Mateo County, represented by the orange blocks.



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Appendix A. Recommendations for Incorporating an "Equity Lens" into the San Mateo County Multijurisdictional Hazard Mitigation Plan

The following information summarizes the options that Tetra Tech is recommending to the Core Planning Team (CPT) for the update to the San Mateo County Multijurisdictional Hazard Mitigation Plan, on how to integrate a social equity lens into the standard hazard mitigation planning process, without impacting the timeline. Before presenting these recommendations, the key points Tetra Tech would like to emphasize are:

- This is a multi-jurisdictional scope plan that included both municipal and special purpose district planning partners. While both are defined as "local governments" under the Disaster Mitigation Act of 2000, each has very different responsibilities and roles mitigating the impacts from hazards.
- Addressing social vulnerability is not a requirement for Local Hazard Mitigation Plans prescribed under 44CFR, section 201.6.
- There are distinct limitations regarding data available to assess social vulnerability in the context of what is required for a local hazard mitigation plan.

With these points in mind, the recommendations provided below have been separated into Standard elements and Optional elements. The standard elements are ways the plan can enhance acknowledging the concepts and principles of an "equity lens" without disrupting the standard protocols applied for risk ranking and action planning. The optional elements are enhancements that would impact the risk ranking and action planning protocols and would be considered "optional" be each planning partner based on their desire to utilize the equity lens concepts for this plan update. Tetra Tech feels very strongly that the only way for this process to not appear as being a forced directive from the County, is to give each planning partner the option to adopt the proposed protocols. The Overview of the recommendations are as follows:

Standard Elements

Regional Profile: Volume 1, Part 1, Chapter 4 of the plan provides a regional profile of the entire planning area broken down into the following sections:

- Historical Overview
- Major Past Hazard Events
- Physical Setting
- Development
- Demographics
- Economy

Recommendation: Following the "demographic" section of Chapter 4, create a new section titled "Social Vulnerability and Hazard Mitigation". This section will be utilized to frame how the social vulnerability lens will be applied to this hazard mitigation plan update. This section should clearly outline the Planning Partnership's understanding of social vulnerability, identify the metrics (indicators) that will be utilized to measure it, and identify the gaps in data that create challenges for inclusion in the mitigation planning process. This section of the plan will be very important as it will set the table for how social equity will be addressed by this plan. Where the equity lens will be applied and where it won't. It will very clearly state the limitations in assessing social vulnerability based on the type of data available and how it can or cannot interface with standard best management practices for hazard mitigation planning risk assessment and ranking. It is also this section where we could attempt to address "historic injustices" in a qualitative, overarching manner, dependent upon data available to support this discussion.

Hazard Profiles: Volume 1, Part II, Chapters 7-17 of the plan are the risk assessment portions of the plan that will include a chapter for each identified hazard of concern. Note: that natural hazards will be fully assessed pursuant to the requirements of 44CFR, section 201.6, while other hazards of interest will be profiled, but not fully assessed. The profile for each hazard that is fully assessed is broken down as follows:

- General Background
- Hazard Profile
  - Past Events
  - Location
  - Frequency
  - Severity
  - Warning Time
  - Compounding Factors and Secondary Hazards
- ***Exposure***
  - ***Population***
  - Property
  - Critical Facilities and Infrastructure
  - Environment
- Vulnerability
  - Population
  - Property
  - Critical Facilities and Infrastructure
  - Environment
- Economic Impact
- Future Trends in Development
- Scenario
- Issues

Social Vulnerability as defined under FEMA's National Risk Index:
Social Vulnerability is the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.

Recommendation: Under the "Exposure" section for each fully assessed hazard profile, a new sub-section will be added titled "Social Vulnerability Indicators". Under this section, the exposure by social vulnerability indicators will be discussed as it pertains to the extent and location of the hazard being profiled. Tetra Tech recommends utilizing the "Social Vulnerability" indicators defined by FEMA under its National Risk Indexing program (NRI) https://hazards.geoplatform.gov/portal/apps/MapSeries/index.html?appid=ddf915a24fb24dc8863eed96bc3345f8

The NRI data will be processed so that the risk indexing will be relative to San Mateo County and not based on the comparison to national averages. Please note that only NRI datasets will be utilized. There will be no creation of "hybrids" using local data.

The reasons for utilizing this data would be that it already has data available nationwide in a format suitable for hazard mitigation planning risk assessment. It is important to note that using and existing data set that has already been vetted and validated is ideal considering the expedited timeline for this process. We simply do not have the time to create and vet new social vulnerability indices. Please note that not all hazards have a clearly defined extent and location, so for those hazards that don't, this discussion would focus on the indices for the entire planning area. This will be a spatial exercise utilizing best available data for each indicator identified.

No attempt will be made to quantify social vulnerability under the "vulnerability" section of each hazard profiled. This will be due to the inconsistencies that would result from trying to intersect regional data (census tract or block level data) with the building specific, point-based data that is the basis for the vulnerability assessments for the plan. This would be clearly explained in Chapter 6 of the plan that defined the methodologies applied for the risk assessment of the plan.

Public Outreach Strategy: The Public Outreach strategy for this plan update process should be framed with an equity lens, and strive to include the following elements that can be completed within the expedited timeline:

- Provide information in easy to digest form and ensure the understanding of information shared by the community at large
- Promote diverse community participation. This should be done through the identification of, and outreach to, trusted community-based organizations.
- Utilize trusted messengers: similar to above
- Translate outreach materials
- Meet people where they are
- Transparent process: We have included the Tt-produced graphic to show which step in the process we are in (added to website). The steering committee meetings will be open to the public, two resident surveys, and resident public meetings.
- Provide the public with links to other relevant websites that the County wants to promote.

Optional Elements

Risk Ranking: Volume 1, Part II, Chapter 19 of the plan currently has a risk ranking protocol that defines "risk" as Probability x Impact where impacts are defined as the impact on the people, property, economy and environment of a planning area. Metrics have been defined for each component that result in each hazard getting is risk score, so that the hazards that were fully assessed can be compared. Risk ranking in this plan takes place on 2 fronts. First, the hazards are ranked for the entire planning area using aggregate data from the risk assessment. Next, each planning partner will rank the risk for their specific jurisdiction utilizing risk assessment data specific to their jurisdiction.

Recommendation: As an optional element, Tetra Tech would recommend establishing 2 versions of the risk ranking protocol. One version would be the standard protocol that is currently being applied under the 2016 plan. The other, would enhance that protocol to include a social vulnerability element utilizing FEMA's National Risk Index (NRI). So, for example:

- **Standard Protocol: Probability x (impacts on People + Property + Economy)**
- **Enhanced Protocol: Probability x {impacts on (People + NRI Social Vulnerability Rating) + Property + Economy}**

The enhanced protocol would need to be developed by Tetra Tech looking at appropriate weighting to the metrics (the NRI social vulnerability rating). The results for both approaches would be categorized as "high, medium or low". The objective for this duel process would be for it to seamlessly integrate into the planning process without creating any delays in the process. It is important to note that having 2 options for ranking risk would create 2 different scoring regimes for the ranking of risk. However, as long as these metrics are clearly defined and protocols established, it should not lead to any confusion within the plan or the planning partnership.

Action Planning: Each planning partner is required to identify and prioritize at least 1 action that addresses each hazard that was ranked as "high" under the risk ranking protocol defined for the plan. This does not mean that the action plan is limited to only addressing high ranked hazards, it just means that it must at a minimum. For those planning partners that were covered under the 2016 plan, they must fully reconcile their actions from the prior plan and determine which actions are to be carried over to this plan update. For each action, the jurisdiction must identify:

- The hazard(s) the action will address
- Whether the Action will address new of existing assets
- The lead agency responsible for implementation
- Any support agencies
- The objectives the action will meet
- The sources of funding for the action
- Timeline for completion

Recommendation: For those planning partners that chose the enhanced protocol for risk ranking, they will screen each action they identify for equity considerations that may result in a reframing of the action. This approach was utilized with success on the City of Portland's Hazard Mitigation Plan. Tetra Tech developed 2 tools to support this process: an equity screening review tool (*Table 1.0*) and an equity screening question matrix (*Table 2.0*). Both tools were applied by the departments in the development and framing of each action in the action plan.

Both tools could be adapted specifically to address the needs for the San Mateo County planning effort. It is important to note that this recommendation includes no changes to the prioritization of the action. Tetra Tech feels that the current prioritization protocol is adequate and is supportive of both options being proposed. For those partners that chose to use the Enhanced protocol, their action plan matrix would be expanded to include the identification of which "equity category" (Procedural, Distributive, or Structural) each action meets.

Table 1.0. Equity Screening Review Tool

	Procedural	Distributive	Structural
Programs/ Services	How was the target audience included in the design of the program? What actions will be taken to ensure that services and programs are physically and programmatically accessible and inclusive? What are the criteria for participation or receipt of benefits?	Is the program or service designed to meet the needs of underserved and underrepresented communities? If not, what would need to be changed to ensure their equitable participation? How will program dollars be allocated to ensure inclusive and accessible service delivery? Does the cost structure of the program result in disparate use? /Does the fee structure of the service result in increased burdens for low-income communities?	Does this program/service create unintended consequences for communities that are underserved and underrepresented? How will they be mitigated? Is there an opportunity to extend additional benefits through this program/service that can help support the healing of past harms to communities? Does the program empower and build capacity of a community?
Capital Investments	What are the criteria for prioritizing projects and investments? Does the data and information used consider the demographic, geographic and real-world experience of residents and businesses in the area? If data gaps exist, what are you using to guide decisions? What process will be used to get input from the community? How will you reach underserved populations?	Will the investment provide improved safety, health, access, or opportunity for the communities who need it most? How will the underserved people who currently live and work in the area benefit from the investment?	What measures will be taken to mitigate the potential impacts of involuntary displacement in the project? How will business or employment opportunity created through the project be extended to communities of color, people with disabilities, and low-income people? How will community benefits be negotiated?
Regulation	Has analysis been done on the impacts to communities of color, people with disabilities, low-income populations, seniors, children, renters, and other historically underserved or excluded groups? How will impacted communities be able to learn about and understand changes with the regulation? How will the regulation be enforced?	Will the regulation provide improved safety, health, access, or opportunity for the communities who need it most? How will the regulation alleviate any cost-burden for those who are already in a position where it is difficult to pay?	Does the regulation create or inhibit opportunity for communities of color, people with disabilities, and low-income populations? Will enforcement disproportionately negatively affect low-income communities or communities of color? How will this be mitigated?
Planning	How will impacted communities be involved in the planning process? What measures will be taken to ensure the process is fair and inclusive?	How does the plan prioritize and address the needs of the most impacted or vulnerable in the community? Does the plan improve safety, health, access, or opportunity for the communities who need it most? How will resources shift to ensure equitable implementation of the plan?	What measures will be taken to mitigate the potential impacts of involuntary displacement? How will policies support community development? What support is needed to build the community's ownership and self-determination with the plan?

a. Procedural equity—ensuring that processes are fair and inclusive in the development and implementation of any program or policy
b. Distributive equity—ensuring that resources or benefits and burdens of a policy or program are distributed fairly, prioritizing those with highest need first.
c. Structural equity—a commitment and action to correct past harms and prevent future negative consequences by institutionalizing accountability and decision-making structures that aim to sustain positive outcomes

Source: BPS Presentation, Climate Action Plan and Equity: Connecting the Dots with the Community

Table 2.0. Equity Screening Question Matrix

Evaluation Question		Response
1. What issue/problem/risk is the action designed to address? And what are the expected benefits?		Issue:
		Benefits:
2. Who is the target audience/beneficiary for this action? Who is affected if no action is taken?		
3. How would you classify the mitigation action? (Programs/Service; Capital Investment; Regulation; Planning). *Refer to questions in table above based on your answer to this question.*		
4. Will any community groups be involved in the design/implementation of this action? (i.e. potential partners)		
5. Will this action reduce risk from natural hazards for the following groups? How?		
	Communities of color	
	Persons with disabilities and/or access and functional needs	
	Households with limited English Proficiency	
	Renters	
	Economically disadvantaged families	
	Seniors (age 65 or older)	
	Children (under 15 years of age)	
6. How could this action benefit the following groups? Or How could this action be modified so that there are benefits?		
	Communities of color	
	Persons with disabilities and/or access and functional needs	
	Households with limited English Proficiency	
	Renters	
	Economically disadvantaged families	
	Seniors (age 65 or older)	
	Children (under 15 years of age)	
7. How could this action burden/negatively impact/leave out the following groups, for example through communication, transportation, physical or programmatic barriers?		
	Communities of color	
	Persons with disabilities and/or access and functional needs	
	Households with limited English Proficiency	
	Renters	
	Economically disadvantaged families	
	Seniors (age 65 or older)	
	Children (under 15 years of age)	
8. If you have identified burdens, barriers, or negative impacts, or opportunities for benefits please revisit the action to identify strategies to reduce or eliminate burdens or negative impacts; remove communication, transportation, physical or programmatic barriers; or enhance potential benefits.		
9. Have you identified a performance metric for evaluating progress on this action? How will you know when this action is complete? (please provide) Have you considered outcomes for communities of color, people with disabilities, low-income families, people with limited English proficiency, renters, seniors, and children?		

2021 Multijurisdictional Local Hazard Mitigation Plan

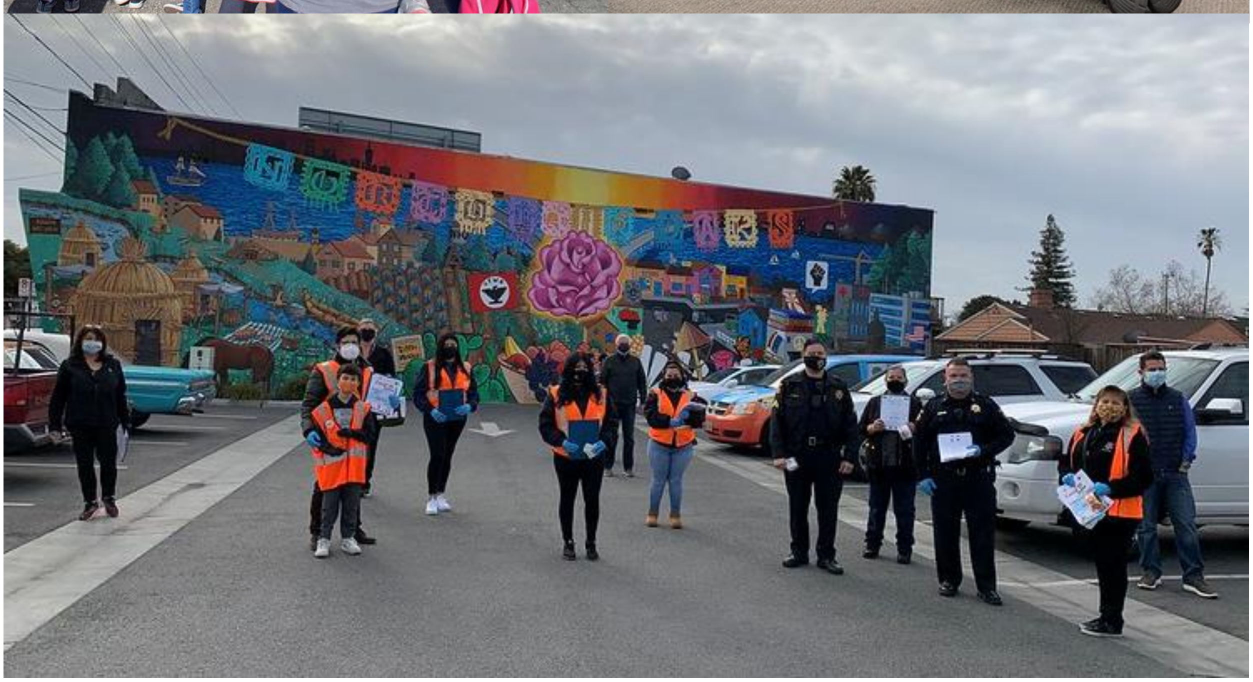
Appendix B. Public Outreach Information

SAN MATEO COUNTY
REPORT ON
OUTREACH EFFORTS
FOR HAZARD MITIGATION
PLAN UPDATE

REPORT: Hard-to-Reach Community Input

and Mitigation Actions Ideas for the San Mateo County's 2021 Multijurisdictional Local Hazard Plan Update

July 19, 2021



This report was prepared by the San Mateo County Office of Sustainability, Planning and Building.

Hard-to-Reach Community Input and Mitigation Actions Ideas

for the San Mateo County's 2021 Multijurisdictional Local Hazard Plan Update

Introduction

This report summarizes the input gathered through community engagement with hard-to-reach and socially vulnerable populations throughout San Mateo County for the County of San Mateo's Multijurisdictional Local Hazard Mitigation Plan Update.

The San Mateo County Office of Sustainability (OOS) conducted outreach activities designed to include socially vulnerable groups that are typically under-represented populations in LHMP planning in order to benefit from the experience and expertise of socially vulnerable community members and to support planning staff to incorporate social vulnerability considerations in mitigation actions.

OOS selected eight organizations in a competitive process to support outreach and engagement from March to July 2021. The organizations engaged frontline, traditionally underserved and/or socially vulnerable populations and communities that have not been effectively included in many traditional planning processes in the past.

The goal was to better understand what hazards were impacting these communities and how the impact was affected by social vulnerability, and then to gather community mitigation action ideas that would minimize community risk. For a description of the organizations and the communities they serve and an overview of events, see Appendix A.

Populations Reached

The community members engaged primarily included low-income communities, people of color including Latinos, African Americans, Pacific Islanders and others, rural and urban communities, monolingual community members, previously redlined communities, undocumented people, people with disabilities and medical needs, older adults, farmworkers and unhoused residents. Additional engagement to these and other hard to reach populations should be conducted in future planning. Several of the events were conducted in Spanish and some of the communications were modified to support access by people with disabilities.

Community members were engaged and put at ease because of the leading role of trusted and culturally and linguistically competent community-based organizations and online activities were accessible to transit-dependent urban and rural people. The recommendations made by the communities should be understood in the context of daily experiences of barriers, hardships, and creativity, leadership and resilience to overcome them. More detail about these frequently intersecting and compounding barriers is included in the Social Vulnerability section.

Summary of Community Mitigation Ideas by Hazard

WILDFIRES

Information in Spanish delivered by trusted CBOs

Well-publicized **evacuation routes and shelters** access for people with disabilities

Bilingual text alert system for evacuation warnings

Emergency preparedness training and how to stay safe if you can't evacuate

Defensible spaces assistance for seniors, people with disabilities

DROUGHT

Drought resistant landscaping and rain barrels in households

Habitat restoration and incentives for people to replace lawns

Greywater use, policies for new construction in commercial & multifamily building

Underground **water storage,** groundwater recharge, updating wastewater treatment plants to clean water to potable standards

Rain water catchment and dual plumbing to utilize grey water for landscaping in large land / commercial properties

HEALTH & PANDEMIC

Send test & vaccine info through SMC Alert, help vaccination appointments

Partner with CBOs to **communicate with people with disabilities & medical needs**

Foster community building and offer support for isolated seniors and other isolated people

Integrate **mental health & trauma support into training** for emergency responders

Free bus, home pick-ups and paratransit evacuations to shelters during an emergency

HEAT & POOR AIR QUALITY

Combined cooling & clean air centers accessible to people with disabilities

Partner with CBOs to **improve public messaging**, bilingual SMC Alerts

Programs: Solar + storage, updating HVAC systems, backup generators, home weatherization, tree planting

Community team to inspect homes for air leaks, thermal loss, to prevent heat & smoke intrusion

Education for employers on the risks for outdoor workers, provide protective equipment

FLOODING

Creek dredging, drainage ditch maintenance

Policies to allow **building higher**

Incentives for landlords to upgrade rentals and farmworker housing

Fixing roads, adding rain gutters, sidewalks, and **evacuation routes signage**

Subsidies to raise and flood-proof homes; county-sponsored contractor help

EARTHQUAKES

Handbook of numbers to call for help in case of an disaster

Pre-made emergency kits or list of items for an emergency kit

Text alert system for evacuation warnings

Safety and preparedness training especially for people living in apartments

Retrofit homes, apartment complexes not up to current building code standards

Summary of Key Mitigation Themes

COMMUNICATION and CAPACITY BUILDING

- Increase multilingual and multimodal communication, improve text alert systems.
- Invest in local broadcast media capacity to use during an emergency.
- Partner with trusted CBOs to improve outreach and provide preparedness training.
- Foster two-way communication and collaboration with organized and spontaneous community-led hazard mitigation and emergency preparedness efforts.

POLICY and INFRASTRUCTURE

- Consider disability access, vulnerable populations, language barriers and financial barriers to assure inclusive implementation in emergency planning.
- Address infrastructure needs for communities facing chronic hazards (such as heat and flooding), historic underinvestment in infrastructure or difficulty getting to resources elsewhere.
- Invest in solar power generators, batteries and power storage.
- Add more shelters and cooling/clean air centers and power charging sites.
- Provide more advance warning of known hazards and lower thresholds to open sites.
- Address the long-term viability of highway 1 due to sea level rise and erosion.

ELIMINATING ACCESS BARRIERS

- Address needs of low literacy people, people with disabilities and medical needs, low income people, undocumented residents, transit dependent populations, renters, vulnerable workers, communities with limited routes in and out and/or limited resilience resources, and people temporarily or permanently without access to the internet and/or telephone service.
- Address current infrastructural and institutional access barriers, such as related to sidewalks, buildings, construction, etc. to aid evacuation for people with disabilities, older adults, people with medical needs, strollers and bicycles, during hazard events.
- Provide free or affordable and conveniently located supplies, such as sandbags or air filters, and subsidized or loaned equipment, such as back-up batteries.
- Provide free coordinated evacuation including at the door pick-ups for people with disabilities and transit dependent people.

MANAGING MULTIPLE HAZARDS

- Planning and capacity to manage a combination of heat, smoke, COVID-19 and or power outage. Assure clean air and cooling in shelters and cooling centers.

See Appendix B for additional themes and details.

Mitigation Ideas by Hazards

The following section summarizes community recommendations for hazard mitigation.

Extreme Heat and Poor Air Quality

Heat and poor air quality due to wildfire smoke was one of the most commented upon topics.

General Recommendations: Most were centered on the need to have more cooling and clean air centers throughout the County that are accessible to people with disabilities, have stated policies welcoming undocumented residents, and better outreach including disability access information. People suggested mobile centers to deploy in vulnerable communities and using schools, libraries and churches as centers and shelters. Participants asked for improved communication about heat warnings and excessive heat events and for a list of cooling centers available ahead of extreme heat so that people with disabilities and medical conditions can have more time to prepare and respond.

Preparedness and Equipment Solutions: Providing free or loaner equipment such as fans and air purifiers, distributing better extension cords or surge protectors, and free pool access for residents on high heat days. People suggested having something like a Community Emergency Response Team (CERT) to inspect homes for air leaks, thermal loss, and to certify that structures are working as efficiently as possible to prevent heat and smoke intrusion.

Infrastructure Solutions: Ideas included investing in updating HVAC systems and solar plus storage for public facilities and shelters to address power shutoffs associated with heat events, providing backup generators for elderly and at-risk individuals, home weatherization for vulnerable communities, and tree planting as a strategy to reduce heat in communities lacking trees and shade.

Communications Solutions: In terms of communications, ideas included partnering with community-based organizations to improve public messaging around the impacts of extreme heat and preparedness strategies by implementing multilingual outreach to raise awareness about what they could do and where to go during a heat or poor air quality emergency, especially in unincorporated communities. Another solution recommended was to identify residents to be block representatives that can disseminate information to neighbors and notice who might need help. Using text messaging and phone calls to provide this information is the best way to reach the Latino community, and there is a need to assure all SMC Alert messages are bilingual. Multiple community members requested a list of cooling centers available ahead of extreme heat. Special information and education are needed to help employers understand the dangers of working outdoors during a heat or poor air quality event, as well as providing workers with protective equipment.

Wildfire

Wildfire was identified as one of the hazards of most concern by community members.

Information gaps and concerns: Lack of clear communication was one of the main issues identified, especially by Coastside communities. People mentioned that they did not have clear information about how and when to evacuate or where to go during the CZU-Lightning Fire in 2020, specifically lacking information in Spanish. Furthermore, they stated that the information provided and CalFire guidance was not easy to access or to understand for elders and low-income residents. Several people expressed concern about the difficulty to use ZoneHaven. More shelters are also needed on the Coastside along with accessible and affordable transportation to the sites.

Communications and Education Solutions: Ideas included more information in Spanish delivered by trusted community organizations, well-publicized evacuation routes, promoting the Firewise USA program to increase awareness and preparedness regarding wildfires, and sending multilingual messages via the text alert systems for wildfire evacuation warnings. Suggestions related to emergency preparedness training included education on how to stay safe from fire and smoke if you can't evacuate, since farm and outdoor workers, especially on the Coastside, are often required to keep working even during a wildfire situation.

Defensible Space: People said that creating and maintaining defensible spaces was difficult for seniors, people with disabilities or those who cannot afford or don't know how to clear defensible space around homes. Some organizations on the Coastside provide a home repair program that could be expanded to provide some services in this regard.

Other Wildfire Solutions: More funding for volunteer fire brigades was recommended. To address the lack of personnel to fight fires or to maintain defensible spaces in public lands/open spaces, people suggested an internship towards firefighting career path working with prisoners, homeless residents, and high school students. Ideas to address lack of water to fight wildfires included capturing stormwater runoff, building more water reservoirs and establishing pre-existing agreements for private water providers to be reimbursed.

Flooding

Policy Solutions: Policy related ideas include changing regulations to allow building higher, subsidies or training on how to flood-proof your home that include County-sponsored contractor help, providing low-cost loans to raise homes and post-disaster funding for repairs and appliances after a flood event to help people get back on their feet. Other ideas are related with providing incentives for landlords or lowering permitting fees to upgrade rental housing and farmworker housing, plus promoting community drain clearing and flood-conscious architecture.

Infrastructure Solutions: Ideas included assuring good road conditions and securing effective rain gutters prior to a disaster, completing drainage ditch maintenance, providing sidewalks for roads that don't have them to assure pedestrian safety, and creating evacuation routes signage and signage indicating whether it is safe to drive through flooded areas in communities prone to flooding. On the Coastside, suggestions included to continue Butano Creek bank restoration, and creek dredging.

Health and Pandemic

Overall, community members wanted to see health, medical, and disability considerations addressed throughout hazard mitigation and emergency planning and implementation.

Community Capacity: There was interest in increasing community-based capacity, for example training residential block leaders to conduct wellness checks and act as emergency contacts for neighbors. Community members noted that they developed their own strategies to respond rapidly and cope with COVID-19 with neighbors and community organizations and they want government to learn from and engage with these strategies.

Medical and Disability Needs: The needs of residents with health and mental health conditions as well as disabilities were highlighted as needing special attention in emergency planning, shelters and cooling/ clean air centers and evacuation.

Communications and Outreach: Community members wanted COVID-19 information, particularly about where to get tests and vaccinations, to be more readily available and distributed in a more visible way such as through SMC-Alert or through a one-stop-shop website and app including real time information during an emergency. Guidance on wearing masks, getting tested and getting vaccinated was seen as inadequate if community members could not afford or even find masks, or get testing and vaccination appointments. Community members wanted masks for those who couldn't afford them and resources for getting vaccinated and tested to accompany these messages.

Earthquake

Earthquake Preparedness Solutions: Participants called out a need for earthquake safety training and basic preparedness information, especially for people living in apartment buildings. Participants suggested promoting the use of emergency kits by either distributing pre-made emergency kits or providing people with a list of items that should be included in an emergency kit. Another idea was to include a handbook of numbers to call for help in case of an earthquake or other disaster.

Infrastructure Solutions: Other suggestions included teaching people how to retrofit their homes and the need to address big apartment complexes that are in bad shape and/or not up to current building code standards.

Drought

Water Conservation Solutions: At the household level, water conservation ideas to address shortages included encouraging drought-resistant landscaping and rain barrels in households, retrofitting to save water in residential areas. Infrastructure solutions at the county and city scale included increasing water storage capacity, underground water storage, groundwater recharge, updating wastewater treatment plants in order to clean water to potable standards, and allowing access to non-potable water for large users like golf courses. Nature-based solutions include habitat restoration and incentives for people to replace lawns.

Policy Solutions: Policy considerations include the removal of restrictions for greywater use programs, water use policies for new construction in commercial and multifamily building, and cities setting targets to conserve water. Other ideas include low-impact development (LID) requirements for all new residential and commercial construction, requiring large land and commercial properties to have rainwater catchment and plumbing that allows for reuse of grey water for landscape purposes.

Communications Solutions: Broadcast information on programs such as Lawn Be Gone and Rain Garden Rebate Options from the Bay Area Water Supply and Conservation Agency (BAWSCA).

Multiple Overlapping Hazards

Many people described the challenges they faced in the summer of 2020 when extreme heat, smoke from wildfires, and the pandemic all happened at the same time with overlapping Public Safety Power Shutoffs (PSPS). This combination of events meant that people couldn't take the usual measures to get relief from the individual hazards. For example, people couldn't open their windows to get relief from the heat because then the harmful smoky air would get into their homes or run fans when the power was out. Going to a cooling center with air filters to get relief from the heat and smoke would put them at greater risk of catching COVID-19. In normal times people would usually go to the coast and beach for relief from the heat, but the beaches where closed due to COVID-19.

- Provide clean air and cooling in shelters and cooling centers. A need for capacity to manage a combination of heat and smoke or heat, smoke and COVID-19 plus access to power was raised frequently.
- Assistance with roof replacements for both fire protection and solar installations.
- Use a messaging text alert system, such as SMC Alert, for evacuation warnings related to wildfires, flooding and earthquakes, and for heat advisories and extreme heat warnings.
- Conduct outreach to disabled community about signing up for alerts.
- Develop/replace farmworker housing to withstand extreme storms, floods, quakes, and fire.
- Overlapping power outages were a substantial challenge. See more recommendations in the Power Outage section.

Overarching Social Vulnerability Considerations

This initiative received extensive input and solution suggestions from community members that address how to prevent social vulnerability (see box) from increasing hazard risk. Most participant input could be addressed by adapting the principle of Universal Design, that is to design all hazard mitigation and emergency planning to be accessible for all community members by devising solutions to social vulnerability-driven and other barriers to access.

Community input: mitigate hazards and social barriers together - examples

Plan for improvements in emergency communications to assure socially vulnerable groups can access and feel comfortable accessing emergency operations including evacuation and shelters.

- Assure information is accessible, relevant and helpful to and reaches low income people, monolingual non-English speakers, people of color, people with disabilities and medical needs, youth and older adults.
- Include on site and online publicly posted inclusion policies confirming undocumented people will be served equally.

Conduct emergency planning that mainstreams the needs of and addresses barriers for low-income and socially vulnerable people and assures inclusive implementation.

- Comprehensive integration of disability access, access to power, medicines, service and comfort animals throughout Emergency Planning with a focus on developing staff leadership, adding disability community oversight, coordinated evacuation and mainstreaming disability access and access to uninterrupted power for people with physical and mental disabilities and those with medical needs.
- Comprehensive planning for people who cannot access private transportation due to cost or availability of transit, rural or remote location, lack of paratransit, inability to drive at night, one car households and youth, older adults, people with disabilities and others who do not drive.
- Comprehensive planning for financial barriers, for example low-income people may not be able to afford air filtration devices, generators, air conditioners, or to replace spoiled food resulting from power outages.
- Comprehensive planning for vulnerable workers such as the informal workforce, agricultural and outdoor workers and their employers.

Conclusion

This report summarizes feedback gathered through targeted outreach and engagement activities to socially vulnerable communities and hard-to-reach community members. Working in partnership with eight community-based organizations, Office of Sustainability staff gathered feedback from over 600 people and reached 30,000 people through social media and email listservs.

The feedback highlighted community members' interest in being involved and active participants in hazard mitigation, and emergency planning and response activities in their communities. Many of the comments from community members were around suggestions for improving hazard-related communications. In summary, community members requested more frequent alerts and information in Spanish and other languages. Addressing barriers faced by one group is likely to help other groups, for example increased disability access could greatly benefit older adult populations, and people recovering from hazard caused or other temporary injuries. The outreach and engagement efforts conducted as part of the Multijurisdictional Hazard Mitigation Plan is part of an ongoing effort to understand community needs and improve hazard mitigation and response for all individuals in the county and especially those most vulnerable to hazards.

Appendix A. Overview of Community Partners in MJLHMP Outreach

The County of San Mateo Office of Sustainability developed an RFQ to expand the capacity to engage hard to reach and socially vulnerable communities for the Multijurisdictional Local Hazard Mitigation Plan process. Eight organizations were selected in a competitive process. Some of the key competencies being sought were:

- Organizations with established relationships of trust with their communities.
- Capacity to meet community members where they gather and in culturally appropriate ways
- Provide culturally and linguistically appropriate community engagement
- Convening culturally, linguistically and accessible focus groups
- Familiarity with the concerns of areas with overlapping social vulnerability and hazard risk.

The county developed tailored scopes of work with each organization based on their recommendations on how to best reach their communities. A summary of events is at the end of this section.

Ayudando Latinos A Soñar

- Ayudando Latinos A Soñar, known as ALAS (wings) is dedicated to giving creative expression to Latino youth and families of Half Moon Bay. Their mission celebrates "the rich cultures, traditions and values of Mexico and Latin America" which are incorporated in all their work including cultural arts, education, mental health, farmworker support, social justice advocacy, and COVID crisis response programs. ALAS was part of the City of Half Moon Bay Climate Action and Adaptation Plan supported as a Climate Ready Pilot Project which developed culturally appropriate ways to engage the community on climate and natural hazard issues.
- ALAS provides support to the Latino community, many of whom are monolingual Spanish-speakers, from Half Moon Bay to Montara.
- ALAS reached 65 community members through engagement at food distributions, a mother's group and other existing programs serving Coastal Latino immigrant individuals and families in English and Spanish. Social media posts on Facebook and Twitter (1,322 followers) and email blasts were shared.

Bay Area Community Health Advisory Council

- The Bay Area Community Health Advisory Council (BACHAC) is dedicated to eliminating health disparities across generations and diverse communities through education and services. Since its founding in 1995, BACHAC has fostered a cross-sector coalition and volunteer corps dedicated to increasing awareness of and reducing the debilitating effects of health concerns that disproportionately affect communities of color
- BACHAC includes and serves community members of color and allies concerned about health equity. African Americans, Pacific Islanders, Latinos. Countywide including City of San Mateo, Daly City and East Palo Alto.
- 356 individuals were reached through a combination of presentations and discussions at monthly meetings, email distribution, and at vaccine clinics (English and Spanish) and 620 individuals were reached through email outreach.

Center for Independence for Individuals with Disabilities

- Center for Independence for Individuals with Disabilities' (CID) mission is to provide support services, community awareness, and systems change advocacy to promote full and equal community integration and participation for people with disabilities. CID supports older adults and people with disabilities during the activation of a Public Safety Power Shutoff (PSPS) event or other emergency. The goal is to enable them to remain safe while independent in their residences and communities. CID coordinates various programs for those who depend on power for durable medical equipment or for their livelihood.

- CID is a center for independent living run by and for people with disabilities countywide.
- CID reached 916 individuals through email newsletters, Facebook, and Twitter and 34 individuals through focus and support groups as well as individual engagement to provide for specific access needs. Collaboration to increase accessibility of County presentation.

Climate Resilient Communities

- Climate Resilient Communities (CRC) specializes in community-led resilience in underserved communities. In 2019, they developed and coordinated the East Palo Alto Climate Change Community Team (CCCT). The CCCT completed a Climate Change Community Survey and Community Adaptation Pilot Project (community-led vulnerability assessment and resilience planning) funded by San Mateo County. In 2020, CRC partnered with the North Fair Oaks Climate Ready Team and where we currently coordinating the team's efforts to address environmental justice and climate change issues. CRC is an independent organization fiscally sponsored by Acterra.
- Populations served: Residents of East Palo Alto, Belle Haven and North Fair Oaks. Latino, Pacific Islander and African American community members.
- Collaboration to develop culturally appropriate community engagement through a community meeting 6/23. Participants include the general public (English and Spanish speaking residents of East Palo Alto, North Fair Oaks and Belle Haven) held jointly with a focus group engagement for community members and leaders actively working on climate resilience and civic participation.

El Concilio of San Mateo County

- ECSMC has worked with, for and in low-income/vulnerable communities since 1980. ECSMC's signature Promotora model ensures community engagement in assessment and planning of programs. ECSMC implements multiple federal, state, local, and privately funded low-income programs inside SMC. ECSMC is nationally recognized as a leader in representing low-income issues and helps to shape policies effecting low-income residents across the State. Some of their programs include: PG&E Energy Savings Assistance Program (ESA), Peninsula Minor Home Repair, Community Help and Awareness of Natural Gas and Electric Services (CHANGES), Telecommunications Education and Assistance in Multiple-Languages (TEAM) Program, PCE Outreach and Education Grant, Green Business Program Outreach, Low-Income COVID-19 Outreach, Climate Ready North Fair Oaks, Broadband Awareness and Adoption and Family and Individual Support Services.
- Populations served: Countywide including residents of South San Francisco, East Palo Alto, Belle Haven and North Fair Oaks. Low income residents including Latino, Chinese, and African American community members.
- 72 participants in low income serving programs were engaged to take the LHMP hazards survey. The great majority of participants indicated their ethnicity / race as Latino or from a

specific Latino country and a few participants indicated Caucasian, Filipino, Vietnamese, Chinese and Palestinian. Participants included residents of North Fair Oaks (37), South San Francisco (22), San Bruno (6) and East Palo Alto, East Menlo Park, Redwood City, San Mateo and Burlingame.

Nuestra Casa

- Nuestra Casa has conducted outreach and education projects in the Bay Area for almost 20 years. They are best known for rapid response to immigrant community needs and specialize in community outreach and education services to marginalized populations. Their programs and campaigns help immigrant community members understand their rights and connect to safety net resources. Their Environmental Justice includes the Parent Academy and food distribution among other programs and fosters community member capacity to understand, develop, and prioritize local solutions to address environmental equity and justice issues. Nuestra Casa works with Promotoras as the backbone of every program. They live, work, and worship in the communities served.
- Nuestra Casa primarily Spanish-speaking Latinos in East Palo Alto, eastern Menlo Park (Belle Haven), Redwood City and North Fair Oaks.
- Nuestra Casa led a joint workshop on mitigation actions in Spanish and English for 25 participants. They conducted extensive outreach through food banks in East Palo Alto and North Fair Oaks, utilizing paper surveys to increase access for Spanish speaking participants.

Senior Coastsiders

- Senior Coastsiders provides opportunities, support and resources for older adults and adults with disabilities living on the Coastside, from Montara to Pescadero and Skyline to the Sea. We celebrate the value of seniors and act as a community resource for information, caregiver support and innovative approaches to successful aging.
- Senior Coastsiders serves older adults and adults with disabilities living on the Coastside, from Montara to Pescadero and Skyline to the Sea, including Chinese-speaking residents and unhoused residents.
- Senior Coastsiders social media, media and email outreach went to 27,729 Coastal older adults and members of the general public including a subset of Chinese speakers (40) and a subset of unhoused local residents. Senior Coastsiders hosted a workshop for older adults and other coastal residents with presentations by City of Half Moon Bay and County staff attended by 12 individuals and hosted an outdoor engagement for unhoused residents reaching 5 individuals.

South Coast Sustainable

- South Coast Sustainable is a coalition of community leaders who work intentionally to build trust with neighbors and other stakeholders. We understand the nuances of rural culture, where people still prefer to share information face-to-face at the post office, market, and taqueria. We can reach the hidden communities, road by road, and can shape messages and information in ways that will be best received by the intended audience.
- South Coast Sustainable serves residents of the South Coast including the Latino community and partners closely with Puente de la Costa Sur.
- SCS reached 630 rural individuals through social media and email outreach and 98 individuals through online meetings and individual in person engagement such as through the Pescadero PopUp Market and SC4 Amateur Radio Club.

Overview of MJLHMP Event Outreach					
Date	**Organization**	**Event**	**People reached**	**Demographics**	**Language**
3/20/2021	South Coast Sustainable	SC4 Amateur Radio Club	50	Coastside community	English
3/25/2021	Senior Coastsiders	Survey Outreach for Unhoused Populations	5	Unhoused residents (Coastside)	English
4/12/2021	BACHAC	Monthly Meeting #1 (presentation from County staff)	22	90% African American	English
5/13/2021	Senior Coastsiders	Evergreen Seniors (panel from various coastal jurisdictions)	12	Coastside Seniors & community	English
6/7/2021	Center for Individuals with Disabilities	Meeting of Staff and Board members	15	People with disabilities	English - for visual disability access
6/10/2021	Nuestra Casa	Environmental Justice Academy focus group	25	17 Spanish / 8 English	English and Spanish
6/14/2021	BACHAC	Monthly Meeting #2 (presentation from County staff)	22	90% African American	English
6/17/2021	Center for Individuals with Disabilities	CID Virtual Peer Support Group Meeting	6	People with disabilities	English
6/23/2021	Climate Resilient Communities	Community leaders and community members focus group NFO, Belle Haven, East Palo Alto	44	27 Latino, 6 Pacific Islanders and 6 African Americans, 5 Caucasians	English and Spanish
6/24/2021	South Coast Sustainable	Coastside focus groups with Puente de la costa Sur	15	Coastside community, farmworkers, Latinx	Spanish
04/05 - 05/05	South Coast Sustainable	Sustainable Pescadero meetings on 04/05 and 05/05	32	Coastside community	English
06/03 - 06/29	South Coast Sustainable	Coastside focus groups	24	Coastside community	English and Spanish
Total			**272**		

Appendix B: Summary of What We Heard: Mitigation Themes

Communication & Education

In general, people indicated that they were not receiving notifications at all or in their language and wanted to be notified ahead of an anticipated disaster. They wanted information about what actions they could take to protect themselves, what resources are available to them and advance information about resources and expected duration of predictable events like a PSPS. Suggestions also include early outreach to people in hazard areas to help them understand the risk where they live and how to prepare.

People wanted more information and education (both for themselves and for the larger community) on the following topics:

- Existing emergency plans
- Evacuation plans and what to do and bring if you are required to evacuate
- Emergency kits
- How and where to obtain supplies needed during a disaster (for example, masks in a pandemic)
- Shelter locations, including the accessibility of shelters for people and service/comfort animals
- Assistance programs for people with disabilities and/or people who require access to power
- More education about specific hazards and information for employers on the danger of working outdoors during extreme weather or wildfire smoke events

Participants suggested a variety of different communication methods and noted the need to use multiple forms of communication to reach everyone. Suggested communications methods included:

- Website and app (one-stop shop)
- Email
- Social media
- Workshops / Zoom meetings
- Posters
- Flyers & Pamphlets
- Posting information at hotels
- Community groups
- Neighbor to neighbor
- Door to door
- Libraries
- Outreach in frequently visited places such as schools, markets, clinics.
- Newspapers
- Radio
- Magnets/stickers with emergency numbers to call for information
- Calls to elders who are not tech savvy or to those who have language barriers
- Signage in hazard areas
- Alert Systems

Participants also commented on the best ways to package hazard information. They said that information needed to be easy to digest, illustrated/accessible to low literacy community members, and provided in multiple languages. They suggested that meetings and workshops should be short and designed for families. Participants also flagged the need to provide tailored outreach to specific populations like people with disabilities, people living in rural areas, and people who are elderly or don't have access to the internet. People also mentioned the need to plan for communication when the internet and cell phone service goes out.

Several comments reflected on a need for government be involved in the local fast-moving conversations about hazards in person, online, and via community-based organizations at the local community level to share resources when they are most needed. Participants wanted to educate the community on how to reach out to local government, and to let people know it is ok to call your city/county and ask for help. Another suggestion was for better coordination between agencies, so information does not contradict.

Emergency Planning and Community Role

There was interest in community-wide involvement in Emergency Planning to include partnerships with trusted community-based organizations, increased investment in community capacity building in socially vulnerable neighborhoods and more community-tailored communication, outreach and opportunity for leadership and input. People expressed that government processes should include youth and residents.

There were many concerns about effective inclusion of socially vulnerable populations in Emergency Planning. Participants asked for approaches including:

- Expert staff, responder training, and oversight by people with disabilities, to assure effective inclusion of people with disabilities and medical needs including technology, disability legal rights, etc. during an emergency.
- It was noted that older adults, monolingual people and low-literacy people need assistance to access response and recovery resources, especially those that require filling out applications.
- More trauma/ mental health training and services during emergencies.
- A clearly communicated policy that undocumented immigrants would be served respectfully.

There were many comments asking for an emergency plan, wanting to know where it was and wishing there was more outreach about emergency plans and opportunities to participate in the planning. Community members also requested designated emergency areas, evacuation routes and advance lists of cooling centers.

There was desire for the County to be more proactive in “solving hazard issues, creating disaster plans, and increasing community awareness of the plans” and concern that Office of Emergency Services only responds when “the threat level is very high”, indicating that response thresholds for heat, smoke and COVID, did not seem adequate to communities experiencing hazard impacts. In particular, community members were concerned that they didn’t know whether and where cooling centers would open and felt there were not enough of them, they were not open when needed, and that they should also address clean air. Many community members indicated they could not afford to buy air conditioners, air purifiers or fans and funding or loaned equipment was recommended.

There were numerous comments about how community members would like to be involved in planning for hazards, particularly for emergency communications, evacuation, preparedness and response. Support for block organizing and local preparedness capacity building such as Block Action Teams (BAT) and Community Emergency Response Teams (CERT) was recommended. For context fewer of these programs are active in socially vulnerable communities and they may need to be adapted to be culturally and linguistically competent and accessible to people with disabilities.

There were recommendations to work with community-based organizations and promatoras (Latino community outreach workers) to reach community members due to their established relationships of trust and their localized cultural expertise to support preparedness, response and to help community members to prepare for current and coming climate impacts. They had many additional suggestions reflected in the Emergency Planning, Evacuations, Shelters and other sections.

Evacuation

Community members wanted to be informed about evacuation plans, to be able to access the plans and to be consulted in plan development. Participants with disabilities and medical needs indicated that currently some individuals choose not to evacuate due to accessibility barriers and concerns. They recommended coordinated evacuation of people with disabilities including disability community oversight – key issues include accessibility to people with the full range of disabilities including non-physical disabilities, access to power, escorting those who need assistance to shelters, medicines, support network, transportation, and service / comfort animals. It was recommended to develop criteria to aid evacuation prioritization (related to people with disabilities).

Further the need to address current every day, baseline conditions and institutional access barriers was elevated as important to have in place to ensure access for evacuation for people with disabilities, older adults, people with medical needs, such as:

- In all evacuation operations and communications including accessible transition from evacuation to shelter and
- Through infrastructure improvements such as installing sidewalks, traffic islands and ramps and
- Through guidelines for signage, construction and other operations to eliminate temporary and project-related barriers.

There was also concern about evacuation for transit-dependent people that is affordable accessible, and at the needed times and places. A Senior Coastsiders' program was mentioned as a best practice: a buddy system pairing seniors or other community members who drive with those who don't in the event of an emergency. There was concern that current traffic congestion would need to be decreased to aid evacuation which was mentioned in Belle Haven/Menlo Park and on the Coastside, where there is desire for additional ways to evacuate from the Coast. Coastal residents requested more local services, such as shelter in place and outdoor sheltering options so transportation off the Coast is not needed.

Disability Access and Medical Needs

Comprehensive Access: Comprehensive disability access implementation was recommended including new staff positions with detailed knowledge of how to help people with diverse disabilities including non-physical disabilities, technology needs and legal rights. Dedicated staff and detailed training on these topics for first responders and emergency personnel including shelter and cooling center staff was also strongly recommended. Address current infrastructural and institutional access barriers, such as related to sidewalks, buildings, construction, etc. to aid evacuation for people with disabilities, older adults, people with medical needs during hazard events.

Additional accessibility needs included the following:

- Access to power including batteries with appropriate life span, back-up generators for people who would have difficulty traveling, and hotel, and hotel rooms with power.
- Limited resources on the Coast was noted as a major challenge with a participant noting there were no open gas stations and one hotel room using generator power during a PSPS event.
- Improving mechanisms for people to learn about where shelters are during an emergency that addresses disability access, access for folks that can't access the internet or phone system, and

which utilizes best practices customized for specific community and disability needs, such as partnerships with community organizations.

Evacuation: Coordinated evacuation including disability community oversight was recommended. Training for first responders, emergency and shelter personnel to include laws governing service animals, comfort animals versus pets including questions they are not legally allowed to ask was recommended to encourage more participation. It was suggested that people with medical needs or disabilities should be enabled to use Zonehaven to request help. Evacuation plans should include continuous access to power, medical devices and medicines including refrigeration for some medicines, escorting those who need assistance to get to shelters. Multiple participants recommended coordinated transportation solutions including free bus and paratransit evacuations and home pick-ups and/or affordable paratransit, given current paratransit is inadequate to get people out in an emergency situation.

Communication: Communication about hazards, especially power outages/PSPS and heat events, should take place as far in advance as possible generally and to allow extra time needed for people with disabilities and medical needs to prepare and coordinate assistance. Improve mechanisms for people to learn about where shelters are during an emergency that addresses disability access, including for those that can't access the internet or phone system. Conduct a survey to find out how people with disabilities obtain information and outreach and education with the disabled community about signing up for alerts and disaster preparedness. Collaborate with relevant organizations to better communicate with people with disabilities and medical needs.

Shelters (including Cooling/Clean Air centers)

There were many comments expressing concern about the availability of local shelters and cooling/clean air centers, whether shelters would welcome or meet needs of socially vulnerable community members, and desire to know where shelters and cooling centers would be and how to find out when and where they are open. Recommendations included:

- Increase number of, open time and publicity for cooling centers. Community members want to be able to access them more frequently (i.e. at lower temperatures and fewer days of heat), more locally, and want to know under what conditions they open and who opens them.
- Provide clean air and cooling in shelters and cooling centers. A need for capacity to manage a combination of hazards such as heat, smoke, power outage and COVID-19 was raised frequently.
- Desire for consistent definition / implementation of disability access to shelters and cooling / clean air centers and training for staff.
- Desire for communication of policy that undocumented people will be welcomed by shelters, cooling / clean air centers.
- Improving mechanisms for people to learn about where shelters are during an emergency that addresses disability access, access for folks that can't access the internet or phone system, and which utilizes best practices customized for community needs, such as partnerships with trusted community-based organizations, description of images for people who are visually impaired, door to door outreach, etc. (See communications)
- Assure Shelter information and access is available to people who are monolingual in a language other than English.

- More shelters desired on the Coastside and more than one Red Cross shelter needed on the South Coast.
- Promote shelter-in-place preparedness where access to shelters is limited
- Develop outdoor shelter locations where shelter access is limited such as on the Coast (golf course, the farm fields, parking lots).

Preparedness

Many people asked for education and training on how to prepare for and stay safe during a disaster. In particular, a participant wanted information on how to stay safe if you can't evacuate during a wildfire. Another suggestion was for education specific to people with disabilities about how to prepare for a disaster (e.g. medicines, emergency contacts, transportation, service & comfort animals). Participants also called out the need for trainings in Spanish (like for CPR classes), and the need to promote the CERT trainings in Spanish through the LISTOS program.

Community members also discussed the need for help obtaining supplies for an emergency event. Many participants mentioned emergency kits and the need to distribute free emergency kits to low-income community members. One suggestion was to include self-care and emergency information in a kit as well as supplies. Participants suggested that the County should stock up on air conditioning and air purifiers to give out to people who can't afford or find them in an emergency. Other participants suggested helping people get affordable/comfortable protective equipment, for example helping laborers get better clothing and eye protection for Spare the Air days.

Participants recommended nurturing connections within a community so that neighbors will have the support of their neighbors during emergencies and organizing emergency teams of community members to help their community in an emergency. The County's Department of Emergency Management could support these efforts with resources and trainings.

Housing and Home Improvements

Many participants suggested providing people with assistance in making improvements to their homes and properties that would reduce the risks from hazards like earthquakes, flooding, extreme storms, heat, wildfires, smoke, and drought. Specific suggested improvements included:

- Clearing defensible space around homes and buildings
- Drought resistant landscaping and rain barrels
- Bring buildings up to current code
- Flood-proofing homes
- Installing air conditioning and providing air purifiers
- Checking for and fixing air leaks in buildings
- Checking homes for thermal loss and proper installation
- Cleaning air filters
- Providing cooling centers in large apartment complexes

Participates suggested the following methods to help with improvements:

- Financial assistance such as low-cost loans, grants, and/or subsidies
- Incentives such as lower permitting fees or more density credits
- County-sponsored contractors or a list of good contractors
- Education and training about risk reducing improvements

- Team (such as CERT) or program that certifies that structures
- Requirements for large apartment complexes to provide air conditioning or cooling centers
- Provide financial resources for low income families who are impacted by disasters

Participants also specifically mentioned the need to develop and replace farmworker housing to withstand hazards, to provide help to seniors for hazard related property improvements, and the need to make improvements in apartment buildings.

Infrastructure Improvements

Countywide suggestions for infrastructure improvement include:

- Low impact development or green infrastructure for all new residential and commercial construction
- Change regulations to allow building higher, which would allow buildings to be raised out of the level of potential flooding (this comment came from the South Coast)
- Invest in improving PG&E infrastructure to prevent PSPS events
- More shelters, cooling / clean air centers, pools for cooling
- Take better care of nature to reduce the threat of wildfires, as right now there is a lack of maintenance of public lands and open space

Participants from the South Coast had several suggestions infrastructure improvements, including:

- Underground utilities so that power lines are not impacted by strong winds and falling trees
- Dredge creeks and maintain drainage ditches to reduce flooding
- Creek bank restoration, and specifically to continue the Butano Creek bank restoration
- Build more water reservoirs and water storage capacity, both for use during droughts and for fighting wildfires
- Capture stormwater runoff for later irrigation or fire fighting
- Provide batteries or back up power for communication infrastructure (internet, cell phone, ham radio networks, and radio) and for water treatment plants (water supply can be impacted during power shutoffs)
- Invest in local broadcast media capacity and equipment that can be used during an emergency, especially when the phone and internet services fail
- Invest in microgrids and solar power; use large parking lots (like at schools) as locations for generating solar power
- Run the power lines from the Pescadero high school to town when doing the water extension
- More evacuation routes from the Coast

Suggestions from participants in the East Palo Alto, Menlo Park and Redwood City areas for infrastructure improvements included:

- Raise parking lots and driveways to address flooding issues
- Build a bigger wall to hold back flooding
- Install effective rain gutters in roads to keep them safe during a flood
- Increase ways in and out of communities with limited egress and which can be cut off by flooding or other hazard
- Community members also wanted to see improved road conditions, including repair of potholes and upgrades or designs to reduce or eliminate flooding

Power Outages

Community members had many concerns and suggestions related to the increasingly frequent PSPS events and other power outages, including:

- Invest in solar power, solar generators, solar and battery, power storage. Need for more access to generators and more reliable sources of power. Cross reference to Infrastructure: undergrounding utility lines, back up battery / power for communications, PG&E and microgrids.
- Need for more power charging stations more densely distributed throughout the Coast. Need more PG&E resource centers – one in La Honda is not adequate. Need more than one hotel room with power on the Coast. Need open gas stations during PSPS.
- Continuity in access to power for people with disabilities and medical needs, older adults and other at-risk individuals.
- Accessible and affordable transportation to shelters, hotels or power charging sites during PSPS is needed for people who need power with disabilities or medical needs for medical and assistive devices.
- Communications: need better estimates of the length of the power outage.
- Food preservation – providing coolers was suggested.
- People reported extensive use of online resources accessed via computer or mobile phone so access to power is critical to access to information. Multiple comments desired a phone line to speak to an actual person.
- Bayside residents also reported power outages that were not related to PSPS events.
- A North Fair Oaks resident noted the need for equitable access to PG&E services.

MEDIA RELEASES ISSUED FOR HAZARD MITIGATION PLAN UPDATE

COUNTY OF SAN MATEO

Michelle Durand
Chief Communications Officer

County Government Center
400 County Center, 1st Floor
Redwood City, CA 94063
650-363-4153 T
650-363-1916 F
mdurand@smcgov.org
www.smcgov.org

NEWS

March 15, 2021
For Immediate Release

THE COUNTY OF SAN MATEO LAUNCHES 2021 MULTIJURISDICTIONAL LOCAL HAZARD MITIGATION PLAN UPDATE MULTIPLE OPPORTUNITIES AVAILABLE FOR PUBLIC INPUT

The County of San Mateo, led by the Office of Emergency Services, has begun to develop the County's updated Multijurisdictional Local Hazard Mitigation Plan to address threats such as earthquake, flooding, extreme heat, and landslide.

The County needs your help identifying solutions to the problems associated with natural hazards.

For Phase 1, the public is invited to participate in the hazard mitigation plan by:
1) filling out a survey about San Mateo County's natural hazard risks https://www.surveymonkey.com/r/RG5GTPS ,
2) attending the first virtual public workshop on Thursday, March 25 at 4:00 PM https://cmo.smcgov.org/events/march-25-2021-preparing-hazards-san-mateo-county-local-hazard-mitigation-plan-public-workshop; and/or
3) attending a virtual Steering Committee meeting on March 22 at 2:00 PM https://cmo.smcgov.org/events/march-22-2021-hazard-mitigation-plan-update-steering-committee-meeting.

An updated Multijurisdictional Local Hazard Mitigation Plan will serve as a meaningful template for a more resilient and sustainable San Mateo County. The plan looks at how the County of San Mateo and its planning partners can reduce its impact of natural hazards such as earthquake, flooding, extreme heat, and landslide. Once approved by the Federal Emergency Management Agency (FEMA), the plan ensures the County of San Mateo and its partners remain eligible for pre- and post-disaster mitigation project grant funding through FEMA's Hazard Mitigation Assistance programs and other non-emergency disaster assistance like FEMA's new Building Resilient Infrastructure and Communities (BRIC) program. The County of San Mateo's current Multijurisdictional Local Hazard Mitigation Plan expires in September 2021 (the Plan is updated every five years), so the 2021 update will remain active until 2025.

The planning process will be organized into three phases. Each phase will include opportunities for public input and feedback:

Phase 1 | March 2021 – April 2021
Take a survey!
Attend the first Public Workshop: March 25, 2021 at 4:00 PM
Attend a Steering Committee Meeting: March 22, 2021 and April 26, 2021 at 2:00 PM
Email comments: MJLHMP@smcgov.org

Phase 2 | May - June 2021
Review the StoryMap : an evolving and interactive component of the project website
Attend a Steering Committee Meeting: May 24, 2021 and June 28, 2021 at 2:00 PM
Email comments: MJLHMP@smcgov.org

Phase 3 | July - August 2021
Review the StoryMap: an evolving and interactive component of the project website
Attend the second Public Workshop: July 22, 2021 at 4:00 PM
Attend a Steering Committee Meeting: July 26, 2021 and August 23, 2021 at 2:00 PM
Review the *Draft* plan and submit comments. The plan will be posted to the website.
Email comments: MJLHMP@smcgov.org

More public engagement opportunities may become available throughout the process and, if so, will be posted to the project website: https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan

For more information about the County of San Mateo's Multijurisdictional Local Hazard Mitigation Plan or to learn about ways to participate in the development of the LHMP:

- Visit the project's website at: https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan;
- Send an email to MJLHMP@smcgov.org; and/or
- Contact Ann Ludwig, Project Manager at 510-734-9831.

###

COUNTY OF SAN MATEO

Michelle Durand
Chief Communications Officer

County Government Center
400 County Center, 1st Floor
Redwood City, CA 94063
650-363-4153 T
650-363-1916 F
mdurand@smcgov.org
www.smcgov.org

NEWS

June 4, 2021
For Immediate Release

County of San Mateo Launches 2021 Multijurisdictional Local Hazard Mitigation Plan Update

Public Invited to Provide Input on Preparing for Natural Hazard Events

REDWOOD CITY — The County of San Mateo, led by the Office of Emergency Services, is in the process of developing the county's updated Multijurisdictional Local Hazard Mitigation Plan (LHMP) to address natural hazards such as earthquake, fire, flooding, extreme heat, and landslide.

The County seeks the public's help in identifying solutions to the problems associated with natural hazards and invites residents to participate in the hazard mitigation plan by:

1) filling out a survey on actions the County and its partner agencies can take to help community members prepare for natural hazard events (https://www.surveymonkey.com/r/MHJ5YDJ);

2) attending the next virtual public workshop on Thursday, Aug. 12, 2021, at 4 p.m. (https://smcgov.zoom.us/meeting/register/tJYtceqoqzwjGdxF5Dt4Kt1yufuxwVgp99TJ); and/or

3) reviewing the Draft Multijurisdictional Plan when it is released on Aug. 5, 2021. (https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan).

The County of San Mateo's current Multijurisdictional Local Hazard Mitigation Plan expires in September 2021. An updated Multijurisdictional Local Hazard Mitigation Plan will serve as a meaningful template for a more resilient and sustainable San Mateo County. The 2021 update will remain active through 2025.

Once approved by the Federal Emergency Management Agency (FEMA), the updated plan ensures the County of San Mateo and its planning partners remain eligible for pre- and post-disaster mitigation project grant funding through FEMA's Hazard Mitigation Assistance programs and other non-emergency disaster assistance like FEMA's new Building Resilient Infrastructure and Communities (BRIC) program.

For more information about the Multijurisdictional Local Hazard Mitigation Plan or to learn about ways to participate in the development of the LHMP:

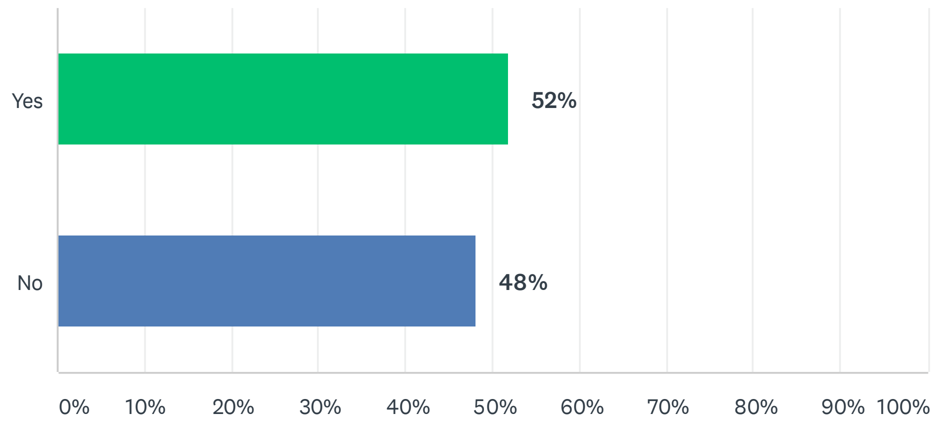
- visit the project's website at: https://cmo.smcgov.org/multijurisdictional-local-hazard-mitigation-plan;
- send an email to MJLHMP@smcgov.org; and/or
- contact Ann Ludwig, Project Manager at 510-734-9831.

###

SURVEY #1 RESULTS

Q1 Have you ever experienced, or been impacted, physically or financially, by a natural disaster in San Mateo County?

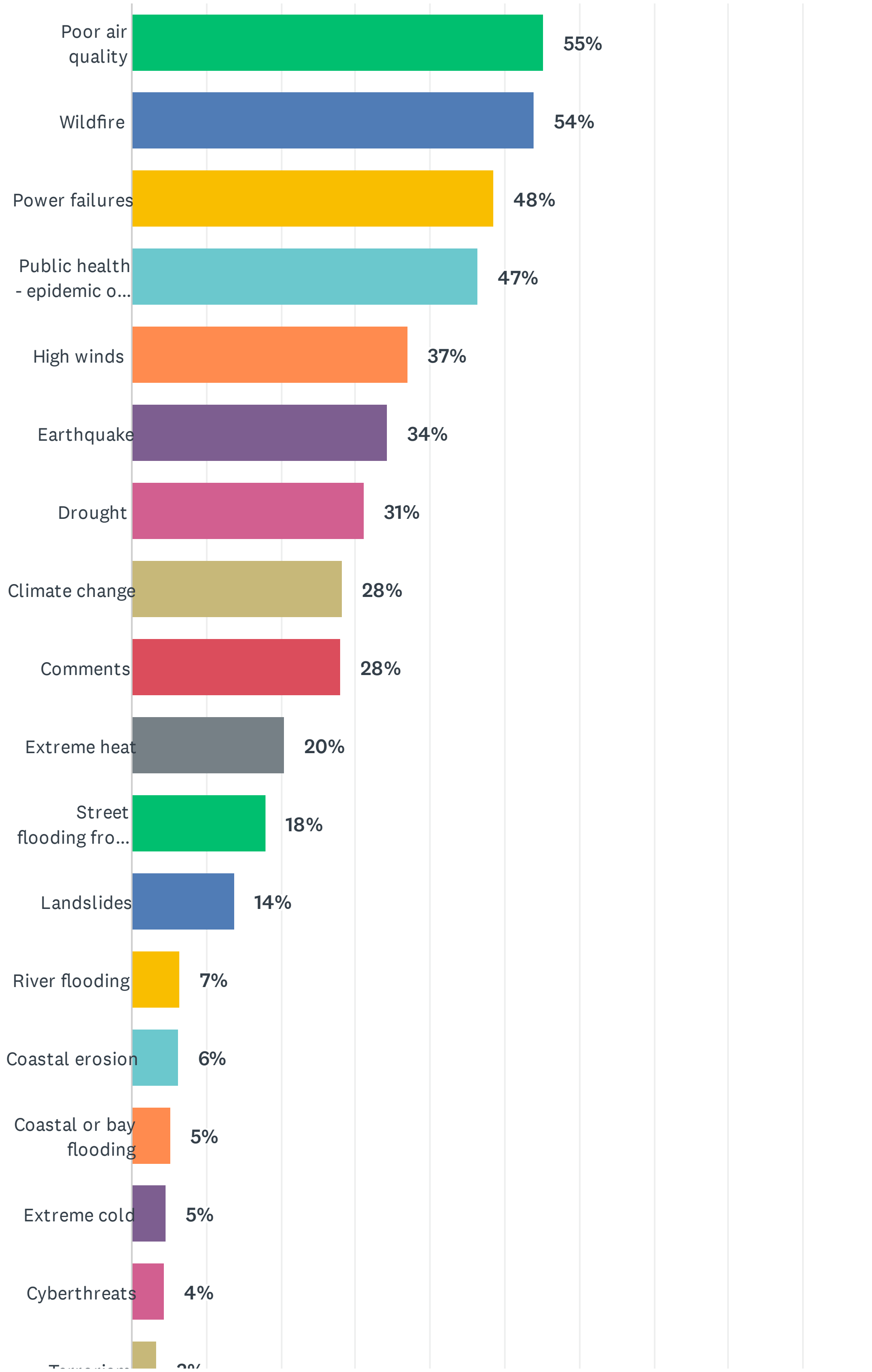
Answered: 1,293 Skipped: 6

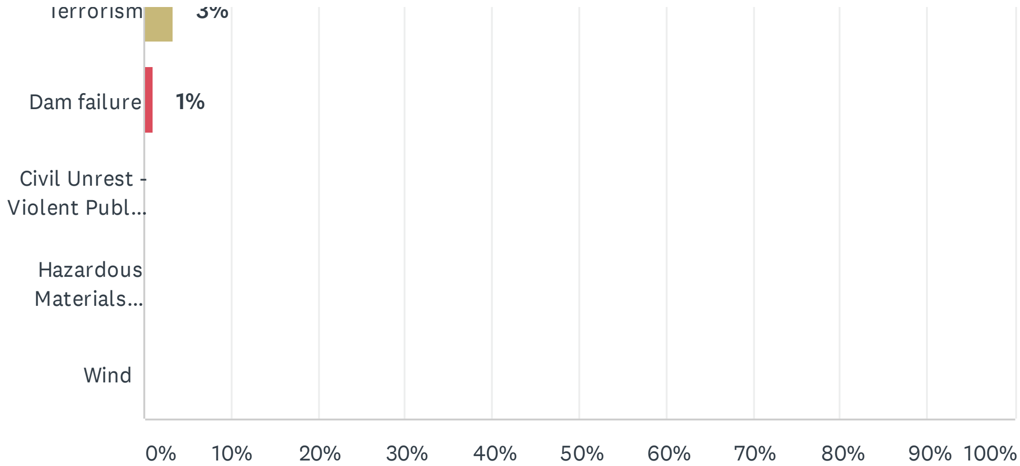


ANSWER CHOICES	RESPONSES	
Yes	52%	671
No	48%	622
TOTAL		1,293

Q2 What type of hazard was the cause of the disaster you experienced? What happened? (Check all that apply and please explain what happened in the "Comments")

Answered: 675 Skipped: 624

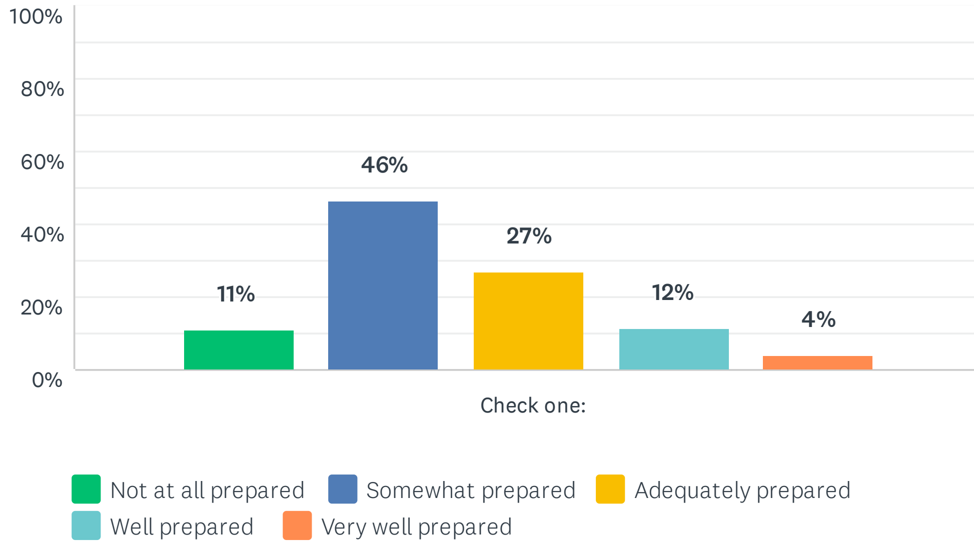




ANSWER CHOICES	RESPONSES	
Poor air quality	55%	373
Wildfire	54%	364
Power failures	48%	327
Public health - epidemic or pandemic	47%	314
High winds	37%	250
Earthquake	34%	231
Drought	31%	211
Climate change	28%	191
Comments	28%	189
Extreme heat	20%	138
Street flooding from storm	18%	121
Landslides	14%	93
River flooding	7%	44
Coastal erosion	6%	42
Coastal or bay flooding	5%	36
Extreme cold	5%	31
Cyberthreats	4%	29
Terrorism	3%	22
Dam failure	1%	7
Civil Unrest - Violent Public Disturbance	0%	0
Hazardous Materials Incident - Radiological Incident	0%	0
Wind	0%	0
Total Respondents: 675		

Q3 How prepared is your household to deal with a hazard event?

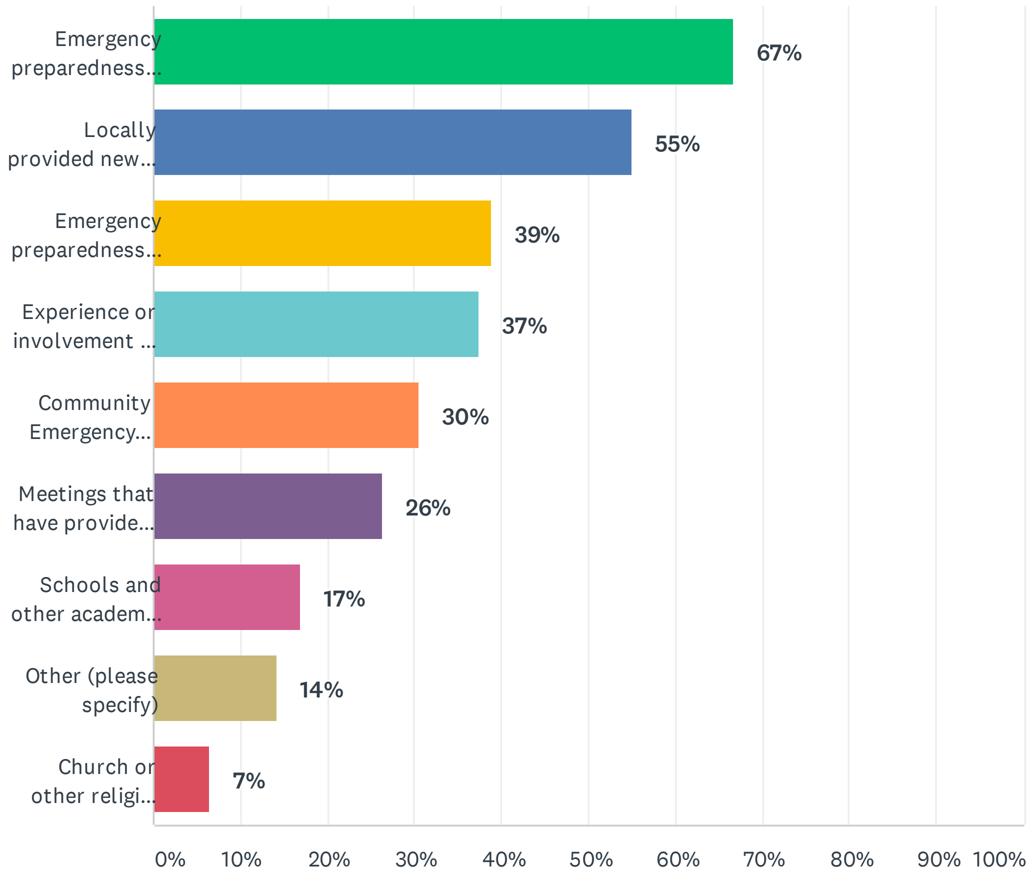
Answered: 1,291 Skipped: 8



	NOT AT ALL PREPARED	SOMEWHAT PREPARED	ADEQUATELY PREPARED	WELL PREPARED	VERY WELL PREPARED	TOTAL	WEIGHTED AVERAGE
Check one:	11% 142	46% 599	27% 350	12% 151	4% 49	1,291	2.51

Q4 Please select any of the means listed below that have helped you become more prepared for emergencies and disasters. (Check all that apply)

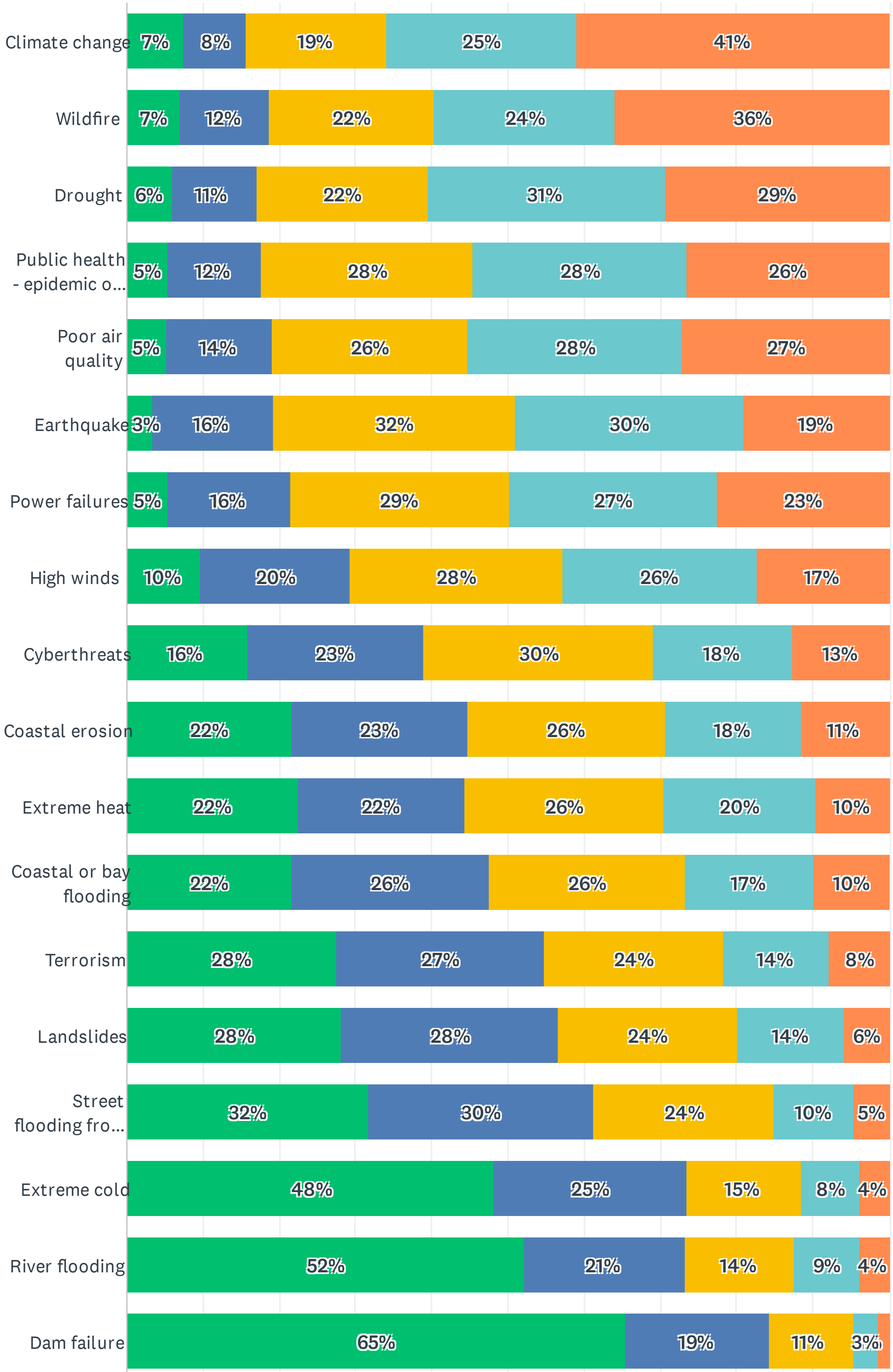
Answered: 1,251 Skipped: 48

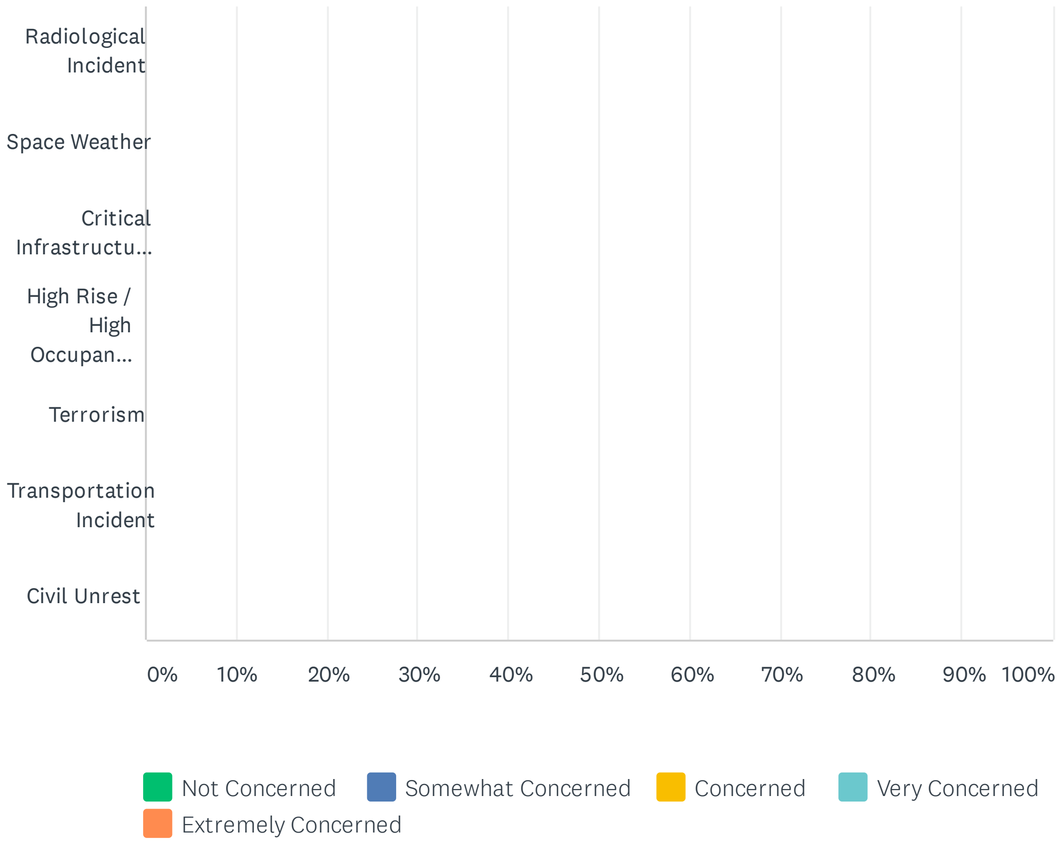


ANSWER CHOICES	RESPONSES	
Emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	67%	836
Locally provided news or other media information	55%	688
Emergency preparedness information from a local utility (e.g. power, water, etc.)	39%	487
Experience or involvement in one or more hazards or disasters	37%	469
Community Emergency Response Training (CERT) or other disaster training program	30%	381
Meetings that have provided information on disaster preparedness	26%	330
Schools and other academic institutions	17%	212
Other (please specify)	14%	179
Church or other religious organization	7%	82
Total Respondents: 1,251		

Q5 How concerned are you about the following hazards in San Mateo County? (Check one response for each hazard)

Answered: 1,291 Skipped: 8




Radiological Incident
Space Weather
Critical Infrastructu...
High Rise / High Occupan...
Terrorism
Transportation Incident
Civil Unrest
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Not Concerned
Somewhat Concerned
Concerned
Very Concerned
Extremely Concerned

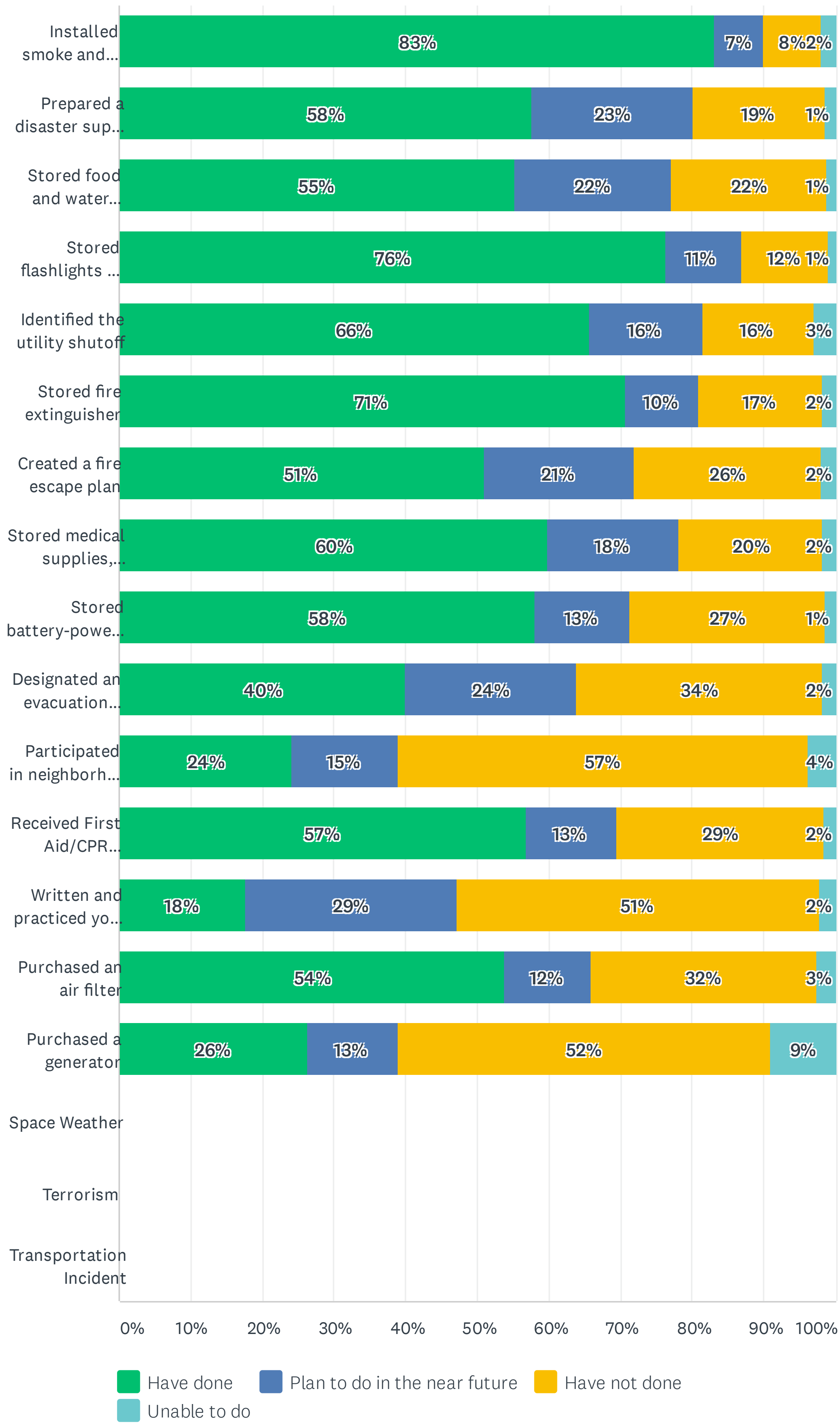
	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
Climate change	7% 93	8% 104	19% 234	25% 314	41% 519	1,264	3.84
Wildfire	7% 90	12% 149	22% 275	24% 302	36% 457	1,273	3.70
Drought	6% 75	11% 142	22% 284	31% 393	29% 371	1,265	3.67
Public health - epidemic or pandemic	5% 68	12% 156	28% 354	28% 358	26% 337	1,273	3.58
Poor air quality	5% 65	14% 177	26% 325	28% 357	27% 342	1,266	3.58
Earthquake	3% 44	16% 200	32% 405	30% 380	19% 243	1,272	3.45
Power failures	5% 69	16% 204	29% 364	27% 347	23% 286	1,270	3.45
High winds	10% 123	20% 248	28% 355	26% 325	17% 218	1,269	3.21
Cyberthreats	16% 199	23% 287	30% 375	18% 228	13% 158	1,247	2.89
Coastal erosion	22% 274	23% 292	26% 327	18% 228	11% 144	1,265	2.74
Extreme heat	22% 283	22% 275	26% 329	20% 250	10% 121	1,258	2.72
Coastal or bay flooding	22% 271	26% 325	26% 321	17% 212	10% 122	1,251	2.67
Terrorism	28% 345	27% 340	24% 295	14% 172	8% 99	1,251	2.47
Landslides	28% 354	28% 357	24% 296	14% 176	6% 74	1,257	2.41
Street flooding from storm	32% 397	30% 372	24% 298	10% 131	5% 57	1,255	2.27
Extreme cold	48% 598	25% 313	15% 187	8% 95	4% 47	1,240	1.94
River flooding	52% 648	21% 263	14% 177	9% 107	4% 48	1,243	1.91
Dam failure	65% 806	19% 232	11% 137	3% 39	1% 18	1,232	1.56
Radiological Incident	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00
Space Weather	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00
Critical Infrastructure Failure	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00
High Rise / High Occupancy Building Fire	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00

Terrorism	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00
Transportation Incident	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00
Civil Unrest	0% 0	0% 0	0% 0	0% 0	0% 0	0	0.00

Q6 Which of the following steps has your household taken to prepare for a disaster? (Provide a response for all)

Answered: 1,291 Skipped: 8

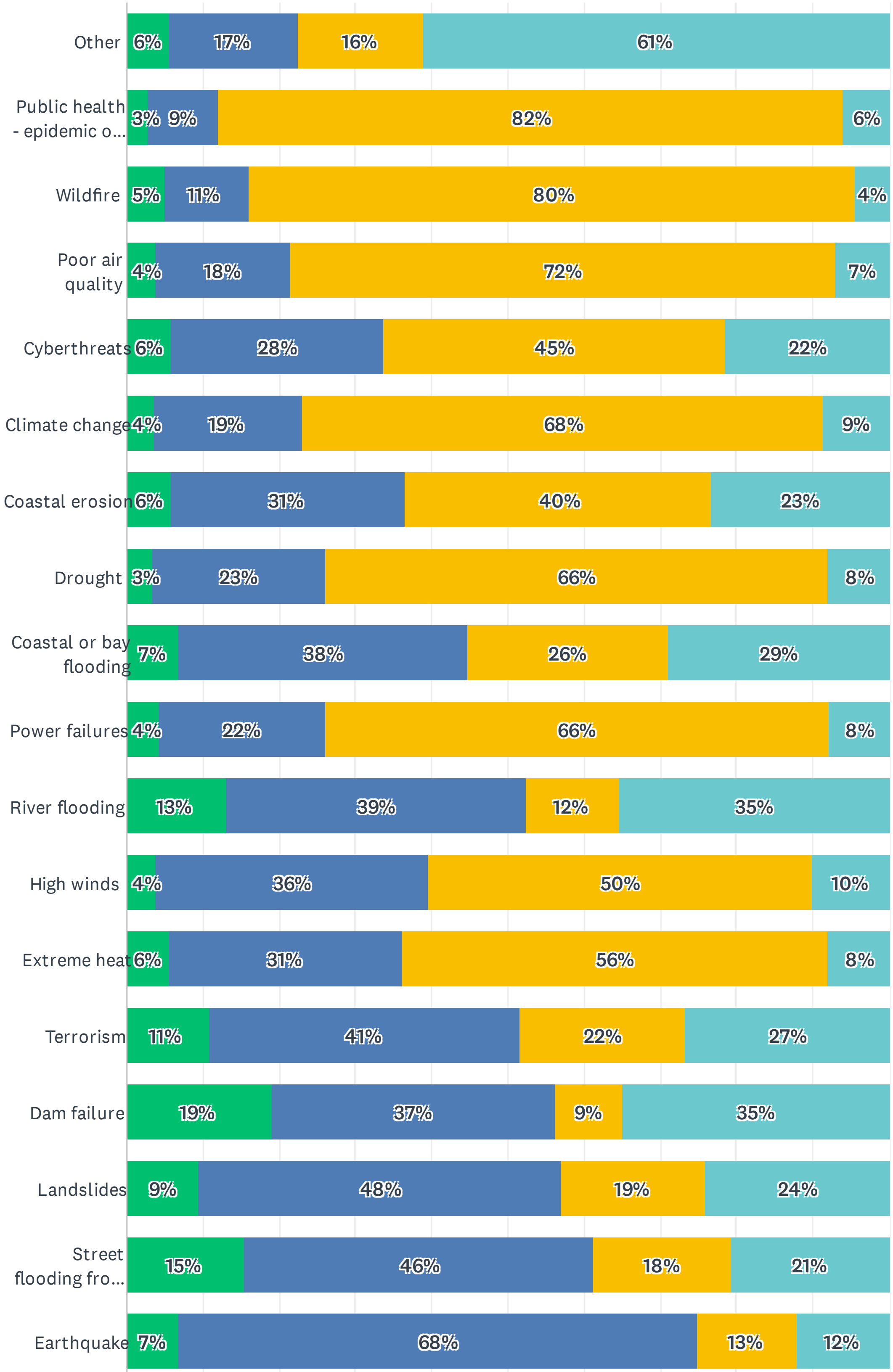
San Mateo County Multijurisdictional Local Hazard Mitigation Plan Update Survey 2021

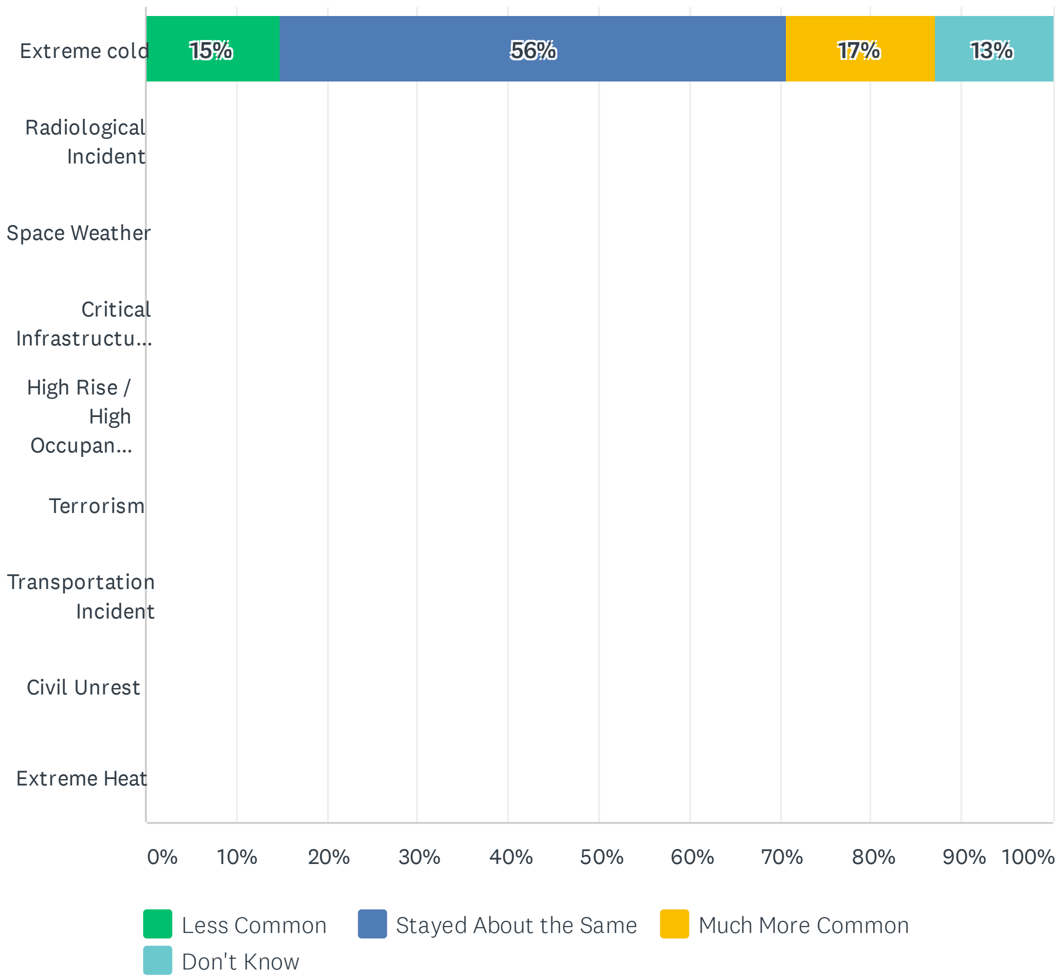


	HAVE DONE	PLAN TO DO IN THE NEAR FUTURE	HAVE NOT DONE	UNABLE TO DO	TOTAL
Installed smoke and carbon monoxide detectors on each level of your house	83% 1,067	7% 88	8% 103	2% 26	1,284
Prepared a disaster supply kit	58% 734	23% 287	19% 236	1% 18	1,275
Stored food and water (2-week supply)	55% 705	22% 278	22% 276	1% 16	1,275
Stored flashlights and batteries	76% 972	11% 136	12% 152	1% 14	1,274
Identified the utility shutoff	66% 835	16% 200	16% 198	3% 38	1,271
Stored fire extinguisher	71% 898	10% 131	17% 218	2% 24	1,271
Created a fire escape plan	51% 648	21% 265	26% 330	2% 26	1,269
Stored medical supplies, including necessary medications	60% 760	18% 230	20% 255	2% 23	1,268
Stored battery-powered radio	58% 734	13% 170	27% 346	1% 17	1,267
Designated an evacuation meeting place	40% 507	24% 302	34% 434	2% 23	1,266
Participated in neighborhood disaster preparedness and planning	24% 305	15% 187	57% 723	4% 49	1,264
Received First Aid/CPR training	57% 717	13% 160	29% 364	2% 20	1,261
Written and practiced your family disaster plan	18% 223	29% 369	51% 638	2% 27	1,257
Purchased an air filter	54% 677	12% 149	32% 397	3% 33	1,256
Purchased a generator	26% 329	13% 158	52% 651	9% 114	1,252
Space Weather	0% 0	0% 0	0% 0	0% 0	0
Terrorism	0% 0	0% 0	0% 0	0% 0	0
Transportation Incident	0% 0	0% 0	0% 0	0% 0	0

Q7 Are hazard events in San Mateo County becoming more or less common over the past 5 years? (Check one response for each hazard)

Answered: 1,291 Skipped: 8



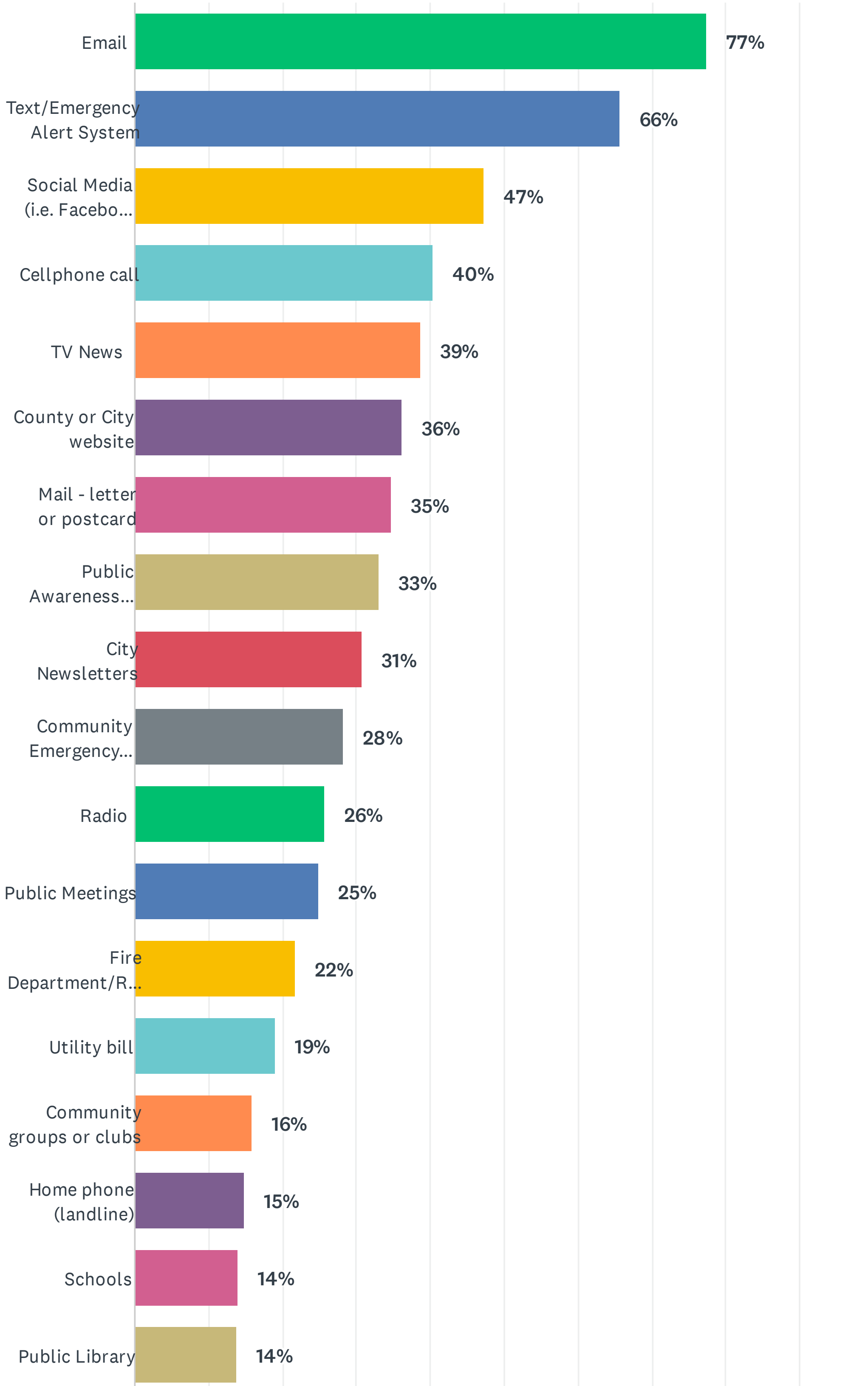

Extreme cold
15%
56%
17%
13%
Radiological Incident
Space Weather
Critical Infrastructu...
High Rise / High Occupan...
Terrorism
Transportation Incident
Civil Unrest
Extreme Heat
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Less Common
Stayed About the Same
Much More Common
Don't Know

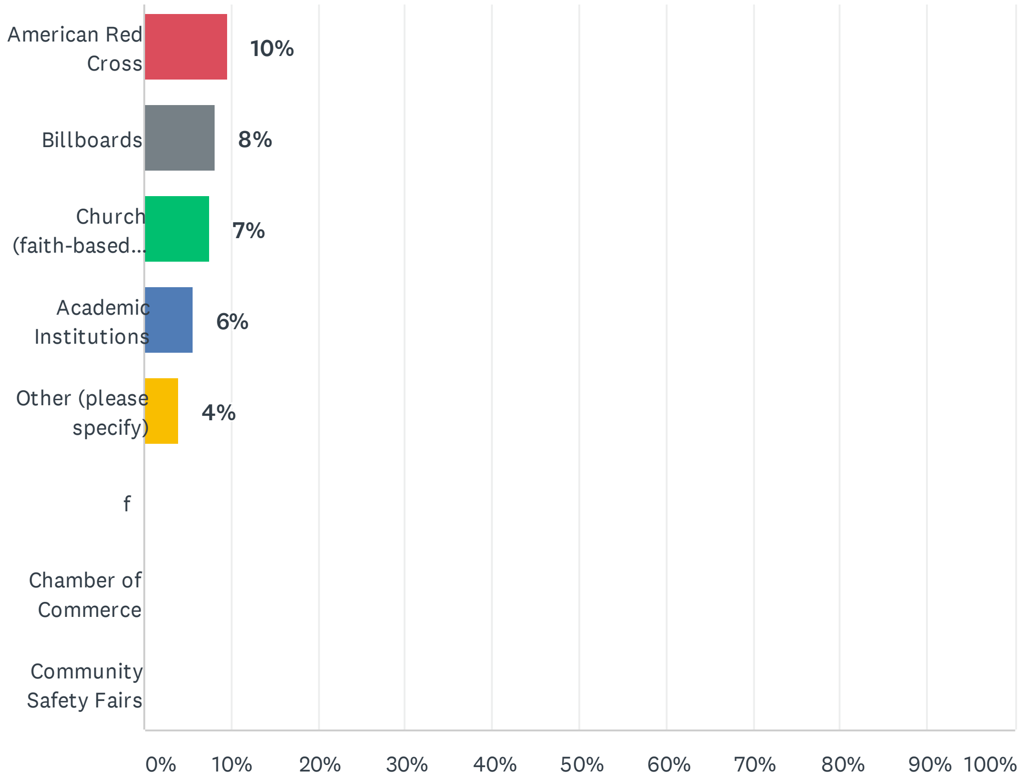
	LESS COMMON	STAYED ABOUT THE SAME	MUCH MORE COMMON	DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Other	6% 28	17% 84	16% 82	61% 304	498	3.33
Public health - epidemic or pandemic	3% 35	9% 118	82% 1,048	6% 77	1,278	2.91
Wildfire	5% 63	11% 140	80% 1,010	4% 55	1,268	2.83
Poor air quality	4% 48	18% 223	72% 905	7% 88	1,264	2.82
Cyberthreats	6% 74	28% 353	45% 568	22% 273	1,268	2.82
Climate change	4% 47	19% 246	68% 863	9% 110	1,266	2.82
Coastal erosion	6% 74	31% 390	40% 511	23% 295	1,270	2.81
Drought	3% 43	23% 286	66% 835	8% 101	1,265	2.79
Coastal or bay flooding	7% 87	38% 476	26% 331	29% 365	1,259	2.77
Power failures	4% 54	22% 279	66% 840	8% 100	1,273	2.77
River flooding	13% 164	39% 494	12% 155	35% 443	1,256	2.70
High winds	4% 47	36% 453	50% 637	10% 126	1,263	2.67
Extreme heat	6% 70	31% 388	56% 706	8% 103	1,267	2.66
Terrorism	11% 137	41% 516	22% 274	27% 339	1,266	2.64
Dam failure	19% 242	37% 468	9% 112	35% 442	1,264	2.60
Landslides	9% 119	48% 603	19% 239	24% 304	1,265	2.58
Street flooding from storm	15% 195	46% 581	18% 228	21% 263	1,267	2.44
Earthquake	7% 87	68% 864	13% 167	12% 152	1,270	2.30
Extreme cold	15% 187	56% 704	17% 209	13% 162	1,262	2.27
Radiological Incident	0% 0	0% 0	0% 0	0% 0	0	0.00
Space Weather	0% 0	0% 0	0% 0	0% 0	0	0.00
Critical Infrastructure Failure	0% 0	0% 0	0% 0	0% 0	0	0.00
High Rise / High Occupancy Building Fire	0% 0	0% 0	0% 0	0% 0	0	0.00

Terrorism	0% 0	0% 0	0% 0	0% 0	0	0.00
Transportation Incident	0% 0	0% 0	0% 0	0% 0	0	0.00
Civil Unrest	0% 0	0% 0	0% 0	0% 0	0	0.00
Extreme Heat	0% 0	0% 0	0% 0	0% 0	0	0.00

Q8 What is the best way for you to receive information about hazards and emergency preparedness? (Check all that apply)

Answered: 1,291 Skipped: 8

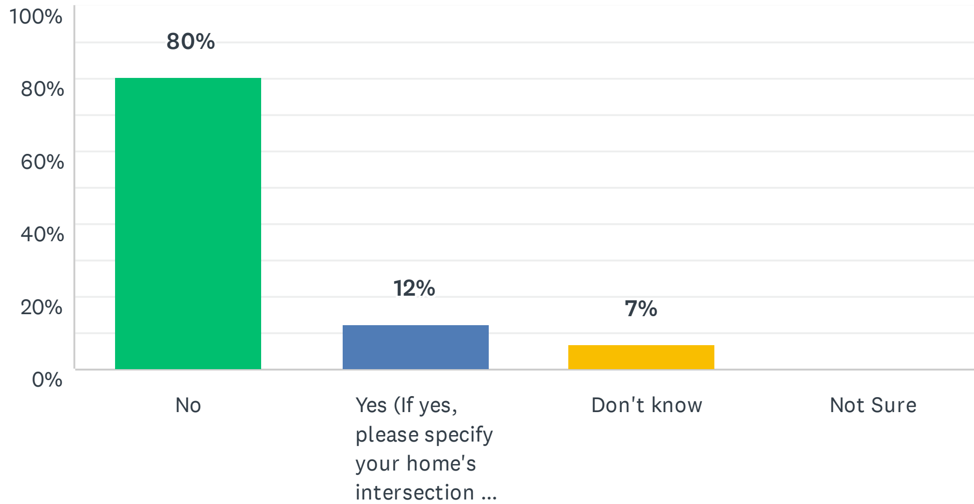



American Red Cross
10%
Billboards
8%
Church (faith-based...
7%
Academic Institutions
6%
Other (please specify)
4%
f
Chamber of Commerce
Community Safety Fairs
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Email	77%	1,000
Text/Emergency Alert System	66%	847
Social Media (i.e. Facebook, Nextdoor, Twitter, etc.)	47%	611
Cellphone call	40%	522
TV News	39%	500
County or City website	36%	467
Mail - letter or postcard	35%	449
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)	33%	428
City Newsletters	31%	397
Community Emergency Response Training (CERT) classes	28%	365
Radio	26%	333
Public Meetings	25%	321
Fire Department/Rescue	22%	282
Utility bill	19%	246
Community groups or clubs	16%	206
Home phone (landline)	15%	192
Schools	14%	182
Public Library	14%	177
American Red Cross	10%	123
Billboards	8%	105
Church (faith-based institutions)	7%	96
Academic Institutions	6%	73
Other (please specify)	4%	52
f	0%	0
Chamber of Commerce	0%	0
Community Safety Fairs	0%	0
Total Respondents: 1,291		

Q9 Does your street flood during rain events?

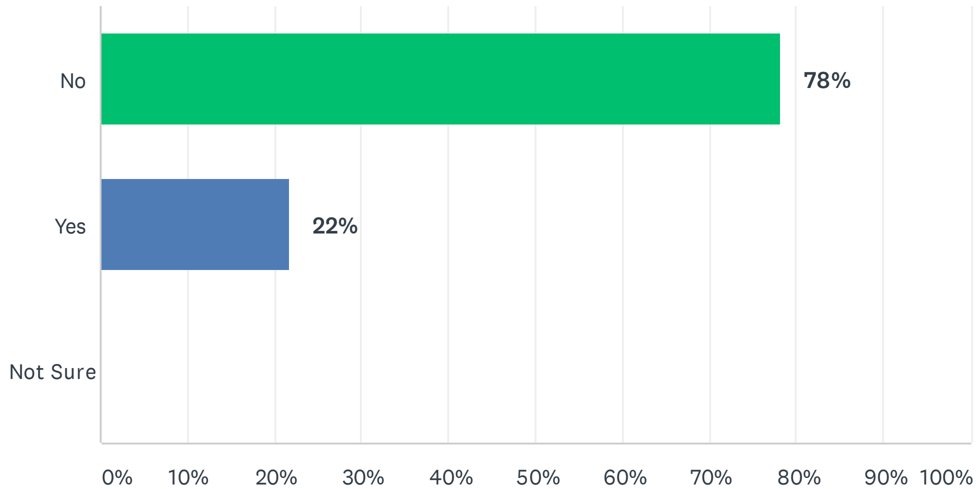
Answered: 1,291 Skipped: 8



ANSWER CHOICES	RESPONSES	
No	80%	1,039
Yes (If yes, please specify your home's intersection or street name below)	12%	159
Don't know	7%	93
Not Sure	0%	0
TOTAL		1,291

Q10 Is your current home or housing located in or near a FEMA designated floodplain? If you're not sure, input your address into this FEMA flood zone tool: https://msc.fema.gov/portal/search

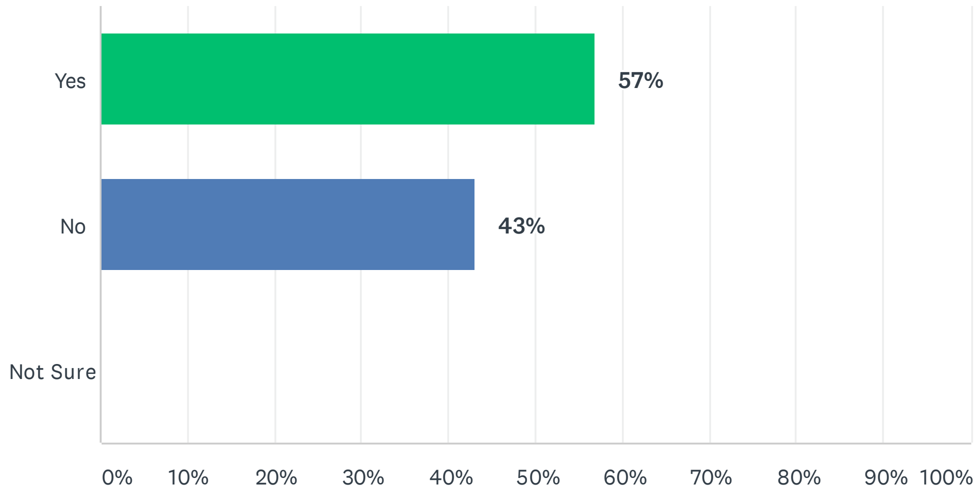
Answered: 1,291 Skipped: 8



ANSWER CHOICES	RESPONSES	
No	78%	1,010
Yes	22%	281
Not Sure	0%	0
TOTAL		1,291

Q11 Is your current home or housing located near an earthquake fault? If you're not sure, type your address into this earthquake fault tool: https://maps.conservation.ca.gov/cgs/EQZApp/app/

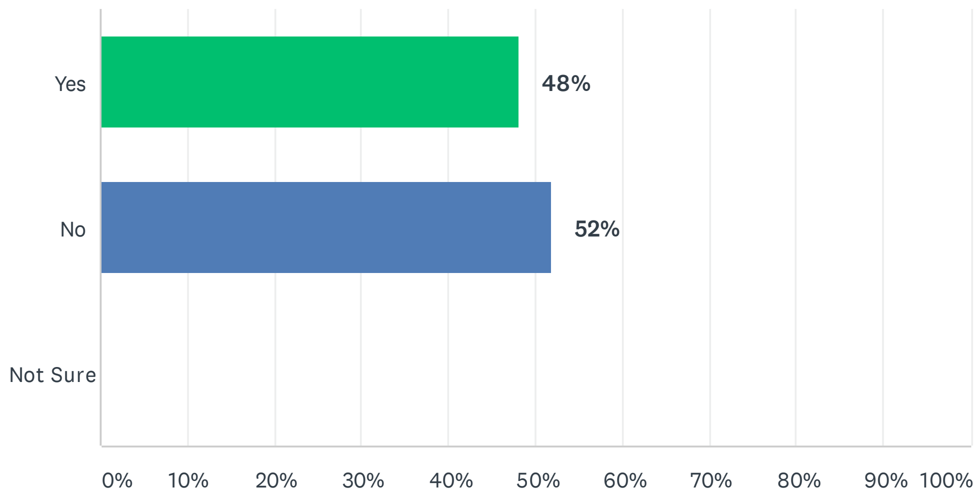
Answered: 1,291 Skipped: 8



ANSWER CHOICES	RESPONSES	
Yes	57%	735
No	43%	556
Not Sure	0%	0
TOTAL		1,291

Q12 Is your current home or housing located in an area at-risk for wildfire? If you're not sure, type your address into this wildfire risk tool: https://www.buzzfeednews.com/article/peteraldhous/wildfire-risk-maps-search-your-home

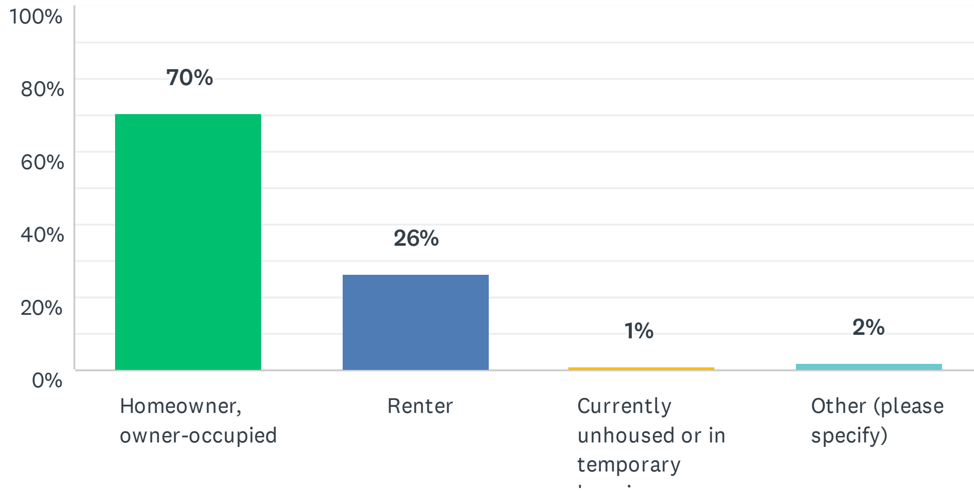
Answered: 1,291 Skipped: 8



ANSWER CHOICES	RESPONSES	
Yes	48%	620
No	52%	671
Not Sure	0%	0
TOTAL		1,291

Q13 What is your current housing status?

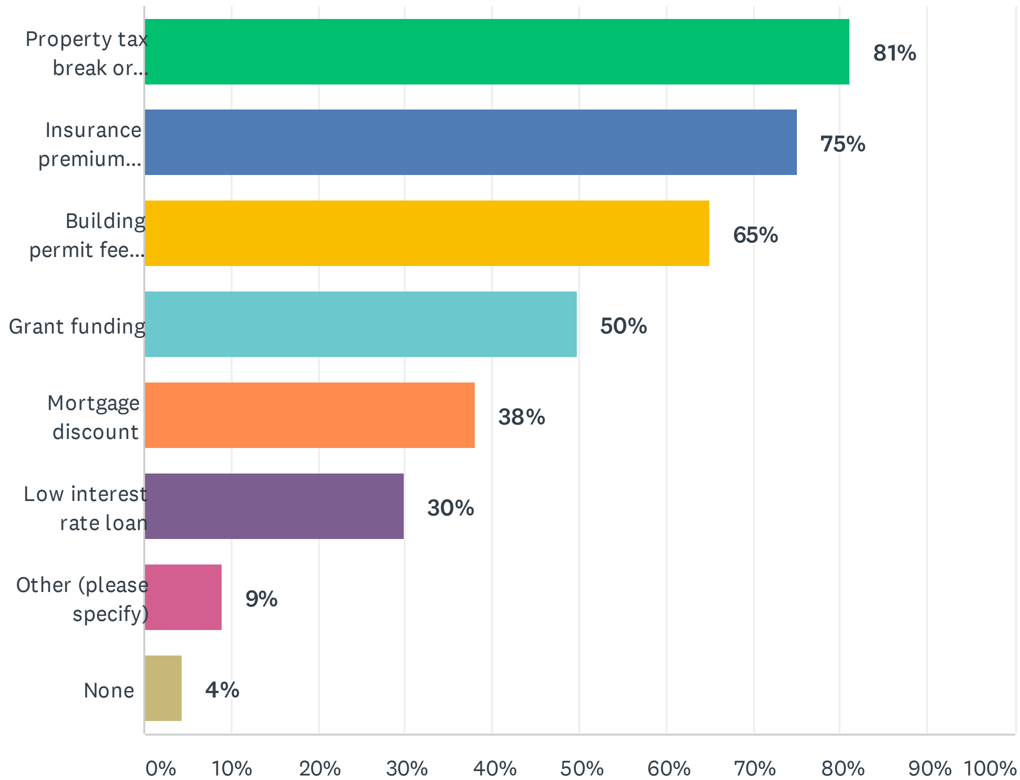
Answered: 1,288 Skipped: 11



ANSWER CHOICES	RESPONSES	
Homeowner, owner-occupied	70%	908
Renter	26%	341
Currently unhoused or in temporary housing	1%	15
Other (please specify)	2%	24
TOTAL		1,288

Q14 Which of the following incentives would encourage you to spend money to retrofit your home to protect against disasters? (Check all that apply)

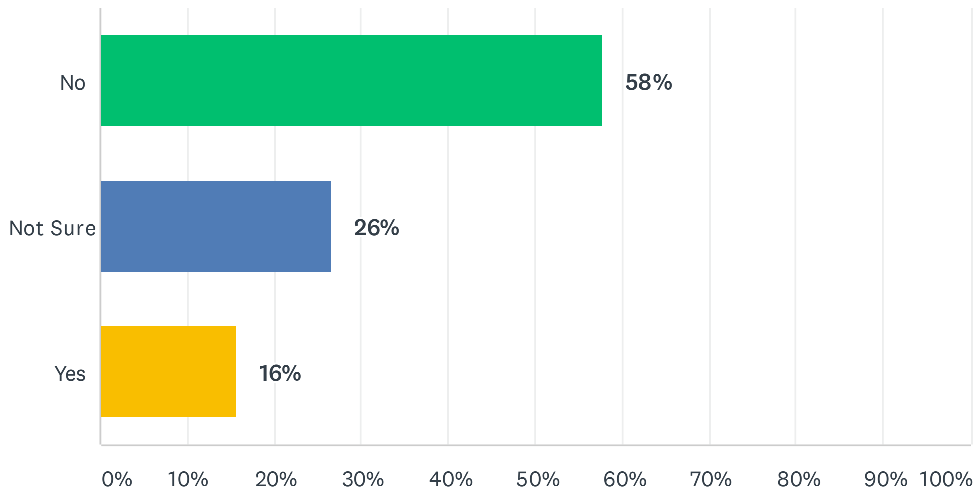
Answered: 907 Skipped: 392



ANSWER CHOICES	RESPONSES	
Property tax break or incentive	81%	736
Insurance premium discount	75%	682
Building permit fee waiver	65%	590
Grant funding	50%	452
Mortgage discount	38%	346
Low interest rate loan	30%	272
Other (please specify)	9%	81
None	4%	39
Total Respondents: 907		

Q15 To the best of your knowledge, does the home in which you live have an active flood insurance policy?

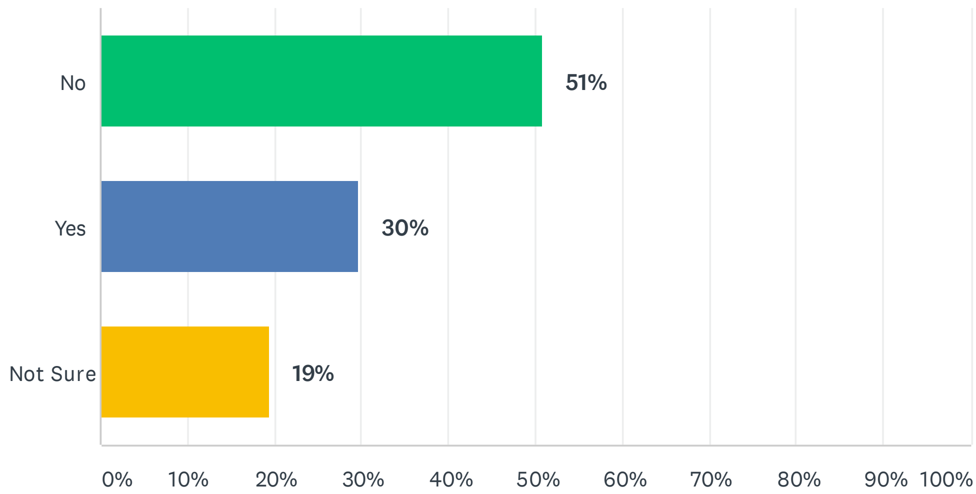
Answered: 1,242 Skipped: 57



ANSWER CHOICES	RESPONSES	
No	58%	718
Not Sure	26%	329
Yes	16%	195
TOTAL		1,242

Q16 To the best of your knowledge, does the home in which you live have an active earthquake insurance policy?

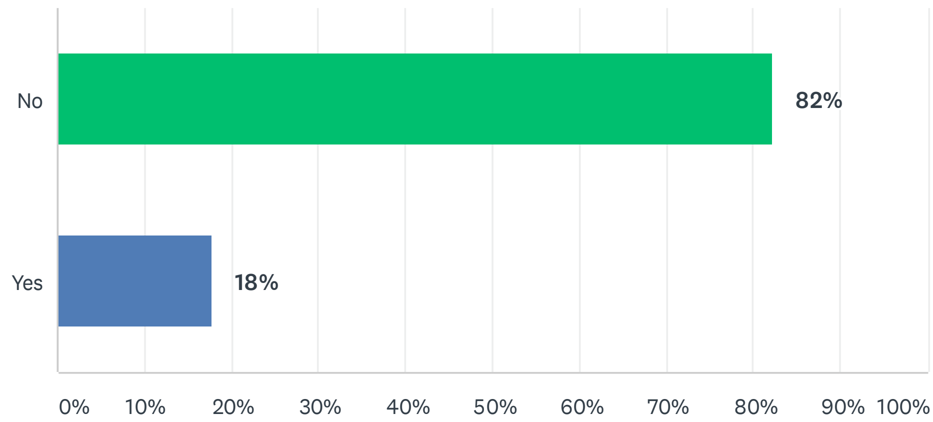
Answered: 1,242 Skipped: 57



ANSWER CHOICES	RESPONSES	
No	51%	632
Yes	30%	369
Not Sure	19%	241
TOTAL		1,242

Q17 Have you ever had problems getting homeowners or renters insurance due to risks from hazards?

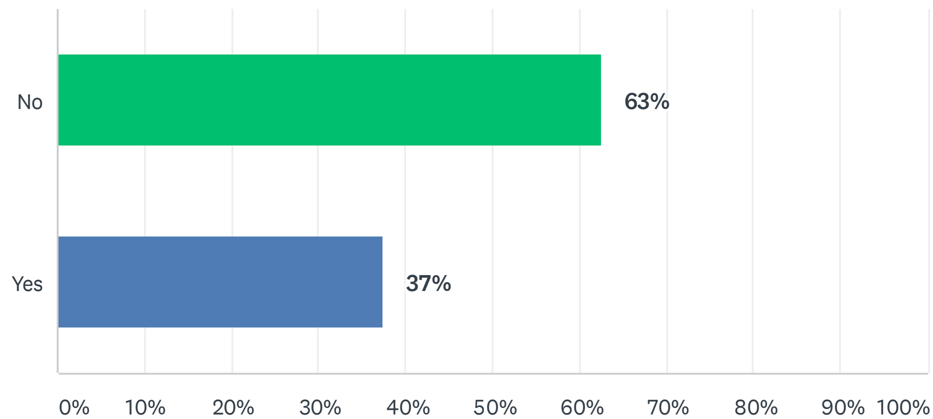
Answered: 1,227 Skipped: 72



ANSWER CHOICES	RESPONSES	
No	82%	1,010
Yes	18%	217
TOTAL		1,227

Q18 Was the presence of a hazard risk zone (e.g., earthquake fault zone, dam failure zone, flood zone, landslide hazard area, or high fire risk area) disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your home?

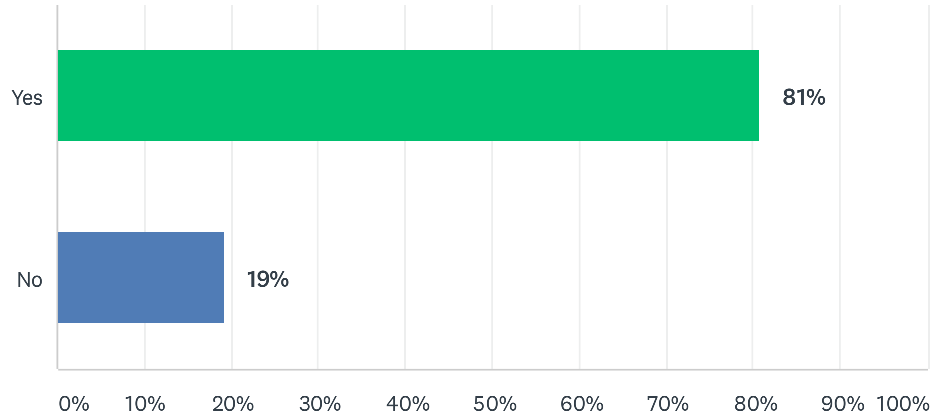
Answered: 1,242 Skipped: 57



ANSWER CHOICES	RESPONSES	
No	63%	778
Yes	37%	464
TOTAL		1,242

Q19 Would the disclosure of this type of information influence your decision to purchase or move into a home in the future?

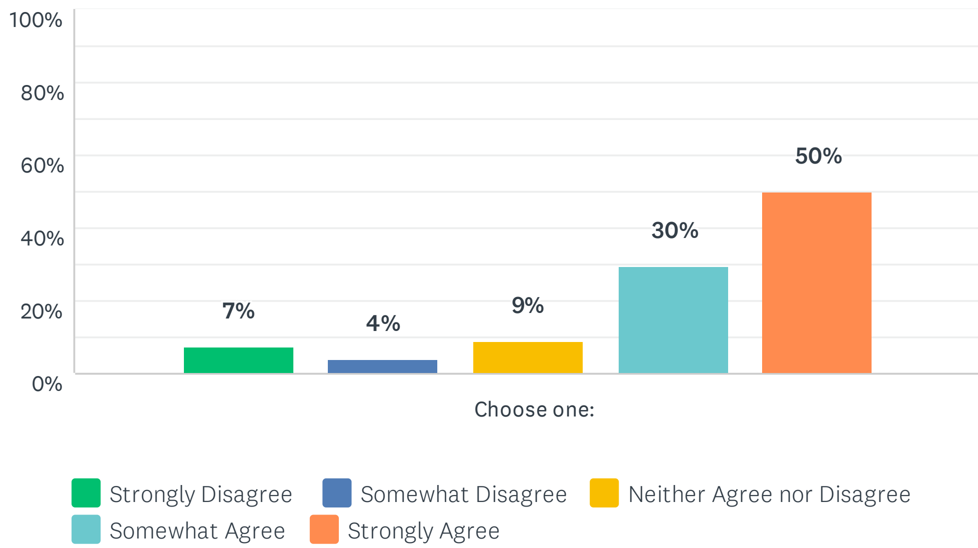
Answered: 1,242 Skipped: 57



ANSWER CHOICES	RESPONSES	
Yes	81%	1,002
No	19%	240
TOTAL		1,242

Q20 Please indicate how you feel about the following statement:"I believe it is the responsibility of government (local, state and federal) to provide education and programs that promote its residents to take action to reduce their exposure and risk to natural hazards."

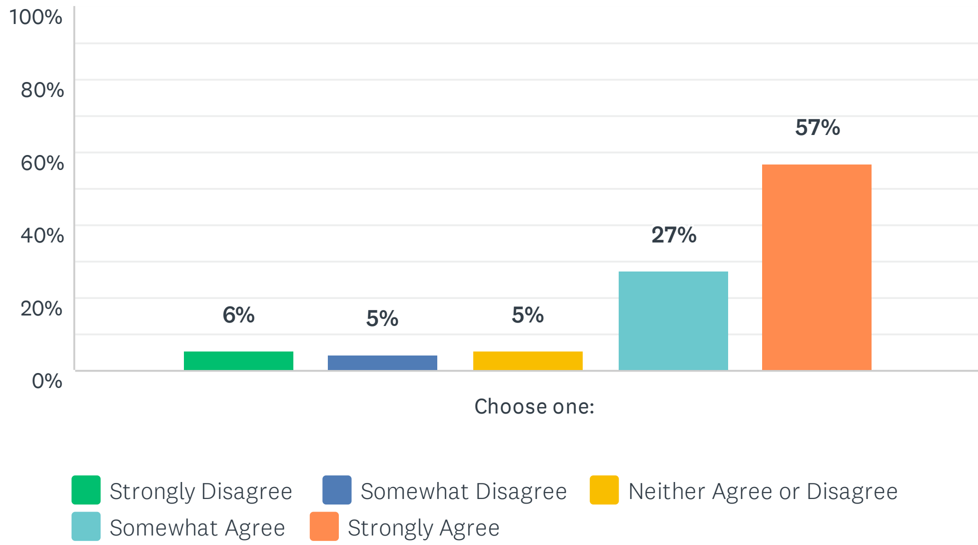
Answered: 1,262 Skipped: 37



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
Choose one:	7% 94	4% 53	9% 111	30% 373	50% 631	1,262	4.10

Q21 Please indicate how you feel about the following statement: "I believe it is my responsibility to educate myself about programs that reduce my exposure to natural hazards."

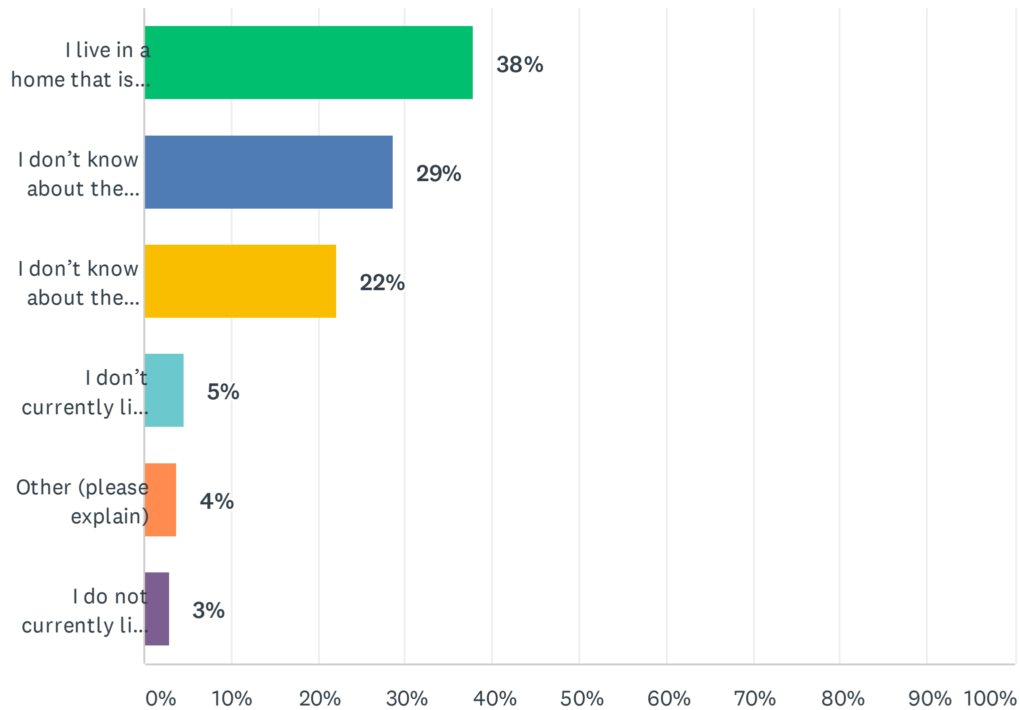
Answered: 1,263 Skipped: 36



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE OR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
Choose one:	6% 71	5% 59	5% 67	27% 346	57% 720	1,263	4.25

Q22 If a natural disaster such as a large earthquake were to strike tomorrow, how would you feel regarding your personal safety?

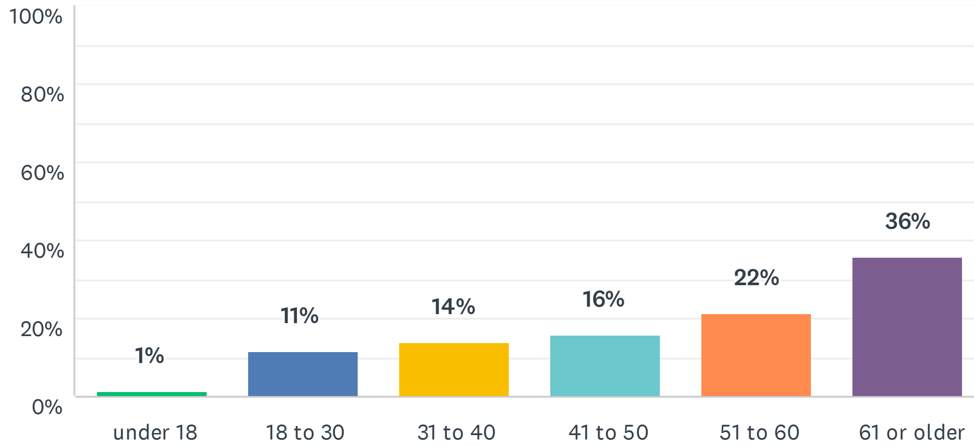
Answered: 1,264 Skipped: 35



ANSWER CHOICES	RESPONSES	
I live in a home that is structurally safe, I feel confident I would be safe	38%	478
I don't know about the structural integrity of my home but know that I have alternative safe places I could go	29%	361
I don't know about the structural integrity of my home, and I do not know where else I could go to feel safe	22%	281
I don't currently live in a home that would keep me safe during a large earthquake, and I don't know where else I would go to feel safe	5%	59
Other (please explain)	4%	47
I do not currently live in a home that would be structurally safe during a large earthquake, but I have friends or family nearby where I could feel safe	3%	38
TOTAL		1,264

Q23 Please indicate your age range:

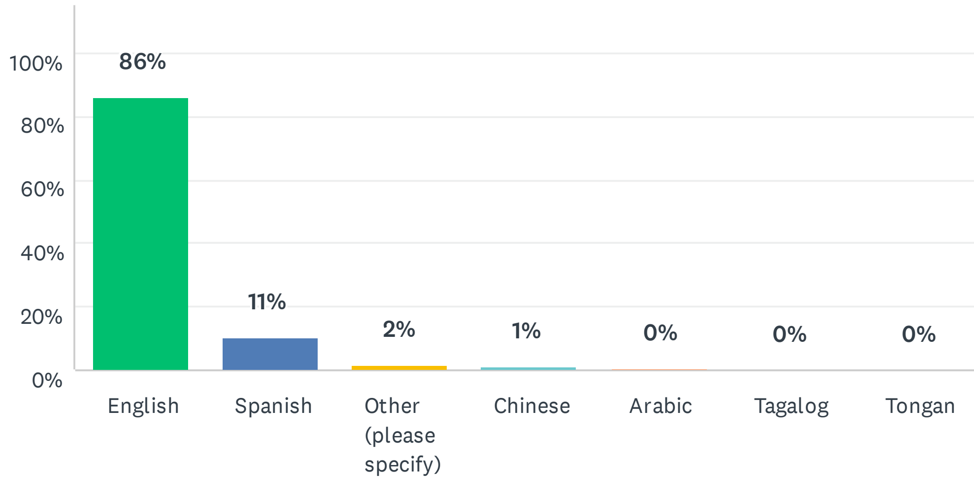
Answered: 1,263 Skipped: 36



ANSWER CHOICES	RESPONSES	
under 18	1%	15
18 to 30	11%	144
31 to 40	14%	177
41 to 50	16%	200
51 to 60	22%	272
61 or older	36%	455
TOTAL		1,263

Q24 Please indicate the primary language spoken in your household.

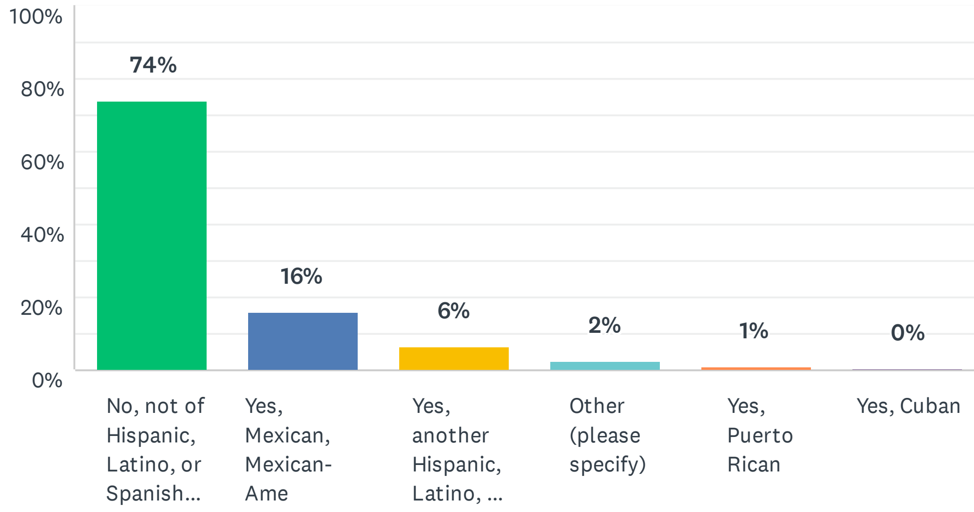
Answered: 1,257 Skipped: 42



ANSWER CHOICES	RESPONSES	
English	86%	1,083
Spanish	11%	132
Other (please specify)	2%	20
Chinese	1%	16
Arabic	0%	4
Tagalog	0%	1
Tongan	0%	1
TOTAL		1,257

Q25 Are you of Hispanic, Latino, or Spanish origin?

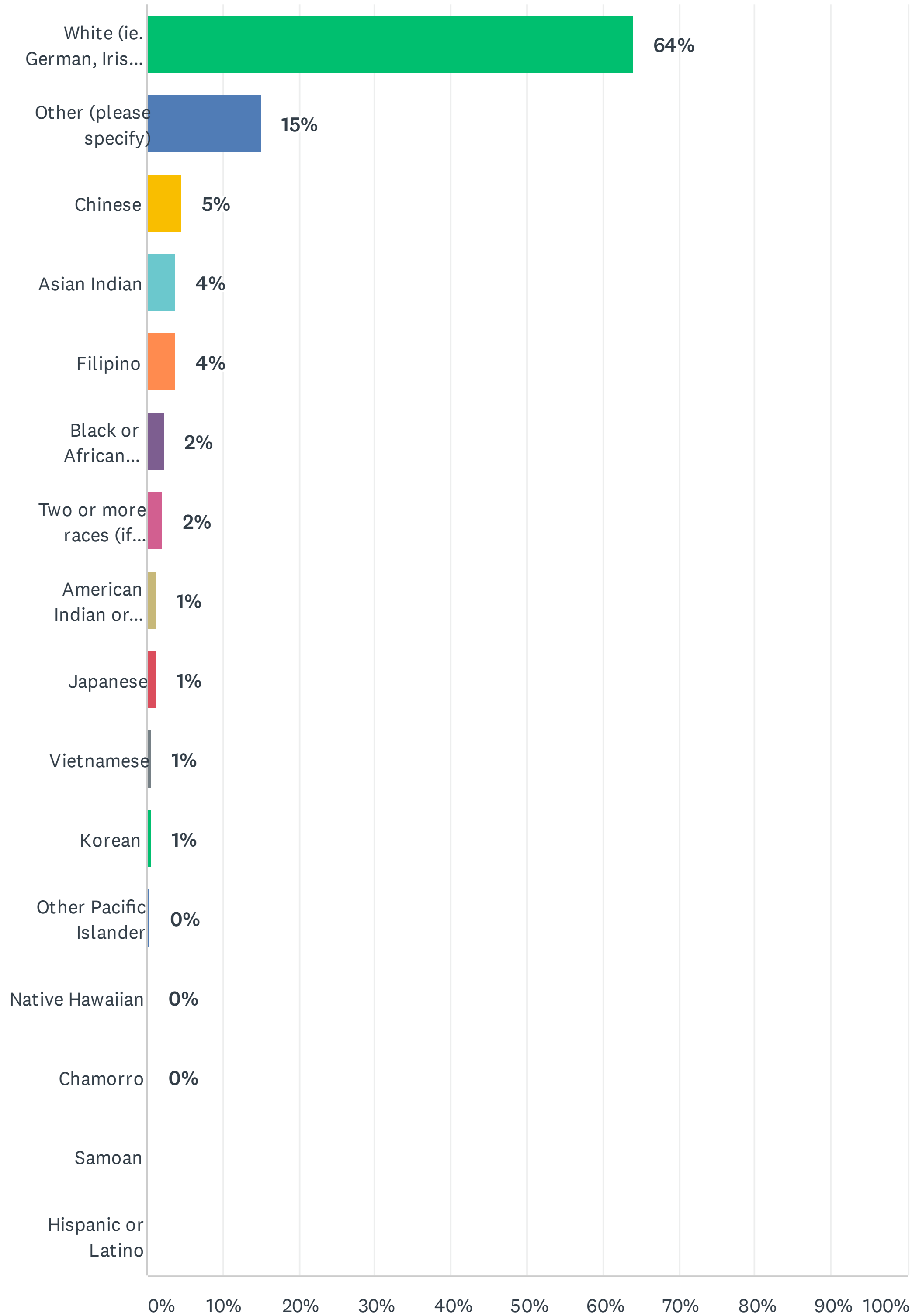
Answered: 1,226 Skipped: 73



ANSWER CHOICES	RESPONSES	
No, not of Hispanic, Latino, or Spanish origin	74%	908
Yes, Mexican, Mexican-American, Chicano	16%	198
Yes, another Hispanic, Latino, or Spanish origin -- ie. Salvadoran, Dominican, Colombian, Guatemalan, Spaniard, etc.	6%	77
Other (please specify)	2%	28
Yes, Puerto Rican	1%	11
Yes, Cuban	0%	4
TOTAL		1,226

Q26 What is your race?

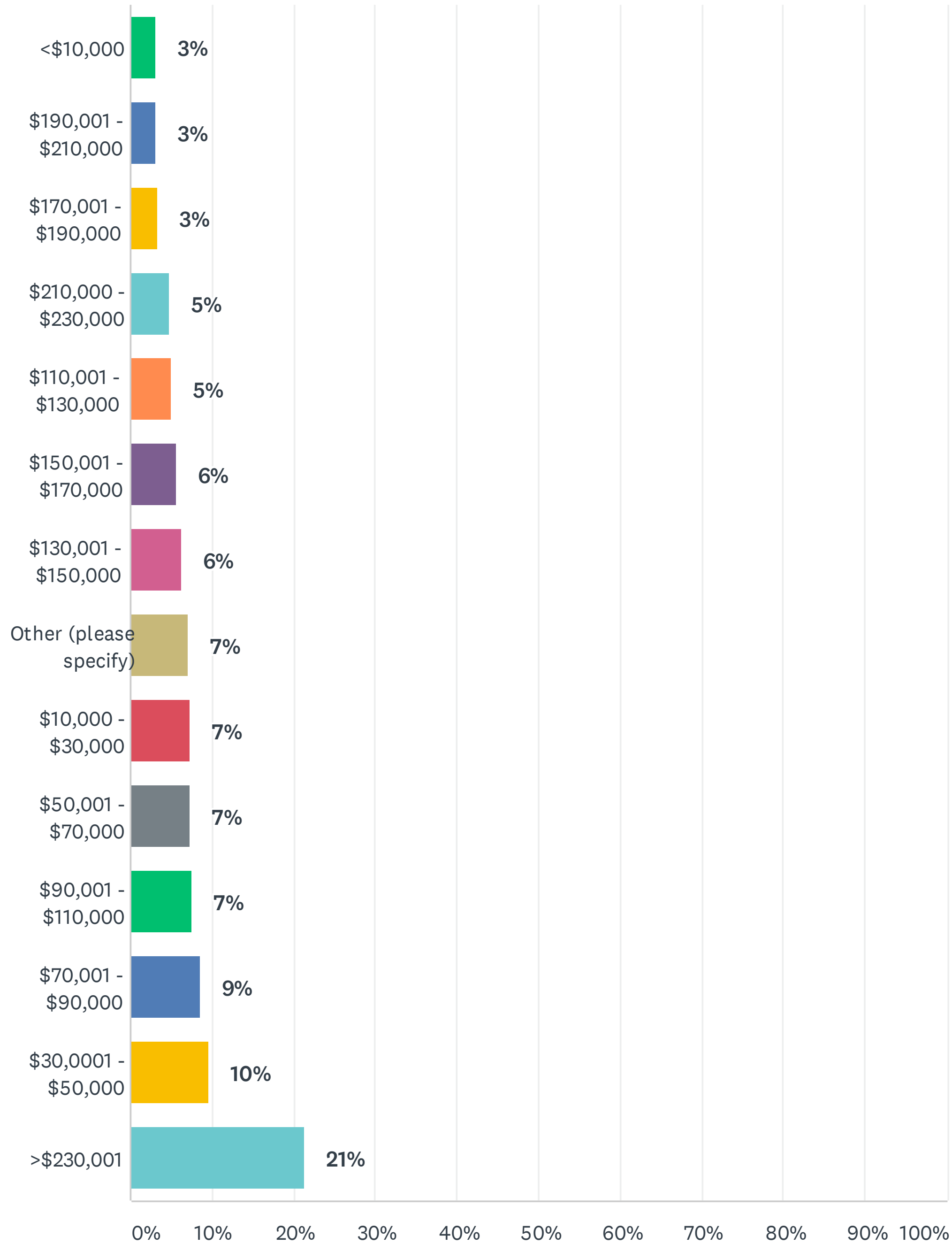
Answered: 1,200   Skipped: 99



ANSWER CHOICES	RESPONSES	
White (ie. German, Irish, English, Lebanese, Egyptian, etc.)	64%	767
Other (please specify)	15%	182
Chinese	5%	56
Asian Indian	4%	45
Filipino	4%	44
Black or African American (ie. African American, Jamaican, Haitian, Nigerian, Somali, etc.)	2%	27
Two or more races (if selected, please explain below)	2%	25
American Indian or Alaska Native	1%	15
Japanese	1%	15
Vietnamese	1%	7
Korean	1%	7
Other Pacific Islander	0%	4
Native Hawaiian	0%	3
Chamorro	0%	3
Samoan	0%	0
Hispanic or Latino	0%	0
TOTAL		1,200

Q27 What is your household income?

Answered: 1,180 Skipped: 119



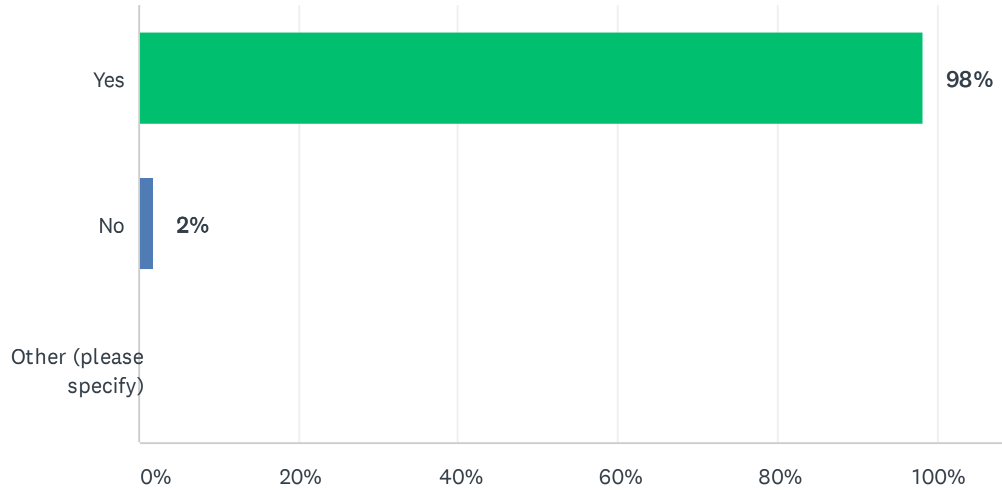
ANSWER CHOICES	RESPONSES	
<$10,000	3%	36
$190,001 - $210,000	3%	37
$170,001 - $190,000	3%	39
$210,000 - $230,000	5%	56
$110,001 - $130,000	5%	60
$150,001 - $170,000	6%	66
$130,001 - $150,000	6%	73
Other (please specify)	7%	85
$10,000 - $30,000	7%	86
$50,001 - $70,000	7%	87
$90,001 - $110,000	7%	88
$70,001 - $90,000	9%	102
$30,0001 - $50,000	10%	113
>$230,001	21%	252
TOTAL		1,180

Q28 What is your zip code?

Answered: 1,263 Skipped: 36

Q29 Do you have internet access at your home?

Answered: 1,255 Skipped: 44



ANSWER CHOICES	RESPONSES	
Yes	98%	1,233
No	2%	22
Other (please specify)	0%	0
TOTAL		1,255

SURVEY #2
EXECUTIVE
SUMMARY

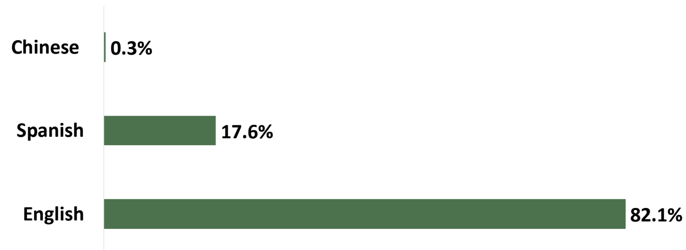
SMC Multijurisdictional Local Hazard Mitigation Plan – Survey #2

San Mateo County (SMC) released Survey #2 for the SMC Multijurisdictional Local Hazard Mitigation Plan on June 4, 2021. The survey focused on three costly or damaging hazards likely to occur in the area: earthquakes, wildfire, and extreme heat. The survey was closed on July 11, 2021. The following provides an executive summary of the survey and its results, followed by the full export of survey responses.

BASICS

37
DAYS

703
RESPONSES



KEY INSIGHTS

Most Popular Sources

The top 2 sources used by participants to stay informed about potential emergency situations and disaster preparedness included:

- **SMCAlert (78.4%)**
- **Emails and websites from state, county or cities, public utilities, such as PG&E, or non-profits, such as the Red Cross (63.0%)**

Responses that showed up frequently in the comments included:

- **Nextdoor**
- **Media - Radio/TV/Social Media**

Most Helpful Mitigation

During an earthquake, wildfire event, or extreme heat event, most participants responded that **"Knowing my community can provide safe, accessible emergency shelters for my family and neighbors…"** would be the most helpful to them.

Responses that showed up frequently in the comments included:

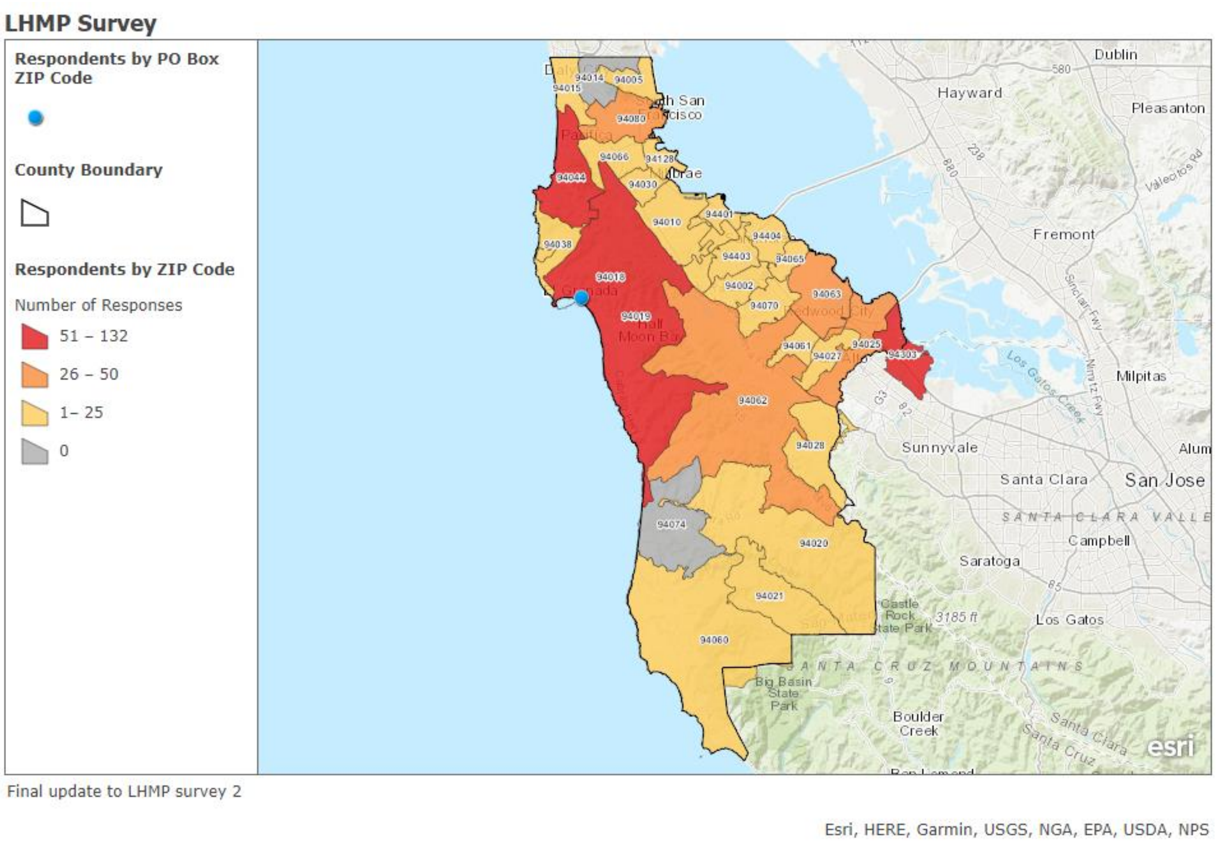
- Safe evacuation planning
- Communication plan in case of power loss

- Education, expertise, and resources surrounding building safety and general preparedness
- Fuel reduction plan
- Financial help for cooling systems

PARTICIPANTS

Location

- 23 cities
- Most participants from Half Moon Bay (18.8%), Pacifica (12.8%), and Redwood City (11.4%)
- A list of responses by City can be found in Appendix A



How they Heard about Survey

- Top responses for how participants heard about the survey included:
  - Social Media (16.8%)
  - County Media Release (9.6%)
  - El Concilio of San Mateo County (9.5%)

   - Nuestra Casa (9.3%)
   - Ayudando Latinos A Soñar (ALAS) (8.4%)
- Most participants (40.1%) selected the "Other" category, of which **54.8%** specified CERT
- Considering the number of total responses to this question (677), **22.0%** of participants indicated CERT as the source through which they heard about the survey

Demographics

Age: Most participants were 61 or older (41.4%)

Primary Language: The primary language spoken in the household of most participants was English (75.7%), followed by Spanish (22.3%)

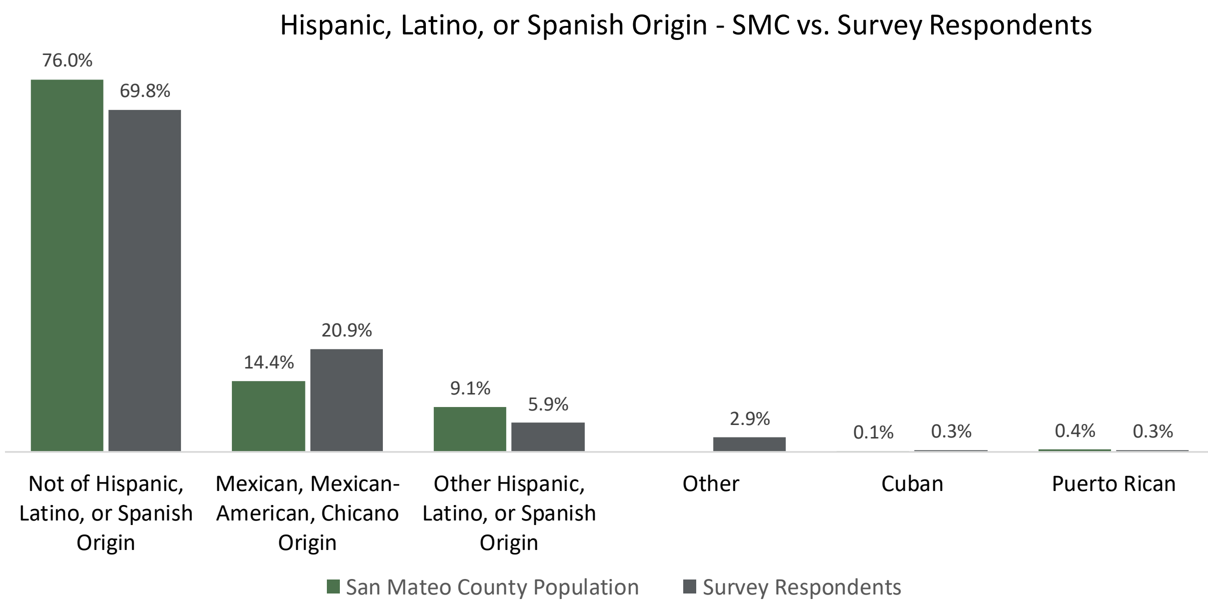
Income: Though there was a wide spread, most participants responded that their household income was between:

- $30,001 and $50,000 (16.1%)
- Greater than $230,001 (12.5%)

In general,

- **46.6%** of participants indicated an income range falling at or below $90,000
- **47.5%** of participants indicated an income range falling above $90,001
- **5.9%** of participants indicated "Other," with most noting that they preferred not to answer

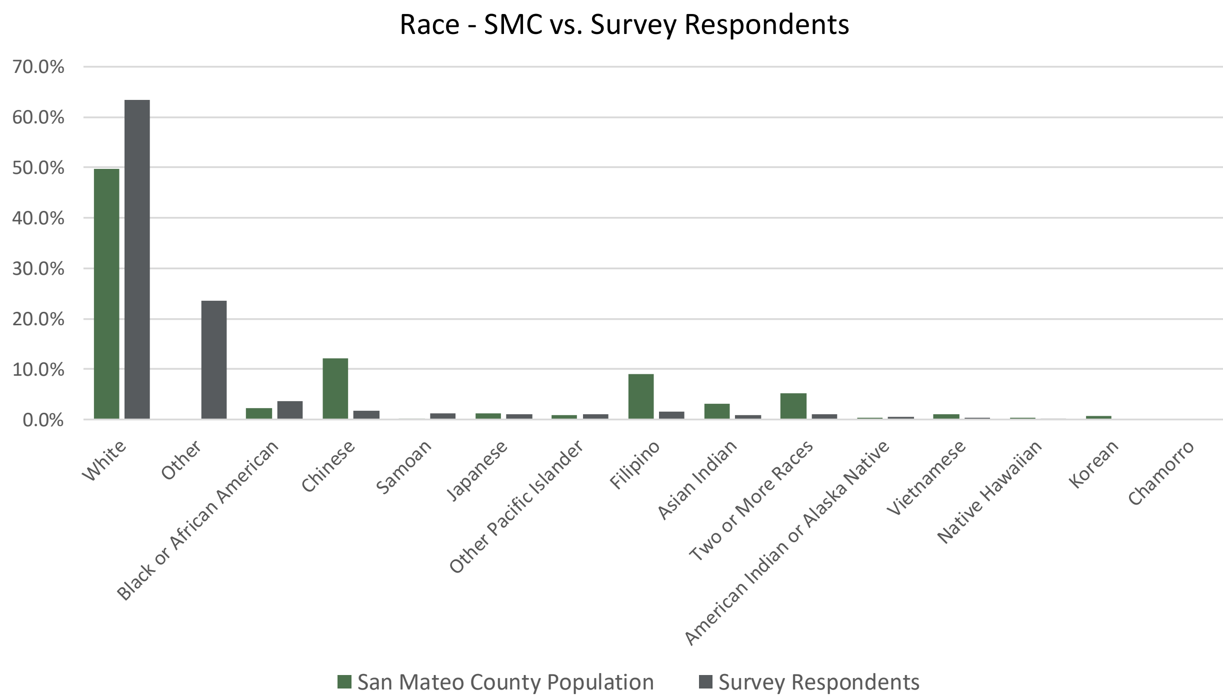
Hispanic, Latino, or Spanish origin



Source: 2019 ACS 1-Year Estimates

- Compared to **76.0%** of the County's population, **69.8%** of survey respondents did not identify with Hispanic, Latino, or Spanish origin
- Among participants who identified with Hispanic, Latino, or Spanish origin:
    - **20.9%** identified with Mexican, Mexican-American, or Chicano origin, as compared to **14.4%** of the County's population
    - **5.9%** identified with Other Hispanic, Latino, or Spanish origin, as compared to **9.1%** of the County's population

Race



Source: 2019 ACS 1-Year Estimates

- Individuals identifying as White were generally overrepresented among participants (making up **63.5%** of survey participants and approximately **49.7%** of the County's population)
- Among the following Race categories, there was underrepresentation of over 5%, between survey participants and the County's population:
    - Individuals identifying as Chinese made up **1.8%** of survey participants, while making up approximately **12.2%** of the County's population (-10.4%)
    - Individuals identifying as Filipino made up **1.6%** of survey participants, while making up approximately **9.0%** of the County's population (-7.4%)

- **23.5%** of individuals marked their Race as “Other,” with many written-in comments indicating “Mexican”/”Mexicano”; “Latina”/”Latino”/”Latin American”; and “Hispano”/“Hispana”/“Hispanic”

APPENDIX A

Responses by City

City	# Responses	% Responses
Half Moon Bay	132	18.8%
Pacifica	90	12.8%
Redwood City	80	11.4%
East Palo Alto	75	10.7%
San Mateo	71	10.1%
El Granada	44	6.3%
Menlo Park	38	5.4%
South San Francisco	30	4.3%
Montara	22	3.1%
San Carlos	19	2.7%
Burlingame	16	2.3%
Pescadero	15	2.1%
Belmont	14	2.0%
Moss Beach	14	2.0%
San Bruno	13	1.8%
Millbrae	8	1.1%
Brisbane	7	1.0%
La Honda	7	1.0%
Daly City	3	0.4%
Atherton	2	0.3%
Loma Mar	1	0.1%
Portola Valley	1	0.1%
SFIA Airport Influence Area	1	0.1%
	703	100%

SURVEY #2 RESULTS

Q1 What is your 5-digit zip code?

Answered: 703 Skipped: 0

#	RESPONSES	DATE
1	94044	7/11/2021 12:35 PM
2	94401	7/11/2021 10:14 AM
3	94401	7/11/2021 10:11 AM
4	94018	7/10/2021 4:43 PM
5	94044	7/10/2021 12:21 PM
6	94002	7/9/2021 6:30 PM
7	94025	7/9/2021 3:02 PM
8	94044	7/9/2021 1:46 PM
9	94044	7/9/2021 1:04 PM
10	94044	7/9/2021 12:48 PM
11	94030	7/9/2021 12:39 PM
12	94019	7/9/2021 8:23 AM
13	94019	7/9/2021 8:22 AM
14	94019	7/9/2021 8:21 AM
15	94044	7/9/2021 12:07 AM
16	94044	7/8/2021 10:53 PM
17	94044	7/8/2021 10:10 PM
18	94060	7/8/2021 9:53 PM
19	94044	7/8/2021 7:39 PM
20	94044	7/8/2021 4:54 PM
21	94070	7/8/2021 4:33 PM
22	94018	7/8/2021 3:44 PM
23	94019	7/8/2021 3:13 PM
24	94044	7/8/2021 3:07 PM
25	94404	7/8/2021 11:46 AM
26	94044	7/8/2021 9:52 AM
27	94044	7/8/2021 8:16 AM
28	94019	7/8/2021 8:13 AM
29	94044	7/8/2021 7:58 AM
30	94044	7/8/2021 7:23 AM
31	94044	7/8/2021 7:00 AM
32	94044	7/8/2021 6:58 AM
33	94019	7/8/2021 6:28 AM

34	94044	7/8/2021 5:41 AM
35	94044	7/7/2021 11:31 PM
36	94044	7/7/2021 10:23 PM
37	94044	7/7/2021 9:52 PM
38	94044	7/7/2021 9:51 PM
39	94403	7/7/2021 8:53 PM
40	94044	7/7/2021 8:48 PM
41	94044	7/7/2021 7:32 PM
42	94044	7/7/2021 7:31 PM
43	94403	7/7/2021 5:45 PM
44	94044	7/7/2021 5:39 PM
45	94044	7/7/2021 4:01 PM
46	94061	7/7/2021 3:43 PM
47	94044	7/7/2021 3:07 PM
48	94044	7/7/2021 2:52 PM
49	94080	7/7/2021 2:50 PM
50	94044	7/7/2021 2:29 PM
51	94044	7/7/2021 12:51 PM
52	94044	7/7/2021 12:44 PM
53	94303	7/7/2021 12:43 PM
54	94044	7/7/2021 11:52 AM
55	94044	7/7/2021 11:44 AM
56	94044	7/7/2021 11:10 AM
57	94044	7/7/2021 10:36 AM
58	94044	7/7/2021 10:26 AM
59	94044	7/7/2021 10:08 AM
60	94044	7/7/2021 9:29 AM
61	94044	7/7/2021 9:21 AM
62	94044	7/7/2021 9:04 AM
63	94044	7/7/2021 9:02 AM
64	94401	7/7/2021 8:59 AM
65	94015	7/7/2021 8:56 AM
66	94044	7/7/2021 8:47 AM
67	94044	7/7/2021 8:34 AM
68	94044	7/7/2021 8:28 AM
69	94038	7/7/2021 8:24 AM
70	94044	7/7/2021 8:17 AM
71	94044	7/7/2021 8:07 AM

72	94044	7/7/2021 8:02 AM
73	94044	7/7/2021 7:53 AM
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75	94044	7/7/2021 7:42 AM
76	94044	7/7/2021 7:42 AM
77	94044	7/7/2021 7:38 AM
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82	94044	7/7/2021 6:57 AM
83	94044	7/7/2021 6:43 AM
84	94044	7/7/2021 6:37 AM
85	94044	7/7/2021 6:33 AM
86	94044	7/7/2021 6:24 AM
87	94044	7/7/2021 6:23 AM
88	94044	7/7/2021 6:20 AM
89	94044	7/7/2021 5:52 AM
90	94044	7/7/2021 5:29 AM
91	94044	7/7/2021 4:50 AM
92	94044	7/7/2021 4:05 AM
93	94044	7/7/2021 2:35 AM
94	94044	7/7/2021 2:20 AM
95	94044	7/7/2021 1:52 AM
96	94044	7/7/2021 1:28 AM
97	94044	7/7/2021 1:12 AM
98	94044	7/7/2021 1:10 AM
99	94044	7/7/2021 12:59 AM
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101	94070	7/6/2021 10:29 PM
102	94401	7/6/2021 5:28 PM
103	94404	7/6/2021 5:26 PM
104	94401	7/6/2021 2:52 PM
105	94070	7/6/2021 2:43 PM
106	94401	7/6/2021 2:36 PM
107	94303	7/6/2021 12:23 PM
108	94303	7/6/2021 12:22 PM
109	94303	7/6/2021 12:20 PM

110	94303	7/6/2021 12:19 PM
111	94303	7/6/2021 12:18 PM
112	94303	7/6/2021 12:17 PM
113	94303	7/6/2021 12:16 PM
114	94303	7/6/2021 12:15 PM
115	94303	7/6/2021 12:14 PM
116	94303	7/6/2021 12:12 PM
117	94303	7/6/2021 12:11 PM
118	94303	7/6/2021 12:10 PM
119	94303	7/6/2021 12:09 PM
120	94303	7/6/2021 12:08 PM
121	94303	7/6/2021 12:07 PM
122	94303	7/6/2021 12:06 PM
123	94303	7/6/2021 12:05 PM
124	94303	7/6/2021 12:03 PM
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126	94303	7/6/2021 11:40 AM
127	94303	7/6/2021 11:34 AM
128	94303	7/6/2021 11:30 AM
129	94303	7/6/2021 11:29 AM
130	94303	7/6/2021 11:27 AM
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138	94303	7/6/2021 11:08 AM
139	94303	7/6/2021 11:07 AM
140	94303	7/6/2021 11:05 AM
141	94303	7/6/2021 11:04 AM
142	94303	7/6/2021 11:03 AM
143	94303	7/6/2021 11:01 AM
144	94303	7/6/2021 11:00 AM
145	94303	7/6/2021 10:52 AM
146	94303	7/6/2021 10:51 AM
147	94019	7/6/2021 10:51 AM

148	94303	7/6/2021 10:50 AM
149	94019	7/6/2021 10:49 AM
150	94303	7/6/2021 10:48 AM
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162	94303	7/6/2021 10:33 AM
163	94303	7/6/2021 10:31 AM
164	94303	7/6/2021 10:30 AM
165	94303	7/6/2021 10:27 AM
166	94303	7/6/2021 10:20 AM
167	94303	7/6/2021 10:18 AM
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169	94018	7/6/2021 7:28 AM
170	94038	7/6/2021 6:00 AM
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172	94018	7/5/2021 4:03 PM
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174	94080	7/3/2021 9:07 PM
175	94005	7/3/2021 7:15 PM
176	94018	7/3/2021 2:46 PM
177	94025	7/3/2021 2:08 PM
178	94025	7/3/2021 11:00 AM
179	94066	7/3/2021 9:02 AM
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181	94061	7/2/2021 9:44 PM
182	94062	7/2/2021 4:36 PM
183	94019	7/2/2021 2:19 PM
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186	94402	7/2/2021 9:29 AM
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193	94018	7/2/2021 12:25 AM
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195	94044	7/2/2021 12:04 AM
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208	94019	7/1/2021 4:27 PM
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210	94020	7/1/2021 3:07 PM
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218	94044	7/1/2021 12:02 PM
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223	94062	7/1/2021 11:05 AM

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229	94044	7/1/2021 9:38 AM
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408	94019	6/27/2021 8:45 AM
409	94018	6/27/2021 8:45 AM
410	94044	6/27/2021 8:43 AM
411	94019	6/27/2021 8:43 AM
412	94037	6/27/2021 8:42 AM
413	94018	6/27/2021 8:41 AM

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415	94402	6/26/2021 7:42 PM
416	94025	6/26/2021 2:28 PM
417	94019	6/25/2021 9:13 PM
418	94010	6/25/2021 2:00 PM
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420	94403	6/25/2021 10:43 AM
421	94403	6/25/2021 8:38 AM
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439	94025	6/23/2021 10:09 PM
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454	94402	6/23/2021 2:34 PM
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457	94063	6/23/2021 2:21 PM
458	94061	6/23/2021 2:15 PM
459	94066	6/23/2021 1:48 PM
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462	94065	6/23/2021 1:06 PM
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464	94025	6/23/2021 6:54 AM
465	94303	6/22/2021 5:30 PM
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468	94019	6/22/2021 5:11 PM
469	94019	6/22/2021 5:10 PM
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471	94066	6/22/2021 5:02 PM
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474	94080	6/22/2021 4:54 PM
475	94063	6/22/2021 4:50 PM
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495	94063	6/21/2021 1:53 PM
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502	94019	6/19/2021 2:54 PM
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554	94303	6/16/2021 10:04 AM
555	94402	6/16/2021 10:03 AM
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558	94019	6/16/2021 6:54 AM
559	94060	6/15/2021 9:47 PM
560	94002	6/15/2021 7:54 PM
561	94025	6/15/2021 7:19 PM
562	94403	6/15/2021 6:50 PM
563	94027	6/15/2021 6:14 PM
564	94063	6/15/2021 4:56 PM
565	94063	6/15/2021 4:42 PM

566	94063	6/15/2021 4:25 PM
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568	94080	6/15/2021 2:48 PM
569	94402	6/15/2021 12:45 PM
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574	94019	6/15/2021 6:48 AM
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581	94403	6/14/2021 2:46 PM
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597	94019	6/14/2021 7:29 AM
598	94019	6/14/2021 6:58 AM
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601	94403	6/13/2021 8:35 PM
602	94404	6/13/2021 7:55 PM
603	94062	6/13/2021 3:41 PM

604	94403	6/13/2021 3:20 PM
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606	94061	6/13/2021 7:08 AM
607	94404	6/12/2021 9:52 PM
608	94404	6/12/2021 9:24 PM
609	94402	6/12/2021 8:31 PM
610	94403	6/12/2021 7:32 PM
611	94401	6/12/2021 6:02 PM
612	94403	6/12/2021 4:14 PM
613	94404	6/12/2021 4:08 PM
614	94005	6/12/2021 3:59 PM
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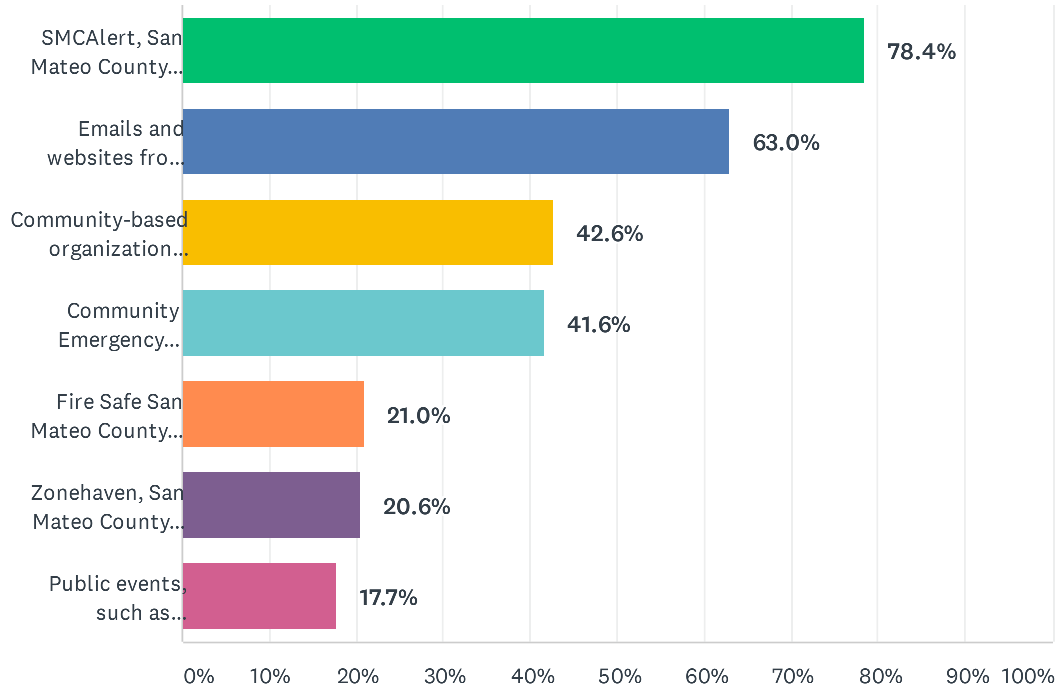
616	94002	6/12/2021 11:35 AM
617	94062	6/12/2021 11:30 AM
618	94404	6/12/2021 11:02 AM
619	94005	6/12/2021 10:43 AM
620	94002	6/12/2021 10:17 AM
621	94401	6/12/2021 10:00 AM
622	94061	6/12/2021 9:44 AM
623	94401	6/12/2021 7:00 AM
624	94005	6/12/2021 2:49 AM
625	94401	6/11/2021 10:00 PM
626	94044	6/11/2021 9:24 PM
627	94403	6/11/2021 9:18 PM
628	94404	6/11/2021 9:16 PM
629	94404	6/11/2021 8:57 PM
630	94402	6/11/2021 8:02 PM
631	94401	6/11/2021 7:59 PM
632	94404	6/11/2021 7:54 PM
633	94066	6/11/2021 7:24 PM
634	94403	6/11/2021 6:41 PM
635	94062	6/11/2021 6:24 PM
636	94403	6/11/2021 6:23 PM
637	94404	6/11/2021 6:19 PM
638	94404	6/11/2021 6:05 PM
639	94404	6/11/2021 6:03 PM
640	94403	6/11/2021 5:52 PM
641	94002	6/11/2021 5:50 PM

642	94019	6/11/2021 2:24 PM
643	94062	6/11/2021 1:50 PM
644	94062	6/11/2021 1:33 PM
645	94019	6/11/2021 11:36 AM
646	94061	6/11/2021 10:51 AM
647	94019	6/11/2021 9:16 AM
648	94019	6/11/2021 8:57 AM
649	94019	6/11/2021 7:45 AM
650	94062	6/11/2021 7:16 AM
651	94010	6/11/2021 6:01 AM
652	94403	6/10/2021 9:15 PM
653	94002	6/10/2021 8:53 PM
654	94061	6/10/2021 7:10 PM
655	94019	6/10/2021 6:28 PM
656	94063	6/10/2021 6:23 PM
657	94002	6/10/2021 5:55 PM
658	94019	6/10/2021 5:17 PM
659	94070	6/10/2021 4:35 PM
660	94070	6/10/2021 4:16 PM
661	94038	6/10/2021 4:14 PM
662	94070	6/10/2021 4:07 PM
663	94002	6/10/2021 4:06 PM
664	94044	6/10/2021 4:04 PM
665	94010	6/10/2021 4:03 PM
666	94062	6/10/2021 3:44 PM
667	94062	6/10/2021 12:48 PM
668	94062	6/10/2021 12:16 PM
669	94062	6/10/2021 11:44 AM
670	94062	6/10/2021 11:19 AM
671	94019	6/10/2021 11:07 AM
672	94019	6/10/2021 10:47 AM
673	94019	6/10/2021 7:54 AM
674	94030	6/9/2021 8:57 PM
675	94019	6/9/2021 6:29 PM
676	94030	6/9/2021 3:31 PM
677	94019	6/9/2021 3:11 PM
678	94002	6/9/2021 2:57 PM
679	94019	6/9/2021 1:09 PM

680	94030	6/9/2021 11:39 AM
681	94030	6/9/2021 11:05 AM
682	94019	6/9/2021 9:43 AM
683	94061	6/9/2021 8:46 AM
684	94061	6/8/2021 10:12 PM
685	94061	6/8/2021 1:42 PM
686	94061	6/8/2021 1:05 PM
687	94061	6/8/2021 12:32 PM
688	94070	6/8/2021 12:08 PM
689	94010	6/8/2021 11:11 AM
690	94063	6/8/2021 9:11 AM
691	94404	6/8/2021 8:06 AM
692	94070	6/8/2021 3:28 AM
693	94010	6/7/2021 10:52 PM
694	94062	6/7/2021 9:01 PM
695	94403	6/7/2021 8:45 PM
696	94402	6/7/2021 4:10 PM
697	94062	6/7/2021 3:14 PM
698	94402	6/7/2021 2:33 PM
699	94402	6/7/2021 2:12 PM
700	94060	6/7/2021 1:28 PM
701	94062	6/7/2021 11:57 AM
702	94019	6/7/2021 11:55 AM
703	94019	6/7/2021 10:52 AM

Q2 Which of these sources do you use to stay informed about potential emergency situations and disaster preparedness? (Check all that apply)

Answered: 695 Skipped: 8



ANSWER CHOICES	RESPONSES	
SMCAlert, San Mateo County's Alert System, https://hsd.smcsheriff.com/smcalert	78.4%	545
Emails and websites from the state, county or cities, public utilities, such as PG&E, or non-profits, such as the Red Cross	63.0%	438
Community-based organizations, neighborhood groups, or faith-based groups	42.6%	296
Community Emergency Response Team (CERT), training for neighborhood and community-based organizations	41.6%	289
Fire Safe San Mateo County, https://www.firesafesanmateo.org/	21.0%	146
Zonehaven, San Mateo County's Evacuation Map System, https://myzone.zonehaven.com	20.6%	143
Public events, such as Farmer's Markets and community meetings or other celebrations	17.7%	123
Total Respondents: 695		

#	PLEASE PROVIDE OTHER SOURCES HERE:	DATE
1	Belmont City Manager's Weekly Update	7/9/2021 6:32 PM
2	Nextdoor, Pacifica Tribune, Citizen app	7/9/2021 1:15 PM
3	Citizen app, Pacifica.patch.com, Nextdoor.com, Pacifica Tribune	7/9/2021 12:58 PM
4	Nextdoor, Patch	7/8/2021 10:13 PM
5	Friends and neighbors	7/8/2021 9:55 PM
6	Check online news sources frequently.	7/8/2021 4:38 PM

7	MyShake app for earthquakes & RING doorbell neighborhood alerts	7/8/2021 3:12 PM
8	Friends on Facebook	7/8/2021 11:48 AM
9	Pacifica Police C.E.R.T.	7/8/2021 7:18 AM
10	Nextdoor app	7/7/2021 11:32 PM
11	Cal Fire	7/7/2021 8:52 PM
12	Connect With Pacifica	7/7/2021 7:36 PM
13	local newspapers	7/7/2021 12:49 PM
14	NextDoor	7/7/2021 8:41 AM
15	Local news and the internet	7/7/2021 7:06 AM
16	City Council Meetings, Fire Safety meetings etc…	7/7/2021 7:01 AM
17	twitter	7/7/2021 5:54 AM
18	I usually go on Twitter for news when something big happens. No news stations or county alerts gave any info on the San Bruno fire for almost 30 minutes after it happened, but people were talking about it on Twitter.	7/7/2021 5:31 AM
19	Nextdoor	7/7/2021 1:31 AM
20	friends, neighbors, next door	7/6/2021 2:54 PM
21	hillsborough website	7/5/2021 7:11 PM
22	Redes sociales y noticias locales.	7/3/2021 9:41 PM
23	—Nextdoor app —Facebook for various San Bruno & San Mateo government entities	7/3/2021 9:14 AM
24	NEXTDOOR	7/2/2021 4:40 PM
25	Sustainable San Mateo County https://sustainablesanmateo.org	7/2/2021 9:32 AM
26	The news	7/2/2021 6:05 AM
27	Facebook, Twitter, NextDoor but none work well on the coast in an emergency. Our ATT cell service is poor (and goes out if the power is out for a few days because battery backup on cell towers fails.)	7/2/2021 12:32 AM
28	Postings on Facebook.	7/1/2021 11:36 PM
29	PG&E texts	7/1/2021 7:19 PM
30	Media (ie TV News, and even Facebook)	7/1/2021 6:52 PM
31	Social media	7/1/2021 6:40 PM
32	Some of these plus others on Twitter	7/1/2021 4:33 PM
33	AlertWildfire, Smokepoint, Myshake	7/1/2021 3:12 PM
34	News	7/1/2021 2:55 PM
35	Facebook groups and pages	7/1/2021 1:14 PM
36	Pacifica locals facebook page	7/1/2021 12:08 PM
37	notifications on the USPS entryway community message board	7/1/2021 11:46 AM
38	Twitter	7/1/2021 11:24 AM
39	Facebook and twitter	7/1/2021 11:07 AM
40	Local Facebook, nextdoor	7/1/2021 9:57 AM
41	None	7/1/2021 8:51 AM
42	HMB Review	7/1/2021 8:26 AM

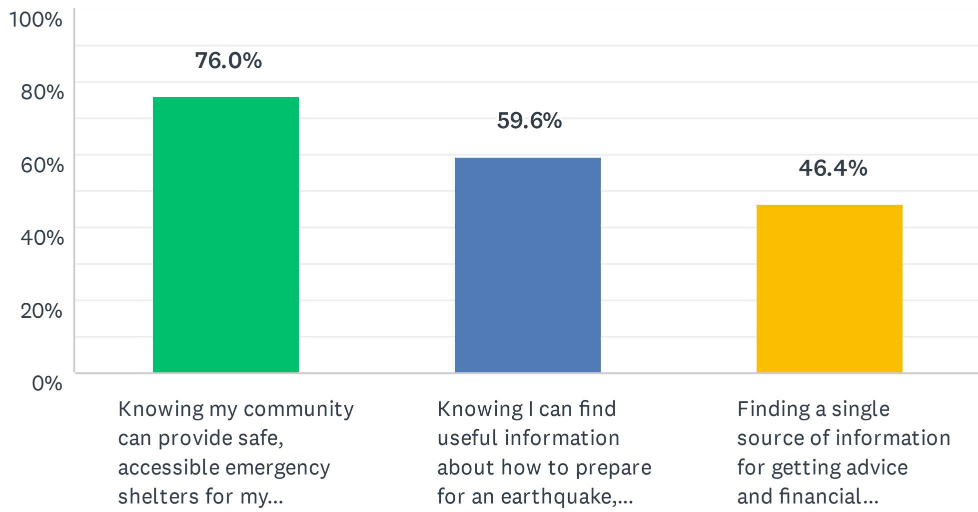
43	Firedispatch.com	7/1/2021 7:23 AM
44	Social media	7/1/2021 7:03 AM
45	Biblioteca, escuelas	7/1/2021 3:23 AM
46	Redes sociales ,,Facebook, tik tok y Instagram	6/30/2021 11:36 PM
47	Radio or tv news	6/30/2021 11:16 PM
48	I receive some emergency alerts through cell phone via text message; however, not all and puzzled on how same household members receive alerts that I do not.	6/30/2021 9:43 PM
49	en realidad no tengo nada especifico que uso, solo si alguien me avisa	6/30/2021 9:30 PM
50	Google group, NextDoor	6/30/2021 11:26 AM
51	next-door	6/29/2021 7:25 PM
52	Television	6/29/2021 11:25 AM
53	Puente	6/29/2021 8:08 AM
54	Family in the county	6/28/2021 8:07 PM
55	CALFIRE	6/28/2021 8:01 PM
56	Neighbors	6/28/2021 7:39 PM
57	Twitter	6/28/2021 5:51 PM
58	Puente de la costa sur Talking points La Honda- Pescadero districto	6/28/2021 2:22 PM
59	Calfire twitter	6/28/2021 1:54 PM
60	work place and radio (NPR and local)	6/28/2021 9:24 AM
61	Internet forums, including < *shudder* > NextDoor. Neighbors' awareness and gossip. Primary sources like CalFire briefings.	6/28/2021 9:12 AM
62	Next Door	6/27/2021 7:26 PM
63	Twitter - for immediate reports about conditions Major News outlets	6/27/2021 7:06 PM
64	TV news	6/27/2021 5:46 PM
65	Nextdoor	6/27/2021 4:40 PM
66	Kings Mountain CERT	6/27/2021 4:03 PM
67	CEAP	6/27/2021 3:15 PM
68	Social platforms, such as Next Door	6/27/2021 11:41 AM
69	please consider a small box which LISTS ALL EMERGENCY CONTACTS in the half moon bay review. ALSO, PLEASE SEND THIS INFO TO CONGREGATE LIVING BLDGS TO DISPLAY ON THEIR BULLETIN BOARDS. ALSO, WHY NOT USE CITY HALL TO DISPLY THIS INFO.	6/27/2021 11:08 AM
70	HMB review breaking news emails.	6/27/2021 9:56 AM
71	Coastside Senior Center	6/27/2021 9:37 AM
72	Firedispatch.com	6/27/2021 9:34 AM
73	An office assistant that I know who works at Hornsley's office - let's me know all the behind the scenes dirt about how he dose not really care. Just wants the reports to look good enough to keep developing the coast.	6/27/2021 9:25 AM
74	CERT training and Chief Cosgrave videos zoom talks about earthquake safety. And his talk about fire safety and cleanung the area around your house. And the ham radio operators who van communicate during a power outage!	6/27/2021 9:14 AM
75	SMCalert has become a defunct notification tool. Too much nonsense, complete ignores	6/27/2021 9:10 AM

	certain communities. Another Don Horsley failure.	
76	I receive the CERT emails and next door. I didn't know Zonehaven existed. or Fire Safe San Mateo	6/27/2021 9:00 AM
77	La Honda Radio Club	6/27/2021 8:55 AM
78	Nextdoor app	6/27/2021 8:54 AM
79	Next-door community app.	6/27/2021 8:46 AM
80	Thank you for sharing these options. I will add Zonehaven and Fire Safe to my list of organizations.	6/27/2021 8:45 AM
81	MPC Ready, Menlo Park Fire Department	6/26/2021 2:47 PM
82	CEAP, HMB Review, HMBRadio, Nextdoor, CZU press releases	6/25/2021 9:17 PM
83	Local news outlets like SM DailyJournal, KTVU, KPIX, sfgate.com.	6/25/2021 11:21 AM
84	seachangesmc.org	6/24/2021 9:19 AM
85	I filled out a survey. There was no place to comment. My neighborhood shares a zip code that covers at least 3 significantly ecosystems.	6/23/2021 10:55 PM
86	En las noticias en la Televisión	6/23/2021 8:35 PM
87	Ninguno de estos, no sabia que existian	6/23/2021 7:59 PM
88	Next door, Facebook	6/23/2021 4:17 PM
89	South Skyline Group i.o. South Skyline Association Newsletter La Honda Digest	6/23/2021 3:28 PM
90	Twitter	6/23/2021 1:26 PM
91	Daily newspapers (SF Chronicle, Daily Journal, Daily Post; email from many sources.	6/23/2021 1:11 PM
92	Nextdoor posts from the most reliable posters i.e. volunteer firefighters or Calfire. last year CHP came to our street and told us to evacuate-most useful for folks without cell phones or if the internet is down. we listen to the radio, too.	6/23/2021 8:08 AM
93	city of menlo park newsletter and city of east palo alto newsletter	6/22/2021 9:50 AM
94	NextDoor Texts from the city/county The citizen app Definitely word of mouth	6/21/2021 6:55 PM
95	Next door	6/21/2021 3:48 PM
96	online newspapers	6/21/2021 10:53 AM
97	Twitter	6/17/2021 3:31 PM
98	Online and Social Media	6/17/2021 8:41 AM
99	Church of Jesus Christ of the later Day Saints.	6/16/2021 11:55 AM
100	Foster City Amateur Radio Emergency Service	6/16/2021 9:26 AM
101	SCARES—South County Amateur Radio Emergency Service	6/15/2021 8:12 PM
102	CID SAN MATEO	6/15/2021 12:47 PM
103	MyShake, QuakeFeed	6/15/2021 10:40 AM
104	Cal fire Facebook updates for SMC	6/14/2021 7:38 PM
105	Employer	6/14/2021 6:39 PM
106	Nextdoor social media platform	6/14/2021 1:06 PM
107	Social Media Twitter	6/14/2021 1:04 PM
108	Nixie.com (Police info system for San Mateo)	6/12/2021 7:40 PM
109	nextdoor and facebook	6/12/2021 6:09 PM

110	Communications from the City of Brisbane such as the Star and the City Manager's Friday Blast.	6/12/2021 4:02 PM
111	Brisbane weekly city manager email	6/12/2021 10:46 AM
112	Local police & fire phone alerts	6/12/2021 2:55 AM
113	choices should be publicized for broader consumption	6/11/2021 8:10 PM
114	SMC alert red	6/11/2021 6:25 PM
115	Amateur radio	6/11/2021 7:20 AM
116	NextDoor HillsboroughTogether websites	6/11/2021 6:03 AM
117	TV and Newspapers, Local Weather stations, neighbors	6/10/2021 10:10 PM
118	NextDoor	6/10/2021 6:26 PM
119	FEMA and other App Alerts Twitter feeds	6/10/2021 4:07 PM
120	Nextdoor and pages and groups on Facebook	6/9/2021 8:48 AM
121	during fire season I use various government run air quality reporting services	6/8/2021 12:36 PM
122	Twitter, Facebook, Local Newspapers and news websites, emails from organizations, texts from friends	6/8/2021 12:16 PM
123	San Mateo Moms and Being Neighborly Facebook groups	6/7/2021 8:48 PM
124	SC4ARES (Amateur Radio Emergency Services); KPDO radio; CalFireCZU Twitter feed; PulsePoint and Fire Incidents apps;	6/7/2021 1:35 PM
125	Nextdoor - people often share links.	6/7/2021 12:01 PM

Q3 To prepare for an earthquake, what would be most helpful to me is.... (Check all that apply)

Answered: 674 Skipped: 29



ANSWER CHOICES	RESPONSES	
Knowing my community can provide safe, accessible emergency shelters for my family and neighbors if our homes are damaged in an earthquake.	76.0%	512
Knowing I can find useful information about how to prepare for an earthquake, what I can do to protect myself and my family, and where I can get assistance in my preferred language.	59.6%	402
Finding a single source of information for getting advice and financial assistance to make my home earthquake safe.	46.4%	313
Total Respondents: 674		

#	PLEASE PROVIDE OTHER IDEAS HERE:	DATE
1	Provide real time evacuation route updates	7/11/2021 12:38 PM
2	In the event of "the big one", for how long should we prepare to be sheltered in place (with pets) without power, water, gas and possibly sewer?	7/9/2021 1:15 PM
3	Communication assistance for multiple housing units - condo developments	7/8/2021 3:16 PM
4	Knowing that my local water supply is secure from damage and that we have enough production and storage for long term power and pipeline interruptions. Second would be knowing that food supplies would be able to be delivered into our isolated areas.	7/8/2021 8:22 AM
5	A warning system for earthquake, fire, tsunami like the ones in Japan where loudspeakers are clear and located in every neighborhood. I also like the 5pm daily chime/jingle to test the system (not once weekly tests).	7/8/2021 8:02 AM
6	Knowing local shelters	7/7/2021 8:52 PM
7	Connect With Pacifica	7/7/2021 7:36 PM
8	Truly affordable earthquake insurance	7/7/2021 1:01 PM
9	Maybe promoting more neighborhood watch groups would help neighbors help each other in an emergency. I know CERT has a program but I don't think it's been implemented very much here in Pacifica. What if you formed a CERT committee to help organize more neighborhood groups to aid in case needed. Also, have CERT re-freshers to keep us up to date on procedures.	7/7/2021 10:31 AM

10	being on a phone tree for information about the disaster when it is happening.	7/7/2021 7:55 AM
11	Regular training in earthquake preparedness; an individualized earthquake prep plan on each street, earthquake drills at the local level.	7/7/2021 7:06 AM
12	Cert	7/7/2021 7:01 AM
13	Free home assessment for earthquake damage vulnerability	7/7/2021 6:26 AM
14	Emergency Neighborhood capto	7/6/2021 2:49 PM
15	—info for those who don't drive &/or have mobility disabilities —apartment renter-specific info would be helpful	7/3/2021 9:14 AM
16	Single location for ALL	7/2/2021 4:40 PM
17	I would love to be able to look at more pictures of the various ways foundations can have been retrofitted, to know if my contractor did it all correctly when we added a 2nd story in 1995. I tried to find out, but the building department could not assure me. Were the codes good enough in 1995? Would the building inspector have checked? My contractor was NOT good with waterproofing, although they were honorable men, not trying to cheat me. They just did not have enough experience. I think I hired someone to do retrofit, but not sure now. Some estimates were very expensive, and I think I never decided to have it done, cause the building department thought I probably didn't need to.	7/2/2021 10:34 AM
18	We need more information and action about design issues, especially multi story homes, apartments with "soft stories" and homes built on hillsides.	7/2/2021 9:32 AM
19	A community plan for organization when there is no cell, no internet. That will be our reality in a bad quake and we are not prepared.	7/2/2021 12:32 AM
20	Or resources - especially power, water, food, communications to the coast	7/2/2021 12:28 AM
21	Knowing how road access to evacuate to our mountain home, if possible.	7/1/2021 9:31 PM
22	I rent and don't have a lot of confidence the house I live in is adequately prepared for a quake. I'd like a system in place that can assure renters their apartments have been inspected and are compliant/prepared. Something an owner would have to do to prove to prospective renters the apartment is safe.	7/1/2021 5:25 PM
23	We've done brace and bolt.	7/1/2021 3:40 PM
24	How I can get out of HMB FAST!	7/1/2021 1:30 PM
25	Knowing my community will be able to provide clean water	7/1/2021 12:08 PM
26	Mandando mucha informacion a nuestras escuelas relacionadas a estos temas, para tener acceso a ella más fácilmente.	7/1/2021 11:59 AM
27	More public safety demonstrations and information presented by firefighters and EMTs, as well as geologists/hydrologists/etc	7/1/2021 9:57 AM
28	Assistance with information and vetted service providers and video training on how to make earthquake improvements to homes for seniors	7/1/2021 8:51 AM
29	All 3 of these options should be an easily accessible single source, a source that people actually use - not buried somewhere on the SM County website	7/1/2021 8:26 AM
30	Why do I have to have a preferred language or choice 1? Wouldn't every question need this? Shouldn't the survey itself have a preferred language clause? Malarkey.	7/1/2021 7:18 AM
31	Entrenamientos de simulación	6/30/2021 11:36 PM
32	If I need food and medicine Where.can I go	6/30/2021 11:16 PM
33	Most homes in our area have built in brick chimneys and worry about potential damage to person and neighboring property in case of an earthquake. Knowing and being able to find information about securing chimneys is hard to find.	6/30/2021 9:43 PM
34	Que hubiera lago en mi comunidad de SSF donde yo pudiera aprender y prepararme	6/30/2021 9:30 PM
35	Lobbying the County Planning Department to expedite and even incentivize foundation repairs	6/30/2021 11:26 AM

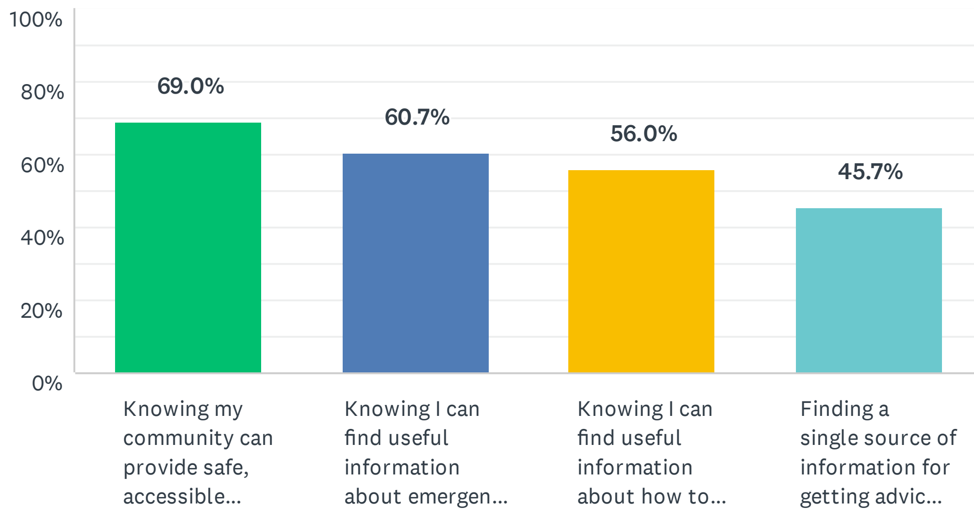
	and retrofits for EQ safety--permit fees waved, or subsidies, even, for including repairs/improvements in permitted projects	
36	Single source is a great idea.	6/28/2021 7:59 PM
37	CERT	6/28/2021 7:54 PM
38	CERT	6/28/2021 7:53 PM
39	CERT	6/28/2021 7:47 PM
40	A property inspection?	6/28/2021 7:39 PM
41	Knowing the buildings around me in my neighborhood are as safe as can be to prevent major earthquake damage	6/28/2021 3:20 PM
42	Living on the coast, where can we find information if highway 92 and/or highway 1 are closed and we are largely cut off from the rest of the bay area.	6/28/2021 3:14 PM
43	Information on what each individual/family needs to do and what cities/the county/state will be doing.	6/28/2021 2:39 PM
44	Assistance to make/get earthquake/emergency kits for low income folks	6/28/2021 1:54 PM
45	Regular CERT meetings and updates	6/28/2021 11:20 AM
46	0% interest / $0 payment state loans for earthquake hardening, preparedness supplies, and more. Growing up in CA, I am already well informed, thankyouverymuch.	6/28/2021 9:12 AM
47	Knowing that I do not have to be separated from my pet if we need to seek shelter. Having a list of pet friendly (large dog) shelters and resources for pets during an emergency.	6/28/2021 8:27 AM
48	Knowing what the earthquake plans are... Will food be brought in to the airport, where the potential shelters are, etc...	6/28/2021 8:14 AM
49	Alternative, renewable sources of electrical power, telecommunications, water purification	6/27/2021 7:06 PM
50	Ensuring the county will prioritize getting off the Coast safely.	6/27/2021 5:46 PM
51	Personally, I am not too concerned with earthquakes. Single family, wood-frame, hoses ten to do quite well. It's our LPG and water lines that pose the larger risks.	6/27/2021 4:03 PM
52	There is a dearth of information regarding the availability of contractors who actually have bona fide experience with respect to earthquake inspections and preparedness. A similar issues exists with respect to post-disaster repairs and how problematic it is to find qualified contractors.	6/27/2021 12:40 PM
53	Providing plans to enable residents to exit to other areas as needed. This includes special efforts to keep 92 clear for evacuation and keeping the Devil's Slide Tunnel open in an emergency.	6/27/2021 11:41 AM
54	SOMEONE tasked within each city hall who could address this subject. hold public outdoor briefings in the town center. like a TOWN CRIER who can speak to keeping us informed AND SAFE!!!!!!	6/27/2021 11:08 AM
55	It is important to have a source of information that would be operational when power is out and there is no internet. KHMB - 100.9 - should be given information that can be broadcast to the San Mateo County Coastside from Montara thru Half Moon Bay. They need to be included in emergency planning by local and county officials!!!	6/27/2021 10:06 AM
56	Source for emergency info about road closures and power outages, evacuation routes. Also knowledge of where community shelter and water will be located, if we are isolated on the coastside post-quake.	6/27/2021 9:56 AM
57	That we could evacuate safely during a crowded sunny beach day when we have thousands of visitors-	6/27/2021 9:25 AM
58	My cert training! I have my earthquake supplies and I am ready! Also ready to assist my neighbors!	6/27/2021 9:14 AM
59	Rework San Mateo County Fire to be a functional organization, not another half baked state failure. Reassign SMC OES to SMC Fire. Then have SMC OES rework local assistance	6/27/2021 9:10 AM

	information from the ground up. Basically, do the opposite of what SMC has been doing the last 25 years.	
60	The Earthquake drill day was great. I think it could be fun to have an Earthquake Kit prep day- where most of the supplies that could be needed could be available and people could gather all the things they need at one time. I'm not sure how that would roll out. Maybe free to people who cannot afford it and registration required. If someone can afford it, they would pay for the supplies.	6/27/2021 9:00 AM
61	Apartment dwellers here: it would be most helpful to have our City organized on earthquake preparedness. Having neighborhood preparedness is essential, but the City isn't investing in our preparedness plans. We feel abandoned especially knowing we are due for the next big one.	6/26/2021 2:47 PM
62	Supporting CERT, LAEG, DART and other local groups/agencies/City departments so there is more outreach and training in the local area to help folks at a grass-roots level to be prepared for all of these eventualities.	6/25/2021 9:17 PM
63	A printed and regularly updated handbook summarizing all useful information that can be kept on hand at home. Nothing online or mobile will be useful in the event of a natural disaster, so a printed booklet would be the only thing useful in such an emergency.	6/25/2021 2:08 PM
64	Talleres o material por correo para que la Comunidad se entere de los recursos	6/23/2021 7:59 PM
65	Make sure there is cellular service available. Clear communication for and to the community. During the fires, there were updates to the media that was not informative to our community.	6/23/2021 6:56 PM
66	Red Cross present in community	6/23/2021 4:13 PM
67	To know there is a local source of potable water should an earthquake damage our wells. To know our roads will be cleared quickly of slides, trees, debris should they become blocked.	6/23/2021 3:28 PM
68	Knowing that local schools/daycares are safe (understanding requirements and protocols pertaining to schools/daycares better) -- can only control so much within the home but could be even more vulnerable if earthquake occurs when kids are out of the home	6/23/2021 2:32 PM
69	Block by block emergency plans.	6/23/2021 1:50 PM
70	all our notifications and emergency systems rely on electricity and/or cell phones. not all of us have generators and cell phone service.	6/23/2021 8:08 AM
71	Knowing the emergency evacuation routes, and what resources are available at the other end.	6/22/2021 5:41 PM
72	list of community resources available to support from neighboring cities in case my city is down.	6/22/2021 9:50 AM
73	Knowing that elderly and disabled people in my community are going to be taken care of!	6/21/2021 6:55 PM
74	Having emergency shelters is the biggest concern, but I do hope everyone will be vaccinated.	6/21/2021 2:34 PM
75	no soy dueno de casa	6/21/2021 12:01 PM
76	a viable neighorhood-based structure for support and communication.	6/19/2021 4:05 PM
77	我不知道。	6/18/2021 7:03 AM
78	Disaster preparedness should include locked shipping containers with emergency supplies at all local schools & parks, so that in a widespread disaster, the open space (athletic fields, parking lots, classrooms) associated with schools & parks can be used for emergency shelter & triage activities.	6/15/2021 7:49 AM
79	Single source is ideal, but presenting all the info at once is overwhelming. Better to have individual guides for earthquakes (home safety before, earthquake supply kit, actions to do after)	6/14/2021 2:50 PM
80	Knowing that sufficient emergency supplies are stored close enough to my home and office to satisfy immediate food, medical and shelter needs without having to depend on supplies being shipped in.	6/12/2021 7:40 PM
81	The shelters should be trauma informed and have financial assistance - I'm sure there are best practices to research	6/12/2021 6:09 PM

82	Signs in my community directing residents to the "MASSING AREA" if there is an evacuation or all communication methods are "down".	6/12/2021 4:02 PM
83	Communications is usually the big challenge, and the possible inability to access our stored information which is no on our phone.	6/12/2021 2:55 AM
84	Read the earthquake hazard mitigation plan	6/11/2021 6:25 PM
85	one point of informational contact to mitigate "Fake News"	6/11/2021 5:54 PM
86	Earthquake exercise training and drills so that all my neighbors don't come to me for help or to steal my food. They each should have made preparations for such a disaster.	6/10/2021 10:10 PM
87	CERT do neighborhood block by block CERT organization outreach. LA county has a program that does this. The pandemic experience is an example of how fragile our supply system is when an event causes increased demand for essential items. Let’s seize this opportunity to encourage people to prepare.	6/10/2021 9:41 PM
88	Who in my immediate neighborhood may be CERT Trained, or a ham radio operator.	6/10/2021 6:26 PM
89	Relying on the community to provide what I need is certainly the most convenient for me--but that would also incentivize me to rely on the community instead of myself. I don't think its realistic for people to assume "my community" will take care of me. Ideally information to prepare will be in one place, but in practice I find that there are lots of angles on preparedness and it is unrealistic to expect one site to accommodate all needs/interests.	6/10/2021 12:25 PM
90	A variation on the shelter resources, I'd like to suggest capacity, processes, and tools be put in place, tested and organized for post-disaster response. A streamlined, reliable single-track for all to get info, access help, etc. The response provided by Red Cross is inadequate locally.	6/10/2021 11:28 AM
91	Knowing about a centralized website, simple to find with listed resources, info and generating alerts	6/8/2021 1:08 PM
92	Incentives to help renters, landlords, low income homeowners, funding for community groups that help low income renters and homeowners	6/8/2021 12:16 PM
93	Knowing where to buy a kit if earthquake supplies	6/7/2021 8:48 PM
94	subsidized earthquake insurance for my house	6/7/2021 12:03 PM

Q4 To help prepare for a wildfire event, what would be most helpful to me is… (Check all that apply)

Answered: 672 Skipped: 31



ANSWER CHOICES	RESPONSES	
Knowing my community can provide safe, accessible emergency shelters for my family and neighbors if we need to leave our homes during a wildfire or a wildfire smoke event.	69.0%	464
Knowing I can find useful information about emergency evacuation routes in my preferred language.	60.7%	408
Knowing I can find useful information about how to prepare for a wildfire event, what I can do to protect myself and my family, and where I can get emergency assistance in my preferred language.	56.0%	376
Finding a single source of information for getting advice and financial assistance to create defensible space by removing excessive vegetation around my home and in my neighborhood.	45.7%	307
Total Respondents: 672		

#	PLEASE PROVIDE OTHER IDEAS HERE:	DATE
1	Knowing how to manage unruly members of my community with respect to their addictions to illegal fireworks.	7/9/2021 1:15 PM
2	Zonehaven was a nightmare to use for a source, and we live in Pacifica. God help the people in the firezone last year who were forced to use it during an emergency!	7/8/2021 10:13 PM
3	Living on the coast, having emergency evacuation routes and sufficient warning about wildfires is of critical importance to me.	7/8/2021 4:55 PM
4	Follow most of the rest of the state and make ALL fireworks illegal in Pacfica. It's irresponsible to allow/condone any these days. City Council doesn't see/care about the danger to residents, inherent egress issues and effect on regional resources.	7/8/2021 3:12 PM
5	Knowing that my local water supply is secure from damage and that we have enough production and storage for long term power and pipeline interruptions.	7/8/2021 8:22 AM
6	Having police enforce laws to help prevent illegal fireworks	7/8/2021 8:18 AM
7	See my comment about an emergency system located in every neighborhood above.	7/8/2021 8:02 AM
8	Detailed evacuation plan for Pacifica. We have only one road north and south in Linda Mar. Odds are Devils Slide tunnel will be closed in a wildfire.	7/8/2021 7:01 AM

9	Well-publicized evacuation routes	7/7/2021 8:52 PM
10	Connect With Pacifica	7/7/2021 7:36 PM
11	Pacifica needs emergency evacuation planning. When issues on highway 1 occur, Pacifica PD and Highway Patrol point fingers at each other, but do not respond. During the planned power outage in 2019, it took 2 hours to get from Linda Mar to Sharp Park (typically a 5-10 minute journey). Highway 1 is our only exit. Please plan better and require Police, Highway Patrol, or ideally, both take ownership of traffic control during emergencies.	7/7/2021 2:58 PM
12	The Vallemar district in Pacifica is particularly vulnerable. In addition to removing excessive vegetation and helping residents financially with large clean-up projects, the city should enforce parking restrictions and speed limits on our very narrow streets. Emergency vehicles are severely hampered here.	7/7/2021 1:01 PM
13	my neighborhood doesn't have a lot option for evacuation, existing routes will be overcrowded	7/7/2021 12:49 PM
14	We need to severely limit new construction in town to help prevent a disaster. There's no way all of us can escape should there be a big fire or EQ, much less to accommodate all the new housing proposed.	7/7/2021 10:31 AM
15	A timely, urgent text alert (like Amber Alert, but always works!) for earthquake assist and wildfire evac warnings.	7/7/2021 8:41 AM
16	Knowing that my city and county is taking responsibility for clearing fuel (dead trees, branches and brush) from city owned property! Cattle Hill in Pacifica is a disaster waiting to happen!!!	7/7/2021 8:05 AM
17	I couldn't access zonehaven to learn my evacuation route and practice it. Is the soft ware on all devices for this?	7/7/2021 7:45 AM
18	Regular training at the local level about how to prepare for a wildfire in the area and training in how to prevent fires and how to protect one’s home. How to escape in the event of a fire.	7/7/2021 7:06 AM
19	Ban all fireworks, and find new ways to enforce Illegal fireworks.	7/7/2021 7:01 AM
20	Confidence that an evacuation route will be available and managed. Pacifica is a series of 'giant cul de sacs, most neighborhoods have one road in/out, leading to highway 1. The south end of town is particularly vulnerable, with HWY1 being the ONLY route out. A minor fender bender can cause back ups for miles and paralyze traffic. Under emergency circumstances/wild fire, many of these neighborhoods could be a death trap.	7/7/2021 6:40 AM
21	knowing how I can help.	7/6/2021 2:54 PM
22	Periodic presentations at senior centers, community centers, YMCAs and PTA programs by EMTs and Firefighters	7/6/2021 2:49 PM
23	If the Brisbane Marina is the evacuation location for most residents of Brisbane, we need a safe alternative to getting there. Currently, it is presumed that the Kinder Morgan tanks would not be an aspect or a risk during an emergency situation. How are residents supposed to get to the Marina if the Lagoon Rd connection is compromised?	7/3/2021 7:21 PM
24	again, as above: —info for those who don’t drive &/or have mobility disabilities —apartment renter-specific info would be helpful	7/3/2021 9:14 AM
25	As a renter, I have no control over outdoor space and vegetation around my building.	7/2/2021 10:02 PM
26	Once again ONE site - Easy to remember - SMAC EMERGENCY RESPONSE.org	7/2/2021 4:40 PM
27	I live in the suburbs, close to the Bay, and love the plants surrounding my house! None are fire risk plants, and I would NOT want to remove them. I would want to have OTHER information about preparing for fire. We do have 2 air cleaners as the smoke from the far away wildfires was awful the past 2 years.	7/2/2021 10:34 AM
28	Don't live in wildfire-prone area	7/2/2021 9:31 AM
29	Again, having a community plan for evac in a wildfire, including blocking tourists from 92 and 1 during a fire. CZU fire was terrifying: both access routes blocked by Brach traffic while we waited for evac signal. Should have blocked all out of town traffic.	7/2/2021 12:32 AM
30	I never hear about any cooling stations on the coast. It’s not something we would need often but triple digits here would be disastrous.	7/1/2021 7:39 PM

31	I live on the bay side and probably feel too safe from wildfire. It would be good to know exactly how safe we are, if at all. Or how/why/under what conditions seemingly safe suburbs could burn. It would also be good to know what add on effects a wildfire in the county would impact the bayside, for instance, evacuation times, routes, or how to stay off the streets if the coastside were to be evacuated. Or some system for how we could help evacuees in general or provide housing. I'd like to feel more like part of a team--we are all creating increased conditions for wildfire by our behavior, we should all be included in the response even if we, in particular, are in actually danger of wildfire per se.	7/1/2021 5:25 PM
32	Communication systems that will not go down at the slightest event. Even with a basic power outage we lose cell service and have no way to seek help.	7/1/2021 4:39 PM
33	An intergrated Peninsula fire alert system. I live in southern SMC on SCL border. But can only get emergency notices from SMC, SCC but not SCL.. Distressing with fire season. The CZU Lightening complex was a mile south of my house but got mixed messages from SMC alert about evac; despite seeing the smoke and flames clearly (we ‘d on our own). More integration less Fifedoms please	7/1/2021 3:12 PM
34	Map on where wildfires are	7/1/2021 2:55 PM
35	Knowing emergency information will still be accessible if the community looses power and internet. Understanding the real risks of fires destroying our homes as fires occur with constant and transparent communication. Understanding when to evacuate. Knowing the community is doing everything possible to prevent fires from reaching our community, and from starting, and from spreading.	7/1/2021 1:14 PM
36	Take away the permit fees to remove trees on residential lots	7/1/2021 9:31 AM
37	Reporting system to report neighbors not complying with defensible space requirements	7/1/2021 8:49 AM
38	Again, all of these should be an easily accessible single source of information. Not buried somewhere on the San Mateo County website. Also to know that in an actual emergency our roads and road shoulders are clear to allow for evacuation, and not parked with tourists cars.	7/1/2021 8:26 AM
39	Pet friendly services/shelters	7/1/2021 7:20 AM
40	Tener extinguidores en casa	6/30/2021 11:36 PM
41	Wildfire smoke is also a hazard in our area. Children were asked to report to school and then allowed to be picked up after arriving at schools. It made no sense ! Lung safety and health should be a priority and collaboration with SSF District should be topic of discussion when planning for emergencies.	6/30/2021 9:43 PM
42	Where to go in case we need to evacuate	6/30/2021 5:13 PM
43	Funds and even labor to help those who don't have the tools, fitness, money, or truck to do the fire fuel clearing for a defensible space. Free consults for those who need help figuring out what to do, how to start. Expedited and incentivized permitting for projects related to house hardening for wildfire, such as fireproof siding and roofing, double-paned windows, enclosing decks...	6/30/2021 11:26 AM
44	knowing the county and state are doing their best to clear non native vegetation such as eucalyptus, cypress, and dead Monterey pines, beetle infestation of pines and dead vegetation accruing over the past 40 or more years along emergency egresses along hwys 1 and 92.	6/29/2021 7:25 PM
45	More fuel reduction programs	6/29/2021 8:08 AM
46	Where does someone report weed abatement issues?	6/28/2021 8:05 PM
47	CERT	6/28/2021 7:54 PM
48	A property fire safety inspection	6/28/2021 7:39 PM
49	cut down all the eucalyptus trees that will spread fires or at the very least clean the underbrush in more wooded areas	6/28/2021 3:16 PM
50	Living on the coast, where can we find information if highway 92 and/or highway 1 are closed and we are largely cut off from the rest of the bay area.	6/28/2021 3:14 PM
51	Communication from the City and County on what THEY are doing with the parks and	6/28/2021 2:39 PM

	wildlands that surround so many areas. Information and resources for clearing brush, proper and safe tree trimming practices, etc. (This might also include information from CalTrans on what they are doing by roadsides, key evacuation routes.)	
52	Communication systems need drastic improvement. SMC alert never even sent out messages during August 2020 CZU fires. We were getting updates through neighbors on Nextdoor, but county didn’t have any communications about what was going on and if we needed to worry about fire coming into our area.	6/28/2021 1:54 PM
53	Visit to my home from a CALFIRE employee to advise on best actions we can take to improve our defensible space. Emergency shelters for pets in the event evacuation is required.	6/28/2021 11:20 AM
54	having a fuel reduction plan that did not require time and money to obtain permits	6/28/2021 9:24 AM
55	The best preparation is MITIGATING RISK. REMOVE EVERY DAMNED EUCALYPTUS IN THE COUNTY. Then *make* PG&E underground all lines, everywhere, and update their substations and other infrastructure.	6/28/2021 9:12 AM
56	Family including animals. Finding a way out. Our infrastructure is questionable at most with one road and too many ignitable trees.	6/27/2021 7:35 PM
57	Evacuation routes should include Pillar Point Harbor and HMB Airport	6/27/2021 7:06 PM
58	Information and timelines of forest fuel reduction projects for our surrounding areas. And how to get multiple agencies to work together when they all own land in surrounding areas eg CalTrans, State Parks, GGNRA, San Mateo County	6/27/2021 4:40 PM
59	Don't need information--need more action by San Mateo agencies to reduce fire hazards in El Granada. The Eucalyptus trees are a well know hazard and they need to be removed	6/27/2021 4:13 PM
60	At the moment I am most concerned with the availability of evacuation routes in a wildfire situation. Currently we have one route from our home to a highway, which also has limited options.	6/27/2021 4:03 PM
61	Have the County remove the eucalyptus trees in El Granada, because they are a terrifying fire hazard.	6/27/2021 2:03 PM
62	Comcast provides telco services to more than half of the folks who live on the Coastside. It has chosen not to deploy redundant fiber for its network here on the Coastside and the only route for its fiber infrastructure passes through territory that is quite susceptible to wild fire. This also impacts Verizon Wireless and dependent MVNO wireless carriers. Also, all of the outside of plant equipment for all of the telcos will stop functioning after eight hours without power. More needs to be done to secure our communications infrastructure.	6/27/2021 12:40 PM
63	Vegetation removal plans for POST and county owned right of ways in my area.	6/27/2021 11:31 AM
64	the director of the Lesley Foundation sends memos out to all residents keeping us apprised of this information. mandating us to be have an emergency pack so that we could b evacuated within an hour and a half. SHE HAS KEPT US SO SAFE DURING THE PANDEMIC as well as her team!!!!!	6/27/2021 11:08 AM
65	See previous comment concerning KHMB Radio.	6/27/2021 10:06 AM
66	Information about vegetation safety priorities for homeowners in neighborhoods. Should we be clearing backyard trees? What to worry about if we live near the stands of eucalyptus?	6/27/2021 9:56 AM
67	We need a community fire prevention program that mitigates wildfire risk. This should include regular fire inspections of neighborhoods to identify obvious fire risks. Identifiable risks can be seen all over Montara, El Granada and surrounding areas. Some risks include 1) Vacant lots covered in debris, 2) Dangerous trees encroaching on utility lines and sidewalks and 3) Blighted properties. You would never see these problems in other Bay Area cities. It’s time to implement a real fire prevention program with enforcement actions as needed.	6/27/2021 9:40 AM
68	The escape routes off the coast in the case of wildfire are few. All of them are ringed by trees.	6/27/2021 9:29 AM
69	I do worry about being able to evacuate Half Moon Bay in the event of a widfire. We have only 3 options: 92 which is surrounded by dense brush and trees and seems like a horrible danger if a fire were imminently approaching, and Highway 1 North or South. I know there is potentially another way out of Half Moon Bay: El Granada Blvd up to the Watershed Access Roads. The county should give consideration to making this route available in the event of an emergency.	6/27/2021 9:29 AM

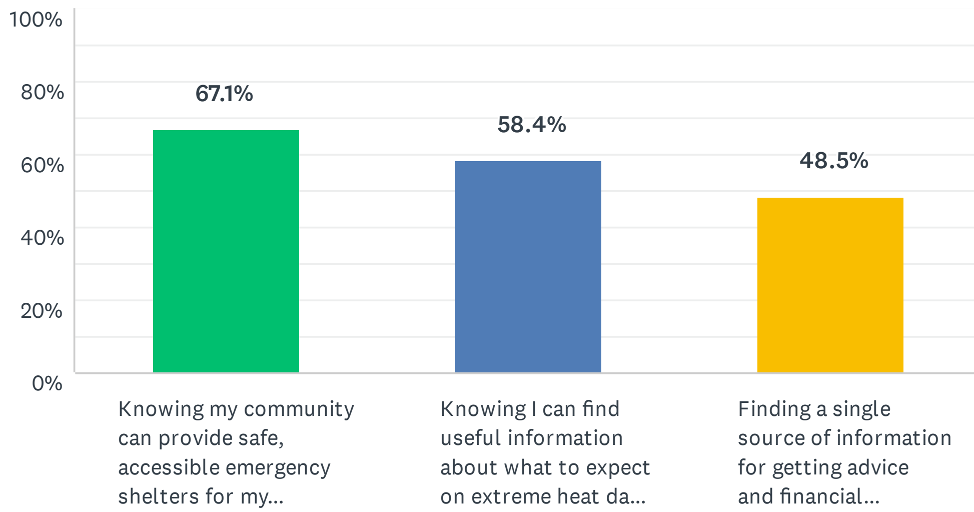
	Another idea would be to have caches of food and water available near the beaches. In the event of a real fire emergency, many people in Half Moon Bay would have to flee to the beaches to escape fire. Having supplies there in advance would be good planning.	
70	Knowing there is enough water supply for fire suppression That we could evacuate safely during a crowded sunny beach day when we have thousands of visitors-	6/27/2021 9:25 AM
71	I am trained to help set up a Red Cross shelter.	6/27/2021 9:14 AM
72	Hold CalFire accountable for shifting resources out of the county when they're needed most.	6/27/2021 9:10 AM
73	Similar to #3, have a day or event where people put together their go bag, except this one would be prepared at home. A list of shelters that will accept pets of all kinds.	6/27/2021 9:00 AM
74	Help with implementing wildfire mitigation strategies. Streamlining regulatory framework for implementation of home hardening.	6/27/2021 8:55 AM
75	Know evacuation routes off the coast	6/27/2021 8:54 AM
76	I have had a fire marshall inspect my house for fire safety. He was very helpful. We also need the state to clear deadfall from their property that borders many homes in Montara.	6/27/2021 8:45 AM
77	knowing best methods of communication when power and cell phones are out	6/27/2021 8:45 AM
78	Again, the City. Our municipality isn't aggressive enough with managing the dead trees. As a property manager, I see the condition of our trees, and to a certain extent vegetation, that isn't being cleared out. Our city could also turn up the heat on Caltrans to remove the dead trees along the freeways.	6/26/2021 2:47 PM
79	Ditto	6/25/2021 9:17 PM
80	Suggestion: During last year's wildfire event, backup batteries at most mobile cell broadcast units / towers were compromised since they failed completely after a short power outage. With technology today, there is NO excuse for such a short backup time. I highly recommend the community ensure backup cellular units can maintain broadcast power for 5-10x longer than existed in 2020. To overlook this would be a massive failure during the next wildfire event.	6/25/2021 2:08 PM
81	Knowing what mitigation efforts are planned by city and county nearby… I have no idea if they are fixing the obvious huge hazards locally.	6/25/2021 11:21 AM
82	The county should hit more public works employees/road maintenance workers who can create defensible space around the area/near properties	6/24/2021 10:46 PM
83	Publicize and identify land owners who need to clear fire fuel. Help land owners reduce fuel such as brush, tall grass, dead and or thick forest.	6/23/2021 6:56 PM
84	There isn't a lot of clear guidance about the responsibility for clearing brush. We live adjacent to the state park and they do not clear brush which puts our homes at risk	6/23/2021 4:17 PM
85	Having the County mow and clear hazardous vegetation fuel along and clear dead trees from all roads in the WUI to prevent fires from vehicle sparks, cigarette butts thrown from vehicles, and to maintain safe evacuation routes BEFORE FIRE SEASON. Also prompt CalTrans to do the same. Fine people who throw cigarette butt, light fireworks, and start any type of fire in the WUI except as designated campsites.	6/23/2021 3:28 PM
86	Getting guidance on air purifiers -- how many are needed in home/ what levels of particulate removal we should look for	6/23/2021 2:32 PM
87	Same as above, very localized plans.	6/23/2021 1:50 PM
88	Knowing how and where to get emergency information in case of either fire or earthquake. Also - is a booklet giving that information already updated and available?	6/23/2021 1:11 PM
89	financial aid? chipper program was good-can this be a bi-yearly service? brush disposal is an issue-what if you don't own a truck? what if you can't burn it? Is there a way to grind it up and compost it?	6/23/2021 8:08 AM
90	Knowing the people who are causing the fires (doing fireworks, dripping cigarette butts, etc) are going to be seriously disciplined	6/21/2021 6:55 PM
91	I have to provide updates to my parents that live in other states, so a single point of info to	6/21/2021 2:34 PM

	pass on to them would be most helpful. They are worried about the fires, as are we.	
92	Hillsborough has instigated a Wildland Urban Interface Fire Safety Program. All properties in the WUI designated area are inspected once a year. I feel I am up to date on creating defensible space around my home.	6/18/2021 1:53 PM
93	Knowing Belmont has a well-funded and concerted brush clearance and fuels reduction program.	6/15/2021 8:12 PM
94	Honestly, what would be more impactful to me is if we actually took steps to reduce the wildfire and PSPS risk, rather than trying bandaid solutions. We need to hold PG&E accountable and get them to address the infrastructure issues that make this a scary place to live in terms of losing power.	6/15/2021 12:47 PM
95	Knowing how wildfire can effect me even though I live in the middle of Menlo Park, away from hills and forests.	6/15/2021 10:40 AM
96	Point #1: Emergency evacuation routes need to be marked on the actual roadway (signs, distinctive red/white pavement arrows, etc). Ability of Apple/Google Maps to quickly/easily display evacuation routes would be NICE-TO-HAVE but would cell network be fully functional? Point #2: Bureaucratic & legal obstacles to wildland maintenance (brush clearing, controlled burns, 100-200 feet safe space creation, etc) do _NOT_ at all. Property owner has de facto right-of-way to clear brush on other lands (e.g. state/local park lands) to create the safe space around their property.	6/15/2021 7:49 AM
97	The hills between 280 and Alameda de las Plugas have large, heavily vegetated open spaces. These will become increasing subject to summer and fall fire risk as droughts frequency and extreme heat events become more common. City planners should identify who owns these parcels and lay out updated brush/fire management plans. Don't let these become the source of a "Coffee Park" event on the peninsula.	6/13/2021 10:00 AM
98	What is the risk for city lots? there is some communications work necessary on what our true risk is today	6/12/2021 6:09 PM
99	Signs in my community showing the preferred evacuation routes.	6/12/2021 4:02 PM
100	More details about how to protect against wildfire smoke - what personal protective devices to keep on hand, how to choose an air purifier, where to use it in the home, etc.	6/12/2021 10:20 AM
101	Having access to standard fire hose and nozzle in order to fight a fire as a volunteer when professionals are unable to be everywhere at once.	6/12/2021 2:55 AM
102	Need to improve roads to ensure people can get out of the coast in case of an emergency	6/11/2021 7:47 AM
103	A way to contact and work together with neighbors who co-abut town open spaces with high fire hazard on mitigations	6/11/2021 6:03 AM
104	Re second sentence about info "in my preferred language," although English is the only communication mode for most, there are many other language speakers in our county. I'm sure many bilingual speakers in those language groups would help with translation of necessary information.	6/10/2021 10:10 PM
105	Include air quality info and what we should do at various levels.	6/10/2021 6:26 PM
106	Provide trained volunteers to assess a home's preparedness level (from firesafe landscaping to earthquake safety to back-up supplies). Again, relying on the community to provide what I need is very convenient--but that would also incentivize me to rely on the community instead of myself. I don't think its realistic for people to assume "my community" will take care of me. Ideally information to prepare will be in one place, but in practice I find that there are lots of angles on preparedness and it is unrealistic to expect one site to accommodate all.	6/10/2021 12:25 PM
107	Also subsidies and other financial assistance to do the home hardening and retrofits to protect home (to all, not limited to low-income residents) (grants for home-hardening landscaping , incentives to replace siding with stucco, etc). Also, Tree removal permitting at the County and wildfire-prone cities needs to be reconciled ASAP to allow homeowners to trim/remove heritage or otherwise protected trees that are a fire danger.	6/10/2021 11:28 AM
108	leveraging existing community run programs by providing additional financial support and eliminating financial barriers for those who have them. Addressing eucalyptus and flammable material on the coast.	6/8/2021 12:16 PM

109	For the county and city to proactively identify areas to trim vegetation and growth (action plan with priorities)	6/7/2021 8:48 PM
110	guarantee that my current home insurer will cover any wildfire damage	6/7/2021 12:03 PM

Q5 To help prepare for an extreme heat event, what would be most helpful to me is… (Check all that apply)

Answered: 639 Skipped: 64



ANSWER CHOICES	RESPONSES	
Knowing my community can provide safe, accessible emergency shelters for my family and neighbors if we need to leave our homes during extreme heat events.	67.1%	429
Knowing I can find useful information about what to expect on extreme heat days, what I can do to protect myself and my family, and where I can get emergency assistance in my preferred language.	58.4%	373
Finding a single source of information for getting advice and financial assistance on home cooling and air purification devices and to help my family and neighbors enroll or qualify for energy saving or renewable energy programs.	48.5%	310
Total Respondents: 639		

#	PLEASE PROVIDE OTHER IDEAS HERE:	DATE
1	I'm hoping the State and County are doing all they can this year to PREVENT FIRES! How about using helicopters to water dry forests, especially forests that adjoin Communities. There's a large unused pond in Quarry Park, El Granada. Maybe that water could be used. Get rid of BBQ pits in all parks & campgrounds during this drought period & post signs no fires in parks due to drought and high fire danger.	7/8/2021 4:10 PM
2	Knowing that my local water supply is secure from damage and that we have enough production and storage for long term power and pipeline interruptions. Local solar and/or wind power generation, such as neighborhood micro grids, to help insulate against electrical transmission line shut down.	7/8/2021 8:22 AM
3	Connect With Pacifica	7/7/2021 7:36 PM
4	We're self sufficient.	7/7/2021 4:05 PM
5	I'm not sure this question really applies to Pacifica since we don't really have extreme heat days….	7/7/2021 10:31 AM
6	Trainings in how we can reduce carbon emissions and safe the planet.	7/7/2021 7:06 AM
7	Help with neighbors with financial difficulties- to clear yards full of junk	7/7/2021 6:22 AM
8	Knowing my community has effectively cleared all public spaces from debris, near dead trees & bushes.	7/6/2021 2:49 PM

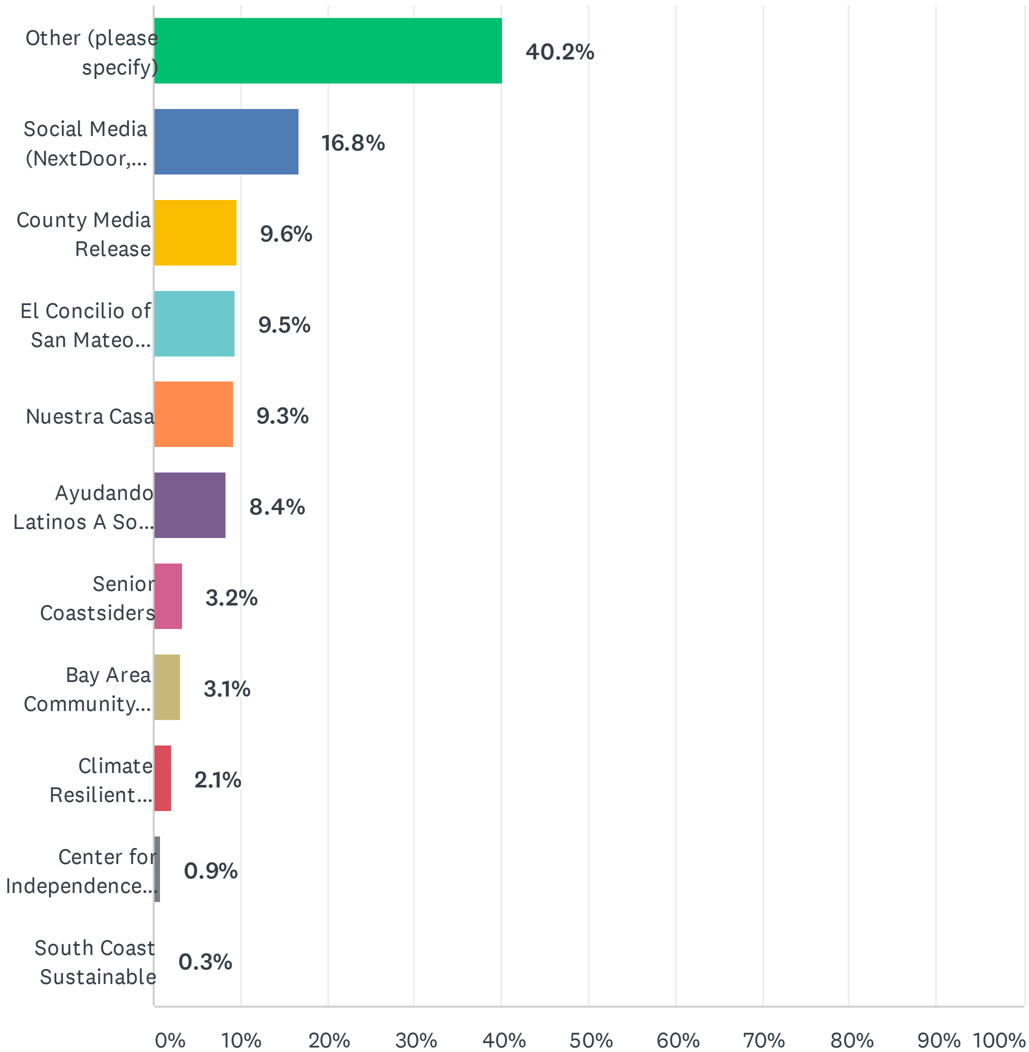
9	Same as above. All three on one site with all info including entering zip code for closet shelter and services - water etc.	7/2/2021 4:40 PM
10	Would love to have included how folks can make a temporary cooling device from a box fan and a pan of ice or water. We do NOT plan on purchasing an air conditioner as we have ceiling fans and floor fans and it never gets that hot downstairs in my house. It would be a waste of money and electricity to install such. Plus air conditioned air is so not fresh!	7/2/2021 10:34 AM
11	The extreme heat days will become worse and worse. We need to tactically prepare for all these emergencies, but more importantly be strategic by dealing with the climate crisis	7/2/2021 9:32 AM
12	Rebates to install heat pump hvac systems	7/2/2021 6:41 AM
13	Not a risk on the coast. Focus on fires, and communication during power outage, which also causes internet and cell outages.	7/2/2021 12:32 AM
14	Cooling centers	7/2/2021 12:28 AM
15	Cooking stations	7/1/2021 7:39 PM
16	Financial help for home cooling would be fantastic. Where do I sign up? Thank you all for the survey and the work you do. It's important.	7/1/2021 5:25 PM
17	Preventing blackouts in our community on hot days. Holding PG&E responsible for failing and outdated equipment. Working with the county, state, and federal government on global warming prevention and mitigation measures.	7/1/2021 1:14 PM
18	Distribution of food, water, and medicine free for anyone who wants it, as well as air conditioners, fans, ice, and air purifiers	7/1/2021 9:57 AM
19	Again, a single source of information for all of these options.	7/1/2021 8:26 AM
20	Pets included in evacuation plans and available shelters	7/1/2021 7:20 AM
21	Knowing the power grid and power generation had a plan to simply provide their service.	7/1/2021 7:18 AM
22	Encontrar aires acondicionados a precios accesibles para estar preparados	6/30/2021 11:36 PM
23	I me personally am not so worried about this, for being able to take care of myself and family	6/30/2021 11:26 AM
24	Our home, like so many around here, does not have air conditioning. Our home was built to passively stay cool in all but the most extreme heat days. However, if there is also wildfire smoke it may not be safe to open our windows at night to cool our home. We will appreciate information about converting to a heat pump HVAC system (from gas furnaces) that will enable us to cool and heat our home without generating carbon pollution. If there are rebates available we would like to find an easy way to learn about this, as well as available products, installers, etc.	6/29/2021 3:02 PM
25	Television	6/28/2021 8:07 PM
26	CERT	6/28/2021 7:53 PM
27	Not a problem for me.	6/28/2021 7:39 PM
28	Easy to implement ideas for cooling that can function without power and how to safe energy/power during these events.	6/28/2021 2:39 PM
29	we are fine at home, we are prepared for this one	6/28/2021 9:24 AM
30	0% interest / $0 payment state loans to support installing AC infrastructure, but only if a lid can be kept on installers' price gouging.	6/28/2021 9:12 AM
31	Keeping a limit on how many outsiders come to the coast. Our roads and beaches get too crowded and if god forbid there was a natural disaster, how are we all to escape and what road would we take?	6/27/2021 7:35 PM
32	Extreme heat is not really a major Coastside concern.	6/27/2021 7:06 PM
33	Not an issue on the coast	6/27/2021 4:13 PM
34	I am not aware of a single air-conditioned room within five miles of Montara that can accommodate more than 50 people during a heat event. Has anyone spoken with the operator	6/27/2021 12:40 PM

	of the Harbor Village Mall in HMB to see what kind of support it could provide during a heat or other kind of emergency event. Also, does it have backup generators or at least generator hookups on site? A heat event that was coupled with an extended power outage would also take hundreds if not thousands of wells offline, which would further impact the ability of people to hydrate and/or cool down.	
35	i know the drill to keep my apartment cool despite high heat. i'm a 21 year resident of CA, but lived in hot and humid climates for 57 years.	6/27/2021 11:08 AM
36	See previous comment concerning KHMB Radio.	6/27/2021 10:06 AM
37	Extreme heat equates to power issues. Identify sources of power, food, water for long outages on the coastside.	6/27/2021 9:56 AM
38	That we could evacuate safely during a crowded sunny beach day when we have thousands of visitors-	6/27/2021 9:25 AM
39	I feel pretty prepared thanks to CERT and ham radio. One of the things this survey leaves out is how if we cannot communicate how the ham radio operators can communicate to us and our neighbors! We all came together during the fire. We were able to tell people to go to the high school and where they could get their cell phones charged!	6/27/2021 9:14 AM
40	knowing that responsible agencies are keeping tourists away on red flag days in order to keep roads less congested in case of need for evacuation	6/27/2021 8:45 AM
41	Our apartment is usually 5-10 degrees hotter than outside. In extreme heat events, we jump in our bathtub with cold water, or place a cold wet towel in the freezer for a few minutes. We usually don't leave our apartment or this local area because of the pandemic, so it would be helpful to have the City, or perhaps the County to provide ideas to help our homeless neighbors. We see them every day. What would help them stay safe, right? A mist fan bottle full of cold water? Something that would not melt immediately like ice cream, plus many are diabetic, and something they could use again. FYI: This survey sounds geared towards SFR owners - are they the dominant constituency you've targeted? Cause otherwise, I know you'd use different language. I hope I'm wrong.	6/26/2021 2:47 PM
42	Ditto	6/25/2021 9:17 PM
43	Don't replicate what is commonly available, but rather concentrate on innovative solutions for the community. There is no need to replicate what is already available and/or known to be available from other sources of information.	6/25/2021 2:08 PM
44	What steps are city and county taking to reduce heat island effects, plant trees, reduce blacktop, etc proactively to reduce local urban hot spots????	6/25/2021 11:21 AM
45	Resources to make my home more resistant to heat. Such as insulation, information on outside window shading, air filtration.	6/23/2021 10:51 PM
46	Understand that PGE is unreliable and don't move to reliance on electricity as the only power source availability in the county.	6/23/2021 6:56 PM
47	Provide incentives to people to purchase generators or solar systems so they have power during a PSPS. Provide cooling centers for people and their pets.	6/23/2021 3:28 PM
48	More rebates for switching to fossil-fuel free cooling/heating	6/23/2021 2:34 PM
49	Having information about available cooling sites would be helpful. Last year, I tried to find something but nothing was up to date. Told me about library and senior center, both of which were closed due to Covid	6/23/2021 2:30 PM
50	Having more cooling shelters (and warming shelters in the winter) and a reliable method to notify citizens. The most vulnerable citizens probably don't have email and cellphones.	6/22/2021 5:41 PM
51	Knowing that elderly and disabled people in my community are going to be taken care of! Also the third one about financial assistance is huge! We didn't have AC for a long time because it's so expensive. But with each year getting hotter and hotter and having to stay indoors because of the smoke from the wildfires, last year was intolerable. We just had to bite the bullet and get AC. Would have been nice to have financial support. I'm sure there are many others like us.	6/21/2021 6:55 PM
52	Updating the grid or some sort of infrastructure maintenance seems necessary to battle the upcoming heat and extreme heat events. Energy-saving/renewal programs are of the utmost	6/21/2021 2:34 PM

	importance to help with this problem.	
53	saber estos beneficios finacioron tambien incluyen a lacomunidad sin documentos	6/21/2021 11:52 AM
54	Knowing that PG&E has beefed up the grid sufficiently to prevent brown-outs and power outages.	6/15/2021 8:12 PM
55	Electric grid reliability is most important; however, focus on renewable green energy does _NOT_ improve electric grid reliability. Nor do bureaucratic obstacles to electric grid maintenance assist with such.	6/15/2021 7:49 AM
56	Air purifier information and air filters information ; best apps to measure outside AQI to determine whether to stay in or not.	6/14/2021 7:38 PM
57	Partnering with air conditioned public spaces: e.g., libraries, malls	6/14/2021 2:50 PM
58	I'd like to see a cybersecurity risk analysis and plan. What is the risk of dam water being released in a cybertakeover? Or if our drinking water was contaminated?	6/12/2021 6:09 PM
59	Attic insulation to reflect the heat out.	6/12/2021 2:55 AM
60	Many individuals that succumb to heat are the elderly and youth. Many of those individuals do not have and/or cannot afford A/C. They also work hard jobs or live in homes without A/C available. This is a hard problem that needs more individuals (e.g., neighborhood associations) to work with/persuade/help them at least get fans!	6/10/2021 10:10 PM
61	An extreme heat event is unlikely for my region (Coastside).	6/10/2021 6:30 PM
62	Easier to plan for heat events. In general, libraries are a great place to cool off, but during COVID we really had no where to go during planned power outages on hot days.	6/10/2021 12:25 PM
63	Zoom sessions would be helpful.	6/9/2021 11:07 AM
64	providing units or incentives for home cooling for low income residents. Incentivize early purchase before the rush.	6/8/2021 12:16 PM
65	Knowing when power will be shut off	6/7/2021 8:48 PM
66	guarantee that PG&E will not shut down/brownout power during an extreme heat event financial support/subsidies for purchase of sizable home batteries to provide ongoing power during an excessive heat event	6/7/2021 12:03 PM

Q6 How did you hear about this survey?

Answered: 677 Skipped: 26



ANSWER CHOICES	RESPONSES	
Other (please specify)	40.2%	272
Social Media (NextDoor, Facebook, Instagram, etc.)	16.8%	114
County Media Release	9.6%	65
El Concilio of San Mateo County	9.5%	64
Nuestra Casa	9.3%	63
Ayudando Latinos A Soñar (ALAS)	8.4%	57
Senior Coastsiders	3.2%	22
Bay Area Community Health Advisory Council (BACHAC)	3.1%	21
Climate Resilient Communities	2.1%	14
Center for Independence of Individuals with Disabilities	0.9%	6
South Coast Sustainable	0.3%	2
Total Respondents: 677		

#	OTHER (PLEASE SPECIFY)	DATE
1	Cert email	7/11/2021 12:39 PM
2	Pacifica	7/10/2021 12:24 PM
3	Belmont City Manager's Weekly Update	7/9/2021 6:33 PM
4	Pacifica CERT / Captain Chris Clements	7/9/2021 1:16 PM
5	Pacifica CERT	7/9/2021 1:01 PM
6	Pacifica Police CERT emails	7/9/2021 12:11 AM
7	Facebook, Get Healthy San Mateo	7/8/2021 10:14 PM
8	San Mateo County Hazard Mitigation Plan Survey email	7/8/2021 4:15 PM
9	CERT Email - Pacifica PD	7/8/2021 9:55 AM
10	Coastside CERT	7/8/2021 8:22 AM
11	Pacifica Police CERT	7/8/2021 7:19 AM
12	Local PD via CERT	7/7/2021 11:34 PM
13	Pacifica CERT contact - Chris Clements	7/7/2021 8:53 PM
14	Email from Pacifica Police Department	7/7/2021 5:42 PM
15	Email from local police. Probably through CERT. We are participants.	7/7/2021 4:08 PM
16	Pacifica CERT	7/7/2021 3:10 PM
17	CERT Coordinator	7/7/2021 2:52 PM
18	Pacifica Police Department	7/7/2021 2:37 PM
19	CERT	7/7/2021 11:46 AM
20	CERT network Pacifica	7/7/2021 10:37 AM
21	Pacifica PD	7/7/2021 10:32 AM
22	Cert message	7/7/2021 10:11 AM

23	CERT Email	7/7/2021 9:22 AM
24	Pacifica CERT email	7/7/2021 9:06 AM
25	friend	7/7/2021 9:02 AM
26	Pacifica PD - CERT member email	7/7/2021 8:51 AM
27	NextDoor	7/7/2021 8:43 AM
28	CERT	7/7/2021 8:27 AM
29	Cert	7/7/2021 8:09 AM
30	workplace	7/7/2021 7:56 AM
31	Nextdoor/Pacifica Police	7/7/2021 7:47 AM
32	Pacifica police	7/7/2021 7:32 AM
33	Police dept	7/7/2021 7:07 AM
34	Direct Email from police, I think via Cert	7/7/2021 7:03 AM
35	CERT email	7/7/2021 6:45 AM
36	Nextdoor	7/7/2021 2:38 AM
37	PPD Facebook page.	7/7/2021 2:25 AM
38	Nextdoor	7/7/2021 1:32 AM
39	Fire chief Cosgrave	7/6/2021 7:31 AM
40	CERT	7/5/2021 4:06 PM
41	City of Brisbane website	7/3/2021 7:21 PM
42	CERT	7/3/2021 11:01 AM
43	Coworker	7/2/2021 2:22 PM
44	Cert	7/2/2021 11:54 AM
45	Fossil Free Redwood City email list	7/2/2021 10:35 AM
46	Vicki Sherman Environmental Initiatives Coordinator Public Works Services Department	7/2/2021 9:35 AM
47	someone I work with sent it to me	7/2/2021 7:17 AM
48	CERT email	7/2/2021 12:33 AM
49	NextDoor	7/2/2021 12:29 AM
50	Coastside Cert	7/1/2021 7:40 PM
51	Hillsborough town hall newsletter	7/1/2021 6:10 PM
52	The Office of Sustainability sent it to me.	7/1/2021 5:26 PM
53	CERT	7/1/2021 4:40 PM
54	Sustainable Silicon Valley	7/1/2021 3:41 PM
55	Email	7/1/2021 3:13 PM
56	Familias tomando acción	7/1/2021 12:33 PM
57	Familias tomando acción	7/1/2021 12:29 PM
58	Facebook Pacifica Locals page	7/1/2021 12:09 PM
59	Familias Tomando Accion	7/1/2021 10:03 AM
60	Coastside CERT sent it to me	7/1/2021 9:13 AM

61	Facebook post	7/1/2021 8:53 AM
62	nextdoor	7/1/2021 7:24 AM
63	San mateo	7/1/2021 7:19 AM
64	El concilio me invito	7/1/2021 7:05 AM
65	Lo	6/30/2021 9:44 PM
66	Familias Tomando Acción	6/30/2021 9:32 PM
67	Menlo Together	6/30/2021 2:30 PM
68	CERT	6/29/2021 7:26 PM
69	Menlo Together newsletter	6/29/2021 3:03 PM
70	Coastside CERT	6/29/2021 2:19 PM
71	Puente	6/29/2021 8:09 AM
72	Coastside CERT	6/29/2021 7:39 AM
73	Puente	6/28/2021 4:33 PM
74	CERT	6/28/2021 4:06 PM
75	email from CERT	6/28/2021 3:45 PM
76	twitter	6/28/2021 3:17 PM
77	Coastside CERT	6/28/2021 3:15 PM
78	SMC Office of Sustainability	6/28/2021 2:40 PM
79	Rita Mancera Directora de Puente de la Costa sur	6/28/2021 2:27 PM
80	Montara Water and Sanitary District	6/28/2021 2:08 PM
81	Puente de la costa sur	6/28/2021 1:55 PM
82	Una amiga que trabaja en Puente de la Costa Sur (Puente)	6/28/2021 1:54 PM
83	Coastside CERT email	6/28/2021 12:44 PM
84	Cert	6/28/2021 12:12 PM
85	Coastside CERT	6/28/2021 11:21 AM
86	Coastside CERT	6/28/2021 10:23 AM
87	Fire Dept list serve	6/28/2021 10:03 AM
88	commission on disabilities and CERT	6/28/2021 9:25 AM
89	CoastsideCERT email	6/28/2021 9:16 AM
90	Fire Safe SMC email. I think.	6/28/2021 9:12 AM
91	Cert email	6/28/2021 8:14 AM
92	email	6/28/2021 6:33 AM
93	Through my email	6/27/2021 11:36 PM
94	Coastside CERT	6/27/2021 9:56 PM
95	I	6/27/2021 9:25 PM
96	CERT email	6/27/2021 8:48 PM
97	Cert	6/27/2021 8:42 PM
98	email	6/27/2021 7:35 PM

99	Coastside CERT email	6/27/2021 7:26 PM
100	Coastside CERT	6/27/2021 7:08 PM
101	cert	6/27/2021 6:17 PM
102	CERT	6/27/2021 5:47 PM
103	Coastside CERT email	6/27/2021 4:41 PM
104	Castside CERT	6/27/2021 4:14 PM
105	e-mail from Coastside CERT	6/27/2021 4:05 PM
106	CERT	6/27/2021 2:56 PM
107	CERT	6/27/2021 2:50 PM
108	Coastside CERT	6/27/2021 2:29 PM
109	CERT email	6/27/2021 2:14 PM
110	Cert	6/27/2021 2:11 PM
111	email	6/27/2021 2:04 PM
112	Direct Email from Coastside CERT	6/27/2021 12:41 PM
113	Email	6/27/2021 12:39 PM
114	Coastside CERT email	6/27/2021 12:26 PM
115	coastside CERT	6/27/2021 12:10 PM
116	Coastside CERT	6/27/2021 11:59 AM
117	CERT	6/27/2021 11:50 AM
118	Coastside CERT	6/27/2021 11:47 AM
119	Coastside CERT	6/27/2021 11:45 AM
120	CERT email	6/27/2021 11:44 AM
121	CERT	6/27/2021 11:42 AM
122	CERT	6/27/2021 11:32 AM
123	CoastsideCERT	6/27/2021 11:09 AM
124	From my local realtor Lisa Forward at Compass	6/27/2021 10:54 AM
125	coastside cert	6/27/2021 10:43 AM
126	Received email	6/27/2021 10:40 AM
127	Coastside CERT	6/27/2021 10:32 AM
128	CERT	6/27/2021 10:24 AM
129	CERT	6/27/2021 10:08 AM
130	Email from Coastside CERT	6/27/2021 10:03 AM
131	Coastside CERT	6/27/2021 10:02 AM
132	Coastside CERT email.	6/27/2021 9:58 AM
133	email	6/27/2021 9:38 AM
134	CERT email	6/27/2021 9:35 AM
135	CERT	6/27/2021 9:30 AM
136	CERT mailing list	6/27/2021 9:30 AM

137	A little bird	6/27/2021 9:28 AM
138	CERT	6/27/2021 9:23 AM
139	CERT	6/27/2021 9:15 AM
140	CERT community	6/27/2021 9:11 AM
141	Coastside CERT	6/27/2021 9:10 AM
142	Coastside CERT	6/27/2021 9:00 AM
143	Email	6/27/2021 8:56 AM
144	Cost side cert	6/27/2021 8:56 AM
145	CoastsideCert	6/27/2021 8:55 AM
146	Coast side CERT	6/27/2021 8:51 AM
147	Direct email to me (probably via CERT database)	6/27/2021 8:49 AM
148	Coastside CERT	6/27/2021 8:47 AM
149	Coastside CERT	6/27/2021 8:47 AM
150	Emailed by coastside cert	6/27/2021 8:46 AM
151	email from Coastside CERT	6/27/2021 8:46 AM
152	CERT	6/27/2021 8:46 AM
153	MPC Ready	6/26/2021 2:48 PM
154	Coastside CERT	6/25/2021 9:18 PM
155	email directly to me	6/25/2021 2:09 PM
156	CERT	6/25/2021 10:45 AM
157	Hillsborough Town Newsletter	6/25/2021 7:10 AM
158	Puente	6/24/2021 10:47 PM
159	San Mateo County Office of Community Affairs	6/24/2021 1:21 PM
160	via email	6/24/2021 9:20 AM
161	post by city	6/23/2021 10:52 PM
162	Puente	6/23/2021 4:18 PM
163	Puente	6/23/2021 4:14 PM
164	Email from Climate Ready SMC	6/23/2021 2:41 PM
165	THRIVE Alliance	6/23/2021 2:23 PM
166	Climate Ready SMC	6/23/2021 1:51 PM
167	Thrive the Alliance of Ninprofits	6/23/2021 1:27 PM
168	Showed up on gmail.	6/23/2021 1:13 PM
169	Menlo Park Faith Leaders/Councilwoman Cecilia Taylor	6/23/2021 7:06 AM
170	My Dr. give information about this survey.	6/22/2021 4:47 PM
171	Friend	6/22/2021 2:43 PM
172	city of menlo park	6/22/2021 9:52 AM
173	Text but not sure exactly from which org	6/21/2021 6:58 PM
174	.	6/21/2021 3:08 PM

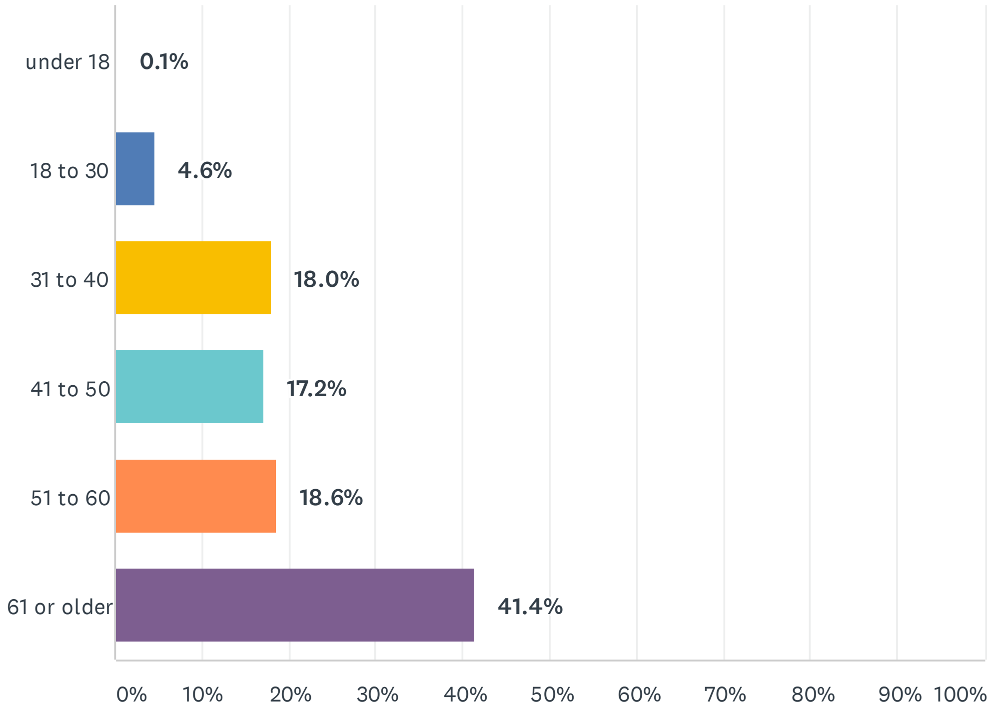
175	City of Menlo Park	6/21/2021 2:28 PM
176	OCA/Thrive	6/21/2021 10:56 AM
177	Alaz	6/19/2021 4:15 PM
178	Menlo Park Fire Protection District CERT	6/19/2021 4:06 PM
179	Es un exelente programa que no sólo informa a nuestra comunidad, también la apoya.	6/19/2021 2:34 PM
180	Brisbane Weekly Newsletter	6/18/2021 7:04 PM
181	Town of Hillsborough Weekly E-Announcement	6/18/2021 1:54 PM
182	CID	6/18/2021 10:17 AM
183	Hillsborough Thursday email	6/17/2021 4:43 PM
184	CERT	6/17/2021 1:45 PM
185	CERT	6/17/2021 11:43 AM
186	San Mateo Consolidated Fire email	6/16/2021 6:42 PM
187	Menlo Fire Cert	6/16/2021 10:34 AM
188	Webinar	6/16/2021 10:06 AM
189	San Mateo Consolidated Fire CERT	6/16/2021 9:27 AM
190	San Mateo Consolidated CERT email.	6/15/2021 8:15 PM
191	Direct email	6/15/2021 7:21 PM
192	San Mateo County fire district	6/15/2021 6:17 PM
193	Por medio de mi paisano, quien me refirio a El Concilio	6/15/2021 5:00 PM
194	Menlo Park CERT	6/15/2021 3:34 PM
195	Menlo Park CERT	6/15/2021 10:41 AM
196	Menlo Park CERT email	6/15/2021 7:50 AM
197	CERT	6/15/2021 4:44 AM
198	CERT	6/14/2021 9:25 PM
199	Menlo Park CERT & Employer	6/14/2021 6:40 PM
200	CERT newsletter	6/14/2021 3:40 PM
201	CERT email list	6/14/2021 2:51 PM
202	SMCFD	6/14/2021 1:46 PM
203	Email from CERT	6/14/2021 11:57 AM
204	News break app	6/14/2021 9:39 AM
205	CERT	6/13/2021 8:39 PM
206	cert	6/13/2021 3:44 PM
207	CERT	6/13/2021 3:22 PM
208	CERT	6/13/2021 10:01 AM
209	cert	6/12/2021 9:59 PM
210	CERT	6/12/2021 9:26 PM
211	Cert	6/12/2021 8:33 PM
212	San Mateo CERT	6/12/2021 7:41 PM

213	CERT email	6/12/2021 6:09 PM
214	CERT	6/12/2021 4:16 PM
215	CERT	6/12/2021 4:10 PM
216	Brisbane online Friday Blast publication	6/12/2021 4:03 PM
217	CERT email	6/12/2021 11:56 AM
218	CERT	6/12/2021 11:38 AM
219	CERT	6/12/2021 11:34 AM
220	Cert	6/12/2021 11:07 AM
221	Brisbane city email	6/12/2021 10:47 AM
222	San Mateo Consolidated CERT email	6/12/2021 10:22 AM
223	CERT	6/12/2021 10:03 AM
224	CERT SMCFire email	6/12/2021 9:47 AM
225	Cert email	6/12/2021 7:03 AM
226	City Managers weekly email	6/12/2021 2:57 AM
227	CERT Announcement	6/11/2021 10:03 PM
228	I was emailed by cert	6/11/2021 9:27 PM
229	CERT	6/11/2021 9:24 PM
230	Email from cert	6/11/2021 9:18 PM
231	CERT newsletter	6/11/2021 8:13 PM
232	SM email list	6/11/2021 8:04 PM
233	Email	6/11/2021 6:44 PM
234	I am a CERT member	6/11/2021 6:27 PM
235	CERT E-Mail	6/11/2021 6:26 PM
236	CERT	6/11/2021 6:08 PM
237	CERT	6/11/2021 6:06 PM
238	CERT distribution list	6/11/2021 5:57 PM
239	CERT	6/11/2021 5:52 PM
240	CERT	6/11/2021 1:52 PM
241	Town of Woodside website	6/11/2021 1:36 PM
242	city of Half Moon Bay email	6/11/2021 11:39 AM
243	CERT email	6/11/2021 10:55 AM
244	Half Moon Bay Community Newsletter	6/11/2021 9:01 AM
245	Half moon Bay community news email	6/11/2021 7:48 AM
246	local CERT group	6/11/2021 7:21 AM
247	Town email update	6/11/2021 6:04 AM
248	Cert email	6/10/2021 9:42 PM
249	email	6/10/2021 8:57 PM
250	Half Moon Bay Community eNews email	6/10/2021 6:31 PM

251	CERT email	6/10/2021 6:27 PM
252	Your email	6/10/2021 5:58 PM
253	City of HMB newsletter	6/10/2021 5:21 PM
254	CERT	6/10/2021 4:39 PM
255	CERT email	6/10/2021 4:20 PM
256	Hazard Mitigation Plan meeting 6/10	6/10/2021 4:18 PM
257	SMC Planning	6/10/2021 4:09 PM
258	Part of SMC MJLHMP Team	6/10/2021 4:09 PM
259	County Workshop	6/10/2021 4:08 PM
260	OES	6/10/2021 4:06 PM
261	Kings Mountain CERT	6/10/2021 3:46 PM
262	CERT captain	6/10/2021 12:27 PM
263	Patch.com	6/9/2021 8:59 PM
264	Coastside CERT	6/9/2021 6:32 PM
265	City of Millbrae email	6/9/2021 11:08 AM
266	Redwood City notice to neighborhood co-chairs	6/9/2021 8:49 AM
267	REDWOOD OKAS NEIGHBORHOOD ASSOCIATION	6/8/2021 10:16 PM
268	Forwarded info from neighborhood leadership	6/8/2021 1:10 PM
269	LHMP	6/8/2021 9:14 AM
270	County employee	6/8/2021 8:18 AM
271	Nextdoor	6/7/2021 4:13 PM
272	Nextdoor App	6/7/2021 2:16 PM

Q7 Please indicate your age range:

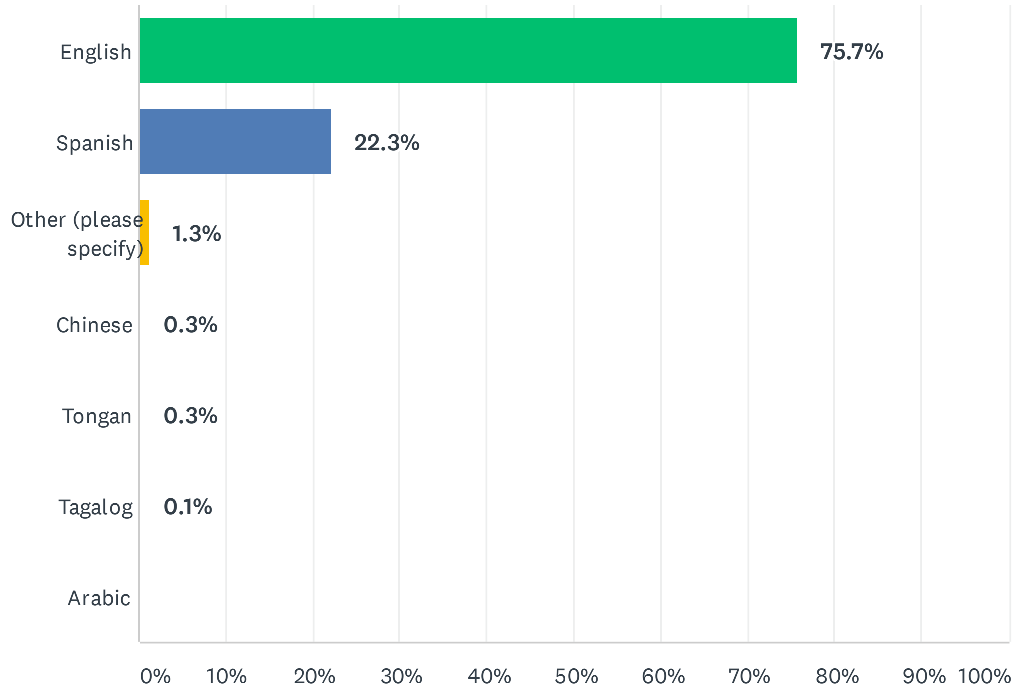
Answered: 676 Skipped: 27



ANSWER CHOICES	RESPONSES	
under 18	0.1%	1
18 to 30	4.6%	31
31 to 40	18.0%	122
41 to 50	17.2%	116
51 to 60	18.6%	126
61 or older	41.4%	280
TOTAL		676

Q8 Please indicate the primary language spoken in your household.

Answered: 678   Skipped: 25



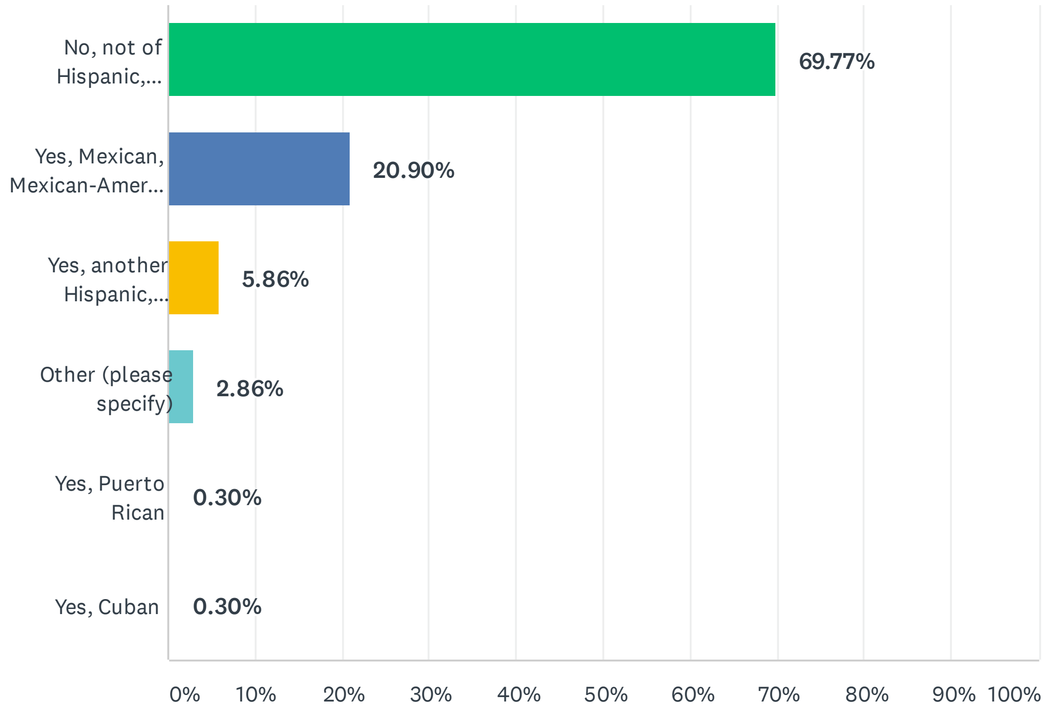
ANSWER CHOICES	RESPONSES	
English	75.7%	513
Spanish	22.3%	151
Other (please specify)	1.3%	9
Chinese	0.3%	2
Tongan	0.3%	2
Tagalog	0.1%	1
Arabic	0.0%	0
TOTAL		678

#	OTHER (PLEASE SPECIFY)	DATE
1	Samoan	7/7/2021 8:57 AM
2	French	7/1/2021 9:06 AM
3	Ingles	7/1/2021 3:24 AM
4	FARSI	6/28/2021 8:02 PM
5	CAT	6/28/2021 7:36 PM
6	English in my own home; Spanish for my family in other homes since I represent member(s)' behalf	6/17/2021 3:35 PM
7	Russian	6/14/2021 1:46 PM

8	french	6/13/2021 9:46 PM
9	Farsi	6/8/2021 8:18 AM

Q9 Are you of Hispanic, Latino, or Spanish origin?

Answered: 665 Skipped: 38



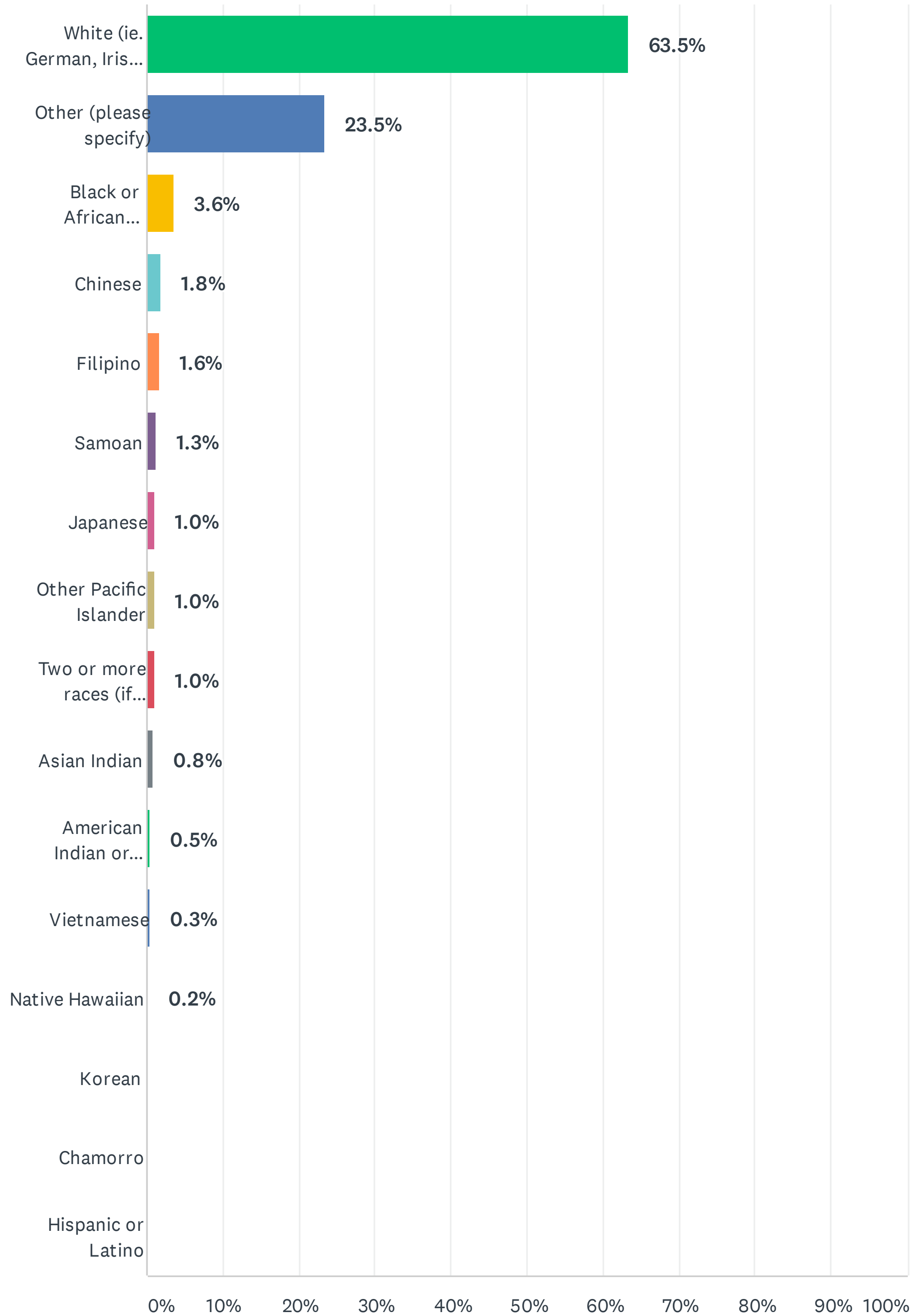
ANSWER CHOICES	RESPONSES	
No, not of Hispanic, Latino, or Spanish origin	69.77%	464
Yes, Mexican, Mexican-American, Chicano	20.90%	139
Yes, another Hispanic, Latino, or Spanish origin -- ie. Salvadoran, Dominican, Colombian, Guatemalan, Spaniard, etc.	5.86%	39
Other (please specify)	2.86%	19
Yes, Puerto Rican	0.30%	2
Yes, Cuban	0.30%	2
TOTAL		665

#	OTHER (PLEASE SPECIFY)	DATE
1	decline to state	7/7/2021 2:38 AM
2	african american	7/6/2021 2:58 PM
3	Hispano	7/1/2021 12:29 PM
4	Mixed	7/1/2021 9:40 AM
5	Mixed race	7/1/2021 7:19 AM
6	I	6/30/2021 9:44 PM
7	Asian American	6/28/2021 9:16 AM
8	White European	6/27/2021 8:42 PM

9	Human	6/27/2021 9:28 AM
10	I don't keep track	6/27/2021 9:11 AM
11	Peru	6/21/2021 3:45 PM
12	Of indigenous group of Mexico	6/17/2021 3:35 PM
13	venezolano	6/16/2021 4:48 PM
14	Portaguese	6/15/2021 9:50 PM
15	prefer not to answer	6/15/2021 10:41 AM
16	Asking this question is racist.	6/15/2021 7:50 AM
17	Yes, Panamanian	6/12/2021 11:07 AM
18	Go figure...as not on the list	6/11/2021 5:57 PM
19	decline to state	6/10/2021 12:27 PM

Q10 What is your race?

Answered: 613 Skipped: 90



ANSWER CHOICES	RESPONSES	
White (ie. German, Irish, English, Lebanese, Egyptian, etc.)	63.5%	389
Other (please specify)	23.5%	144
Black or African American (ie. African American, Jamaican, Haitian, Nigerian, Somali, etc.)	3.6%	22
Chinese	1.8%	11
Filipino	1.6%	10
Samoan	1.3%	8
Japanese	1.0%	6
Other Pacific Islander	1.0%	6
Two or more races (if selected, please explain below)	1.0%	6
Asian Indian	0.8%	5
American Indian or Alaska Native	0.5%	3
Vietnamese	0.3%	2
Native Hawaiian	0.2%	1
Korean	0.0%	0
Chamorro	0.0%	0
Hispanic or Latino	0.0%	0
TOTAL		613

#	OTHER (PLEASE SPECIFY)	DATE
1	Latinx	7/9/2021 12:42 PM
2	White & Portuguese	7/7/2021 8:43 AM
3	decline to state	7/7/2021 2:38 AM
4	Latino	7/7/2021 2:25 AM
5	Caucasian	7/6/2021 5:30 PM
6	Mexicano	7/6/2021 12:23 PM
7	Guatemalan	7/6/2021 12:23 PM
8	Mexicano	7/6/2021 12:20 PM
9	Guatemalan	7/6/2021 12:20 PM
10	Guatemalan	7/6/2021 12:19 PM
11	Mexicano	7/6/2021 12:18 PM
12	Guatemalan	7/6/2021 12:17 PM
13	Mexicano	7/6/2021 12:15 PM
14	Mexicano	7/6/2021 12:14 PM
15	salvadoreno	7/6/2021 12:13 PM
16	salvadoreno	7/6/2021 12:12 PM

17	Mexicano	7/6/2021 12:11 PM
18	Mexicano	7/6/2021 12:10 PM
19	salvadoreno	7/6/2021 12:09 PM
20	Mexicano	7/6/2021 12:08 PM
21	Guatemalan	7/6/2021 12:07 PM
22	Mexicano	7/6/2021 12:06 PM
23	Mexicano	7/6/2021 12:04 PM
24	Mexicano	7/6/2021 12:02 PM
25	Mexicano	7/6/2021 11:42 AM
26	Mexicano	7/6/2021 11:37 AM
27	Guatemalan	7/6/2021 11:33 AM
28	Guatemalan	7/6/2021 11:30 AM
29	Mexicano	7/6/2021 11:28 AM
30	Mexicano	7/6/2021 11:27 AM
31	Mexicano	7/6/2021 11:25 AM
32	Mexicano	7/6/2021 11:23 AM
33	Guatemalan	7/6/2021 11:21 AM
34	Guatemalan	7/6/2021 11:20 AM
35	Mexicano	7/6/2021 11:13 AM
36	Mexican	7/6/2021 11:10 AM
37	puerto rican	7/6/2021 11:06 AM
38	Mexican	7/6/2021 10:21 AM
39	Latino	7/3/2021 9:45 PM
40	Dutch / Indonesian	7/2/2021 2:22 PM
41	South Asia	7/2/2021 8:28 AM
42	Hawaiian and white	7/2/2021 12:05 AM
43	I do not believe in race	7/1/2021 9:32 PM
44	Not listed	7/1/2021 7:21 PM
45	African-American White	7/1/2021 3:13 PM
46	Na	7/1/2021 2:56 PM
47	American Caucasian	7/1/2021 1:31 PM
48	Hispano	7/1/2021 12:33 PM
49	Hispano	7/1/2021 12:29 PM
50	Latino	7/1/2021 12:12 PM
51	Why does this matter?	7/1/2021 11:26 AM
52	Latino	7/1/2021 10:03 AM
53	White, Asian, Native American	7/1/2021 9:40 AM
54	Mixed race	7/1/2021 7:19 AM

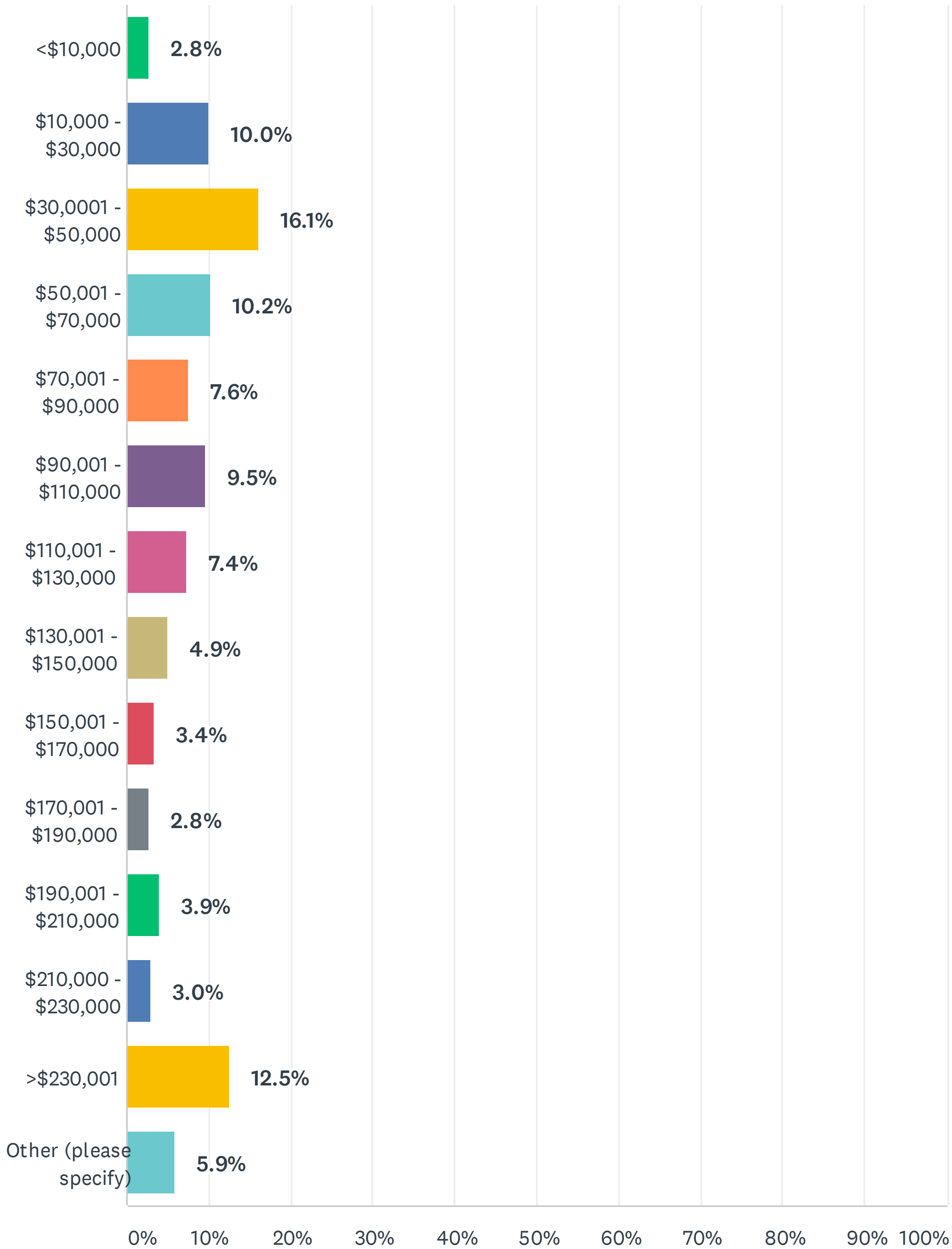
55	Latino o Hispano	7/1/2021 7:05 AM
56	Latino	7/1/2021 3:24 AM
57	Hispano	6/30/2021 11:37 PM
58	Latinx	6/30/2021 9:44 PM
59	Mexicana	6/30/2021 9:32 PM
60	Latino	6/29/2021 4:42 PM
61	Latina	6/29/2021 4:20 PM
62	Latina	6/29/2021 4:19 PM
63	Latina	6/29/2021 4:10 PM
64	Latina	6/29/2021 4:08 PM
65	Latina	6/29/2021 4:05 PM
66	Latino	6/29/2021 4:04 PM
67	Latina	6/29/2021 4:02 PM
68	Latina	6/29/2021 4:00 PM
69	Latina	6/29/2021 3:59 PM
70	Latina	6/29/2021 3:57 PM
71	Latina	6/29/2021 3:55 PM
72	Latino	6/29/2021 3:51 PM
73	IRANIAN	6/28/2021 8:02 PM
74	Hispanic	6/28/2021 2:27 PM
75	Mexicana	6/28/2021 1:54 PM
76	prefer not to answer	6/28/2021 9:25 AM
77	White and Japanese	6/27/2021 12:26 PM
78	spanish	6/27/2021 9:50 AM
79	Human	6/27/2021 9:28 AM
80	I don’t keep track	6/27/2021 9:11 AM
81	Italian american	6/27/2021 8:53 AM
82	Swiss-Italian	6/25/2021 2:09 PM
83	Latino	6/23/2021 8:39 PM
84	Mestiza	6/23/2021 3:56 PM
85	Mexican & Irish	6/23/2021 3:10 PM
86	Latino	6/22/2021 5:13 PM
87	Latino	6/22/2021 5:11 PM
88	Latino	6/22/2021 5:03 PM
89	Latino	6/22/2021 5:00 PM
90	Latino	6/22/2021 4:58 PM
91	Latino	6/22/2021 4:55 PM
92	Latina	6/22/2021 4:51 PM

93	Latino	6/22/2021 4:47 PM
94	centro americana	6/22/2021 4:29 PM
95	Latino Americano	6/22/2021 3:25 PM
96	latina Americana	6/22/2021 3:18 PM
97	SudAmerican	6/21/2021 3:45 PM
98	Mexican American	6/21/2021 2:28 PM
99	Latino Americano	6/21/2021 1:57 PM
100	Blanca latina Americana	6/21/2021 12:58 PM
101	Latin American	6/21/2021 12:03 PM
102	Latin American	6/21/2021 11:53 AM
103	Latino	6/19/2021 4:15 PM
104	Latino	6/19/2021 3:08 PM
105	Latino	6/19/2021 2:47 PM
106	Blanco	6/19/2021 2:34 PM
107	Latina America	6/18/2021 4:05 PM
108	Hispana	6/18/2021 2:45 PM
109	Latina	6/18/2021 2:23 PM
110	LATINO AMERICANO	6/18/2021 12:07 PM
111	Latino Americano	6/18/2021 10:27 AM
112	Hispanic	6/18/2021 10:17 AM
113	Latino	6/17/2021 4:59 PM
114	Hispana	6/17/2021 4:37 PM
115	Hispana	6/17/2021 4:09 PM
116	Latino Americano	6/17/2021 3:42 PM
117	Latin Norte Americana	6/17/2021 3:16 PM
118	Latina	6/17/2021 2:53 PM
119	Latina Norte Americana	6/17/2021 2:53 PM
120	Latino	6/17/2021 2:42 PM
121	Norte Americana	6/17/2021 2:23 PM
122	Hispana	6/17/2021 1:53 PM
123	Latino	6/17/2021 12:13 PM
124	Latina Americana	6/17/2021 10:51 AM
125	Latina Americana	6/17/2021 10:46 AM
126	latino	6/16/2021 4:48 PM
127	Latino	6/15/2021 5:00 PM
128	Centro Americano	6/15/2021 4:45 PM
129	Latina Americana	6/15/2021 4:33 PM
130	Latina Americana	6/15/2021 2:57 PM

131	prefer not to answer	6/15/2021 10:41 AM
132	Asking this question is racist.	6/15/2021 7:50 AM
133	Mexican Native American	6/14/2021 12:03 PM
134	Asían, caucasian, latinx, indigenous, african	6/12/2021 11:07 AM
135	European	6/12/2021 10:47 AM
136	Human	6/12/2021 2:57 AM
137	Uh...these are not racial catagories but cultural-ethnic groupings	6/11/2021 5:57 PM
138	Filipino and Mexican	6/10/2021 4:08 PM
139	decline to state	6/10/2021 12:27 PM
140	mexican	6/10/2021 11:08 AM
141	Mexican	6/10/2021 10:48 AM
142	Mexican	6/10/2021 7:55 AM
143	Europe’s , Norwegian, white American caucasian	6/8/2021 1:10 PM
144	Russian	6/7/2021 10:54 AM

Q11 What is your household income?

Answered: 609   Skipped: 94



ANSWER CHOICES	RESPONSES	
<$10,000	2.8%	17
$10,000 - $30,000	10.0%	61
$30,0001 - $50,000	16.1%	98
$50,001 - $70,000	10.2%	62
$70,001 - $90,000	7.6%	46
$90,001 - $110,000	9.5%	58
$110,001 - $130,000	7.4%	45
$130,001 - $150,000	4.9%	30
$150,001 - $170,000	3.4%	21
$170,001 - $190,000	2.8%	17
$190,001 - $210,000	3.9%	24
$210,000 - $230,000	3.0%	18
>$230,001	12.5%	76
Other (please specify)	5.9%	36
TOTAL		609

#	OTHER (PLEASE SPECIFY)	DATE
1	None of your business	7/8/2021 8:19 AM
2	Don't want to disclose	7/8/2021 7:19 AM
3	Decline to answer. No fireworks in Pacifica.	7/7/2021 7:47 AM
4	decline to state	7/7/2021 2:38 AM
5	Prefer to not answer	7/7/2021 1:15 AM
6	2500	7/3/2021 11:13 PM
7	Social Security	7/1/2021 6:20 PM
8	none of your business	7/1/2021 9:49 AM
9	prefer not to answer	7/1/2021 7:52 AM
10	Prefer not to say	7/1/2021 7:40 AM
11	DTS.	6/28/2021 9:12 AM
12	N/A	6/27/2021 11:50 AM
13	differs from year to year	6/27/2021 9:38 AM
14	Not enough for SMC properly tax	6/27/2021 9:28 AM
15	Decline to answer	6/27/2021 9:15 AM
16	Prefer not to say	6/27/2021 8:49 AM
17	do not want to answer	6/26/2021 11:24 PM
18	N/A	6/25/2021 2:09 PM
19	retired	6/25/2021 11:22 AM

20	prefer not to state	6/23/2021 2:31 PM
21	prefer not to state	6/21/2021 5:48 PM
22	uncomfortable sharing	6/19/2021 4:06 PM
23	would like to keep confidential, saying respectfully	6/17/2021 3:35 PM
24	Na	6/15/2021 9:50 PM
25	Prefer to not answer	6/15/2021 8:15 PM
26	decline to state	6/14/2021 2:51 PM
27	Prefer not to say	6/12/2021 7:41 PM
28	Prefer not to disclose	6/12/2021 11:56 AM
29	prefer not to answer	6/12/2021 11:38 AM
30	Prefer not to answer	6/12/2021 11:07 AM
31	Why the personal Q's don't we want to save everyone?	6/12/2021 2:57 AM
32	Prefer not to share	6/10/2021 4:09 PM
33	varies; living on retirement savings	6/10/2021 12:27 PM
34	CONFIDENTIAL	6/8/2021 10:16 PM
35	Rather not say	6/8/2021 3:31 AM
36	N/A	6/7/2021 10:54 AM

Appendix C. Summary of Federal and State Agencies, Programs and Regulations

C. SUMMARY OF FEDERAL AND STATE AGENCIES, PROGRAMS AND REGULATIONS

Existing laws, ordinances, plans and programs at the federal and state level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. Information presented in this section can be used to review local capabilities to implement the actions found in the jurisdictional annexes of Volume 2. Each planning partner has individually reviewed existing local plans, studies, reports, and technical information in its jurisdictional annex, presented in Volume 2.

FEDERAL

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all community members have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals.

The ADA intersects with disaster preparedness programs in regards to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of community members. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for community members who may require more assistance.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Bureau of Land Management

The U.S. Bureau of Land Management (BLM) funds and coordinates wildfire management programs and structural fire management and prevention on BLM lands. BLM works closely with the Forest Service and state and local governments to coordinate fire safety activities. The Interagency Fire Coordination Center in Boise, Idaho serves as the center for this effort.

Civil Rights Act

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or nation origin and requires equal access to public places and employment. The Act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all community members equally, to the extent possible. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, and pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. Numerous issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program. Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of FEMA, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective.

Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger. CDBG-DR funding is a potential alternative source of funding for actions identified in this plan.

Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The discount partially depends on location of the property. Properties outside the special flood hazard area receive smaller discounts: a 10-percent discount if the community is at Class 1 to 6 and a 5-percent discount if the community is at Class 7 to 9. The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation’s flood risk; over 66 percent of the NFIP’s policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

Emergency Relief for Federally Owned Roads Program

The U.S. Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs. Eligible activities under this program meet some of the goals and objectives for this plan and the program is a possible funding source for actions identified in this plan.

Emergency Watershed Program

The USDA Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. EWP is an emergency recovery program. Financial and technical assistance are available for the following activities (Natural Resources Conservation Service, 2018):

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded banks
- Correct damaged drainage facilities
- Establish cover on critically eroding lands
- Repair levees and structures
- Repair conservation practices.

This federal program could be a possible funding source for actions identified in this plan.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- Threatened means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- Critical habitat means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- Section 4: Listing of a Species—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or community members may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- Section 7: Consultation—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- Section 9: Prohibition of Take—It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- Section 10: Permitted Take—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- Section 11: Citizen Lawsuits—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent engineer approved by the FERC must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors seismic research and applies it in performing structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected community members and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

Federal Wildfire Management Policy and Healthy Forests Restoration Act

Federal Wildfire Management Policy and Healthy Forests Restoration Act (2003). These documents call for a single comprehensive federal fire policy for the Interior and Agriculture Departments (the agencies using federal fire management resources). They mandate community-based collaboration to reduce risks from wildfire.

National Dam Safety Act

Potential for catastrophic flooding due to dam failures led to passage of the National Dam Inspection Act in 1972, creation of the National Dam Safety Program in 1996, and reauthorization of the program through the Dam Safety Act in 2006. National Dam Safety Program, administered by FEMA requires a periodic engineering analysis of the majority of dams in the country; exceptions include the following:

- Dams under jurisdiction of the Bureau of Reclamation, Tennessee Valley Authority, or International Boundary and Water Commission
- Dams constructed pursuant to licenses issued under the Federal Power Act

- Dams that the Secretary of the Army determines do not pose any threat to human life or property.

The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect lives and property of the public. The National Dam Safety Program is a partnership among the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States.

National Environmental Policy Act

The National Environmental Policy Act requires federal agencies to consider the environmental impacts of proposed actions and reasonable alternatives to those actions, alongside technical and economic considerations. The National Environmental Policy Act established the Council on Environmental Quality, whose regulations (40 CFR Parts 1500-1508) set standards for compliance. Consideration and decision-making regarding environmental impacts must be documented in an environmental impact statement or environmental assessment. Environmental impact assessment requires the evaluation of reasonable alternatives to a proposed action, solicitation of input from organizations and individuals that could be affected, and an unbiased presentation of direct, indirect, and cumulative environmental impacts. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

National Fire Plan

The 2001 National Fire Plan was developed based on the National Fire Policy. A major aspect of the National Fire Plan is joint risk reduction planning and implementation carried out by federal, state and local agencies and communities. The National Fire Plan presented a comprehensive strategy in five key initiatives:

- Firefighting—Be adequately prepared to fight fires each fire season.
- Rehabilitation and Restoration—Restore landscapes and rebuild communities damaged by wildfires.
- Hazardous Fuel Reduction—Invest in projects to reduce fire risk.
- Community Assistance—Work directly with communities to ensure adequate protection.
- Accountability—Be accountable and establish adequate oversight, coordination, program development, and monitoring for performance.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities that enact floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act.

Flood Study and Mapping

For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent-annual-chance flood and the 0.2-percent-annual-chance flood.

Base flood elevations and the boundaries of the flood hazard areas are shown on Flood Insurance Rate Maps, which are the principle tool for identifying the extent and location of the flood hazard. Flood Insurance Rate Maps are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under the local floodplain management program. Structures permitted or built in a jurisdiction before its first flood map was approved are called “pre-FIRM” structures, and structures built afterwards are called “post-FIRM.” The insurance rate is different for the two types of structures. In recent years, Flood Insurance Rate Maps have been digitized as Digital Flood Insurance Rate Maps, which are more accessible to community members, local governments and stakeholders.

Requirements for Development Regulations

NFIP participants must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 1-percent-annual-chance flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

NFIP participation is limited to local governments that possess permit authority and have the ability to adopt and enforce regulations that govern land use. This does not typically apply to special purpose districts.

Repetitive Loss Properties and Areas

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

Repetitive loss properties make up 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation’s flood insurance claim payments. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A recent report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 100-year floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency responder disciplines. These cases necessitate coordination across a spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, technological hazards, and human-caused hazards) regardless of size or complexity.

Although participation is voluntary, federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive federal preparedness grants and awards. The content of this plan is considered to be a viable support tool for any phase of emergency management. The NIMS program is considered as a response function, and information in this hazard mitigation plan can support the implementation and update of all NIMS-compliant plans within the planning area.

National Landslide Preparedness Act

The 2021 National Landslide Preparedness Act authorized a national landslide hazards reduction program and a 3D elevation program within the USGS. This broadened the existing Landslide Hazards Program (under the Natural Hazards Mission Area) and the 3D Elevation Program (under the National Geospatial Program). The act required coordination among federal agencies through an Interagency Coordinating Committee on Landslide Hazards representing USGS and other agencies. The act calls for development of a national strategy for landslide loss reduction and a publicly accessible national landslide database of landslide hazard and risk.

Presidential Executive Order 11988, Floodplain Management

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities (FEMA, 2015a):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Presidential Executive Order 11990, Protection of Wetlands

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

Rural Development Program

The mission of the U.S. Department of Agriculture (USDA) Rural Development Program is to help improve the economy and quality of life in rural America. The program provides project financing and technical assistance to help rural communities provide the infrastructure needed by rural businesses, community facilities, and households. The program addresses rural America's need for basic services, such as clean running water, sewage and waste disposal, electricity, and modern telecommunications and broadband. Loans and competitive grants are offered for various community and economic development projects and programs, such as the development of essential community facilities including fire stations. This program is a potential source of funding for actions identified in this plan.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers operates and maintains approximately 700 dams nationwide. It is also responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety. The Corps maintains the National Inventory of Dams, which contains information about a dam's location, size, purpose, type, last inspection and regulatory status.

U.S. Army Corps of Engineers Flood Hazard Management

The following U.S. Army Corps of Engineers authorities and programs related to flood hazard management:

- The Floodplain Management Services program offers 100-percent federally funded technical services such as development and interpretation of site-specific data related to the extent, duration and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.
- For more extensive studies, the Corps of Engineers offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to $100,000 with the local jurisdiction providing 50 percent of the cost.

- The Corps of Engineers has several cost-shared programs (typically 65 percent federal and 35 percent non-federal) aimed at developing, evaluating and implementing structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed:
  - The Continuing Authorities Program for smaller-scale projects includes Section 205 for Flood Control, with a $7 million federal limit and Section 14 for Emergency Streambank Protection with a $1.5 million federal limit. These can be implemented without specific authorization from Congress.
  - Larger scale studies, referred to as General Investigations, and projects for flood risk management, for ecosystem restoration or to address other water resource issues, can be pursued through a specific authorization from Congress and are cost-shared, typically at 65 percent federal and 35 percent non-federal.
  - Watershed management planning studies can be specifically authorized and are cost-shared at 50 percent federal and 50 percent non-federal.
- The Corps of Engineers provides emergency response assistance during and following natural disasters. Public Law 84-99 enables the Corps to assist state and local authorities in flood fight activities and cost share in the repair of flood protective structures. Assistance is provided in the flowing categories:
  - Preparedness—The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for Corps of Engineers emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
  - Response Activities—Public Law 84-99 allows the Corps of Engineers to supplement state and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a project cooperation agreement signed by the public sponsor and the sponsor must remove all flood fight material after the flood has receded. Public Law 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for “advance measures” assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.
  - Rehabilitation—Under Public Law 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the federal system owner, and at 20-percent cost to the eligible non-federal system owner. All systems considered eligible for Public Law 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested federal, state, and local agencies following natural disaster events where flood control works are damaged.

These authorities and programs are all available to the planning partners to support any related mitigation actions.

U.S. Bureau of Reclamation Safety Evaluation of Existing Dams Program

The U.S. Bureau of Reclamation’s Safety Evaluation of Existing Dams Program was officially implemented in 1978 with passage of the Reclamation Safety of Dams Act (Public Law 95-578). This act was amended in 1984 under Public Law 98-404, in 2000 under Public Law 106-377, in 2002 under Public Law 107-117, and in 2004 under Public Law 108-439. Program development and administration of dam safety activities is the responsibility of the Bureau of Reclamation’s Dam Safety Office located in Denver, Colorado.

Dams must be operated and maintained in a safe manner, ensured through inspections for safety deficiencies, analyses utilizing current technologies and designs, and corrective actions if needed based on current engineering practices. In addition, future evaluations should include assessments of benefits foregone with the loss of a dam. For example, a failed dam can no longer provide needed fish and wildlife benefits.

The primary emphasis of the Safety Evaluation of Existing Dams program is to perform site evaluations and to identify potential safety deficiencies on Bureau of Reclamation and other Interior Department dams. The basic objective is to quickly identify dams which pose an increased threat to the public, and to quickly complete the related analyses in order to expedite corrective action decisions and safeguard the public and associated resources.

The program focuses on evaluating and implementing actions to resolve safety concerns at Bureau of Reclamation dams. Under this program, the Bureau of Reclamation completes studies and identifies and implements needed corrective action on Bureau of Reclamation dams. The selected course of action relies on assessments of risks and liabilities with environmental and public involvement input to the decision-making process.

U.S. Fire Administration

There are federal agencies that provide technical support to fire agencies/organizations. For example, the U.S. Fire Administration, which is a part of FEMA, provides leadership, advocacy, coordination, and support for fire agencies and organizations.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service fire management strategy uses prescribed fire to maintain early successional fire-adapted grasslands and other ecological communities throughout the National Wildlife Refuge system.

STATE

AB 32: The California Global Warming Solutions Act

This bill identifies the following potential adverse impacts of global warming:

> "… the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems."

AB 32 establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020 (a reduction of approximately 25 percent from forecast emission levels), with further reductions to follow. The law requires the state Air Resources Board to do the following:

- Establish a program to track and report greenhouse gas emissions.
- Approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions from sources of greenhouse gas emissions.
- Adopt early reduction measures to begin moving forward.
- Adopt, implement and enforce regulations—including market mechanisms such as "cap and-trade" programs—to ensure that the required reductions occur.

The Air Resources Board has adopted a statewide greenhouse gas emissions limit and an emissions inventory, along with requirements to measure, track, and report greenhouse gas emissions by the industries it determined to be significant sources of greenhouse gas emissions.

AB 70: Flood Liability

This bill provides that a city or county may be required to contribute a fair and reasonable share to compensate for property damage caused by a flood to the extent that it has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project, unless the city or county meets specified requirements.

AB 162: Flood Planning

This California State Assembly Bill passed in 2007 requires cities and counties to address flood-related matters in the land use, conservation, and safety and housing elements of their general plans. The land use element must identify and annually review the areas covered by the general plan that are subject to flooding as identified in floodplain mapping by either FEMA or the state California Department of Water Resources. During the next revision of the housing element on or after January 1, 2009, the conservation element of the general plan must identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for the purpose of groundwater recharge and stormwater management. The safety element must identify information regarding flood hazards, including:

- Flood hazard zones
- Maps published by FEMA, the California Department of Water Resources, the U.S. Army Corps of Engineers, the Central Valley Flood Protection Board, and the Governor's Office of Emergency Services (Cal OES)
- Historical data on flooding
- Existing and planned development in flood hazard zones.

The general plan must establish goals, policies and objectives related to flooding risks, including:

- Avoiding or minimizing the risks of flooding new development
- Evaluating whether new development should be located in flood hazard zones
- Identifying construction methods to minimize damage.

AB 162 establishes goals, policies and objectives related to flooding risks. It establishes procedures for the determination of available land suitable for urban development, which may exclude lands where FEMA or the California Department of Water Resources has concluded that the flood management infrastructure is not adequate to avoid the risk of flooding.

AB 747: Required Information for General Plan Safety Elements

This bill requires California communities with general plans to address evacuation routes in the safety element of the general plan. Information on the evacuation routes and their capacity, safety and viability under a range of emergency scenarios must be provided. For communities that have not adopted a local hazard mitigation plan, the safety element must be updated with this information by January 1, 2022. For those with a local hazard mitigation plan, the requirement applies upon the next revision of the hazard mitigation plan on or after January 1, 2022. Communities that have adopted a local hazard mitigation plan, emergency operations plan, or other document that fulfills the goals and objectives of this law may comply with this requirement by summarizing and incorporating by reference the other plan or document in the safety element.

In subsequent revisions to the safety element, communities also will be required to identify new information relating to flood and fire hazards and climate adaptation and resiliency strategies applicable to the city or county that was not available during the previous revision of the safety element. These subsequent updates must occur upon each revision of the general plan housing element or local hazard mitigation plan and not less than once every eight years.

AB 2140: General Plans—Safety Element

This bill provides that the state may allow for more than 75 percent of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the safety element of its general plan. The local hazard mitigation plan needs to include elements specified in this legislation. In addition, this bill requires Cal OES to give preference for federal mitigation funding to cities and counties that have adopted local hazard mitigation plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans.

AB 2800: Climate Change—Infrastructure Planning

This California State Assembly bill passed in 2016 and until July 1, 2020, requires state agencies to take into account the current and future impacts of climate change when planning, designing, building, operating, maintaining, and investing in state infrastructure. The bill, by July 1, 2017, and until July 1, 2020, requires an agency to establish a Climate-Safe Infrastructure Working Group to examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was enacted in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act’s main purpose is to prevent construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as liquefaction or seismically induced landslides. The law requires the State of California Geologist to establish regulatory zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. All seismic hazard mitigation actions identified in this plan will seek full compliance with the Alquist-Priolo Earthquake Fault Zoning Act.

California Coastal Management Program

The California Coastal Management Program under the California Coastal Act requires each city or county lying wholly or partly within the coastal zone to prepare a local coastal plan. The specific contents of such plans are not specified by state law, but they must be certified by the Coastal Commission as consistent with policies of the Coastal Act (Public Resources Code, Division 20). The Coastal Act has provisions relating to geologic hazards, but does not mention tsunamis specifically. Section 30253(1) of the Coastal Act states that new development shall minimize risks to life and property in areas of high geologic, flood, and fire hazard. Development should be prevented or limited in high hazard areas whenever possible. However, where development cannot be prevented or limited, land use density, building value, and occupancy should be kept at a minimum. Any mitigation project identified in this plan that intersects the mapped coastal zone will be consistent with the recommendations of the local coastal plan.

California Department of Forestry and Fire Protection

CAL FIRE has responsibility for wildfires in areas of the county that are not under the jurisdiction of the Forest Service or a local fire organization, including lands designated as State Responsibility Areas. CAL FIRE also has fire protection responsibilities by contract and mutual aid agreements. For example, CAL FIRE provides year-round fire protection under Amador Plan agreements with certain local government agencies (Public Resources Code §4144). Through these agreements, CAL FIRE provides local structural and wildfire protection or dispatch services to a community and maintains a staffing level that otherwise would be available only during the fire season. The local entity pays the additional cost of the service.

California Department of Parks and Recreation (State Parks)

State Parks manages portions of the California coastline including coastal wetlands, estuaries, beaches, and dune systems. The State Parks Resources Management Division has limited wildfire protection resources available to suppress fires on State Park lands.

California Department of Water Resources

In California, the Department of Water Resources is the coordinating agency for floodplain management. The department works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, participating in statewide flood hazard mitigation planning, and facilitating annual statewide workshops. Compliance is monitored by FEMA regional staff and by the Department of Water Resources.

California Division of Safety of Dams

California’s Division of Safety of Dams (a division of the Department of Water Resources) monitors the dam safety program at the state level and maintains a working list of dams in the state. When a new dam is proposed, Division engineers and geologists inspect the site and the subsurface. Upon submittal of an application, the Division reviews the plans and specifications prepared by the owner to ensure that the dam is designed to meet minimum requirements and that the design is appropriate for the known geologic conditions. After approval of the application, the Division inspects all aspects of the construction to ensure that the work is done in accordance with the approved plans and specifications. After construction, the Division inspects each dam to ensure that it is performing as intended and is not developing problems. The Division periodically reviews the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California. Over 1,200 dams are inspected by Division engineers on a yearly schedule to ensure performance and maintenance of dams (California Division of Safety of Dams, 2017).

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was passed in 1970, shortly after the federal government enacted the National Environmental Policy Act, to institute a statewide policy of environmental protection. CEQA requires state and local agencies in California to follow a protocol of analysis and public disclosure of the potential environmental impacts of development projects. CEQA makes environmental protection a mandatory part of every California state and local agency's decision-making process.

CEQA establishes a statewide environmental policy and mandates actions all state and local agencies must take to advance the policy. Jurisdictions conduct analysis of the project to determine if there are potentially significant environmental impacts, identify mitigation measures, and possible project alternatives by preparing environmental reports for projects that requires CEQA review. This environmental review is required before an agency takes action on any policy, program, or project. Any project action identified in this plan will seek full CEQA compliance upon implementation.

California Fire Alliance

The California Fire Alliance (CFA) was established in response to directives from the 2001 National Fire Plan. The CFA pursues four strategies to deal with the National Fire Plan's community assistance initiative:

- Work with communities at risk from wildfires to develop community-based planning leadership and facilitate the development of community fire loss mitigation plans, which transcend jurisdiction and ownership boundaries.
- Assist communities in development of fire loss mitigation planning, education and projects to reduce the threat of wildfire losses on public and private lands.
- Develop an information and education outreach plan to increase awareness of wildfire protection program opportunities available to communities at risk.
- Work collaboratively to develop, modify and maintain a comprehensive list of communities at risk.

California Fire Plan

The State Board of Forestry and CAL FIRE have prepared a comprehensive update of the California Fire Plan for wildfire protection. The planning process included defining a level of service measurement; considering assets at risk; incorporating the cooperative interdependent relationships of wildfire protection providers; providing for public stakeholder involvement; and creating a fiscal framework for policy analysis. The California Fire Plan's overall goal is to reduce costs and losses from wildfire in the state by protecting assets at risk through pre-fire management and by reducing the spread of fire through more successful initial response.

California Fire Safe Council

In 1993, the statewide Fire Safe Council, consisting of private and public membership, was formed to educate and encourage Californians to plan and prepare for wildfires by reducing the risk of fire to property, communities, and natural/structural resources. In 2002, this group created a nonprofit organization and board of directors, called the California Fire Safe Council. The Council works with the California Fire Alliance to facilitate the distribution of National Fire Plan grants for wildfire risk reduction and education (www.grants.firesafecouncil.org). The Council also provides assistance to local Fire Safe Councils through its website (www.firesafecouncil.org), the distribution of educational materials, and technical assistance, primarily through regional representatives. More than 130 local Fire Safe Councils have formed in California to plan, coordinate, and implement fire prevention activities.

California Fire Service and Rescue Emergency Mutual Aid Plan

The Governor's Office of Emergency Services Fire and Rescue Branch administers the California Fire Service and Rescue Emergency Mutual Aid Plan. The agency provides guidance and procedures for agencies developing emergency operations plans, as well as training and technical support, primarily to overall emergency service organizations and urban search and rescue teams.

California General Planning Law

California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The general plan expresses the community's goals, visions, and policies relative to future land uses, both public and private. The general plan is mandated and prescribed by state law (Cal. Gov. Code §65300 et seq.), and forms the basis for most local government land use decision-making.

The plan must consist of an integrated, internally consistent set of goals, policies, and implementation measures. In addition, the plan must focus on issues of the greatest concern to the community and be written in a clear and concise manner. City and county actions, such as those relating to land use allocations, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

California Multi-Hazard Mitigation Plan

Under the DMA, California must adopt a federally approved state multi-hazard mitigation plan to be eligible for certain disaster assistance and mitigation funding. The intent of the State of California Multi-Hazard Mitigation Plan is to reduce or prevent injury and damage from hazards in the state through the following:

- Documenting statewide hazard mitigation planning in California
- Describing strategies and priorities for future mitigation activities
- Facilitating the integration of local and tribal hazard mitigation planning activities into statewide efforts
- Meeting state and federal statutory and regulatory requirements.

The plan is an annex to the State Emergency Plan, and it identifies past and present mitigation activities, current policies and programs, and mitigation strategies for the future. It also establishes hazard mitigation goals and objectives. The plan will be reviewed and updated annually to reflect changing conditions and new information, especially information on local planning activities.

Under 44 CFR Section 201.6, local hazard mitigation plans must be consistent with their state's hazard mitigation plan. In updating this plan, the Steering Committee reviewed the California State Hazard Mitigation Plan to identify key relevant state plan elements (see Section 3.7).

California Residential Mitigation Program

The California Residential Mitigation Program was established in 2011 to help Californians strengthen their homes against damage from earthquakes. The program is a joint powers authority created by Cal OES and the

California Earthquake Authority, which is a not-for-profit, publicly managed, privately funded provider of home earthquake insurance to California homeowners and renters.

Earthquake Brace + Bolt was developed to help homeowners lessen the potential for damage to their houses during an earthquake. A residential seismic retrofit strengthens an existing older house, making it more resistant to earthquake activity such as ground shaking and soil failure. The seismic retrofitting involves bolting the house to its foundation and adding bracing around the perimeter of the crawl space. Most homeowners hire a contractor to do the retrofit work, and owners of houses in ZIP Codes with house characteristics suitable for this type of retrofit are eligible for up to $3,000 toward the cost. A typical retrofit by a contractor may cost between $3,000 and $7,000, depending on the location and size of the house, contractor fees, and the amount of materials and work involved. If the homeowner is an experienced do-it-yourselfer, a retrofit can cost less than $3,000.

California State Building Code

California Code of Regulations Title 24 (CCR Title 24), also known as the California Building Standards Code, is a compilation of building standards from three sources:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes adopted to address particular California concerns.

The state Building Standards Commission is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings in California. The national model code standards adopted into Title 24 apply to all occupancies in California, except for modifications adopted by state agencies and local governing bodies. Since 1989, the Building Standards Commission has published new editions of Title 24 every three years.

On January 1, 2014, California Building Code Accessibility Standards found in Chapter 11B incorporated the 2010 Americans with Disabilities Act (ADA) Standards as the model accessibility code for California. The purpose was to ensure consistency with federal guidelines. As a result of this incorporation, the California standards will fully implement and include 2010 ADA Standards within the California Building Code while maintaining enhanced levels of accessibility already provided by existing California accessibility regulations. All planning partners that have building code and permit authority have adopted building codes that are in full compliance with the California State Building Code.

Disadvantaged and Low-income Communities Investments

Senate Bill (SB) 535 directs state and local agencies to make investments that benefit California's disadvantaged communities. It also directs the California Environmental Protection Agency to identify disadvantaged communities for the purposes of these investments based on geographic, socio-economic, public health, and environmental hazard criteria. Assembly Bill (AB) 1550 increased the percent of funds for projects located in disadvantaged communities from 10 to 25 percent and added a focus on investments in low-income communities and households. This program is a potential alternative source of funding for actions identified in this plan.

Division of the State Architect's AB 300 List of Seismically At-Risk Schools

In 2002, California's Division of the State Architect completed an inventory of public school buildings built before 1978 that identifies buildings with characteristics that might make them unsafe in future earthquakes. This inventory provides a list of potentially at-risk schools known as the AB 300 list (the inventory was authorized by Assembly Bill 300 in 1999). Using available information on school buildings' dates of construction, seismic retrofits, and structural systems (wood-frame, concrete shear wall, or steel moment frame, etc.), the inventory categorized California public school buildings into one of two categories: those expected to perform well in future earthquakes; and those that are not expected to perform well and require more detailed seismic evaluation.

The Division of the State Architect recommends that public schools on this list undergo detailed seismic evaluations to determine if they pose life safety risks, but the state has neither required nor funded school districts to do this.

Governor's Executive Order S-13-08

Governor's Executive Order S-13-08 enhances the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events. There are four key actions in the executive order:

- Initiate California's first statewide climate change adaptation strategy to assess expected climate change impacts, identify where California is most vulnerable, and recommend adaptation policies. This effort will improve coordination within state government so that better planning can more effectively address climate impacts on human health, the environment, the state's water supply and the economy.
- Request that the National Academy of Science establish an expert panel to report on sea level rise impacts in California, to inform state planning and development efforts.
- Issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects.
- Initiate a report on critical infrastructure projects vulnerable to sea level rise.

Office of the State Fire Marshal

The Office of the State Fire Marshal is a division of CAL FIRE that has a wide variety of fire safety and training responsibilities and provides technical support to fire agencies/organizations.

Senate Bill 92: Public Resources Portion of Biennial Budget Bill

The State of California updated its requirements regarding emergency action plans (EAPs) via Senate Bill 92, which became effective in June 2017 as part of the state Legislature's biennial budget process. The bill required dam owners to submit EAPs to Cal OES and the Department of Water Resources for approval by January 1, 2018 (for extremely high hazard dams), January 1, 2019 (for high-hazard dams), and January 1, 2021 (for significant hazard dams). The EAPs were to include the following (California Government Code Section 8589.5; Cal OES, 2018):

- Emergency notification flow charts
- Information on a four-step response process

- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists.

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (State of California, 2018).

SB 92 also requires dams other than low-risk dams to have current inundation mapping, which must be updated every 10 years, or sooner if specific circumstances change. EAPs also must be updated every 10 years. It provides the Department of Water Resources with enforcement tools, including fines and operational restrictions for failure to comply. Cal OES is required by the law to work with state and federal agencies, dam owners, planners, and the public to make dam failure inundation maps available to community members interested in learning their dam failure inundation risk.

Senate Bill 97: Guidelines for Greenhouse Gas Emissions

Senate Bill 97, enacted in 2007, amends CEQA to clearly establish that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for CEQA analysis. It directs the Governor's Office of Planning and Research to develop draft CEQA guidelines for the mitigation of greenhouse gas emissions or their effects by July 1, 2009 and directs the California Natural Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010.

Senate Bill 99: Evacuation Route Planning

Senate Bill 99, enacted in 2019, requires that cities' and counties' general plans address evacuation routes from any hazard area identified in the safety element. Under this law, the safety element must include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. Each city or county must update its safety element with the new information upon the next revision of its housing element on or after January 1, 2020.

Senate Bill 379: General Plans: Safety Element—Climate Adaptation

Senate Bill 379 builds upon the flood planning inclusions into the safety and housing elements and the hazard mitigation planning safety element inclusions in general plans outlined in AB 162 and AB 2140, respectively. SB 379 focuses on a new requirement that cities and counties include climate adaptation and resiliency strategies in the safety element of their general plans beginning January 1, 2017. In addition, this bill requires general plans to include a set of goals, policies and objectives, and specified implementation measures based on the conclusions drawn from climate adaptation research and recommendations.

Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements

In 2016, Senate Bill 1000 amended California's Planning and Zoning Law in two ways:

The original law established requirements for initial revisions of general plan safety elements to address flooding, fire, and climate adaptation and resilience. It also required subsequent review and revision as necessary based on new information. Senate Bill 1000 specifies that the subsequent reviews and revision based on new information are required to address only flooding and fires (not climate adaptation and resilience).

Senate Bill 1000 adds a requirement that, upon adoption or revision of any two other general plan elements on or after January 1, 2018, an environmental justice element be adopted for the general plan or environmental justice goals, policies and objectives be incorporated into other elements of the plan.

Senate Bill 1241: General Plans: Safety Element—Fire Hazard Impacts

In 2012, Senate Bill 1241 passed requiring that the safety elements of all future general plans address fire risk in state responsibility areas and very high fire hazard severity zones. The bill requires cities and counties to make findings regarding available fire protection and suppression services before approving a tentative map or parcel map.

Standardized Emergency Management System

CCR Title 19 establishes the Standardized Emergency Management System (SEMS) to standardize the response to emergencies involving multiple jurisdictions. SEMS is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management. Local governments must use SEMS by December 1, 1996, to be eligible for state funding of response-related personnel costs under CCR Title 19 (Sections 2920, 2925 and 2930). The roles and responsibilities of Individual agencies contained in existing laws or the state emergency plan are not superseded by these regulations. This hazard mitigation plan is considered to be a support document for all phases of emergency management, including those associated with SEMS.

Western Governors Association Ten-Year Comprehensive Strategy

The *Western Governors Association Ten-Year Comprehensive Strategy: A Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment* (August 2001) is strategy implementation plan prepared by federal and Western state agencies that outlines measures to restore fire-adapted ecosystems and reduce hazardous fuels.

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Appendix D. Mapping Methods & Data Sources

D. Mapping Methods & Data Sources

DAM FAILURE INUNDATION MAPPING

Dam breach inundation maps, including inundation boundaries and depth grids, were downloaded from the California Department of Water Resources' website - https://fmds.water.ca.gov/maps/damim/. As required by California Water Code section 6161, the Division of Safety of Dams (DSOD) at the Department of Water Resources reviews and approves inundation maps prepared by licensed civil engineers and submitted by dam owners for extremely high, high, and significant hazard dams and their critical appurtenant structures. Inundation maps are based on a hypothetical failure of a dam or critical appurtenant structure and the information depicted on the maps is approximate. The dams and failure scenarios are as follows:

- Bear Gulch (National Dam ID CA00658) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 10/10/2018.
- Coastways (National Dam ID CA01007) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 3/18/2021.
- Crocker (National Dam ID CA00672) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 7/22/2019.
- Emerald Lake 1 Lower (National Dam ID CA00668) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 2/15/2019.
- Felt Lake (National Dam ID CA00670) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 12/30/2019.
- Laurel Creek (National Dam ID CA00901) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 10/29/2018.
- Lower Crystal Springs – Main Dam (National Dam ID CA00127) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 9/10/2020.
- Lower Crystal Springs – Outlet 1 (National Dam ID CA00127) - Scenario shows an inundation extent for a sunny day failure of Outlet 1. File downloaded from DSOD website generated on 9/10/2020.
- Notre Dame (National Dam ID CA00674) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 10/13/2020.
- Pilarcitos (National Dam ID CA00128) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 7/22/2019.
- Pomponio Ranch (National Dam ID CA01008) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 4/1/2021.

- San Andreas (National Dam ID CA00129) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 7/6/2020.
- Searsville (National Dam ID CA00669) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 2/24/2021.
- Spenser Lake (National Dam ID CA00673) - Scenario shows an inundation extent for a sunny day failure of Main Dam. File downloaded from DSOD website generated on 7/22/2019.

EARTHQUAKE MAPPING

Liquefaction Susceptibility

The Liquefaction dataset presents a map and database of Quaternary deposits and liquefaction susceptibility areas the urban core of the San Francisco Bay region. It supersedes the equivalent area of U.S. Geological Survey Open-File Report 00-444 (Knudsen and others, 2000), which covers the larger 9-county San Francisco Bay region. The report consists of (1) a spatial database, (2) two small-scale colored maps (Quaternary deposits and liquefaction susceptibility), (3) a text describing the Quaternary map and liquefaction interpretation (part 3), and (4) a text introducing the report and describing the database (part 1). The nine counties surrounding San Francisco Bay straddle the San Andreas fault system, which exposes the region to serious earthquake hazard (Working Group on California Earthquake Probabilities, 1999). Much of the land adjacent to the Bay and the major rivers and streams is underlain by unconsolidated deposits that are particularly vulnerable to earthquake shaking and liquefaction of water-saturated granular sediment. This new map provides a consistent detailed treatment of the central part of the 9-county region in which much of the mapping of Open-File Report 00-444 was either at smaller (less detailed) scale or represented only preliminary revision of earlier work. Like Open-File Report 00-444, the current mapping uses geomorphic expression, pedogenic soils, inferred depositional environments, and geologic age to define and distinguish the map units. Further scrutiny of the factors controlling liquefaction susceptibility has led to some changes relative to Open-File Report 00-444: particularly the reclassification of San Francisco Bay mud (Qhbm) to have only MODERATE susceptibility and the rating of artificial fills according to the Quaternary map units inferred to underlie them. The report is the product of cooperative work by the National Earthquake Hazards Reduction Program (NEHRP) and National Cooperative Geologic Mapping Program of the U.S. Geological Survey, William Lettis and & Associates, Inc. (WLA), and the California Geological Survey. An earlier version was submitted to the U.S. Geological Survey by WLA as a final report for a NEHRP grant (Witter and others, 2005). The mapping has been carried out by WLA geologists under contract to the NEHRP Earthquake Program (Grant 99-HQ-GR-0095) and by the California Geological Survey. For detailed information about the map the USGS has an open report, "Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California. U.S. Geological Survey Open File Report 2006-1037 Version 1.1. http://pubs.usgs.gov/of/2006/1037/

National Earthquake Hazard Reduction Program (NEHRP) Soils

NEHRP soils information is derived from a shear wave velocity (Vs30) data produced by the California Geological Survey in 2015. The Vs30 data represents simplified geologic units that have been correlated to the time-averaged shear-wave velocity in the upper 30 meters of the earth's surface. The geologic units were compiled from published maps that range in scale from 1:250,000 to 1:24,000. (Wills, et. al., 2015)

Probabilistic Peak Ground Acceleration Maps

Probabilistic peak ground acceleration data, by Census tract, are generated by Hazus 4.2 SP03. In Hazus' probabilistic analysis procedure, the ground shaking demand is characterized by spectral contour maps developed by the U.S. Geological Survey (USGS) as part of a 2018 update of the National Seismic Hazard Maps. USGS probabilistic seismic hazard maps are revised about every six years to reflect newly published or thoroughly reviewed earthquake science and to keep pace with regular updates of the building code. Hazus includes maps for eight probabilistic hazard levels: ranging from ground shaking with a 39 percent probability of being exceeded in 50 years (100-year return period) to the ground shaking with a 2 percent probability of being exceeded in 50 years (2,500-year return period).

Shake Maps

A shake map is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. For this plan, shake maps were prepared by the USGS for four earthquake scenarios:

- An earthquake on the Butano fault with the following characteristics:
  - Magnitude: 6.93
  - Epicenter: N 37.24 W 122.15
  - Depth: 7.7 km
- An earthquake on the Monte Vista – Shannon fault with the following characteristics:
  - Magnitude: 7.14
  - Epicenter: N 37.27 W 122.09
  - Depth: 9.1 km
- An earthquake on the San Andreas (Peninsula) fault with the following characteristics:
  - Magnitude: 7.38
  - Epicenter: N 37.52 W 122.36
  - Depth: 7.8 km
- An earthquake on the San Gregorio (North) fault with the following characteristics:
  - Magnitude: 7.44
  - Epicenter: N 37.41 W 122.43
  - Depth: 7.0 km

FLOOD MAPPING

Flood hazard areas are from the countywide effective FEMA Digital Flood Insurance Rate Map (DFIRM) dated April 5, 2019.

LANDSLIDE MAPPING

Susceptibility to Deep-Seated Landslides data provided by the California Geological Survey. The map, and associated data, show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. On the most basic level, weak rocks and steep slopes are most likely to generate landslides. The map uses detailed information on the location of past landslides, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high). The USGS 2009 National Elevation Dataset (NED) with 10-m grid size was used as the base map. This landslide susceptibility map is intended to provide infrastructure owners, emergency planners and the public with a general overview of where landslides are more likely to occur. (Wills, et. al., 2011)

SEA LEVEL RISE MAPPING

Projected sea-level rise data are from the USGS Coastal Storm Modeling System, accessed via the Our Coast, Our Future web platform (Point Blue Conservation Science and USGS). The projections were generated using the latest downscaled climate projections and calibrated hydrodynamic models by the Coastal Storm Modeling System project team led by Patrick Barnard, at the USGS Pacific Coastal and Marine Science Center.

The Adapting to Rising Tides, Bay Area Sea Level Rise Analysis and Mapping Project, produces consistent inundation data and mapping products for all nine San Francisco Bay Area counties. The sea-level rise inundation mapping products capture permanent inundation and temporary flooding impacts from sea-level rise scenarios from 0 to 66 inches and extreme high tide events from the 1-year to the 100-year extreme tide (San Francisco Bay Conservation and Development Commission, 2017).

TSUNAMI MAPPING

Tsunami hazard area data are produced collectively by tsunami modelers, geologic hazard mapping scientists, and emergency planning specialists from the California Geological Survey, the California Governor's Office of Emergency Services, the Tsunami Research Center at the University of Southern California, and AECOM Technical Services. The Tsunami Hazard areas are developed for all populated areas at risk to tsunamis in California and represent a combination of the maximum considered tsunamis for each area. Local agencies, organizations, and other stakeholders assisted the State in the development of the hazard area as they will be used for evacuation planning at the community level.

The accompanying metadata file describes the tsunami mapping methods as follows:

> Recent tsunami modeling uses probabilistic tsunami hazard analysis to compute tsunami waves from sources from around the Pacific Ocean and results in inundation models that are associated with different probabilities of exceedance over time. The tsunami modeling process allows for wave evolution over a variable bathymetry and topography used for inundation mapping. The California Geological Survey, Seismic Hazards Program, Tsunami Unit selected the 975-year average return period tsunami model, with a 5% probability of exceedance in 50 years, as abasis for the minimum hazard level; this minimum hazard level, along with a suite of maximum credible events, helped define the extent for inundation mapping.
>
> For the probabilistic modeling the bathymetric/topographic data that are used in the tsunami models consist of a series of nested elevation grids. Deep ocean modeling is prepared using SRTM30+ bathymetric data (30 arc-second resolution). National Centers for Environmental Information coastal digital elevation models with a 1/3 arc-second (~10-meters) resolution and a "Mean High Water" vertical

datum is used as the near-shore grids since these data represent a more conservative sea level for the intended use of the tsunami modeling and mapping.

In order to enhance the 10-meter resolution inundation data, we use higher-resolution digital topographic data (e.g., 1-meter resolution LiDAR digital elevation models) to refine the location of the maximum inundation area. The location of the inundation area is refined by using digital imagery (e.g. recent National Agriculture Imagery Program imagery) and digital terrain data on a GIS platform with consideration given to historic inundation information. This information is verified, where possible, with workshops and fieldwork coordinated with local county personnel.

Data from the California Geological Survey (CGS) Tsunami Inundation Maps for Emergency Planning (2009) and the enhanced high resolution mapping of the 975 year return period probabilistic tsunami inundation model results are initially used as a minimum spatial constraint for the placement of the Tsunami Hazard Area. Guidance from local stakeholders, including emergency managers, first responders, and subject matter experts is used to help advise CGS on the placement of the final hazard area in places that would help the public and government safely evacuate during a tsunami event.

The accuracy of the hazard area shown on these maps and in these data is/are subject to limitations in the accuracy and completeness of the mapping conducted by the California Geological Survey. While an attempt has been made to define a maximum tsunami hazard extent at any location along the coastline, it remains possible that the actual Tsunami Hazard Area may be greater as required by the local agencies.

WILDFIRE MAPPING

PRC 4201 - 4204 and Govt. Code 51175-89 directed the California Department of Forestry and Fire Protection, Fire and Resource Assessment Program (CALFIRE - Fire and Resource Assessment Program) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as fire hazard severity zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. CAL FIRE remapped Fire Hazard Severity Zones (FHSZ) for State Responsibility Areas (SRA) and very high FHSZ recommendations in Local Responsibility Areas (LRA) in 2005 – 2008 to provide updated map zones, based on new data, science, and technology. Mapping of the areas referred to as very high FHSZ was based on data and models of, potential fuels over a 30-50 year time horizon and their associated expected fire behavior, and expected burn probabilities to quantify the likelihood and nature of vegetation fire exposure (including firebrands) to buildings. The goal of the mapping effort was to create more accurate fire hazard zone designations such that mitigation strategies would be implemented in areas where hazards warrant these investments. The fire hazard zones provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources.

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Appendix E. Detailed Risk Assessment Results

DAM FAILURE

Exposure

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Acres of Inundation Area	Number of Structures in Inundation Area (2)							
													Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	532	1,492	**21.2%**	$374,041,542	$209,337,426	$583,378,968	**20.5%**	776	526	3	0	0	0	0	3	**532**
Belmont	26,813	7,335	7,072	$6,073,411,270	37	121	**0.5%**	$99,651,071	$61,516,952	$161,168,022	**2.7%**	69	32	4	0	0	1	0	0	**37**
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Burlingame	30,118	7,601	6,932	$11,121,820,561	1,880	7,295	**24.2%**	$1,217,427,548	$873,948,046	$2,091,375,594	**18.8%**	706	1,679	187	5	0	5	2	2	**1880**
Colma	1,729	445	321	$1,269,795,262	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	151	1,048	**3.4%**	$32,518,265	$18,897,993	$51,416,258	**1.5%**	100	150	1	0	0	0	0	0	**151**
Foster City	33,033	7,904	7,732	$8,139,909,551	7,308	30,594	**92.6%**	$4,185,814,743	$2,915,405,237	$7,101,219,980	**87.2%**	3,286	7,161	111	23	0	4	1	8	**7308**
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	409	1,103	**8.9%**	$281,205,672	$234,164,334	$515,370,006	**14.6%**	386	350	51	0	6	1	1	0	**409**
Hillsborough	11,418	3,926	3,900	$3,326,778,876	491	1,417	**12.4%**	$290,177,766	$160,447,101	$450,624,868	**13.5%**	505	484	5	0	0	0	0	2	**491**
Menlo Park	35,254	9,073	8,545	$12,491,405,466	534	2,100	**6.0%**	$300,728,634	$186,895,977	$487,624,612	**3.9%**	298	509	25	0	0	0	0	0	**534**
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Pacifica	38,331	11,998	11,733	$5,726,928,117	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Redwood City	86,754	19,257	18,203	$21,797,918,834	588	2,516	**2.9%**	$446,499,641	$385,534,177	$832,033,817	**3.8%**	442	528	48	9	0	0	1	2	**588**
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	**0.0%**	$0	$0	$0	**0.0%**	12	0	0	0	0	0	0	0	**0**
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	**0.0%**	$0	$0	$0	**0.0%**	6	0	0	0	0	0	0	0	**0**
San Mateo	103,087	23,685	22,474	$23,908,243,752	14,201	61,277	**59.4%**	$8,355,962,428	$5,742,818,834	$14,098,781,262	**59.0%**	5,615	13,359	716	71	0	29	8	18	**14201**
South San Francisco	67,879	16,695	15,441	$25,673,267,870	0	0	**0.0%**	$0	$0	$0	**0.0%**	0	0	0	0	0	0	0	0	**0**
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	**0.0%**	$0	$0	$0	**0.0%**	1	0	0	0	0	0	0	0	**0**
Unincorporated	66,083	19,926	18,700	$19,545,239,679	736	2,223	**3.4%**	$552,046,349	$472,340,810	$1,024,387,159	**5.2%**	3,226	629	66	23	14	2	0	2	**736**
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**26,867**	**111,185**	**14.4%**	**$16,136,073,660**	**$11,261,306,886**	**$27,397,380,546**	**14.3%**	**15,429**	**25,407**	**1217**	**131**	**20**	**42**	**13**	**37**	**26867**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Economic Impact

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Atherton	7,031	2,504	2,479	$2,851,840,817	8,193	749	40	531	$45,900,410	$35,209,925	$81,110,335	**2.8%**
Belmont	26,813	7,335	7,072	$6,073,411,270	1,684	24	1	36	$18,614,244	$17,850,792	$36,465,036	**0.6%**
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0	0	$0	$0	$0	**0.0%**
Burlingame	30,118	7,601	6,932	$11,121,820,561	20,647	4,907	325	1,863	$160,803,333	$225,367,682	$386,171,015	**3.5%**
Colma	1,729	445	321	$1,269,795,262	0	0	0	0	$0	$0	$0	**0.0%**
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0	0	$0	$0	$0	**0.0%**
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	66	480	34	150	$3,040,743	$4,745,452	$7,786,195	**0.2%**
Foster City	33,033	7,904	7,732	$8,139,909,551	79,473	29,095	2,373	7,300	$609,011,394	$716,848,894	$1,325,860,288	**16.3%**
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	15,487	469	22	407	$52,495,272	$116,101,777	$168,597,049	**4.8%**
Hillsborough	11,418	3,926	3,900	$3,326,778,876	49,111	605	27	488	$155,133,616	$104,787,075	$259,920,691	**7.8%**
Menlo Park	35,254	9,073	8,545	$12,491,405,466	3,396	1,037	61	523	$30,312,684	$41,194,922	$71,507,606	**0.6%**
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	0	0	$0	$0	$0	**0.0%**
Pacifica	38,331	11,998	11,733	$5,726,928,117	0	0	0	0	$0	$0	$0	**0.0%**
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0	0	$0	$0	$0	**0.0%**
Redwood City	86,754	19,257	18,203	$21,797,918,834	3,120	1,141	92	570	$32,252,333	$50,411,358	$82,663,692	**0.4%**
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0	0	$0	$0	$0	**0.0%**
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	0	0	$0	$0	$0	**0.0%**
San Mateo	103,087	23,685	22,474	$23,908,243,752	1,002,771	54,018	4,164	14,179	$3,521,876,003	$3,473,037,885	$6,994,913,888	**29.3%**
South San Francisco	67,879	16,695	15,441	$25,673,267,870	0	0	0	0	$0	$0	$0	**0.0%**
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0	0	$0	$0	$0	**0.0%**
Unincorporated	66,083	19,926	18,700	$19,545,239,679	56,596	1,140	69	733	$157,730,460	$216,580,533	$374,310,993	**1.9%**
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**1,240,544**	**93,665**	**7,209**	**26,780**	**$4,787,170,491**	**$5,002,136,295**	**$9,789,306,786**	**5.1%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03, and adjusted to reflect the estimated population.
(6) Calculated using a user-defined (UDF) analysis in Hazus 4.2 SP03.

Social Vulnerability Index

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	1,498	0	0.00%	0	5	0.36%	3	0	0.00%	0	0	0.00%	0	1,493	99.64%	1	4
Belmont	143	0	0.00%	0	0	0.00%	0	139	97.58%	3	3	2.42%	1	0	0.00%	0	4
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	7,656	0	0.00%	0	0	0.00%	0	1,610	21.03%	2	6,046	78.97%	2	0	0.00%	0	4
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	810	0	0.00%	0	810	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	28,230	0	0.00%	0	0	0.00%	0	16,560	58.66%	3	11,670	41.34%	1	0	0.00%	0	4
Half Moon Bay	1,168	0	0.00%	0	268	22.95%	3	900	77.05%	3	0	0.00%	0	0	0.00%	0	6
Hillsborough	1,357	0	0.00%	0	0	0.00%	0	50	3.66%	2	0	0.00%	0	1,307	96.34%	1	3
Menlo Park	1,861	209	11.21%	4	33	1.79%	3	773	41.55%	3	77	4.13%	1	769	41.33%	0	11
Millbrae	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Pacifica	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Portola Valley	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Redwood City	2,389	552	23.09%	5	1,037	43.39%	4	245	10.23%	2	556	23.29%	1	0	0.00%	0	12
San Bruno	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
San Carlos	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
San Mateo	64,215	8,319	12.95%	4	27,449	42.75%	4	19,727	30.72%	2	6,575	10.24%	1	2,145	3.34%	0	11
South San Francisco	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Woodside	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Unincorporated	3,861	3,143	81.42%	5	98	2.55%	3	6	0.17%	2	25	0.65%	1	587	15.22%	0	11
Total	**113,186**	**12,222**	**10.80%**	**4**	**29,701**	**26.24%**	**4**	**40,010**	**35.35%**	**3**	**24,952**	**22.05%**	**1**	**6,301**	**5.57%**	**0**	**12**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	21.22%	Medium	2	6	20.46%	Medium	2	4	2.84%	Low	1	1	**22**	**Medium**
Belmont	Medium	2	0.45%	Low	1	3	2.65%	Low	1	2	0.60%	Low	1	1	**12**	**Low**
Brisbane	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Burlingame	Medium	2	24.22%	Medium	2	6	18.80%	Medium	2	4	3.47%	Low	1	1	**22**	**Medium**
Colma	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	Medium	2	3.40%	Low	1	3	1.47%	Low	1	2	0.22%	Low	1	1	**12**	**Low**
Foster City	Medium	2	92.62%	High	3	9	87.24%	High	3	6	16.29%	High	3	3	**36**	**High**
Half Moon Bay	Medium	2	8.87%	Low	1	3	14.56%	Medium	2	4	4.76%	Low	1	1	**16**	**Medium**
Hillsborough	Medium	2	12.41%	Medium	2	6	13.55%	Medium	2	4	7.81%	Medium	2	2	**24**	**Medium**
Menlo Park	Medium	2	5.96%	Low	1	3	3.90%	Low	1	2	0.57%	Low	1	1	**12**	**Low**
Millbrae	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Pacifica	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Portola Valley	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Redwood City	Medium	2	2.90%	Low	1	3	3.82%	Low	1	2	0.38%	Low	1	1	**12**	**Low**
San Bruno	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Carlos	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Mateo	Medium	2	59.44%	High	3	9	58.97%	High	3	6	29.26%	High	3	3	**36**	**High**
South San Francisco	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Woodside	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Unincorporated	Medium	2	3.36%	Low	1	3	5.24%	Low	1	2	1.92%	Low	1	1	**12**	**Low**
Total	**Medium**	**2**	**14.38%**	**Medium**	**2**	**6**	**14.28%**	**Medium**	**2**	**4**	**5.10%**	**Medium**	**2**	**2**	**24**	**Medium**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			4	12	20.46%	Medium	2	4	2.84%	Low	1	1	34	High
Belmont	Medium	2			4	12	2.65%	Low	1	2	0.60%	Low	1	1	30	Medium
Brisbane	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Burlingame	Medium	2			4	12	18.80%	Medium	2	4	3.47%	Low	1	1	34	High
Colma	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Daly City	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
East Palo Alto	Medium	2			4	12	1.47%	Low	1	2	0.22%	Low	1	1	30	Medium
Foster City	Medium	2			4	12	87.24%	High	3	6	16.29%	High	3	3	42	High
Half Moon Bay	Medium	2			6	18	14.56%	Medium	2	4	4.76%	Low	1	1	46	High
Hillsborough	Medium	2			3	9	13.55%	Medium	2	4	7.81%	Medium	2	2	30	Medium
Menlo Park	Medium	2			11	33	3.90%	Low	1	2	0.57%	Low	1	1	72	High
Millbrae	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Pacifica	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Portola Valley	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Redwood City	Medium	2			12	36	3.82%	Low	1	2	0.38%	Low	1	1	78	High
San Bruno	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
San Carlos	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
San Mateo	Medium	2			11	33	58.97%	High	3	6	29.26%	High	3	3	84	High
South San Francisco	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Woodside	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	0	Low
Unincorporated	Medium	2			11	33	5.24%	Low	1	2	1.92%	Low	1	1	72	High
Total	**Medium**	**2**			**12**	**36**	**14.28%**	**Medium**	**2**	**4**	**5.10%**	**Medium**	**2**	**2**	**84**	**High**

Combined Dam Failure Areas Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	1	0	0	0	0	1	0	**2**
BELMONT	0	0	0	0	0	0	1	**1**
BRISBANE	0	0	0	0	0	0	0	**0**
BURLINGAME	6	0	1	0	0	4	5	**16**
COLMA	0	0	0	0	0	0	0	**0**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	1	0	1	0	0	0	0	**2**
FOSTER CITY	9	0	4	2	4	17	4	**40**
HALF MOON BAY	1	1	2	0	3	2	3	**12**
HILLSBOROUGH	0	0	0	0	0	2	8	**10**
MENLO PARK	1	0	3	0	1	0	2	**7**
MILLBRAE	0	0	0	0	0	0	0	**0**
PACIFICA	0	0	0	0	0	0	0	**0**
PORTOLA VALLEY	0	0	0	0	0	0	0	**0**
REDWOOD CITY	0	1	12	1	4	7	0	**25**
SAN BRUNO	0	0	0	0	0	0	0	**0**
SAN CARLOS	0	0	0	0	0	1	1	**2**
SAN MATEO	30	4	26	1	31	34	39	**165**
SOUTH SAN FRANCISCO	0	0	0	0	0	0	0	**0**
WOODSIDE	0	0	0	0	0	0	0	**0**
UNINCORPORATED	1	1	4	0	1	3	7	**17**
Total	**50**	**7**	**53**	**4**	**44**	**71**	**70**	**299**

EARTHQUAKE

Exposure and Economic Impact

Butano Fault Scenario

Jurisdiction	Estimated Population (1)	% of Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	"% of Total Value Damaged
Atherton	7,031	100%	2,504	$2,851,840,817	100%	9.16	0	0	$116,523,799	$42,847,583	$159,371,382	5.6%
Belmont	26,813	100%	7,335	$6,073,411,270	100%	4.50	0	0	$111,454,108	$45,999,607	$157,453,715	2.6%
Brisbane	4,633	100%	1,816	$3,727,060,662	100%	0.37	0	0	$13,294,422	$7,848,126	$21,142,548	0.6%
Burlingame	30,118	100%	7,601	$11,121,820,561	100%	16.96	0	0	$261,069,033	$125,611,379	$386,680,412	3.5%
Colma	1,729	100%	445	$1,269,795,262	100%	0.27	0	0	$11,161,580	$6,552,218	$17,713,799	1.4%
Daly City	109,142	100%	21,942	$12,987,124,886	100%	2.26	0	0	$63,625,053	$29,928,121	$93,553,173	0.7%
East Palo Alto	30,794	100%	4,590	$3,491,181,391	100%	8.33	0	0	$212,761,218	$83,861,946	$296,623,164	8.5%
Foster City	33,033	100%	7,904	$8,139,909,551	100%	7.90	0	0	$379,155,775	$143,418,253	$522,574,027	6.4%
Half Moon Bay	12,431	100%	4,158	$3,540,059,183	100%	5.34	0	0	$144,739,778	$63,527,757	$208,267,535	5.9%
Hillsborough	11,418	100%	3,926	$3,326,778,876	100%	0.35	0	0	$8,649,794	$4,203,198	$12,852,992	0.4%
Menlo Park	35,254	100%	9,073	$12,491,405,466	100%	26.71	10	4	$481,001,292	$233,313,137	$714,314,429	5.7%
Millbrae	22,832	100%	6,013	$4,518,625,975	100%	2.31	0	0	$28,195,124	$12,604,289	$40,799,412	0.9%
Pacifica	38,331	100%	11,998	$5,726,928,117	100%	0.42	0	0	$23,525,968	$10,175,900	$33,701,867	0.6%
Portola Valley	4,607	100%	1,578	$1,561,897,019	100%	8.28	0	0	$71,163,593	$28,319,349	$99,482,941	6.4%
Redwood City	86,754	100%	19,257	$21,797,918,834	100%	53.40	1	1	$920,278,179	$410,505,497	$1,330,783,677	6.1%
San Bruno	45,454	100%	11,696	$7,904,426,518	100%	3.69	0	0	$30,181,716	$15,907,010	$46,088,725	0.6%
San Carlos	30,145	100%	9,888	$10,559,383,070	100%	33.45	0	0	$342,183,374	$171,598,751	$513,782,124	4.9%
San Mateo	103,087	100%	23,685	$23,908,243,752	100%	29.18	3	2	$571,658,402	$235,796,877	$807,455,280	3.4%
South San Francisco	67,879	100%	16,695	$25,673,267,870	100%	8.17	0	0	$192,552,416	$115,268,747	$307,821,163	1.2%
Woodside	5,676	100%	2,022	$1,694,299,578	100%	3.19	0	0	$48,205,584	$20,627,512	$68,833,096	4.1%
Unincorporated	66,083	100%	19,926	$19,545,239,679	100%	62.20	1	0	$646,473,606	$327,826,776	$974,300,383	5.0%
Total	**773,244**	**100%**	**194,052**	**$191,910,618,338**	**100%**	**286.47**	**15**	**6**	**$4,677,853,811**	**$2,135,742,033**	**6,813,595,844**	**3.6%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 4.2 SP03.

Monte Vista Fault Scenario

Jurisdiction	Estimated Population (1)	% of Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	"% of Total Value Damaged
Atherton	7,031	100%	2,504	$2,851,840,817	100%	95.31	0	0	$361,685,142	$127,106,931	$488,792,073	17.1%
Belmont	26,813	100%	7,335	$6,073,411,270	100%	73.34	27	14	$549,536,421	$211,807,994	$761,344,414	12.5%
Brisbane	4,633	100%	1,816	$3,727,060,662	100%	2.56	0	0	$88,154,036	$47,987,136	$136,141,172	3.7%
Burlingame	30,118	100%	7,601	$11,121,820,561	100%	139.66	15	6	$874,242,523	$346,672,120	$1,220,914,643	11.0%
Colma	1,729	100%	445	$1,269,795,262	100%	1.78	0	0	$23,723,996	$13,383,773	$37,107,769	2.9%
Daly City	109,142	100%	21,942	$12,987,124,886	100%	10.64	1	0	$225,307,941	$93,519,797	$318,827,738	2.5%
East Palo Alto	30,794	100%	4,590	$3,491,181,391	100%	72.38	2	2	$382,869,479	$146,425,789	$529,295,268	15.2%
Foster City	33,033	100%	7,904	$8,139,909,551	100%	47.15	4	2	$781,630,870	$299,427,478	$1,081,058,348	13.3%
Half Moon Bay	12,431	100%	4,158	$3,540,059,183	100%	31.77	1	1	$284,531,524	$120,807,483	$405,339,007	11.5%
Hillsborough	11,418	100%	3,926	$3,326,778,876	100%	4.95	0	0	$156,573,310	$53,695,124	$210,268,435	6.3%
Menlo Park	35,254	100%	9,073	$12,491,405,466	100%	235.74	127	48	$1,271,691,769	$553,594,086	$1,825,285,855	14.6%
Millbrae	22,832	100%	6,013	$4,518,625,975	100%	19.05	1	0	$176,424,609	$65,062,674	$241,487,284	5.3%
Pacifica	38,331	100%	11,998	$5,726,928,117	100%	2.88	0	0	$163,641,299	$60,848,049	$224,489,348	3.9%
Portola Valley	4,607	100%	1,578	$1,561,897,019	100%	39.92	5	2	$168,309,313	$62,787,830	$231,097,143	14.8%
Redwood City	86,754	100%	19,257	$21,797,918,834	100%	427.11	62	47	$2,426,532,750	$1,007,336,373	$3,433,869,123	15.8%
San Bruno	45,454	100%	11,696	$7,904,426,518	100%	25.58	0	0	$150,985,016	$60,740,859	$211,725,875	2.7%
San Carlos	30,145	100%	9,888	$10,559,383,070	100%	286.41	7	3	$1,313,566,297	$606,512,294	$1,920,078,591	18.2%
San Mateo	103,087	100%	23,685	$23,908,243,752	100%	326.36	246	116	$2,064,901,494	$790,491,887	$2,855,393,381	11.9%
South San Francisco	67,879	100%	16,695	$25,673,267,870	100%	58.57	0	0	$869,781,103	$469,166,929	$1,338,948,033	5.2%
Woodside	5,676	100%	2,022	$1,694,299,578	100%	38.20	1	0	$178,144,320	$68,155,118	$246,299,437	14.5%
Unincorporated	66,083	100%	19,926	$19,545,239,679	100%	295.89	14	8	$1,835,238,609	$861,727,202	$2,696,965,811	13.8%
Total	**773,244**	**100%**	**194,052**	**$191,910,618,338**	**100%**	**2,235.26**	**513**	**249**	**$14,347,471,821**	**$6,067,256,924**	**20,414,728,745**	**10.6%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 4.2 SP03.

San Andreas Fault Scenario

Jurisdiction	Estimated Population (1)	% of Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	"% of Total Value Damaged
Atherton	7,031	100%	2,504	$2,851,840,817	100%	87.56	0	0	$316,016,449	$107,274,711	$423,291,161	14.8%
Belmont	26,813	100%	7,335	$6,073,411,270	100%	90.02	49	25	$594,385,310	$228,272,093	$822,657,402	13.5%
Brisbane	4,633	100%	1,816	$3,727,060,662	100%	36.01	4	2	$308,851,303	$144,287,631	$453,138,933	12.2%
Burlingame	30,118	100%	7,601	$11,121,820,561	100%	444.26	103	44	$1,907,142,642	$807,451,969	$2,714,594,610	24.4%
Colma	1,729	100%	445	$1,269,795,262	100%	48.57	0	0	$140,990,874	$67,958,759	$208,949,632	16.5%
Daly City	109,142	100%	21,942	$12,987,124,886	100%	298.35	550	250	$1,624,798,637	$609,364,564	$2,234,163,201	17.2%
East Palo Alto	30,794	100%	4,590	$3,491,181,391	100%	58.31	1	1	$353,058,018	$134,061,013	$487,119,031	14.0%
Foster City	33,033	100%	7,904	$8,139,909,551	100%	54.67	5	2	$808,093,215	$309,241,763	$1,117,334,978	13.7%
Half Moon Bay	12,431	100%	4,158	$3,540,059,183	100%	29.93	1	0	$285,198,411	$123,427,918	$408,626,329	11.5%
Hillsborough	11,418	100%	3,926	$3,326,778,876	100%	20.05	1	0	$291,431,364	$102,032,072	$393,463,436	11.8%
Menlo Park	35,254	100%	9,073	$12,491,405,466	100%	197.18	104	39	$1,126,667,332	$497,988,741	$1,624,656,073	13.0%
Millbrae	22,832	100%	6,013	$4,518,625,975	100%	129.27	94	52	$584,646,422	$215,295,940	$799,942,362	17.7%
Pacifica	38,331	100%	11,998	$5,726,928,117	100%	77.60	17	9	$688,290,547	$252,155,649	$940,446,196	16.4%
Portola Valley	4,607	100%	1,578	$1,561,897,019	100%	37.60	2	1	$152,479,596	$57,359,765	$209,839,361	13.4%
Redwood City	86,754	100%	19,257	$21,797,918,834	100%	396.71	52	40	$2,346,077,361	$971,331,825	$3,317,409,187	15.2%
San Bruno	45,454	100%	11,696	$7,904,426,518	100%	261.37	47	25	$1,046,097,305	$411,201,761	$1,457,299,066	18.4%
San Carlos	30,145	100%	9,888	$10,559,383,070	100%	300.27	7	3	$1,349,080,179	$628,599,330	$1,977,679,509	18.7%
San Mateo	103,087	100%	23,685	$23,908,243,752	100%	580.43	850	416	$2,734,704,175	$1,041,350,933	$3,776,055,108	15.8%
South San Francisco	67,879	100%	16,695	$25,673,267,870	100%	594.30	74	47	$3,058,190,246	$1,435,580,962	$4,493,771,208	17.5%
Woodside	5,676	100%	2,022	$1,694,299,578	100%	34.62	0	0	$165,463,613	$63,811,346	$229,274,959	13.5%
Unincorporated	66,083	100%	19,926	$19,545,239,679	100%	359.63	14	9	$2,245,070,759	$965,452,413	$3,210,523,172	16.4%
Total	**773,244**	**100%**	**194,052**	**$191,910,618,338**	**100%**	**4,136.71**	**1,977**	**967**	**$22,126,733,755**	**$9,173,501,156**	**31,300,234,912**	**16.3%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 4.2 SP03.

San Gregorio Fault Scenario

Jurisdiction	Estimated Population (1)	% of Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	"% of Total Value Damaged
Atherton	7,031	100%	2,504	$2,851,840,817	100%	11.35	0	0	$136,424,716	$49,312,482	$185,737,198	6.5%
Belmont	26,813	100%	7,335	$6,073,411,270	100%	15.63	1	0	$289,538,315	$114,138,984	$403,677,299	6.6%
Brisbane	4,633	100%	1,816	$3,727,060,662	100%	12.52	0	0	$202,086,793	$102,402,160	$304,488,952	8.2%
Burlingame	30,118	100%	7,601	$11,121,820,561	100%	132.48	9	4	$859,919,170	$346,553,457	$1,206,472,626	10.8%
Colma	1,729	100%	445	$1,269,795,262	100%	15.14	0	0	$84,018,887	$44,190,889	$128,209,776	10.1%
Daly City	109,142	100%	21,942	$12,987,124,886	100%	132.08	124	54	$1,001,746,827	$378,466,774	$1,380,213,601	10.6%
East Palo Alto	30,794	100%	4,590	$3,491,181,391	100%	8.43	0	0	$244,218,232	$97,910,617	$342,128,849	9.8%
Foster City	33,033	100%	7,904	$8,139,909,551	100%	17.15	1	0	$652,791,075	$245,424,971	$898,216,045	11.0%
Half Moon Bay	12,431	100%	4,158	$3,540,059,183	100%	27.33	0	0	$401,033,203	$170,653,796	$571,686,999	16.1%
Hillsborough	11,418	100%	3,926	$3,326,778,876	100%	3.10	0	0	$125,339,461	$42,391,530	$167,730,991	5.0%
Menlo Park	35,254	100%	9,073	$12,491,405,466	100%	27.39	16	6	$524,296,685	$256,020,350	$780,317,034	6.2%
Millbrae	22,832	100%	6,013	$4,518,625,975	100%	35.67	3	2	$265,565,368	$95,366,591	$360,931,959	8.0%
Pacifica	38,331	100%	11,998	$5,726,928,117	100%	55.70	3	2	$578,881,024	$209,904,298	$788,785,322	13.8%
Portola Valley	4,607	100%	1,578	$1,561,897,019	100%	4.13	0	0	$51,621,762	$20,599,308	$72,221,070	4.6%
Redwood City	86,754	100%	19,257	$21,797,918,834	100%	83.38	4	3	$1,328,598,914	$571,865,755	$1,900,464,669	8.7%
San Bruno	45,454	100%	11,696	$7,904,426,518	100%	82.63	2	1	$446,662,301	$168,018,583	$614,680,884	7.8%
San Carlos	30,145	100%	9,888	$10,559,383,070	100%	68.79	0	0	$626,212,064	$291,478,701	$917,690,765	8.7%
San Mateo	103,087	100%	23,685	$23,908,243,752	100%	130.85	94	44	$1,460,616,399	$573,629,248	$2,034,245,647	8.5%
South San Francisco	67,879	100%	16,695	$25,673,267,870	100%	197.03	4	3	$1,601,825,853	$771,058,223	$2,372,884,076	9.2%
Woodside	5,676	100%	2,022	$1,694,299,578	100%	4.81	0	0	$57,244,951	$23,719,031	$80,963,981	4.8%
Unincorporated	66,083	100%	19,926	$19,545,239,679	100%	132.64	2	1	$1,337,457,858	$619,862,693	$1,957,320,551	10.0%
Total	**773,244**	**100%**	**194,052**	**$191,910,618,338**	**100%**	**1,198.24**	**264**	**121**	**$12,276,099,854**	**$5,192,968,440**	**17,469,068,294**	**9.1%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 4.2 SP03.

100-Year Probabilistic Fault Scenario

Jurisdiction	Estimated Population (1)	% of Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	"% of Total Value Damaged
Atherton	7,031	100%	2,504	$2,851,840,817	100%	26.44	2	1	$199,537,776	$73,754,946	$273,292,722	9.6%
Belmont	26,813	100%	7,335	$6,073,411,270	100%	25.52	25	12	$285,119,911	$116,900,770	$402,020,680	6.6%
Brisbane	4,633	100%	1,816	$3,727,060,662	100%	21.21	3	2	$204,882,094	$104,607,233	$309,489,327	8.3%
Burlingame	30,118	100%	7,601	$11,121,820,561	100%	79.39	34	15	$636,335,393	$288,524,951	$924,860,344	8.3%
Colma	1,729	100%	445	$1,269,795,262	100%	7.77	1	0	$35,758,735	$20,470,629	$56,229,364	4.4%
Daly City	109,142	100%	21,942	$12,987,124,886	100%	48.72	48	31	$436,413,522	$180,070,718	$616,484,240	4.7%
East Palo Alto	30,794	100%	4,590	$3,491,181,391	100%	38.62	20	20	$304,312,806	$122,460,274	$426,773,080	12.2%
Foster City	33,033	100%	7,904	$8,139,909,551	100%	28.19	34	16	$707,760,265	$282,779,941	$990,540,206	12.2%
Half Moon Bay	12,431	100%	4,158	$3,540,059,183	100%	6.56	2	1	$147,453,222	$67,667,303	$215,120,525	6.1%
Hillsborough	11,418	100%	3,926	$3,326,778,876	100%	6.07	2	1	$100,894,505	$34,353,654	$135,248,159	4.1%
Menlo Park	35,254	100%	9,073	$12,491,405,466	100%	98.86	72	37	$796,887,499	$397,325,467	$1,194,212,966	9.6%
Millbrae	22,832	100%	6,013	$4,518,625,975	100%	19.70	14	8	$142,366,522	$56,290,425	$198,656,947	4.4%
Pacifica	38,331	100%	11,998	$5,726,928,117	100%	16.15	16	8	$288,635,453	$108,944,514	$397,579,967	6.9%
Portola Valley	4,607	100%	1,578	$1,561,897,019	100%	6.22	2	1	$53,723,040	$21,765,196	$75,488,236	4.8%
Redwood City	86,754	100%	19,257	$21,797,918,834	100%	144.76	81	56	$1,523,995,308	$688,402,181	$2,212,397,489	10.1%
San Bruno	45,454	100%	11,696	$7,904,426,518	100%	35.66	20	12	$148,853,831	$65,112,159	$213,965,990	2.7%
San Carlos	30,145	100%	9,888	$10,559,383,070	100%	80.04	19	9	$637,464,887	$311,239,385	$948,704,272	9.0%
San Mateo	103,087	100%	23,685	$23,908,243,752	100%	127.96	136	71	$1,371,609,488	$568,803,588	$1,940,413,076	8.1%
South San Francisco	67,879	100%	16,695	$25,673,267,870	100%	148.54	26	18	$1,103,064,651	$616,973,862	$1,720,038,512	6.7%
Woodside	5,676	100%	2,022	$1,694,299,578	100%	6.02	1	1	$49,330,325	$21,514,603	$70,844,929	4.2%
Unincorporated	66,083	100%	19,926	$19,545,239,679	100%	85.97	29	21	$899,025,427	$456,638,387	$1,355,663,814	6.9%
Total	**773,244**	**100%**	**194,052**	**$191,910,618,338**	**100%**	**1,058.37**	**587**	**342**	**$10,073,424,657**	**$4,604,600,185**	**14,678,024,842**	**7.6%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 4.2 SP03.

Social Vulnerability Index

		SOVI Rating - Very High			**SOVI Rating - Relatively High**			**SOVI Rating - Relatively Moderate**			**SOVI Rating - Relatively Low**			**SOVI Rating - Very Low**			
Jurisdiction	**Estimated Exposed Population (1)**	**Population Exposed**	**% of Population Exposed**	**Impact Factor**	**Population Exposed**	**% of Population Exposed**	**Impact Factor**	**Population Exposed**	**% of Population Exposed**	**Impact Factor**	**Population Exposed**	**% of Population Exposed**	**Impact Factor**	**Population Exposed**	**% of Population Exposed**	**Impact Factor**	**Total Impact Factor**
Atherton	5,817	98	1.68%	4	32	0.55%	3	0	0.00%	0	9	0.15%	1	5,679	97.62%	1	9
Belmont	5,206	0	0.00%	0	0	0.00%	0	4,341	83.38%	3	751	14.43%	1	114	2.19%	0	4
Brisbane	58	0	0.00%	0	58	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Burlingame	9,087	0	0.00%	0	0	0.00%	0	4,108	45.21%	3	4,417	48.61%	1	561	6.17%	0	4
Colma	165	165	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Daly City	980	727	74.22%	5	235	24.02%	3	17	1.76%	2	0	0.00%	0	0	0.00%	0	10
East Palo Alto	25,667	0	0.00%	0	25,667	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	30,562	0	0.00%	0	0	0.00%	0	17,170	56.18%	3	13,392	43.82%	1	0	0.00%	0	4
Half Moon Bay	6,931	0	0.00%	0	2,655	38.31%	4	3,708	53.51%	3	567	8.18%	1	0	0.00%	0	8
Hillsborough	461	0	0.00%	0	0	0.00%	0	50	10.76%	2	0	0.00%	0	412	89.24%	1	3
Menlo Park	29,705	5,970	20.10%	5	3,459	11.65%	3	4,156	13.99%	2	4,144	13.95%	1	11,975	40.31%	0	11
Millbrae	2,555	1,075	42.06%	5	1,435	56.17%	4	45	1.77%	2	0	0.00%	0	0	0.00%	0	11
Pacifica	12,368	0	0.00%	0	0	0.00%	0	6,276	50.74%	3	6,092	49.26%	1	0	0.00%	0	4
Portola Valley	552	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	552	100.00%	1	1
Redwood City	63,267	7,521	11.89%	4	28,247	44.65%	4	7,468	11.80%	2	10,803	17.07%	1	9,229	14.59%	0	11
San Bruno	1,613	0	0.00%	0	1,332	82.60%	4	281	17.40%	2	0	0.00%	0	0	0.00%	0	6
San Carlos	11,476	0	0.00%	0	0	0.00%	0	4,432	38.61%	3	4,569	39.81%	1	2,476	21.58%	0	4
San Mateo	55,113	4,947	8.98%	4	22,499	40.82%	4	18,670	33.88%	2	8,856	16.07%	1	140	0.25%	0	11
South San Francisco	6,339	4,967	78.36%	5	11	0.17%	3	1,361	21.47%	2	0	0.00%	0	0	0.00%	0	10
Woodside	544	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	544	100.00%	1	1
Unincorporated	23,012	11,604	50.42%	5	1,211	5.26%	3	1,917	8.33%	2	5,663	24.61%	1	2,618	11.38%	0	11
Total	**291,478**	**37,073**	**12.72%**	**4**	**86,842**	**29.79%**	**4**	**74,000**	**25.39%**	**2**	**59,263**	**20.33%**	**1**	**34,301**	**11.77%**	**0**	**11**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking

Butano Fault Scenario

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.59%	Medium	2	2	**34**	**High**
Belmont	Medium	2	100.00%	High	3	9	100.00%	High	3	6	2.59%	Low	1	1	**32**	**Medium**
Brisbane	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.57%	Low	1	1	**32**	**Medium**
Burlingame	Medium	2	100.00%	High	3	9	100.00%	High	3	6	3.48%	Low	1	1	**32**	**Medium**
Colma	Medium	2	100.00%	High	3	9	100.00%	High	3	6	1.40%	Low	1	1	**32**	**Medium**
Daly City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.72%	Low	1	1	**32**	**Medium**
East Palo Alto	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.50%	Medium	2	2	**34**	**High**
Foster City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.42%	Medium	2	2	**34**	**High**
Half Moon Bay	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.88%	Medium	2	2	**34**	**High**
Hillsborough	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.39%	Low	1	1	**32**	**Medium**
Menlo Park	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.72%	Medium	2	2	**34**	**High**
Millbrae	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.90%	Low	1	1	**32**	**Medium**
Pacifica	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.59%	Low	1	1	**32**	**Medium**
Portola Valley	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.37%	Medium	2	2	**34**	**High**
Redwood City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.11%	Medium	2	2	**34**	**High**
San Bruno	Medium	2	100.00%	High	3	9	100.00%	High	3	6	0.58%	Low	1	1	**32**	**Medium**
San Carlos	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.87%	Low	1	1	**32**	**Medium**
San Mateo	Medium	2	100.00%	High	3	9	100.00%	High	3	6	3.38%	Low	1	1	**32**	**Medium**
South San Francisco	Medium	2	100.00%	High	3	9	100.00%	High	3	6	1.20%	Low	1	1	**32**	**Medium**
Woodside	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.06%	Low	1	1	**32**	**Medium**
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.98%	Low	1	1	**32**	**Medium**
Total	**Medium**	**2**	**100.00%**	**High**	**3**	**9**	**100.00%**	**High**	**3**	**6**	**3.55%**	**Low**	**1**	**1**	**32**	**Medium**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			9	27	100.00%	High	3	6	5.59%	Medium	2	2	**70**	**High**
Belmont	Medium	2			4	12	100.00%	High	3	6	2.59%	Low	1	1	**38**	**High**
Brisbane	Medium	2			4	12	100.00%	High	3	6	0.57%	Low	1	1	**38**	**High**
Burlingame	Medium	2			4	12	100.00%	High	3	6	3.48%	Low	1	1	**38**	**High**
Colma	Medium	2			5	15	100.00%	High	3	6	1.40%	Low	1	1	**44**	**High**
Daly City	Medium	2			10	30	100.00%	High	3	6	0.72%	Low	1	1	**74**	**High**
East Palo Alto	Medium	2			4	12	100.00%	High	3	6	8.50%	Medium	2	2	**40**	**High**
Foster City	Medium	2			4	12	100.00%	High	3	6	6.42%	Medium	2	2	**40**	**High**
Half Moon Bay	Medium	2			8	24	100.00%	High	3	6	5.88%	Medium	2	2	**64**	**High**
Hillsborough	Medium	2			3	9	100.00%	High	3	6	0.39%	Low	1	1	**32**	**Medium**
Menlo Park	Medium	2			11	33	100.00%	High	3	6	5.72%	Medium	2	2	**82**	**High**
Millbrae	Medium	2			11	33	100.00%	High	3	6	0.90%	Low	1	1	**80**	**High**
Pacifica	Medium	2			4	12	100.00%	High	3	6	0.59%	Low	1	1	**38**	**High**
Portola Valley	Medium	2			1	3	100.00%	High	3	6	6.37%	Medium	2	2	**22**	**Medium**
Redwood City	Medium	2			11	33	100.00%	High	3	6	6.11%	Medium	2	2	**82**	**High**
San Bruno	Medium	2			6	18	100.00%	High	3	6	0.58%	Low	1	1	**50**	**High**
San Carlos	Medium	2			4	12	100.00%	High	3	6	4.87%	Low	1	1	**38**	**High**
San Mateo	Medium	2			11	33	100.00%	High	3	6	3.38%	Low	1	1	**80**	**High**
South San Francisco	Medium	2			10	30	100.00%	High	3	6	1.20%	Low	1	1	**74**	**High**
Woodside	Medium	2			1	3	100.00%	High	3	6	4.06%	Low	1	1	**20**	**Medium**
Unincorporated	Medium	2			11	33	100.00%	High	3	6	4.98%	Low	1	1	**80**	**High**
Total	**Medium**	**2**			**11**	**33**	**100.00%**	**High**	**3**	**6**	**3.55%**	**Low**	**1**	**1**	**80**	**High**

Monte Vista Fault Scenario

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	100.00%	High	3	9	100.00%	High	3	6	17.14%	High	3	3	**36**	**High**
Belmont	Medium	2	100.00%	High	3	9	100.00%	High	3	6	12.54%	High	3	3	**36**	**High**
Brisbane	Medium	2	100.00%	High	3	9	100.00%	High	3	6	3.65%	Low	1	1	**32**	**Medium**
Burlingame	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.98%	High	3	3	**36**	**High**
Colma	Medium	2	100.00%	High	3	9	100.00%	High	3	6	2.92%	Low	1	1	**32**	**Medium**
Daly City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	2.45%	Low	1	1	**32**	**Medium**
East Palo Alto	Medium	2	100.00%	High	3	9	100.00%	High	3	6	15.16%	High	3	3	**36**	**High**
Foster City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.28%	High	3	3	**36**	**High**
Half Moon Bay	Medium	2	100.00%	High	3	9	100.00%	High	3	6	11.45%	High	3	3	**36**	**High**
Hillsborough	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.32%	Medium	2	2	**34**	**High**
Menlo Park	Medium	2	100.00%	High	3	9	100.00%	High	3	6	14.61%	High	3	3	**36**	**High**
Millbrae	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.34%	Medium	2	2	**34**	**High**
Pacifica	Medium	2	100.00%	High	3	9	100.00%	High	3	6	3.92%	Low	1	1	**32**	**Medium**
Portola Valley	Medium	2	100.00%	High	3	9	100.00%	High	3	6	14.80%	High	3	3	**36**	**High**
Redwood City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	15.75%	High	3	3	**36**	**High**
San Bruno	Medium	2	100.00%	High	3	9	100.00%	High	3	6	2.68%	Low	1	1	**32**	**Medium**
San Carlos	Medium	2	100.00%	High	3	9	100.00%	High	3	6	18.18%	High	3	3	**36**	**High**
San Mateo	Medium	2	100.00%	High	3	9	100.00%	High	3	6	11.94%	High	3	3	**36**	**High**
South San Francisco	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.22%	Medium	2	2	**34**	**High**
Woodside	Medium	2	100.00%	High	3	9	100.00%	High	3	6	14.54%	High	3	3	**36**	**High**
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.80%	High	3	3	**36**	**High**
Total	**Medium**	**2**	**100.00%**	**High**	**3**	**9**	**100.00%**	**High**	**3**	**6**	**10.64%**	**High**	**3**	**3**	**36**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			9	27	100.00%	High	3	6	17.14%	High	3	3	**72**	**High**
Belmont	Medium	2			4	12	100.00%	High	3	6	12.54%	High	3	3	**42**	**High**
Brisbane	Medium	2			4	12	100.00%	High	3	6	3.65%	Low	1	1	**38**	**High**
Burlingame	Medium	2			4	12	100.00%	High	3	6	10.98%	High	3	3	**42**	**High**
Colma	Medium	2			5	15	100.00%	High	3	6	2.92%	Low	1	1	**44**	**High**
Daly City	Medium	2			10	30	100.00%	High	3	6	2.45%	Low	1	1	**74**	**High**
East Palo Alto	Medium	2			4	12	100.00%	High	3	6	15.16%	High	3	3	**42**	**High**
Foster City	Medium	2			4	12	100.00%	High	3	6	13.28%	High	3	3	**42**	**High**
Half Moon Bay	Medium	2			8	24	100.00%	High	3	6	11.45%	High	3	3	**66**	**High**
Hillsborough	Medium	2			3	9	100.00%	High	3	6	6.32%	Medium	2	2	**34**	**High**
Menlo Park	Medium	2			11	33	100.00%	High	3	6	14.61%	High	3	3	**84**	**High**
Millbrae	Medium	2			11	33	100.00%	High	3	6	5.34%	Medium	2	2	**82**	**High**
Pacifica	Medium	2			4	12	100.00%	High	3	6	3.92%	Low	1	1	**38**	**High**
Portola Valley	Medium	2			1	3	100.00%	High	3	6	14.80%	High	3	3	**24**	**Medium**
Redwood City	Medium	2			11	33	100.00%	High	3	6	15.75%	High	3	3	**84**	**High**
San Bruno	Medium	2			6	18	100.00%	High	3	6	2.68%	Low	1	1	**50**	**High**
San Carlos	Medium	2			4	12	100.00%	High	3	6	18.18%	High	3	3	**42**	**High**
San Mateo	Medium	2			11	33	100.00%	High	3	6	11.94%	High	3	3	**84**	**High**
South San Francisco	Medium	2			10	30	100.00%	High	3	6	5.22%	Medium	2	2	**76**	**High**
Woodside	Medium	2			1	3	100.00%	High	3	6	14.54%	High	3	3	**24**	**Medium**
Unincorporated	Medium	2			11	33	100.00%	High	3	6	13.80%	High	3	3	**84**	**High**
Total	**Medium**	**2**			**11**	**33**	**100.00%**	**High**	**3**	**6**	**10.64%**	**High**	**3**	**3**	**84**	**High**

San Andreas Fault Scenario

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	100.00%	High	3	9	100.00%	High	3	6	14.84%	High	3	3	**36**	**High**
Belmont	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.55%	High	3	3	**36**	**High**
Brisbane	Medium	2	100.00%	High	3	9	100.00%	High	3	6	12.16%	High	3	3	**36**	**High**
Burlingame	Medium	2	100.00%	High	3	9	100.00%	High	3	6	24.41%	High	3	3	**36**	**High**
Colma	Medium	2	100.00%	High	3	9	100.00%	High	3	6	16.46%	High	3	3	**36**	**High**
Daly City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	17.20%	High	3	3	**36**	**High**
East Palo Alto	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.95%	High	3	3	**36**	**High**
Foster City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.73%	High	3	3	**36**	**High**
Half Moon Bay	Medium	2	100.00%	High	3	9	100.00%	High	3	6	11.54%	High	3	3	**36**	**High**
Hillsborough	Medium	2	100.00%	High	3	9	100.00%	High	3	6	11.83%	High	3	3	**36**	**High**
Menlo Park	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.01%	High	3	3	**36**	**High**
Millbrae	Medium	2	100.00%	High	3	9	100.00%	High	3	6	17.70%	High	3	3	**36**	**High**
Pacifica	Medium	2	100.00%	High	3	9	100.00%	High	3	6	16.42%	High	3	3	**36**	**High**
Portola Valley	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.43%	High	3	3	**36**	**High**
Redwood City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	15.22%	High	3	3	**36**	**High**
San Bruno	Medium	2	100.00%	High	3	9	100.00%	High	3	6	18.44%	High	3	3	**36**	**High**
San Carlos	Medium	2	100.00%	High	3	9	100.00%	High	3	6	18.73%	High	3	3	**36**	**High**
San Mateo	Medium	2	100.00%	High	3	9	100.00%	High	3	6	15.79%	High	3	3	**36**	**High**
South San Francisco	Medium	2	100.00%	High	3	9	100.00%	High	3	6	17.50%	High	3	3	**36**	**High**
Woodside	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.53%	High	3	3	**36**	**High**
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6	16.43%	High	3	3	**36**	**High**
Total	**Medium**	**2**	**100.00%**	**High**	**3**	**9**	**100.00%**	**High**	**3**	**6**	**16.31%**	**High**	**3**	**3**	**36**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			9	27	100.00%	High	3	6	14.84%	High	3	3	**72**	**High**
Belmont	Medium	2			4	12	100.00%	High	3	6	13.55%	High	3	3	**42**	**High**
Brisbane	Medium	2			4	12	100.00%	High	3	6	12.16%	High	3	3	**42**	**High**
Burlingame	Medium	2			4	12	100.00%	High	3	6	24.41%	High	3	3	**42**	**High**
Colma	Medium	2			5	15	100.00%	High	3	6	16.46%	High	3	3	**48**	**High**
Daly City	Medium	2			10	30	100.00%	High	3	6	17.20%	High	3	3	**78**	**High**
East Palo Alto	Medium	2			4	12	100.00%	High	3	6	13.95%	High	3	3	**42**	**High**
Foster City	Medium	2			4	12	100.00%	High	3	6	13.73%	High	3	3	**42**	**High**
Half Moon Bay	Medium	2			8	24	100.00%	High	3	6	11.54%	High	3	3	**66**	**High**
Hillsborough	Medium	2			3	9	100.00%	High	3	6	11.83%	High	3	3	**36**	**High**
Menlo Park	Medium	2			11	33	100.00%	High	3	6	13.01%	High	3	3	**84**	**High**
Millbrae	Medium	2			11	33	100.00%	High	3	6	17.70%	High	3	3	**84**	**High**
Pacifica	Medium	2			4	12	100.00%	High	3	6	16.42%	High	3	3	**42**	**High**
Portola Valley	Medium	2			1	3	100.00%	High	3	6	13.43%	High	3	3	**24**	**Medium**
Redwood City	Medium	2			11	33	100.00%	High	3	6	15.22%	High	3	3	**84**	**High**
San Bruno	Medium	2			6	18	100.00%	High	3	6	18.44%	High	3	3	**54**	**High**
San Carlos	Medium	2			4	12	100.00%	High	3	6	18.73%	High	3	3	**42**	**High**
San Mateo	Medium	2			11	33	100.00%	High	3	6	15.79%	High	3	3	**84**	**High**
South San Francisco	Medium	2			10	30	100.00%	High	3	6	17.50%	High	3	3	**78**	**High**
Woodside	Medium	2			1	3	100.00%	High	3	6	13.53%	High	3	3	**24**	**Medium**
Unincorporated	Medium	2			11	33	100.00%	High	3	6	16.43%	High	3	3	**84**	**High**
Total	**Medium**	**2**			**11**	**33**	**100.00%**	**High**	**3**	**6**	**16.31%**	**High**	**3**	**3**	**84**	**High**

San Gregorio Fault Scenario

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.51%	Medium	2	2	34	High
Belmont	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.65%	Medium	2	2	34	High
Brisbane	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.17%	Medium	2	2	34	High
Burlingame	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.85%	High	3	3	36	High
Colma	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.10%	High	3	3	36	High
Daly City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.63%	High	3	3	36	High
East Palo Alto	Medium	2	100.00%	High	3	9	100.00%	High	3	6	9.80%	Medium	2	2	34	High
Foster City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	11.03%	High	3	3	36	High
Half Moon Bay	Medium	2	100.00%	High	3	9	100.00%	High	3	6	16.15%	High	3	3	36	High
Hillsborough	Medium	2	100.00%	High	3	9	100.00%	High	3	6	5.04%	Medium	2	2	34	High
Menlo Park	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.25%	Medium	2	2	34	High
Millbrae	Medium	2	100.00%	High	3	9	100.00%	High	3	6	7.99%	Medium	2	2	34	High
Pacifica	Medium	2	100.00%	High	3	9	100.00%	High	3	6	13.77%	High	3	3	36	High
Portola Valley	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.62%	Low	1	1	32	Medium
Redwood City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.72%	Medium	2	2	34	High
San Bruno	Medium	2	100.00%	High	3	9	100.00%	High	3	6	7.78%	Medium	2	2	34	High
San Carlos	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.69%	Medium	2	2	34	High
San Mateo	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.51%	Medium	2	2	34	High
South San Francisco	Medium	2	100.00%	High	3	9	100.00%	High	3	6	9.24%	Medium	2	2	34	High
Woodside	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.78%	Low	1	1	32	Medium
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.01%	High	3	3	36	High
Total	**Medium**	**2**	**100.00%**	**High**	**3**	**9**	**100.00%**	**High**	**3**	**6**	**9.10%**	**Medium**	**2**	**2**	**34**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			9	27	100.00%	High	3	6	6.51%	Medium	2	2	70	High
Belmont	Medium	2			4	12	100.00%	High	3	6	6.65%	Medium	2	2	40	High
Brisbane	Medium	2			4	12	100.00%	High	3	6	8.17%	Medium	2	2	40	High
Burlingame	Medium	2			4	12	100.00%	High	3	6	10.85%	High	3	3	42	High
Colma	Medium	2			5	15	100.00%	High	3	6	10.10%	High	3	3	48	High
Daly City	Medium	2			10	30	100.00%	High	3	6	10.63%	High	3	3	78	High
East Palo Alto	Medium	2			4	12	100.00%	High	3	6	9.80%	Medium	2	2	40	High
Foster City	Medium	2			4	12	100.00%	High	3	6	11.03%	High	3	3	42	High
Half Moon Bay	Medium	2			8	24	100.00%	High	3	6	16.15%	High	3	3	66	High
Hillsborough	Medium	2			3	9	100.00%	High	3	6	5.04%	Medium	2	2	34	High
Menlo Park	Medium	2			11	33	100.00%	High	3	6	6.25%	Medium	2	2	82	High
Millbrae	Medium	2			11	33	100.00%	High	3	6	7.99%	Medium	2	2	82	High
Pacifica	Medium	2			4	12	100.00%	High	3	6	13.77%	High	3	3	42	High
Portola Valley	Medium	2			1	3	100.00%	High	3	6	4.62%	Low	1	1	20	Medium
Redwood City	Medium	2			11	33	100.00%	High	3	6	8.72%	Medium	2	2	82	High
San Bruno	Medium	2			6	18	100.00%	High	3	6	7.78%	Medium	2	2	52	High
San Carlos	Medium	2			4	12	100.00%	High	3	6	8.69%	Medium	2	2	40	High
San Mateo	Medium	2			11	33	100.00%	High	3	6	8.51%	Medium	2	2	82	High
South San Francisco	Medium	2			10	30	100.00%	High	3	6	9.24%	Medium	2	2	76	High
Woodside	Medium	2			1	3	100.00%	High	3	6	4.78%	Low	1	1	20	Medium
Unincorporated	Medium	2			11	33	100.00%	High	3	6	10.01%	High	3	3	84	High
Total	**Medium**	**2**			**11**	**33**	**100.00%**	**High**	**3**	**6**	**9.10%**	**Medium**	**2**	**2**	**82**	**High**

100-Year Probabilistic Fault Scenario

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	100.00%	High	3	9	100.00%	High	3	6	9.58%	Medium	2	2	34	High
Belmont	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.62%	Medium	2	2	34	High
Brisbane	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.30%	Medium	2	2	34	High
Burlingame	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.32%	Medium	2	2	34	High
Colma	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.43%	Low	1	1	32	Medium
Daly City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.75%	Low	1	1	32	Medium
East Palo Alto	Medium	2	100.00%	High	3	9	100.00%	High	3	6	12.22%	High	3	3	36	High
Foster City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	12.17%	High	3	3	36	High
Half Moon Bay	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.08%	Medium	2	2	34	High
Hillsborough	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.07%	Low	1	1	32	Medium
Menlo Park	Medium	2	100.00%	High	3	9	100.00%	High	3	6	9.56%	Medium	2	2	34	High
Millbrae	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.40%	Low	1	1	32	Medium
Pacifica	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.94%	Medium	2	2	34	High
Portola Valley	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.83%	Low	1	1	32	Medium
Redwood City	Medium	2	100.00%	High	3	9	100.00%	High	3	6	10.15%	High	3	3	36	High
San Bruno	Medium	2	100.00%	High	3	9	100.00%	High	3	6	2.71%	Low	1	1	32	Medium
San Carlos	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.98%	Medium	2	2	34	High
San Mateo	Medium	2	100.00%	High	3	9	100.00%	High	3	6	8.12%	Medium	2	2	34	High
South San Francisco	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.70%	Medium	2	2	34	High
Woodside	Medium	2	100.00%	High	3	9	100.00%	High	3	6	4.18%	Low	1	1	32	Medium
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6	6.94%	Medium	2	2	34	High
Total	**Medium**	**2**	**100.00%**	**High**	**3**	**9**	**100.00%**	**High**	**3**	**6**	**7.65%**	**Medium**	**2**	**2**	**34**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			9	27	100.00%	High	3	6	9.58%	Medium	2	2	70	High
Belmont	Medium	2			4	12	100.00%	High	3	6	6.62%	Medium	2	2	40	High
Brisbane	Medium	2			4	12	100.00%	High	3	6	8.30%	Medium	2	2	40	High
Burlingame	Medium	2			4	12	100.00%	High	3	6	8.32%	Medium	2	2	40	High
Colma	Medium	2			5	15	100.00%	High	3	6	4.43%	Low	1	1	44	High
Daly City	Medium	2			10	30	100.00%	High	3	6	4.75%	Low	1	1	74	High
East Palo Alto	Medium	2			4	12	100.00%	High	3	6	12.22%	High	3	3	42	High
Foster City	Medium	2			4	12	100.00%	High	3	6	12.17%	High	3	3	42	High
Half Moon Bay	Medium	2			8	24	100.00%	High	3	6	6.08%	Medium	2	2	64	High
Hillsborough	Medium	2			3	9	100.00%	High	3	6	4.07%	Low	1	1	32	Medium
Menlo Park	Medium	2			11	33	100.00%	High	3	6	9.56%	Medium	2	2	82	High
Millbrae	Medium	2			11	33	100.00%	High	3	6	4.40%	Low	1	1	80	High
Pacifica	Medium	2			4	12	100.00%	High	3	6	6.94%	Medium	2	2	40	High
Portola Valley	Medium	2			1	3	100.00%	High	3	6	4.83%	Low	1	1	20	Medium
Redwood City	Medium	2			11	33	100.00%	High	3	6	10.15%	High	3	3	84	High
San Bruno	Medium	2			6	18	100.00%	High	3	6	2.71%	Low	1	1	50	High
San Carlos	Medium	2			4	12	100.00%	High	3	6	8.98%	Medium	2	2	40	High
San Mateo	Medium	2			11	33	100.00%	High	3	6	8.12%	Medium	2	2	82	High
South San Francisco	Medium	2			10	30	100.00%	High	3	6	6.70%	Medium	2	2	76	High
Woodside	Medium	2			1	3	100.00%	High	3	6	4.18%	Low	1	1	20	Medium
Unincorporated	Medium	2			11	33	100.00%	High	3	6	6.94%	Medium	2	2	82	High
Total	**Medium**	**2**			**11**	**33**	**100.00%**	**High**	**3**	**6**	**7.65%**	**Medium**	**2**	**2**	**82**	**High**

NEHRP D & E Soils Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	2	0	2	0	0	14	1	**19**
BELMONT	5	1	10	0	1	9	7	**33**
BRISBANE	3	1	0	4	1	3	2	**14**
BURLINGAME	24	1	15	4	12	8	12	**76**
COLMA	0	0	0	0	0	0	1	**1**
DALY CITY	0	0	0	0	1	2	0	**3**
EAST PALO ALTO	3	1	30	0	3	23	2	**62**
FOSTER CITY	9	0	4	2	4	19	10	**48**
HALF MOON BAY	5	1	12	1	6	20	3	**48**
HILLSBOROUGH	0	0	0	0		1	2	**3**
MENLO PARK	18	8	24	1	13	21	15	**100**
MILLBRAE	5	0	3	0	2	1	3	**14**
PACIFICA	3	1	19	0	4	17	6	**50**
PORTOLA VALLEY	0	0	0	0	0	2	5	**7**
REDWOOD CITY	33	7	96	17	16	68	34	**271**
SAN BRUNO	0	0	1	0	1	2	1	**5**
SAN CARLOS	10	1	13	6	6	18	7	**61**
SAN MATEO	19	4	26	1	34	32	54	**170**
SOUTH SAN FRANCISCO	5	8	18	11	6	11	30	**89**
WOODSIDE	1	0	0	0	0	6	7	**14**
UNINCORPORATED	17	3	25	10	6	37	83	**181**
Total	**162**	**37**	**298**	**57**	**116**	**314**	**285**	**1,269**

FLOOD

Exposure

1 Percent Annual Chance

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Acres of Floodplain	Number of Structures in Inundation Area (2)							
													Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	187	652	2.4%	$186,018,321	$126,508,448	$312,526,768	5.1%	89	172	12	0	0	1	1	1	187
Brisbane	4,633	1,816	1,566	$3,727,060,662	99	0	0.0%	$612,796,968	$618,782,644	$1,231,579,612	33.0%	1,718	0	96	2	0	0	1	0	99
Burlingame	30,118	7,601	6,932	$11,121,820,561	609	1,538	5.1%	$1,548,334,231	$1,498,854,949	$3,047,189,180	27.4%	715	354	206	46	0	0	2	1	609
Colma	1,729	445	321	$1,269,795,262	1	0	0.0%	$1,790,111	$1,790,111	$3,580,221	0.3%	0	0	1	0	0	0	0	0	1
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	45	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	1,839	12,537	40.7%	$599,832,443	$399,287,175	$999,119,618	28.6%	744	1,795	16	8	1	10	0	9	1839
Foster City	33,033	7,904	7,732	$8,139,909,551	9	38	0.1%	$3,001,341	$1,500,670	$4,502,011	0.1%	1,309	9	0	0	0	0	0	0	9
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	12	38	0.3%	$2,383,894	$1,191,947	$3,575,841	0.1%	179	12	0	0	0	0	0	0	12
Hillsborough	11,418	3,926	3,900	$3,326,778,876	18	50	0.4%	$21,354,993	$15,659,006	$37,013,999	1.1%	16	17	0	0	0	0	0	1	18
Menlo Park	35,254	9,073	8,545	$12,491,405,466	1,372	5,058	14.3%	$1,465,677,586	$1,437,207,888	$2,902,885,474	23.2%	5,119	1,226	68	68	2	4	1	3	1372
Millbrae	22,832	6,013	5,796	$4,518,625,975	231	855	3.7%	$231,815,504	$151,642,885	$383,458,389	8.5%	127	217	12	1	0	0	0	1	231
Pacifica	38,331	11,998	11,733	$5,726,928,117	283	898	2.3%	$104,672,141	$73,379,361	$178,051,502	3.1%	295	275	8	0	0	0	0	0	283
Portola Valley	4,607	1,578	1,533	$1,561,897,019	28	84	1.8%	$11,397,387	$5,698,694	$17,096,081	1.1%	81	28	0	0	0	0	0	0	28
Redwood City	86,754	19,257	18,203	$21,797,918,834	1,316	4,661	5.4%	$2,470,649,511	$2,356,995,687	$4,827,645,198	22.1%	9,564	978	258	72	0	1	4	3	1316
San Bruno	45,454	11,696	11,234	$7,904,426,518	359	1,404	3.1%	$91,416,350	$56,406,244	$147,822,594	1.9%	69	347	10	1	0	0	0	1	359
San Carlos	30,145	9,888	9,054	$10,559,383,070	377	543	1.8%	$1,046,518,896	$1,130,928,417	$2,177,447,314	20.6%	246	163	155	56	1	1	0	1	377
San Mateo	103,087	23,685	22,474	$23,908,243,752	1,845	7,931	7.7%	$887,363,079	$619,454,838	$1,506,817,917	6.3%	1,723	1,729	87	19	0	5	1	4	1845
South San Francisco	67,879	16,695	15,441	$25,673,267,870	545	1,521	2.2%	$1,250,779,121	$1,280,292,636	$2,531,071,757	9.9%	1,870	346	157	40	0	0	2	0	545
Woodside	5,676	2,022	1,980	$1,694,299,578	9	20	0.4%	$31,891,742	$29,990,782	$61,882,524	3.7%	103	7	0	0	2	0	0	0	9
Unincorporated	66,083	19,926	18,700	$19,545,239,679	500	1,470	2.2%	$639,814,341	$576,838,843	$1,216,653,184	6.2%	6,017	416	30	1	46	4	2	1	500
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**9,639**	**39,298**	**5.1%**	**$11,207,507,960**	**$10,382,411,224**	**$21,589,919,184**	**11.2%**	**30,028**	**8,091**	**1116**	**314**	**52**	**26**	**14**	**26**	**9639**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

0.2 Percent Annual Chance

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Acres of Floodplain	Number of Structures in Inundation Area (2)							
													Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	482	1,463	5.5%	$601,176,215	$483,976,660	$1,085,152,875	17.9%	263	386	80	12	0	2	1	1	482
Brisbane	4,633	1,816	1,566	$3,727,060,662	101	0	0.0%	$622,438,579	$628,424,255	$1,250,862,833	33.6%	1,816	0	98	2	0	0	1	0	101
Burlingame	30,118	7,601	6,932	$11,121,820,561	5,319	20,394	67.7%	$5,099,443,145	$3,947,757,020	$9,047,200,165	81.3%	2,063	4694	539	52	0	18	6	10	5319
Colma	1,729	445	321	$1,269,795,262	3	0	0.0%	$5,100,726	$6,504,512	$11,605,239	0.9%	2	0	2	1	0	0	0	0	3
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	45	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	2,380	16,176	52.5%	$787,795,223	$559,388,215	$1,347,183,438	38.6%	895	2316	22	19	1	11	1	10	2380
Foster City	33,033	7,904	7,732	$8,139,909,551	9	38	0.1%	$3,001,341	$1,500,670	$4,502,011	0.1%	1,309	9	0	0	0	0	0	0	9
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	12	38	0.3%	$2,383,894	$1,191,947	$3,575,841	0.1%	179	12	0	0	0	0	0	0	12
Hillsborough	11,418	3,926	3,900	$3,326,778,876	20	53	0.5%	$28,418,845	$25,977,873	$54,396,718	1.6%	16	18	0	0	0	0	1	1	20
Menlo Park	35,254	9,073	8,545	$12,491,405,466	2,055	7,666	21.7%	$2,129,018,277	$2,062,626,870	$4,191,645,146	33.6%	5,453	1858	105	75	2	6	3	6	2055
Millbrae	22,832	6,013	5,796	$4,518,625,975	363	1,150	5.0%	$407,471,763	$299,033,379	$706,505,142	15.6%	173	292	67	2	0	0	1	1	363
Pacifica	38,331	11,998	11,733	$5,726,928,117	578	1,833	4.8%	$193,851,682	$142,662,148	$336,513,830	5.9%	398	561	15	0	1	0	0	1	578
Portola Valley	4,607	1,578	1,533	$1,561,897,019	33	99	2.2%	$13,531,148	$6,765,574	$20,296,723	1.3%	89	33	0	0	0	0	0	0	33
Redwood City	86,754	19,257	18,203	$21,797,918,834	4,469	18,692	21.5%	$4,872,454,173	$4,141,189,984	$9,013,644,157	41.4%	10,684	3922	445	78	0	6	9	9	4469
San Bruno	45,454	11,696	11,234	$7,904,426,518	476	1,857	4.1%	$117,142,599	$72,836,221	$189,978,821	2.4%	90	459	14	2	0	0	0	1	476
San Carlos	30,145	9,888	9,054	$10,559,383,070	868	1,305	4.3%	$1,940,403,069	$2,146,986,332	$4,087,389,401	38.7%	500	392	343	127	1	2	0	3	868
San Mateo	103,087	23,685	22,474	$23,908,243,752	2,627	11,004	10.7%	$1,744,729,066	$1,209,421,320	$2,954,150,385	12.4%	1,997	2399	185	25	0	13	1	4	2627
South San Francisco	67,879	16,695	15,441	$25,673,267,870	653	1,552	2.3%	$2,017,260,708	$2,140,952,293	$4,158,213,002	16.2%	2,171	353	241	56	0	0	3	0	653
Woodside	5,676	2,022	1,980	$1,694,299,578	13	23	0.4%	$40,329,172	$37,929,069	$78,258,241	4.6%	129	8	3	0	2	0	0	0	13
Unincorporated	66,083	19,926	18,700	$19,545,239,679	696	1,951	3.0%	$962,591,436	$929,892,879	$1,892,484,315	9.7%	6,229	552	63	27	47	4	2	1	696
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**21,157**	**85,294**	**11.0%**	**$21,588,541,063**	**$18,845,017,220**	**$40,433,558,283**	**21.1%**	**34,501**	**18,264**	**2222**	**478**	**54**	**62**	**29**	**48**	**21157**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Economic Impact

1 Percent Annual Chance

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0	0	$0	$0	$0	0.0%
Belmont	26,813	7,335	7,072	$6,073,411,270	1,112	71	3	126	$5,400,170	$2,585,073	$7,985,243	0.1%
Brisbane	4,633	1,816	1,566	$3,727,060,662	65,421	0	0	76	$110,450,612	$188,894,248	$299,344,860	8.0%
Burlingame	30,118	7,601	6,932	$11,121,820,561	4,783	285	9	423	$77,338,007	$189,453,823	$266,791,830	2.4%
Colma	1,729	445	321	$1,269,795,262	0	0	0	0	$0	$0	$0	0.0%
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0	0	$0	$0	$0	0.0%
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	4,432	7,151	510	1,379	$37,630,037	$29,172,467	$66,802,504	1.9%
Foster City	33,033	7,904	7,732	$8,139,909,551	0	2	0	0	$0	$0	$0	0.0%
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	0	2	0	0	$0	$0	$0	0.0%
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	3	0	0	$0	$0	$0	0.0%
Menlo Park	35,254	9,073	8,545	$12,491,405,466	4,331	2,300	147	947	$43,507,539	$56,205,504	$99,713,042	0.8%
Millbrae	22,832	6,013	5,796	$4,518,625,975	1,202	142	5	157	$5,556,721	$7,611,058	$13,167,779	0.3%
Pacifica	38,331	11,998	11,733	$5,726,928,117	615	97	4	138	$2,899,539	$2,953,668	$5,853,207	0.1%
Portola Valley	4,607	1,578	1,533	$1,561,897,019	22	3	0	4	$97,329	$47,599	$144,927	0.0%
Redwood City	86,754	19,257	18,203	$21,797,918,834	4,717	1,923	149	713	$62,079,826	$71,910,488	$133,990,315	0.6%
San Bruno	45,454	11,696	11,234	$7,904,426,518	615	714	47	246	$5,092,953	$4,996,568	$10,089,521	0.1%
San Carlos	30,145	9,888	9,054	$10,559,383,070	1,975	97	2	197	$19,632,968	$45,504,436	$65,137,404	0.6%
San Mateo	103,087	23,685	22,474	$23,908,243,752	11,540	3,748	244	1,578	$115,934,902	$119,635,300	$235,570,203	1.0%
South San Francisco	67,879	16,695	15,441	$25,673,267,870	1,277	354	29	366	$11,664,407	$28,693,189	$40,357,595	0.2%
Woodside	5,676	2,022	1,980	$1,694,299,578	0	2	0	1	$65,327	$23,755	$89,082	0.0%
Unincorporated	66,083	19,926	18,700	$19,545,239,679	8,615	254	9	289	$12,592,359	$26,755,680	$39,348,039	0.2%
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**110,657**	**17,146**	**1,158**	**6,640**	**$509,942,697**	**$774,442,857**	**$1,284,385,554**	**0.7%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03, and adjusted to reflect the estimated population.
(6) Calculated using a user-defined (UDF) analysis in Hazus 4.2 SP03.

0.2 Percent Annual Chance

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0	0	$0	$0	$0	0.0%
Belmont	26,813	7,335	7,072	$6,073,411,270	6,013	420	22	253	$31,571,470	$26,597,060	$58,168,531	1.0%
Brisbane	4,633	1,816	1,566	$3,727,060,662	65,401	0	0	77	$110,326,168	$188,567,808	$298,893,975	8.0%
Burlingame	30,118	7,601	6,932	$11,121,820,561	46,617	18,290	1,327	2,780	$414,151,927	$708,234,639	$1,122,386,566	10.1%
Colma	1,729	445	321	$1,269,795,262	8	0	0	1	$490,967	$1,510,910	$2,001,877	0.2%
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0	0	$0	$0	$0	0.0%
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	4,546	10,020	748	1,612	$40,892,896	$36,908,676	$77,801,573	2.2%
Foster City	33,033	7,904	7,732	$8,139,909,551	0	2	0	0	$0	$0	$0	0.0%
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	0	2	0	0	$0	$0	$0	0.0%
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	2	0	0	$0	$0	$0	0.0%
Menlo Park	35,254	9,073	8,545	$12,491,405,466	4,768	3,840	262	1,310	$50,829,536	$67,123,175	$117,952,710	0.9%
Millbrae	22,832	6,013	5,796	$4,518,625,975	1,404	218	7	203	$9,044,771	$18,413,576	$27,458,347	0.6%
Pacifica	38,331	11,998	11,733	$5,726,928,117	859	305	18	281	$5,178,178	$5,246,002	$10,424,179	0.2%
Portola Valley	4,607	1,578	1,533	$1,561,897,019	22	4	0	4	$97,329	$47,599	$144,927	0.0%
Redwood City	86,754	19,257	18,203	$21,797,918,834	6,379	10,409	820	1,320	$79,289,865	$97,946,571	$177,236,436	0.8%
San Bruno	45,454	11,696	11,234	$7,904,426,518	667	1,013	70	338	$5,764,543	$5,408,382	$11,172,925	0.1%
San Carlos	30,145	9,888	9,054	$10,559,383,070	25,768	337	11	489	$132,704,118	$313,520,155	$446,224,273	4.2%
San Mateo	103,087	23,685	22,474	$23,908,243,752	14,053	5,629	418	1,923	$132,834,121	$136,088,829	$268,922,950	1.1%
South San Francisco	67,879	16,695	15,441	$25,673,267,870	2,319	308	23	456	$26,983,599	$80,843,515	$107,827,114	0.4%
Woodside	5,676	2,022	1,980	$1,694,299,578	45	1	0	2	$182,707	$331,532	$514,239	0.0%
Unincorporated	66,083	19,926	18,700	$19,545,239,679	39,533	377	13	430	$36,289,660	$80,758,787	$117,048,448	0.6%
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**218,401**	**51,178**	**3,740**	**11,479**	**$1,076,631,853**	**$1,767,547,216**	**$2,844,179,068**	**1.5%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03, and adjusted to reflect the estimated population.
(6) Calculated using a user-defined (UDF) analysis in Hazus 4.2 SP03.

Social Vulnerability Index

1 Percent Annual Chance

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Belmont	788	0	0.00%	0	0	0.00%	0	788	100.00%	3	0	0.00%	0	0	0.00%	0	3
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	1,456	0	0.00%	0	0	0.00%	0	148	10.19%	2	1,289	88.51%	2	19	1.31%	0	4
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	10,443	0	0.00%	0	10,443	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	42	0	0.00%	0	0	0.00%	0	10	24.88%	2	32	75.12%	2	0	0.00%	0	4
Half Moon Bay	36	0	0.00%	0	33	92.58%	4	0	0.00%	0	3	7.42%	1	0	0.00%	0	5
Hillsborough	51	0	0.00%	0	0	0.00%	0	7	13.80%	2	0	0.00%	0	44	86.20%	1	3
Menlo Park	5,589	2,030	36.33%	5	523	9.35%	3	0	0.00%	0	0	0.00%	0	3,036	54.32%	0	8
Millbrae	1,303	1,261	96.76%	5	35	2.71%	3	7	0.53%	2	0	0.00%	0	0	0.00%	0	10
Pacifica	771	0	0.00%	0	0	0.00%	0	12	1.57%	2	759	98.43%	2	0	0.00%	0	4
Portola Valley	77	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	77	100.00%	1	1
Redwood City	4,700	1,881	40.02%	5	2,174	46.25%	4	639	13.60%	2	0	0.00%	0	6	0.13%	0	11
San Bruno	1,633	0	0.00%	0	1,633	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
San Carlos	475	0	0.00%	0	0	0.00%	0	105	22.11%	2	268	56.38%	2	102	21.50%	0	4
San Mateo	8,943	4,229	47.29%	5	3,825	42.77%	4	109	1.22%	2	780	8.72%	1	0	0.00%	0	12
South San Francisco	1,940	1,940	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Woodside	18	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	18	100.00%	1	1
Unincorporated	1,290	358	27.77%	5	731	56.64%	4	3	0.27%	2	131	10.12%	1	67	5.20%	0	12
Total	**39,557**	**11,700**	**29.58%**	**5**	**19,397**	**49.04%**	**4**	**1,830**	**4.63%**	**2**	**3,260**	**8.24%**	**1**	**3,370**	**8.52%**	**0**	**12**

(1) Population estimates from FEMA National Risk Index database.

0.2 Percent Annual Chance

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Belmont	1,821	0	0.00%	0	0	0.00%	0	1,793	98.48%	3	28	1.52%	1	0	0.00%	0	4
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	20,725	0	0.00%	0	0	0.00%	0	6,138	29.61%	2	13,402	64.67%	2	1,185	5.72%	0	4
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	13,139	0	0.00%	0	13,139	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	42	0	0.00%	0	0	0.00%	0	10	24.88%	2	32	75.12%	2	0	0.00%	0	4
Half Moon Bay	36	0	0.00%	0	33	92.58%	4	0	0.00%	0	3	7.42%	1	0	0.00%	0	5
Hillsborough	54	0	0.00%	0	0	0.00%	0	7	13.11%	2	0	0.00%	0	47	86.89%	1	3
Menlo Park	8,270	3,632	43.93%	5	523	6.32%	3	0	0.00%	0	0	0.00%	0	4,114	49.75%	0	8
Millbrae	1,697	1,541	90.77%	5	146	8.61%	3	10	0.61%	2	0	0.00%	0	0	0.00%	0	10
Pacifica	1,574	0	0.00%	0	0	0.00%	0	58	3.71%	2	1,515	96.29%	2	0	0.00%	0	4
Portola Valley	91	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	91	100.00%	1	1
Redwood City	20,640	2,801	13.57%	4	12,389	60.02%	4	921	4.46%	2	4,523	21.91%	1	6	0.03%	0	11
San Bruno	2,149	0	0.00%	0	2,149	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
San Carlos	1,282	0	0.00%	0	0	0.00%	0	835	65.18%	3	341	26.63%	1	105	8.19%	0	4
San Mateo	13,697	4,633	33.83%	5	7,667	55.98%	4	512	3.73%	2	884	6.46%	1	0	0.00%	0	12
South San Francisco	1,968	1,957	99.45%	5	11	0.55%	3	0	0.00%	0	0	0.00%	0	0	0.00%	0	8
Woodside	21	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	21	100.00%	1	1
Unincorporated	1,670	365	21.86%	5	743	44.52%	4	3	0.21%	2	491	29.40%	1	67	4.02%	0	12
Total	**88,875**	**14,930**	**16.80%**	**5**	**36,802**	**41.41%**	**4**	**10,288**	**11.58%**	**2**	**21,220**	**23.88%**	**1**	**5,637**	**6.34%**	**0**	**12**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking

1 Percent Annual Chance

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3	2.43%	Low	1	3	5.15%	Low	1	2	0.13%	Low	1	1	**18**	**Medium**
Brisbane	High	3	0.00%	None	0	0	33.04%	High	3	6	8.03%	Medium	2	2	**24**	**Medium**
Burlingame	High	3	5.11%	Low	1	3	27.40%	High	3	6	2.40%	Low	1	1	**30**	**Medium**
Colma	High	3	0.00%	None	0	0	0.28%	Low	1	2	0.00%	None	0	0	**6**	**Low**
Daly City	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3	40.71%	High	3	9	28.62%	High	3	6	1.91%	Low	1	1	**48**	**High**
Foster City	High	3	0.12%	Low	1	3	0.06%	Low	1	2	0.00%	None	0	0	**15**	**Low**
Half Moon Bay	High	3	0.30%	Low	1	3	0.10%	Low	1	2	0.00%	None	0	0	**15**	**Low**
Hillsborough	High	3	0.44%	Low	1	3	1.11%	Low	1	2	0.00%	None	0	0	**15**	**Low**
Menlo Park	High	3	14.35%	Medium	2	6	23.24%	Medium	2	4	0.80%	Low	1	1	**33**	**High**
Millbrae	High	3	3.74%	Low	1	3	8.49%	Low	1	2	0.29%	Low	1	1	**18**	**Medium**
Pacifica	High	3	2.34%	Low	1	3	3.11%	Low	1	2	0.10%	Low	1	1	**18**	**Medium**
Portola Valley	High	3	1.83%	Low	1	3	1.09%	Low	1	2	0.01%	None	0	0	**15**	**Low**
Redwood City	High	3	5.37%	Low	1	3	22.15%	Medium	2	4	0.61%	Low	1	1	**24**	**Medium**
San Bruno	High	3	3.09%	Low	1	3	1.87%	Low	1	2	0.13%	Low	1	1	**18**	**Medium**
San Carlos	High	3	1.80%	Low	1	3	20.62%	Medium	2	4	0.62%	Low	1	1	**24**	**Medium**
San Mateo	High	3	7.69%	Low	1	3	6.30%	Low	1	2	0.99%	Low	1	1	**18**	**Medium**
South San Francisco	High	3	2.24%	Low	1	3	9.86%	Low	1	2	0.16%	Low	1	1	**18**	**Medium**
Woodside	High	3	0.35%	Low	1	3	3.65%	Low	1	2	0.01%	None	0	0	**15**	**Low**
Unincorporated	High	3	2.22%	Low	1	3	6.22%	Low	1	2	0.20%	Low	1	1	**18**	**Medium**
Total	**High**	**3**	**5.08%**	**Low**	**1**	**3**	**11.25%**	**Medium**	**2**	**4**	**0.67%**	**Low**	**1**	**1**	**24**	**Medium**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3			3	9	5.15%	Low	1	2	0.13%	Low	1	1	**36**	**High**
Brisbane	High	3			0	0	33.04%	High	3	6	8.03%	Medium	2	2	**24**	**Medium**
Burlingame	High	3			4	12	27.40%	High	3	6	2.40%	Low	1	1	**57**	**High**
Colma	High	3			0	0	0.28%	Low	1	2	0.00%	None	0	0	**6**	**Low**
Daly City	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3			4	12	28.62%	High	3	6	1.91%	Low	1	1	**57**	**High**
Foster City	High	3			4	12	0.06%	Low	1	2	0.00%	None	0	0	**42**	**High**
Half Moon Bay	High	3			5	15	0.10%	Low	1	2	0.00%	None	0	0	**51**	**High**
Hillsborough	High	3			3	9	1.11%	Low	1	2	0.00%	None	0	0	**33**	**High**
Menlo Park	High	3			8	24	23.24%	Medium	2	4	0.80%	Low	1	1	**87**	**High**
Millbrae	High	3			10	30	8.49%	Low	1	2	0.29%	Low	1	1	**99**	**High**
Pacifica	High	3			4	12	3.11%	Low	1	2	0.10%	Low	1	1	**45**	**High**
Portola Valley	High	3			1	3	1.09%	Low	1	2	0.01%	None	0	0	**15**	**Low**
Redwood City	High	3			11	33	22.15%	Medium	2	4	0.61%	Low	1	1	**114**	**High**
San Bruno	High	3			4	12	1.87%	Low	1	2	0.13%	Low	1	1	**45**	**High**
San Carlos	High	3			4	12	20.62%	Medium	2	4	0.62%	Low	1	1	**51**	**High**
San Mateo	High	3			12	36	6.30%	Low	1	2	0.99%	Low	1	1	**117**	**High**
South San Francisco	High	3			5	15	9.86%	Low	1	2	0.16%	Low	1	1	**54**	**High**
Woodside	High	3			1	3	3.65%	Low	1	2	0.01%	None	0	0	**15**	**Low**
Unincorporated	High	3			12	36	6.22%	Low	1	2	0.20%	Low	1	1	**117**	**High**
Total	**High**	**3**			**12**	**36**	**11.25%**	**Medium**	**2**	**4**	**0.67%**	**Low**	**1**	**1**	**123**	**High**

0.2 Percent Annual Chance

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	Medium	2	5.46%	Low	1	3	17.87%	Medium	2	4	0.96%	Low	1	1	**16**	**Medium**
Brisbane	Medium	2	0.00%	None	0	0	33.56%	High	3	6	8.02%	Medium	2	2	**16**	**Medium**
Burlingame	Medium	2	67.71%	High	3	9	81.35%	High	3	6	10.09%	High	3	3	**36**	**High**
Colma	Medium	2	0.00%	None	0	0	0.91%	Low	1	2	0.16%	Low	1	1	**6**	**Low**
Daly City	Medium	2	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	Medium	2	52.53%	High	3	9	38.59%	High	3	6	2.23%	Low	1	1	**32**	**Medium**
Foster City	Medium	2	0.12%	Low	1	3	0.06%	Low	1	2	0.00%	None	0	0	**10**	**Low**
Half Moon Bay	Medium	2	0.30%	Low	1	3	0.10%	Low	1	2	0.00%	None	0	0	**10**	**Low**
Hillsborough	Medium	2	0.46%	Low	1	3	1.64%	Low	1	2	0.00%	None	0	0	**10**	**Low**
Menlo Park	Medium	2	21.74%	Medium	2	6	33.56%	High	3	6	0.94%	Low	1	1	**26**	**Medium**
Millbrae	Medium	2	5.04%	Low	1	3	15.64%	Medium	2	4	0.61%	Low	1	1	**16**	**Medium**
Pacifica	Medium	2	4.78%	Low	1	3	5.88%	Low	1	2	0.18%	Low	1	1	**12**	**Low**
Portola Valley	Medium	2	2.15%	Low	1	3	1.30%	Low	1	2	0.01%	None	0	0	**10**	**Low**
Redwood City	Medium	2	21.55%	Medium	2	6	41.35%	High	3	6	0.81%	Low	1	1	**26**	**Medium**
San Bruno	Medium	2	4.09%	Low	1	3	2.40%	Low	1	2	0.14%	Low	1	1	**12**	**Low**
San Carlos	Medium	2	4.33%	Low	1	3	38.71%	High	3	6	4.23%	Low	1	1	**20**	**Medium**
San Mateo	Medium	2	10.67%	Medium	2	6	12.36%	Medium	2	4	1.12%	Low	1	1	**22**	**Medium**
South San Francisco	Medium	2	2.29%	Low	1	3	16.20%	Medium	2	4	0.42%	Low	1	1	**16**	**Medium**
Woodside	Medium	2	0.40%	Low	1	3	4.62%	Low	1	2	0.03%	Low	1	1	**12**	**Low**
Unincorporated	Medium	2	2.95%	Low	1	3	9.68%	Low	1	2	0.60%	Low	1	1	**12**	**Low**
Total	**Medium**	**2**	**11.03%**	**Medium**	**2**	**6**	**21.07%**	**Medium**	**2**	**4**	**1.48%**	**Low**	**1**	**1**	**22**	**Medium**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	Medium	2			4	12	17.87%	Medium	2	4	0.96%	Low	1	1	**34**	**High**
Brisbane	Medium	2			0	0	33.56%	High	3	6	8.02%	Medium	2	2	**16**	**Medium**
Burlingame	Medium	2			4	12	81.35%	High	3	6	10.09%	High	3	3	**42**	**High**
Colma	Medium	2			0	0	0.91%	Low	1	2	0.16%	Low	1	1	**6**	**Low**
Daly City	Medium	2			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	Medium	2			4	12	38.59%	High	3	6	2.23%	Low	1	1	**38**	**High**
Foster City	Medium	2			4	12	0.06%	Low	1	2	0.00%	None	0	0	**28**	**Medium**
Half Moon Bay	Medium	2			5	15	0.10%	Low	1	2	0.00%	None	0	0	**34**	**High**
Hillsborough	Medium	2			3	9	1.64%	Low	1	2	0.00%	None	0	0	**22**	**Medium**
Menlo Park	Medium	2			8	24	33.56%	High	3	6	0.94%	Low	1	1	**62**	**High**
Millbrae	Medium	2			10	30	15.64%	Medium	2	4	0.61%	Low	1	1	**70**	**High**
Pacifica	Medium	2			4	12	5.88%	Low	1	2	0.18%	Low	1	1	**30**	**Medium**
Portola Valley	Medium	2			1	3	1.30%	Low	1	2	0.01%	None	0	0	**10**	**Low**
Redwood City	Medium	2			11	33	41.35%	High	3	6	0.81%	Low	1	1	**80**	**High**
San Bruno	Medium	2			4	12	2.40%	Low	1	2	0.14%	Low	1	1	**30**	**Medium**
San Carlos	Medium	2			4	12	38.71%	High	3	6	4.23%	Low	1	1	**38**	**High**
San Mateo	Medium	2			12	36	12.36%	Medium	2	4	1.12%	Low	1	1	**82**	**High**
South San Francisco	Medium	2			8	24	16.20%	Medium	2	4	0.42%	Low	1	1	**58**	**High**
Woodside	Medium	2			1	3	4.62%	Low	1	2	0.03%	Low	1	1	**12**	**Low**
Unincorporated	Medium	2			12	36	9.68%	Low	1	2	0.60%	Low	1	1	**78**	**High**
Total	**Medium**	**2**			**12**	**36**	**21.07%**	**Medium**	**2**	**4**	**1.48%**	**Low**	**1**	**1**	**82**	**High**

100-yr Flood Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	0	0	2	0	0	0	0	**2**
BRISBANE	0	0	0	1	0	0	0	**1**
BURLINGAME	2	0	10	4	6	5	3	**30**
COLMA	0	0	0	0	0	0	0	**0**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	0	1	8	0	0	7	0	**16**
FOSTER CITY	0	0	0	0	0	0	1	**1**
HALF MOON BAY	0	0	0	0	0	0	0	**0**
HILLSBOROUGH	0	0	0	0	0	0	1	**1**
MENLO PARK	6	2	9	1	3	4	5	**30**
MILLBRAE	1	1	1	0	1	0	2	**6**
PACIFICA	1	0	6	0	1	0	1	**9**
PORTOLA VALLEY	0	0	0	0	0	0	4	**4**
REDWOOD CITY	7	4	50	12	4	18	13	**108**
SAN BRUNO	0	0	2	0	0	1	1	**4**
SAN CARLOS	1	1	4	2	1	5	2	**16**
SAN MATEO	3	2	6	0	0	11	10	**32**
SOUTH SAN FRANCISCO	0	0	7	1	1	6	18	**33**
WOODSIDE	0	0	0	0	0	0	0	**0**
UNINCORPORATED	1	0	5	1	0	3	37	**47**
Total	**22**	**11**	**110**	**22**	**17**	**60**	**98**	**340**

500-yr Flood Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	2	1	3	0	1	1	4	**12**
BRISBANE	0	0	0	1	0	0	0	**1**
BURLINGAME	23	1	16	4	13	15	11	**83**
COLMA	0	0	0	0	0	0	1	**1**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	0	1	11	0	0	10	0	**22**
FOSTER CITY	0	0	0	0	0	0	1	**1**
HALF MOON BAY	0	0	0	0	0	0	0	**0**
HILLSBOROUGH	0	0	0	0	0	0	1	**1**
MENLO PARK	6	2	9	1	3	6	6	**33**
MILLBRAE	5	1	1	0	1	1	2	**11**
PACIFICA	2	0	12	0	1	2	3	**20**
PORTOLA VALLEY	0	0	0	0	0	0	4	**4**
REDWOOD CITY	16	4	68	15	8	43	25	**179**
SAN BRUNO	0	1	2	0	0	2	1	**6**
SAN CARLOS	1	1	5	2	5	10	3	**27**
SAN MATEO	4	2	6	0	3	13	17	**45**
SOUTH SAN FRANCISCO	1	0	11	4	3	7	19	**45**
WOODSIDE	0	0	0	0	0	0	2	**2**
UNINCORPORATED	2	0	5	1	3	6	42	**59**
Total	**62**	**14**	**149**	**28**	**41**	**116**	**142**	**552**

LANDSLIDE

Exposure

Very High Susceptibility

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	56	212	0.8%	$22,020,605	$11,010,302	$33,030,907	0.5%	56	0	0	0	0	0	0	56
Brisbane	4,633	1,816	1,566	$3,727,060,662	16	44	1.0%	$2,785,230	$1,755,722	$4,540,952	0.1%	15	0	1	0	0	0	0	16
Burlingame	30,118	7,601	6,932	$11,121,820,561	25	109	0.4%	$7,492,378	$3,746,189	$11,238,568	0.1%	25	0	0	0	0	0	0	25
Colma	1,729	445	321	$1,269,795,262	7	11	0.6%	$41,733,033	$41,564,970	$83,298,003	6.6%	2	5	0	0	0	0	0	7
Daly City	109,142	21,942	21,366	$12,987,124,886	690	3,458	3.2%	$362,614,998	$255,666,426	$618,281,424	4.8%	677	13	0	0	0	0	0	690
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Hillsborough	11,418	3,926	3,900	$3,326,778,876	8	23	0.2%	$3,743,679	$1,871,839	$5,615,518	0.2%	8	0	0	0	0	0	0	8
Menlo Park	35,254	9,073	8,545	$12,491,405,466	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Millbrae	22,832	6,013	5,796	$4,518,625,975	64	248	1.1%	$17,931,275	$9,148,092	$27,079,367	0.6%	63	1	0	0	0	0	0	64
Pacifica	38,331	11,998	11,733	$5,726,928,117	496	1,611	4.2%	$98,087,795	$50,358,720	$148,446,514	2.6%	493	2	0	0	1	0	0	496
Portola Valley	4,607	1,578	1,533	$1,561,897,019	116	340	7.4%	$64,971,454	$41,730,307	$106,701,761	6.8%	113	2	0	1	0	0	0	116
Redwood City	86,754	19,257	18,203	$21,797,918,834	8	38	0.0%	$2,267,099	$1,133,549	$3,400,648	0.0%	8	0	0	0	0	0	0	8
San Bruno	45,454	11,696	11,234	$7,904,426,518	368	1,481	3.3%	$74,503,818	$46,649,379	$121,153,197	1.5%	366	2	0	0	0	0	0	368
San Carlos	30,145	9,888	9,054	$10,559,383,070	32	107	0.4%	$8,738,082	$4,369,041	$13,107,124	0.1%	32	0	0	0	0	0	0	32
San Mateo	103,087	23,685	22,474	$23,908,243,752	31	128	0.1%	$21,819,675	$17,804,878	$39,624,554	0.2%	28	3	0	0	0	0	0	31
South San Francisco	67,879	16,695	15,441	$25,673,267,870	184	800	1.2%	$50,671,774	$26,219,681	$76,891,455	0.3%	182	2	0	0	0	0	0	184
Woodside	5,676	2,022	1,980	$1,694,299,578	59	169	3.0%	$23,904,231	$11,952,116	$35,856,347	2.1%	59	0	0	0	0	0	0	59
Unincorporated	66,083	19,926	18,700	$19,545,239,679	462	1,512	2.3%	$317,198,939	$318,475,599	$635,674,538	3.3%	428	3	0	29	0	0	2	462
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**2,622**	**10,292**	**1.3%**	**$1,120,484,064**	**$843,456,811**	**$1,963,940,875**	**1.0%**	**2,555**	**33**	**1**	**30**	**1**	**0**	**2**	**2,622**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

High Susceptibility

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	15	43	0.6%	$6,998,870	$3,499,435	$10,498,305	0.4%	15	0	0	0	0	0	0	15
Belmont	26,813	7,335	7,072	$6,073,411,270	2,286	8,493	31.7%	$1,116,342,396	$654,429,427	$1,770,771,823	29.2%	2,240	34	6	0	2	0	4	2,286
Brisbane	4,633	1,816	1,566	$3,727,060,662	988	2,890	62.4%	$311,858,056	$213,341,236	$525,199,292	14.1%	977	8	1	0	1	0	1	988
Burlingame	30,118	7,601	6,932	$11,121,820,561	912	3,893	12.9%	$683,670,623	$524,013,944	$1,207,684,566	10.9%	896	9	2	0	3	0	2	912
Colma	1,729	445	321	$1,269,795,262	197	711	41.1%	$397,697,454	$382,029,378	$779,726,832	61.4%	132	63	2	0	0	0	0	197
Daly City	109,142	21,942	21,366	$12,987,124,886	13,267	66,340	60.8%	$4,396,136,938	$2,846,771,225	$7,242,908,162	55.8%	12,987	241	2	3	14	5	15	13,267
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	13	84	0.3%	$17,958,879	$9,819,130	$27,778,009	0.8%	12	1	0	0	0	0	0	13
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	200	573	4.6%	$248,395,905	$195,562,311	$443,958,216	12.5%	182	10	2	6	0	0	0	200
Hillsborough	11,418	3,926	3,900	$3,326,778,876	1,396	4,081	35.7%	$692,568,695	$346,457,128	$1,039,025,823	31.2%	1,394	2	0	0	0	0	0	1,396
Menlo Park	35,254	9,073	8,545	$12,491,405,466	211	850	2.4%	$148,797,962	$93,515,042	$242,313,004	1.9%	206	5	0	0	0	0	0	211
Millbrae	22,832	6,013	5,796	$4,518,625,975	2,488	9,572	41.9%	$931,787,095	$559,879,411	$1,491,666,506	33.0%	2,430	58	0	0	0	0	0	2,488
Pacifica	38,331	11,998	11,733	$5,726,928,117	5,234	16,890	44.1%	$1,495,863,314	$914,474,547	$2,410,337,861	42.1%	5,170	45	0	1	9	2	7	5,234
Portola Valley	4,607	1,578	1,533	$1,561,897,019	193	565	12.3%	$83,855,863	$47,276,220	$131,132,082	8.4%	188	3	0	1	0	0	1	193
Redwood City	86,754	19,257	18,203	$21,797,918,834	674	3,174	3.7%	$212,422,020	$114,000,385	$326,422,404	1.5%	666	6	0	0	1	0	1	674
San Bruno	45,454	11,696	11,234	$7,904,426,518	4,368	17,463	38.4%	$1,440,163,908	$936,974,785	$2,377,138,693	30.1%	4,316	41	0	0	3	0	8	4,368
San Carlos	30,145	9,888	9,054	$10,559,383,070	2,758	9,116	30.2%	$1,008,804,966	$551,538,265	$1,560,343,231	14.8%	2,738	18	1	0	0	0	1	2,758
San Mateo	103,087	23,685	22,474	$23,908,243,752	2,539	11,463	11.1%	$1,302,048,335	$891,023,459	$2,193,071,793	9.2%	2,499	30	1	0	2	1	6	2,539
South San Francisco	67,879	16,695	15,441	$25,673,267,870	6,823	29,554	43.5%	$2,980,300,070	$2,340,617,805	$5,320,917,876	20.7%	6,723	73	12	0	5	1	9	6,823
Woodside	5,676	2,022	1,980	$1,694,299,578	289	820	14.4%	$159,675,873	$100,675,762	$260,351,634	15.4%	286	2	0	1	0	0	0	289
Unincorporated	66,083	19,926	18,700	$19,545,239,679	5,135	17,376	26.3%	$2,108,072,747	$1,461,884,560	$3,569,957,307	18.3%	4,917	85	2	109	7	6	9	5,135
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**49,986**	**203,952**	**26.4%**	**$19,743,419,969**	**$13,187,783,453**	**$32,931,203,421**	**17.2%**	**48,974**	**734**	**31**	**121**	**47**	**15**	**64**	**49,986**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Moderate Susceptibility

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	49	139	2.0%	$30,824,503	$15,412,251	$46,236,754	1.6%	49	0	0	0	0	0	0	49
Belmont	26,813	7,335	7,072	$6,073,411,270	2,009	7,473	27.9%	$758,098,790	$437,992,894	$1,196,091,683	19.7%	1,971	31	2	0	1	0	4	2,009
Brisbane	4,633	1,816	1,566	$3,727,060,662	608	1,506	32.5%	$689,546,404	$642,861,774	$1,332,408,178	35.7%	509	91	3	0	2	0	3	608
Burlingame	30,118	7,601	6,932	$11,121,820,561	830	3,571	11.9%	$347,598,754	$243,630,012	$591,228,765	5.3%	822	2	0	0	1	1	4	830
Colma	1,729	445	321	$1,269,795,262	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	3,503	17,690	16.2%	$844,713,789	$494,207,336	$1,338,921,125	10.3%	3,463	31	0	0	4	2	3	3,503
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	2	6	0.1%	$143,999	$72,000	$215,999	0.0%	2	0	0	0	0	0	0	2
Hillsborough	11,418	3,926	3,900	$3,326,778,876	1,604	4,658	40.8%	$901,393,164	$507,624,226	$1,409,017,390	42.4%	1,591	8	0	0	0	2	3	1,604
Menlo Park	35,254	9,073	8,545	$12,491,405,466	123	495	1.4%	$143,374,389	$96,574,751	$239,949,139	1.9%	120	3	0	0	0	0	0	123
Millbrae	22,832	6,013	5,796	$4,518,625,975	1,318	5,164	22.6%	$412,402,508	$233,279,674	$645,682,182	14.3%	1,311	3	0	0	0	1	3	1,318
Pacifica	38,331	11,998	11,733	$5,726,928,117	1,935	6,240	16.3%	$516,899,849	$311,247,681	$828,147,530	14.5%	1,910	20	0	1	2	0	2	1,935
Portola Valley	4,607	1,578	1,533	$1,561,897,019	206	613	13.3%	$143,211,196	$98,145,326	$241,356,522	15.5%	204	1	0	0	0	0	1	206
Redwood City	86,754	19,257	18,203	$21,797,918,834	1,520	7,154	8.2%	$589,811,968	$442,991,264	$1,032,803,231	4.7%	1,501	10	0	0	3	1	5	1,520
San Bruno	45,454	11,696	11,234	$7,904,426,518	1,932	7,760	17.1%	$484,499,205	$271,960,873	$756,460,078	9.6%	1,918	10	0	0	1	1	2	1,932
San Carlos	30,145	9,888	9,054	$10,559,383,070	2,241	7,401	24.6%	$718,201,187	$424,868,328	$1,143,069,514	10.8%	2,223	10	0	1	4	0	3	2,241
San Mateo	103,087	23,685	22,474	$23,908,243,752	2,307	10,417	10.1%	$1,015,981,547	$711,211,574	$1,727,193,121	7.2%	2,271	26	0	0	6	0	4	2,307
South San Francisco	67,879	16,695	15,441	$25,673,267,870	2,965	12,621	18.6%	$1,101,163,178	$858,321,102	$1,959,484,280	7.6%	2,871	72	11	0	5	2	4	2,965
Woodside	5,676	2,022	1,980	$1,694,299,578	469	1,333	23.5%	$193,459,307	$98,212,380	$291,671,687	17.2%	465	4	0	0	0	0	0	469
Unincorporated	66,083	19,926	18,700	$19,545,239,679	2,771	9,450	14.3%	$1,408,094,599	$1,205,292,489	$2,613,387,087	13.4%	2,674	35	2	47	1	5	7	2,771
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**26,392**	**103,691**	**13.4%**	**$10,299,418,332**	**$7,093,905,932**	**$17,393,324,265**	**9.1%**	**25,875**	**357**	**18**	**49**	**30**	**15**	**48**	**26,392**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Social Vulnerability Index

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	42	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	42	100.00%	1	1
Belmont	8,027	0	0.00%	0	0	0.00%	0	4,069	50.69%	3	1,533	19.09%	1	2,425	30.21%	0	4
Brisbane	2,873	0	0.00%	0	2,873	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Burlingame	3,347	0	0.00%	0	0	0.00%	0	2,361	70.53%	3	547	16.34%	1	439	13.13%	0	4
Colma	595	595	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Daly City	63,961	36,865	57.64%	5	15,754	24.63%	3	11,342	17.73%	2	0	0.00%	0	0	0.00%	0	10
East Palo Alto	110	0	0.00%	0	110	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Half Moon Bay	583	0	0.00%	0	332	56.98%	4	251	43.02%	3	3	0.46%	1	0	0.00%	0	8
Hillsborough	3,835	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	3,835	100.00%	1	1
Menlo Park	871	0	0.00%	0	245	28.10%	4	24	2.75%	2	21	2.45%	1	581	66.70%	0	7
Millbrae	8,320	460	5.53%	4	5,455	65.57%	4	2,405	28.91%	2	0	0.00%	0	0	0.00%	0	10
Pacifica	17,586	0	0.00%	0	0	0.00%	0	13,645	77.59%	3	3,940	22.41%	1	0	0.00%	0	4
Portola Valley	830	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	830	100.00%	1	1
Redwood City	1,960	0	0.00%	0	61	3.13%	3	7	0.37%	2	1,766	90.08%	2	126	6.42%	0	7
San Bruno	15,722	1,508	9.59%	4	5,036	32.03%	4	7,444	47.35%	3	1,734	11.03%	1	0	0.00%	0	12
San Carlos	8,470	0	0.00%	0	0	0.00%	0	1,464	17.28%	2	1,316	15.54%	1	5,690	67.18%	0	3
San Mateo	8,018	0	0.00%	0	608	7.59%	3	1,833	22.86%	2	4,155	51.82%	2	1,422	17.73%	0	7
South San Francisco	27,668	6,449	23.31%	5	15,678	56.66%	4	5,541	20.03%	2	0	0.00%	0	0	0.00%	0	11
Woodside	902	0	0.00%	0	0	0.00%	0	3	0.32%	2	0	0.00%	0	899	99.68%	1	3
Unincorporated	16,725	3,343	19.99%	5	2,333	13.95%	3	2,088	12.49%	2	4,543	27.16%	1	4,418	26.42%	0	11
Total	**190,445**	**49,220**	**25.84%**	**5**	**48,485**	**25.46%**	**4**	**52,477**	**27.56%**	**2**	**19,557**	**10.27%**	**1**	**20,708**	**10.87%**	**0**	**12**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking (High and Very High Susceptibility)

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3	0.61%	Low	1	3	0.37%	Low	1	2	0.09%	Low	1	1	**18**	**Medium**
Belmont	High	3	32.47%	High	3	9	29.70%	High	3	6	7.42%	Medium	2	2	**51**	**High**
Brisbane	High	3	63.35%	High	3	9	14.21%	Medium	2	4	3.55%	Low	1	1	**42**	**High**
Burlingame	High	3	13.29%	Medium	2	6	10.96%	Medium	2	4	2.74%	Low	1	1	**33**	**High**
Colma	High	3	41.74%	High	3	9	67.97%	High	3	6	16.99%	High	3	3	**54**	**High**
Daly City	High	3	63.95%	High	3	9	60.53%	High	3	6	15.13%	High	3	3	**54**	**High**
East Palo Alto	High	3	0.27%	Low	1	3	0.80%	Low	1	2	0.20%	Low	1	1	**18**	**Medium**
Foster City	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Half Moon Bay	High	3	4.61%	Low	1	3	12.54%	Medium	2	4	3.14%	Low	1	1	**24**	**Medium**
Hillsborough	High	3	35.95%	High	3	9	31.40%	High	3	6	7.85%	Medium	2	2	**51**	**High**
Menlo Park	High	3	2.41%	Low	1	3	1.94%	Low	1	2	0.48%	Low	1	1	**18**	**Medium**
Millbrae	High	3	43.01%	High	3	9	33.61%	High	3	6	8.40%	Medium	2	2	**51**	**High**
Pacifica	High	3	48.27%	High	3	9	44.68%	High	3	6	11.17%	High	3	3	**54**	**High**
Portola Valley	High	3	19.63%	Medium	2	6	15.23%	Medium	2	4	3.81%	Low	1	1	**33**	**High**
Redwood City	High	3	3.70%	Low	1	3	1.51%	Low	1	2	0.38%	Low	1	1	**18**	**Medium**
San Bruno	High	3	41.68%	High	3	9	31.61%	High	3	6	7.90%	Medium	2	2	**51**	**High**
San Carlos	High	3	30.59%	High	3	9	14.90%	Medium	2	4	3.73%	Low	1	1	**42**	**High**
San Mateo	High	3	11.24%	Medium	2	6	9.34%	Low	1	2	2.33%	Low	1	1	**27**	**Medium**
South San Francisco	High	3	44.72%	High	3	9	21.03%	Medium	2	4	5.26%	Medium	2	2	**45**	**High**
Woodside	High	3	17.42%	Medium	2	6	17.48%	Medium	2	4	4.37%	Low	1	1	**33**	**High**
Unincorporated	High	3	28.58%	High	3	9	21.52%	Medium	2	4	5.38%	Medium	2	2	**45**	**High**
Total	**High**	**3**	**27.71%**	**High**	**3**	**9**	**18.18%**	**Medium**	**2**	**4**	**4.55%**	**Low**	**1**	**1**	**42**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3			1	3	0.37%	Low	1	2	0.09%	Low	1	1	**18**	**Medium**
Belmont	High	3			4	12	29.70%	High	3	6	7.42%	Medium	2	2	**60**	**High**
Brisbane	High	3			4	12	14.21%	Medium	2	4	3.55%	Low	1	1	**51**	**High**
Burlingame	High	3			4	12	10.96%	Medium	2	4	2.74%	Low	1	1	**51**	**High**
Colma	High	3			5	15	67.97%	High	3	6	16.99%	High	3	3	**72**	**High**
Daly City	High	3			10	30	60.53%	High	3	6	15.13%	High	3	3	**117**	**High**
East Palo Alto	High	3			4	12	0.80%	Low	1	2	0.20%	Low	1	1	**45**	**High**
Foster City	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Half Moon Bay	High	3			8	24	12.54%	Medium	2	4	3.14%	Low	1	1	**87**	**High**
Hillsborough	High	3			1	3	31.40%	High	3	6	7.85%	Medium	2	2	**33**	**High**
Menlo Park	High	3			7	21	1.94%	Low	1	2	0.48%	Low	1	1	**72**	**High**
Millbrae	High	3			10	30	33.61%	High	3	6	8.40%	Medium	2	2	**114**	**High**
Pacifica	High	3			4	12	44.68%	High	3	6	11.17%	High	3	3	**63**	**High**
Portola Valley	High	3			1	3	15.23%	Medium	2	4	3.81%	Low	1	1	**24**	**Medium**
Redwood City	High	3			7	21	1.51%	Low	1	2	0.38%	Low	1	1	**72**	**High**
San Bruno	High	3			12	36	31.61%	High	3	6	7.90%	Medium	2	2	**132**	**High**
San Carlos	High	3			3	9	14.90%	Medium	2	4	3.73%	Low	1	1	**42**	**High**
San Mateo	High	3			7	21	9.34%	Low	1	2	2.33%	Low	1	1	**72**	**High**
South San Francisco	High	3			11	33	21.03%	Medium	2	4	5.26%	Medium	2	2	**117**	**High**
Woodside	High	3			3	9	17.48%	Medium	2	4	4.37%	Low	1	1	**42**	**High**
Unincorporated	High	3			11	33	21.52%	Medium	2	4	5.38%	Medium	2	2	**117**	**High**
Total	**High**	**3**			**12**	**36**	**18.18%**	**Medium**	**2**	**4**	**4.55%**	**Low**	**1**	**1**	**123**	**High**

Landslide Susceptibility - Very High & High Categories Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	2	0	10	0	2	6	0	**20**
BRISBANE	0	0	1	0	0	2	2	**5**
BURLINGAME	0	0	1	0	1	1	0	**3**
COLMA	0	0	0	2	0	0	1	**3**
DALY CITY	14	3	11	0	16	25	24	**93**
EAST PALO ALTO	0	0	2	0	0	0	1	**3**
FOSTER CITY	0	0	0	0	0	0	0	**0**
HALF MOON BAY	0	0	0	1	0	0	1	**2**
HILLSBOROUGH	0	0	0	0	0	0	4	**4**
MENLO PARK	1	0	0	0	0	0	4	**5**
MILLBRAE	3	0	0	0	0	1	3	**7**
PACIFICA	3	1	11	0	0	11	2	**28**
PORTOLA VALLEY	0	0	0	0	0	2	4	**6**
REDWOOD CITY	0	1	6	0	1	1	4	**13**
SAN BRUNO	3	1	2	0	4	9	14	**33**
SAN CARLOS	2	0	4	1	1	0	1	**9**
SAN MATEO	7	1	1	0	0	6	5	**20**
SOUTH SAN FRANCISCO	9	0	5	2	8	6	7	**37**
WOODSIDE	3	0	0	0	0	1	3	**7**
UNINCORPORATED	25	4	12	5	3	29	36	**114**
Total	**72**	**11**	**66**	**11**	**36**	**100**	**116**	**412**

SEA LEVEL RISE

Exposure

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.00%	0	0	0	0.00%	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	734	2,718	10.14%	445,268,649	300,961,604	746,230,252	12.29%	717	15	1	0	1	0	0	734
Brisbane	4,633	1,816	1,566	$3,727,060,662	18	0	0.00%	127,860,350	131,160,569	259,020,919	6.95%	0	15	2	0	0	1	0	18
Burlingame	30,118	7,601	6,932	$11,121,820,561	1,161	3,684	12.23%	2,348,194,094	2,062,287,283	4,410,481,377	39.66%	848	255	53	0	2	1	2	1,161
Colma	1,729	445	321	$1,269,795,262	0	0	0.00%	0	0	0	0.00%	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	1	0	0.00%	421,962	421,962	843,924	0.01%	0	1	0	0	0	0	0	1
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	2,954	19,954	64.80%	862,237,865	643,256,464	1,505,494,329	43.12%	2,857	51	20	2	12	1	11	2,954
Foster City	33,033	7,904	7,732	$8,139,909,551	7,902	33,029	99.99%	4,761,006,898	3,351,210,965	8,112,217,863	99.66%	7,731	130	23	0	7	3	8	7,902
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	1	3	0.03%	466,663	233,331	699,994	0.02%	1	0	0	0	0	0	0	1
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	0	0.00%	0	0	0	0.00%	0	0	0	0	0	0	0	0
Menlo Park	35,254	9,073	8,545	$12,491,405,466	998	3,441	9.76%	1,775,800,248	1,816,099,334	3,591,899,581	28.75%	834	77	72	2	7	1	5	998
Millbrae	22,832	6,013	5,796	$4,518,625,975	396	1,469	6.44%	291,080,691	198,726,850	489,807,541	10.84%	373	19	2	0	0	0	2	396
Pacifica	38,331	11,998	11,733	$5,726,928,117	201	591	1.54%	92,869,688	65,139,248	158,008,936	2.76%	181	20	0	0	0	0	0	201
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0.00%	0	0	0	0.00%	0	0	0	0	0	0	0	0
Redwood City	86,754	19,257	18,203	$21,797,918,834	6,705	29,101	33.54%	6,651,711,081	5,748,804,630	12,400,515,711	56.89%	6,106	488	84	0	4	11	12	6,705
San Bruno	45,454	11,696	11,234	$7,904,426,518	651	2,529	5.56%	160,161,976	103,373,270	263,535,246	3.33%	625	21	4	0	0	0	1	651
San Carlos	30,145	9,888	9,054	$10,559,383,070	652	1,025	3.40%	1,761,290,754	1,922,998,357	3,684,289,111	34.89%	308	199	143	1	0	0	1	652
San Mateo	103,087	23,685	22,474	$23,908,243,752	11,068	48,856	47.39%	5,664,952,406	4,021,534,619	9,686,487,025	40.52%	10,651	333	52	1	12	5	14	11,068
South San Francisco	67,879	16,695	15,441	$25,673,267,870	466	66	0.10%	3,412,500,108	3,603,330,078	7,015,830,186	27.33%	15	379	71	0	0	1	0	466
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0.00%	0	0	0	0.00%	0	0	0	0	0	0	0	0
Unincorporated	66,083	19,926	18,700	$19,545,239,679	477	1,110	1.68%	1,521,607,287	1,559,281,930	3,080,889,217	15.76%	314	102	59	2	0	0	0	477
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**34,385**	**147,577**	**19.09%**	**29,877,430,719**	**25,528,820,493**	**55,406,251,212**	**28.87%**	**31,561**	**2,105**	**586**	**8**	**45**	**24**	**56**	**34,385**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Social Vulnerability Index

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Belmont	3,532	0	0.00%	0	0	0.00%	0	3,532	100.00%	3	0	0.00%	0	0	0.00%	0	3
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	3,462	0	0.00%	0	0	0.00%	0	43	1.24%	2	3,419	98.76%	2	0	0.00%	0	4
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	14,980	0	0.00%	0	14,980	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
Foster City	30,557	0	0.00%	0	0	0.00%	0	17,165	56.17%	3	13,392	43.83%	1	0	0.00%	0	4
Half Moon Bay	3	0	0.00%	0	0	0.00%	0	0	0.00%	0	3	100.00%	2	0	0.00%	0	2
Hillsborough	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Menlo Park	4,576	4,576	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Millbrae	2,317	2,317	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Pacifica	531	0	0.00%	0	0	0.00%	0	157	29.54%	2	374	70.46%	2	0	0.00%	0	4
Portola Valley	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Redwood City	25,278	5,048	19.97%	5	6,980	27.61%	4	5,914	23.40%	2	0	0.00%	0	7,336	29.02%	0	11
San Bruno	2,954	0	0.00%	0	2,954	100.00%	4	0	0.00%	0	0	0.00%	0	0	0.00%	0	4
San Carlos	833	0	0.00%	0	16,033	1925.19%	4	0	0.00%	0	833	100.00%	2	0	0.00%	0	6
San Mateo	45,644	5,595	12.26%	4	0	0.00%	0	16,646	36.47%	3	7,370	16.15%	1	0	0.00%	0	8
South San Francisco	64	64	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Woodside	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Unincorporated	1,120	825	73.70%	5	32	2.87%	3	0	0.00%	0	262	23.43%	1	0	0.00%	0	9
Total	**135,851**	**18,425**	**13.56%**	**4**	**40,980**	**30.17%**	**4**	**43,456**	**31.99%**	**2**	**25,653**	**18.88%**	**1**	**7,336**	**5.40%**	**0**	**11**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3	10.14%	Medium	2	6	12.29%	Medium	2	4	7.77%	Medium	2	2	**36**	**High**
Brisbane	High	3	0.00%	None	0	0	6.95%	Low	1	2	4.39%	Low	1	1	**9**	**Low**
Burlingame	High	3	12.23%	Medium	2	6	39.66%	High	3	6	25.06%	High	3	3	**45**	**High**
Colma	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	High	3	0.00%	None	0	0	0.01%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3	64.80%	High	3	9	43.12%	High	3	6	27.25%	High	3	3	**54**	**High**
Foster City	High	3	99.99%	High	3	9	99.66%	High	3	6	62.98%	High	3	3	**54**	**High**
Half Moon Bay	High	3	0.03%	Low	1	3	0.02%	Low	1	2	0.01%	None	0	0	**15**	**Low**
Hillsborough	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Menlo Park	High	3	9.76%	Low	1	3	28.75%	High	3	6	18.17%	High	3	3	**36**	**High**
Millbrae	High	3	6.44%	Low	1	3	10.84%	Medium	2	4	6.85%	Medium	2	2	**27**	**Medium**
Pacifica	High	3	1.54%	Low	1	3	2.76%	Low	1	2	0.89%	Low	1	1	**18**	**Medium**
Portola Valley	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Redwood City	High	3	33.54%	High	3	9	56.89%	High	3	6	35.95%	High	3	3	**54**	**High**
San Bruno	High	3	5.56%	Low	1	3	3.33%	Low	1	2	2.11%	Low	1	1	**18**	**Medium**
San Carlos	High	3	3.40%	Low	1	3	34.89%	High	3	6	22.05%	High	3	3	**36**	**High**
San Mateo	High	3	47.39%	High	3	9	40.52%	High	3	6	25.61%	High	3	3	**54**	**High**
South San Francisco	High	3	0.10%	Low	1	3	27.33%	High	3	6	17.27%	High	3	3	**36**	**High**
Woodside	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Unincorporated	High	3	1.68%	Low	1	3	15.76%	Medium	2	4	9.96%	Medium	2	2	**27**	**Medium**
Total	**High**	**3**	**19.09%**	**Medium**	**2**	**6**	**28.87%**	**High**	**3**	**6**	**18.25%**	**High**	**3**	**3**	**45**	**High**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3			3	9	12.29%	Medium	2	4	7.77%	Medium	2	2	**45**	**High**
Brisbane	High	3			0	0	6.95%	Low	1	2	4.39%	Low	1	1	**9**	**Low**
Burlingame	High	3			4	12	39.66%	High	3	6	25.06%	High	3	3	**63**	**High**
Colma	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	High	3			0	0	0.01%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3			4	12	43.12%	High	3	6	27.25%	High	3	3	**63**	**High**
Foster City	High	3			4	12	99.66%	High	3	6	62.98%	High	3	3	**63**	**High**
Half Moon Bay	High	3			2	6	0.02%	Low	1	2	0.01%	None	0	0	**24**	**Medium**
Hillsborough	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Menlo Park	High	3			5	15	28.75%	High	3	6	18.17%	High	3	3	**72**	**High**
Millbrae	High	3			5	15	10.84%	Medium	2	4	6.85%	Medium	2	2	**63**	**High**
Pacifica	High	3			4	12	2.76%	Low	1	2	0.89%	Low	1	1	**45**	**High**
Portola Valley	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Redwood City	High	3			11	33	56.89%	High	3	6	35.95%	High	3	3	**126**	**High**
San Bruno	High	3			4	12	3.33%	Low	1	2	2.11%	Low	1	1	**45**	**High**
San Carlos	High	3			6	18	34.89%	High	3	6	22.05%	High	3	3	**81**	**High**
San Mateo	High	3			8	24	40.52%	High	3	6	25.61%	High	3	3	**99**	**High**
South San Francisco	High	3			5	15	27.33%	High	3	6	17.27%	High	3	3	**72**	**High**
Woodside	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Unincorporated	High	3			9	27	15.76%	Medium	2	4	9.96%	Medium	2	2	**99**	**High**
Total	**High**	**3**			**11**	**33**	**28.87%**	**High**	**3**	**6**	**18.25%**	**High**	**3**	**3**	**126**	**High**

Sea Level Rise - ART 108" (bay) and OCOF 200cm with 100-yr storm (ocean) Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	2	1	3	0	1	1	4	**12**
BRISBANE	0	1	0	0	0	1	1	**3**
BURLINGAME	7	1	11	4	7	6	5	**41**
COLMA	0	0	0	0	0	0	0	**0**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	0	1	17	0	2	14	0	**34**
FOSTER CITY	9	0	4	2	4	19	10	**48**
HALF MOON BAY	0	0	0	0	0	0	0	**0**
HILLSBOROUGH	0	0	0	0	0	0	0	**0**
MENLO PARK	7	4	12	1	4	7	3	**38**
MILLBRAE	1	1	5	0	1	0	4	**12**
PACIFICA	2	0	8	0	1	1	1	**13**
PORTOLA VALLEY	0	0	0	0	0	0	0	**0**
REDWOOD CITY	21	6	84	17	11	47	22	**208**
SAN BRUNO	0	1	2	0	0	1	1	**5**
SAN CARLOS	1	1	4	5	3	7	4	**25**
SAN MATEO	5	4	24	1	21	25	29	**109**
SOUTH SAN FRANCISCO	2	7	21	10	3	4	22	**69**
WOODSIDE	0	0	0	0	0	0	0	**0**
UNINCORPORATED	13	3	2	6	1	4	51	**80**
Total	**70**	**31**	**197**	**46**	**59**	**137**	**157**	**697**

TSUNAMI

Exposure

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Acres of Inundation Area	Number of Structures in Inundation Area (2)							
													Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	1	0	0.0%	$202,400	$202,400	$404,799	0.0%	36	0	1	0	0	0	0	0	1
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0.0%	$0	$0	$0	0.0%	10,904	0	0	0	0	0	0	0	0
Burlingame	30,118	7,601	6,932	$11,121,820,561	150	52	0.2%	$1,222,364,796	$1,023,976,402	$2,246,341,198	20.2%	1,335	12	113	23	0	1	0	1	150
Colma	1,729	445	321	$1,269,795,262	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	52	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	1	0	0.0%	$1,679,381	$1,679,381	$3,358,762	0.1%	277	0	1	0	0	0	0	0	1
Foster City	33,033	7,904	7,732	$8,139,909,551	2	0	0.0%	$3,433,911	$3,433,911	$6,867,822	0.1%	9,996	0	2	0	0	0	0	0	2
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	1,235	3,743	30.1%	$542,818,094	$336,701,826	$879,519,920	24.8%	1,316	1,188	40	0	6	1	0	0	1235
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Menlo Park	35,254	9,073	8,545	$12,491,405,466	4	0	0.0%	$7,571,343	$7,571,343	$15,142,685	0.1%	7,257	0	2	0	2	0	0	0	4
Millbrae	22,832	6,013	5,796	$4,518,625,975	4	8	0.0%	$104,621,964	$54,156,245	$158,778,209	3.5%	61	2	2	0	0	0	0	0	4
Pacifica	38,331	11,998	11,733	$5,726,928,117	1,336	4,097	10.7%	$462,935,857	$311,997,537	$774,933,394	13.5%	680	1,254	75	1	0	3	1	2	1336
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Redwood City	86,754	19,257	18,203	$21,797,918,834	189	634	0.7%	$742,814,652	$867,992,231	$1,610,806,884	7.4%	15,686	133	22	31	0	0	2	1	189
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	0.0%	$0	$0	$0	0.0%	3	0	0	0	0	0	0	0	0
San Mateo	103,087	23,685	22,474	$23,908,243,752	1	0	0.0%	$25,353,385	$25,353,385	$50,706,770	0.2%	2,135	0	1	0	0	0	0	0	1
South San Francisco	67,879	16,695	15,441	$25,673,267,870	4	0	0.0%	$72,846,597	$83,959,777	$156,806,375	0.6%	13,075	0	3	1	0	0	0	0	4
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0	0
Unincorporated	66,083	19,926	18,700	$19,545,239,679	1,156	3,552	5.4%	$526,749,363	$413,139,253	$939,888,616	4.8%	17,245	1,005	116	16	10	2	4	3	1156
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**4,083**	**12,085**	**1.6%**	**$3,713,391,742**	**$3,130,163,691**	**$6,843,555,434**	**3.6%**	**80,060**	**3,594**	**378**	**72**	**18**	**7**	**7**	**7**	**4083**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Economic Impacts

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0	0	$0	$0	$0	0.0%
Belmont	26,813	7,335	7,072	$6,073,411,270	0	0	0	1	$370	$740	$1,110	0.0%
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0	0	$0	$0	$0	0.0%
Burlingame	30,118	7,601	6,932	$11,121,820,561	0	52	0	100	$43,995,491	$81,323,618	$125,319,109	1.1%
Colma	1,729	445	321	$1,269,795,262	0	0	0	0	$0	$0	$0	0.0%
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0	0	$0	$0	$0	0.0%
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0	0	$0	$0	$0	0.0%
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0	0	$0	$0	$0	0.0%
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	6	2,556	149	746	$175,349,489	$153,377,426	$328,726,914	9.3%
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	0	0	0	$0	$0	$0	0.0%
Menlo Park	35,254	9,073	8,545	$12,491,405,466	0	0	0	2	$33,091	$45,877	$78,968	0.0%
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	0	2	$802,730	$1,467,941	$2,270,671	0.1%
Pacifica	38,331	11,998	11,733	$5,726,928,117	5	2,508	151	941	$186,524,132	$173,747,882	$360,272,014	6.3%
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0	0	$0	$0	$0	0.0%
Redwood City	86,754	19,257	18,203	$21,797,918,834	2	274	19	169	$27,603,799	$56,828,955	$84,432,754	0.4%
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0	0	$0	$0	$0	0.0%
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	0	0	$0	$0	$0	0.0%
San Mateo	103,087	23,685	22,474	$23,908,243,752	0	0	0	1	$10,252,386	$13,801,860	$24,054,246	0.1%
South San Francisco	67,879	16,695	15,441	$25,673,267,870	2	0	0	3	$7,211,103	$11,247,538	$18,458,642	0.1%
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0	0	$0	$0	$0	0.0%
Unincorporated	66,083	19,926	18,700	$19,545,239,679	16	1,971	97	1,013	$333,420,323	$311,456,985	$644,877,308	3.3%
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**31**	**7,362**	**415**	**2,978**	**$785,192,914**	**$803,298,822**	**$1,588,491,736**	**0.8%**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 4.2 SP03, and adjusted to reflect the estimated population.
(6) Calculated using a user-defined (UDF) analysis in Hazus 4.2 SP03.

Social Vulnerability Index

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Belmont	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	49	0	0.00%	0	0	0.00%	0	0	0.00%	0	49	100.00%	2	0	0.00%	0	2
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Foster City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Half Moon Bay	3,835	0	0.00%	0	682	17.79%	3	2,586	67.43%	3	567	14.78%	1	0	0.00%	0	7
Hillsborough	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Menlo Park	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Millbrae	12	12	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
Pacifica	3,736	0	0.00%	0	0	0.00%	0	1,644	44.00%	3	2,092	56.00%	2	0	0.00%	0	5
Portola Valley	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Redwood City	403	403	100.00%	5	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	5
San Bruno	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
San Carlos	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
San Mateo	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
South San Francisco	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Woodside	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Unincorporated	2,814	36	1.29%	4	228	8.12%	3	0	0.00%	0	2,549	90.59%	2	0	0.00%	0	9
Total	**10,849**	**452**	**4.16%**	**4**	**911**	**8.39%**	**3**	**4,229**	**38.98%**	**3**	**5,258**	**48.46%**	**1**	**0**	**0.00%**	**0**	**11**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	Low	1	0.00%	None	0	0	0.01%	None	0	0	0.00%	None	0	0	**0**	**Low**
Brisbane	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Burlingame	Low	1	0.17%	Low	1	3	20.20%	Medium	2	4	1.13%	Low	1	1	**8**	**Low**
Colma	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	Low	1	0.00%	None	0	0	0.10%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Foster City	Low	1	0.00%	None	0	0	0.08%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Half Moon Bay	Low	1	30.11%	High	3	9	24.84%	Medium	2	4	9.29%	Medium	2	2	**15**	**Low**
Hillsborough	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Menlo Park	Low	1	0.00%	None	0	0	0.12%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Millbrae	Low	1	0.03%	Low	1	3	3.51%	Low	1	2	0.05%	Low	1	1	**6**	**Low**
Pacifica	Low	1	10.69%	Medium	2	6	13.53%	Medium	2	4	6.29%	Medium	2	2	**12**	**Low**
Portola Valley	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Redwood City	Low	1	0.73%	Low	1	3	7.39%	Low	1	2	0.39%	Low	1	1	**6**	**Low**
San Bruno	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Carlos	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Mateo	Low	1	0.00%	None	0	0	0.21%	Low	1	2	0.10%	Low	1	1	**3**	**Low**
South San Francisco	Low	1	0.00%	None	0	0	0.61%	Low	1	2	0.07%	Low	1	1	**3**	**Low**
Woodside	Low	1	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Unincorporated	Low	1	5.37%	Low	1	3	4.81%	Low	1	2	3.30%	Low	1	1	**6**	**Low**
Total	**Low**	**1**	**1.56%**	**Low**	**1**	**3**	**3.57%**	**Low**	**1**	**2**	**0.83%**	**Low**	**1**	**1**	**6**	**Low**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	Low	1			0	0	0.01%	None	0	0	0.00%	None	0	0	**0**	**Low**
Brisbane	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Burlingame	Low	1			2	6	20.20%	Medium	2	4	1.13%	Low	1	1	**11**	**Low**
Colma	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	Low	1			0	0	0.10%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Foster City	Low	1			0	0	0.08%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Half Moon Bay	Low	1			7	21	24.84%	Medium	2	4	9.29%	Medium	2	2	**27**	**Medium**
Hillsborough	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Menlo Park	Low	1			0	0	0.12%	Low	1	2	0.00%	None	0	0	**2**	**Low**
Millbrae	Low	1			5	15	3.51%	Low	1	2	0.05%	Low	1	1	**18**	**Medium**
Pacifica	Low	1			5	15	13.53%	Medium	2	4	6.29%	Medium	2	2	**21**	**Medium**
Portola Valley	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Redwood City	Low	1			5	15	7.39%	Low	1	2	0.39%	Low	1	1	**18**	**Medium**
San Bruno	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Carlos	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Mateo	Low	1			0	0	0.21%	Low	1	2	0.10%	Low	1	1	**3**	**Low**
South San Francisco	Low	1			0	0	0.61%	Low	1	2	0.07%	Low	1	1	**3**	**Low**
Woodside	Low	1			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Unincorporated	Low	1			9	27	4.81%	Low	1	2	3.30%	Low	1	1	**30**	**Medium**
Total	**Low**	**1**			**11**	**33**	**3.57%**	**Low**	**1**	**2**	**0.83%**	**Low**	**1**	**1**	**36**	**High**

Tsunami Hazard Area Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	0	0	0	0	0	0	0	**0**
BRISBANE	0	0	0	0	0	0	0	**0**
BURLINGAME	7	0	2	2	6	1	3	**21**
COLMA	0	0	0	0	0	0	0	**0**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	0	0	0	0	0	0	0	**0**
FOSTER CITY	0	0	0	0	0	0	1	**1**
HALF MOON BAY	3	0	2	1	2	5	3	**16**
HILLSBOROUGH	0	0	0	0	0	0	0	**0**
MENLO PARK	4	2	0	0	0	0	1	**7**
MILLBRAE	1	0	1	0	0	0	0	**2**
PACIFICA	2	0	18	0	1	4	4	**29**
PORTOLA VALLEY	0	0	0	0	0	0	0	**0**
REDWOOD CITY	1	3	30	9	0	4	10	**57**
SAN BRUNO	0	0	0	0	0	0	0	**0**
SAN CARLOS	0	0	0	0	0	0	0	**0**
SAN MATEO	0	0	5	0	0	5	2	**12**
SOUTH SAN FRANCISCO	0	0	0	0	0	0	12	**12**
WOODSIDE	0	0	0	0	0	0	0	**0**
UNINCORPORATED	2	0	5	0	0	9	18	**34**
Total	**20**	**5**	**63**	**12**	**9**	**28**	**54**	**191**

WILDFIRE

Exposure

Very High

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	989	3,712	13.8%	$699,037,611	$423,366,102	$1,122,403,713	18.5%	979	8	0	0	0	0	2	989
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Burlingame	30,118	7,601	6,932	$11,121,820,561	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Colma	1,729	445	321	$1,269,795,262	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	14	28	0.2%	$15,634,877	$11,636,466	$27,271,343	0.8%	9	2	0	3	0	0	0	14
Hillsborough	11,418	3,926	3,900	$3,326,778,876	1,265	3,692	32.3%	$621,566,515	$320,022,682	$941,589,198	28.3%	1,261	4	0	0	0	0	0	1,265
Menlo Park	35,254	9,073	8,545	$12,491,405,466	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Pacifica	38,331	11,998	11,733	$5,726,928,117	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Portola Valley	4,607	1,578	1,533	$1,561,897,019	146	427	9.3%	$79,544,337	$60,708,940	$140,253,277	9.0%	142	3	0	0	1	0	0	146
Redwood City	86,754	19,257	18,203	$21,797,918,834	987	4,613	5.3%	$454,747,267	$285,201,186	$739,948,453	3.4%	968	11	0	0	4	1	3	987
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Carlos	30,145	9,888	9,054	$10,559,383,070	2,036	6,742	22.4%	$808,482,389	$443,238,066	$1,251,720,455	11.9%	2,025	9	0	0	1	0	1	2,036
San Mateo	103,087	23,685	22,474	$23,908,243,752	551	2,417	2.3%	$374,166,065	$343,723,673	$717,889,739	3.0%	527	19	0	0	2	0	3	551
South San Francisco	67,879	16,695	15,441	$25,673,267,870	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Woodside	5,676	2,022	1,980	$1,694,299,578	696	1,967	34.6%	$314,463,082	$196,964,577	$511,427,659	30.2%	686	8	0	1	0	0	1	696
Unincorporated	66,083	19,926	18,700	$19,545,239,679	4,369	15,111	22.9%	$1,749,443,774	$1,123,697,010	$2,873,140,784	14.7%	4,276	34	3	44	2	4	6	4,369
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**11,053**	**38,709**	**5.0%**	**$5,117,085,918**	**$3,208,558,702**	**$8,325,644,620**	**4.3%**	**10,873**	**98**	**3**	**48**	**10**	**5**	**16**	**11,053**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

High

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Burlingame	30,118	7,601	6,932	$11,121,820,561	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Colma	1,729	445	321	$1,269,795,262	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Menlo Park	35,254	9,073	8,545	$12,491,405,466	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Pacifica	38,331	11,998	11,733	$5,726,928,117	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Redwood City	86,754	19,257	18,203	$21,797,918,834	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Mateo	103,087	23,685	22,474	$23,908,243,752	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
South San Francisco	67,879	16,695	15,441	$25,673,267,870	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Unincorporated	66,083	19,926	18,700	$19,545,239,679	1,458	4,573	6.9%	$1,219,355,370	$1,228,113,630	$2,447,469,000	12.5%	1,294	47	1	97	1	4	14	1,458
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**1,458**	**4,573**	**0.6%**	**$1,219,355,370**	**$1,228,113,630**	**$2,447,469,000**	**1.3%**	**1,294**	**47**	**1**	**97**	**1**	**4**	**14**	**1,458**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Moderate

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed	Number of Structures in Inundation Area (2)							
												Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Atherton	7,031	2,504	2,479	$2,851,840,817	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Belmont	26,813	7,335	7,072	$6,073,411,270	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Brisbane	4,633	1,816	1,566	$3,727,060,662	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Burlingame	30,118	7,601	6,932	$11,121,820,561	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Colma	1,729	445	321	$1,269,795,262	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Daly City	109,142	21,942	21,366	$12,987,124,886	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
East Palo Alto	30,794	4,590	4,409	$3,491,181,391	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Foster City	33,033	7,904	7,732	$8,139,909,551	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Half Moon Bay	12,431	4,158	3,946	$3,540,059,183	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Hillsborough	11,418	3,926	3,900	$3,326,778,876	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Menlo Park	35,254	9,073	8,545	$12,491,405,466	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Millbrae	22,832	6,013	5,796	$4,518,625,975	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Pacifica	38,331	11,998	11,733	$5,726,928,117	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Portola Valley	4,607	1,578	1,533	$1,561,897,019	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Redwood City	86,754	19,257	18,203	$21,797,918,834	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Bruno	45,454	11,696	11,234	$7,904,426,518	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Carlos	30,145	9,888	9,054	$10,559,383,070	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
San Mateo	103,087	23,685	22,474	$23,908,243,752	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
South San Francisco	67,879	16,695	15,441	$25,673,267,870	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Woodside	5,676	2,022	1,980	$1,694,299,578	0	0	0.0%	$0	$0	$0	0.0%	0	0	0	0	0	0	0	0
Unincorporated	66,083	19,926	18,700	$19,545,239,679	727	2,000	3.0%	$1,030,006,736	$895,582,972	$1,925,589,708	9.9%	566	26	2	131	0	1	1	727
Total	**773,244**	**194,052**	**184,416**	**$191,910,618,338**	**727**	**2,000**	**0.3%**	**$1,030,006,736**	**$895,582,972**	**$1,925,589,708**	**1.0%**	**566**	**26**	**2**	**131**	**0**	**1**	**1**	**727**

(1) Population estimates from 2020 population from State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Census Benchmark. Sacramento, California, May 2020.
(2) Values based off of 2020 tax assessor data from San Mateo County.
(3) Percent of residential buildings exposed multiplied by the Estimated Population.

Social Vulnerability Index

Jurisdiction	Estimated Exposed Population (1)	SOVI Rating - Very High			SOVI Rating - Relatively High			SOVI Rating - Relatively Moderate			SOVI Rating - Relatively Low			SOVI Rating - Very Low			Total Impact Factor
		Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	Population Exposed	% of Population Exposed	Impact Factor	
Atherton	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Belmont	5,020	0	0.00%	0	0	0.00%	0	5,017	99.94%	3	3	0.06%	1	0	0.00%	0	4
Brisbane	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Burlingame	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Colma	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Daly City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
East Palo Alto	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Foster City	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Half Moon Bay	31	0	0.00%	0	3	9.98%	3	27	90.02%	3	3	8.80%	1	0	0.00%	0	7
Hillsborough	3,455	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	3,455	100.00%	1	1
Menlo Park	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Millbrae	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Pacifica	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Portola Valley	392	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	392	100.00%	1	1
Redwood City	2,692	0	0.00%	0	0	0.00%	0	0	0.00%	0	2,057	76.44%	2	634	23.56%	0	2
San Bruno	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
San Carlos	6,104	0	0.00%	0	0	0.00%	0	651	10.67%	2	1,321	21.65%	1	4,131	67.68%	0	3
San Mateo	1,542	0	0.00%	0	0	0.00%	0	661	42.88%	3	104	6.71%	1	777	50.40%	0	4
South San Francisco	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0
Woodside	1,792	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	1,792	100.00%	1	1
Unincorporated	16,103	0	0.00%	0	3,397	21.09%	3	1,930	11.99%	2	2,857	17.74%	1	7,919	49.18%	0	6
Total	**37,128**	**0**	**0.00%**	**0**	**3,400**	**9.16%**	**3**	**8,287**	**22.32%**	**2**	**6,345**	**17.09%**	**1**	**19,099**	**51.44%**	**0**	**6**

(1) Population estimates from FEMA National Risk Index database.

Risk Ranking (High and Very High Fire Hazard Severity)

Baseline

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3	13.84%	Medium	2	6	18.48%	Medium	2	4	4.62%	Low	1	1	**33**	**High**
Brisbane	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Burlingame	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Colma	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Foster City	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Half Moon Bay	High	3	0.23%	Low	1	3	0.77%	Low	1	2	0.19%	Low	1	1	**18**	**Medium**
Hillsborough	High	3	32.33%	High	3	9	28.30%	High	3	6	7.08%	Medium	2	2	**51**	**High**
Menlo Park	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Millbrae	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Pacifica	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Portola Valley	High	3	9.26%	Low	1	3	8.98%	Low	1	2	2.24%	Low	1	1	**18**	**Medium**
Redwood City	High	3	5.32%	Low	1	3	3.39%	Low	1	2	0.85%	Low	1	1	**18**	**Medium**
San Bruno	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Carlos	High	3	22.37%	Medium	2	6	11.85%	Medium	2	4	2.96%	Low	1	1	**33**	**High**
San Mateo	High	3	2.34%	Low	1	3	3.00%	Low	1	2	0.75%	Low	1	1	**18**	**Medium**
South San Francisco	High	3	0.00%	None	0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Woodside	High	3	34.65%	High	3	9	30.19%	High	3	6	7.55%	Medium	2	2	**51**	**High**
Unincorporated	High	3	29.79%	High	3	9	27.22%	High	3	6	6.81%	Medium	2	2	**51**	**High**
Total	**High**	**3**	**5.60%**	**Low**	**1**	**3**	**5.61%**	**Low**	**1**	**2**	**1.40%**	**Low**	**1**	**1**	**18**	**Medium**

Equity Lens

	Probability		Impact on People				Impact on Property				Impact on Economy					
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Atherton	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Belmont	High	3			4	12	18.48%	Medium	2	4	4.62%	Low	1	1	**51**	**High**
Brisbane	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Burlingame	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Colma	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Daly City	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
East Palo Alto	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Foster City	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Half Moon Bay	High	3			7	21	0.77%	Low	1	2	0.19%	Low	1	1	**72**	**High**
Hillsborough	High	3			1	3	28.30%	High	3	6	7.08%	Medium	2	2	**33**	**High**
Menlo Park	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Millbrae	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Pacifica	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Portola Valley	High	3			1	3	8.98%	Low	1	2	2.24%	Low	1	1	**18**	**Medium**
Redwood City	High	3			2	6	3.39%	Low	1	2	0.85%	Low	1	1	**27**	**Medium**
San Bruno	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
San Carlos	High	3			3	9	11.85%	Medium	2	4	2.96%	Low	1	1	**42**	**High**
San Mateo	High	3			4	12	3.00%	Low	1	2	0.75%	Low	1	1	**45**	**High**
South San Francisco	High	3			0	0	0.00%	None	0	0	0.00%	None	0	0	**0**	**Low**
Woodside	High	3			1	3	30.19%	High	3	6	7.55%	Medium	2	2	**33**	**High**
Unincorporated	High	3			6	18	27.22%	High	3	6	6.81%	Medium	2	2	**78**	**High**
Total	**High**	**3**			**6**	**18**	**5.61%**	**Low**	**1**	**2**	**1.40%**	**Low**	**1**	**1**	**63**	**High**

Wildfire - Very High & High Severity Zones Critical Facilities Exposure

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
ATHERTON	0	0	0	0	0	0	0	**0**
BELMONT	0	0	4	0	0	0	0	**4**
BRISBANE	0	0	0	0	0	0	0	**0**
BURLINGAME	0	0	0	0	0	0	0	**0**
COLMA	0	0	0	0	0	0	0	**0**
DALY CITY	0	0	0	0	0	0	0	**0**
EAST PALO ALTO	0	0	0	0	0	0	0	**0**
FOSTER CITY	0	0	0	0	0	0	0	**0**
HALF MOON BAY	0	0	1	0	0	0	0	**1**
HILLSBOROUGH	0	0	0	0	0	0	5	**5**
MENLO PARK	0	0	0	0	0	0	0	**0**
MILLBRAE	0	0	0	0	0	0	0	**0**
PACIFICA	0	0	0	0	0	0	0	**0**
PORTOLA VALLEY	0	0	0	0	0	0	0	**0**
REDWOOD CITY	0	1	1	0	1	3	0	**6**
SAN BRUNO	0	0	0	0	0	0	0	**0**
SAN CARLOS	1	0	2	0	0	2	0	**5**
SAN MATEO	7	0	0	0	1	1	0	**9**
SOUTH SAN FRANCISCO	0	0	0	0	0	0	0	**0**
WOODSIDE	4	0	1	0	0	1	6	**12**
UNINCORPORATED	64	8	9	6	2	35	46	**170**
Total	**76**	**9**	**18**	**6**	**4**	**42**	**57**	**212**

2021 Multijurisdictional Local Hazard Mitigation Plan

Appendix F. San Mateo County Severe Weather Events Since 1950

F. SAN MATEO COUNTY SEVERE WEATHER EVENTS SINCE 1950

The table below lists past severe weather events in San Mateo County as recorded by NOAA since 1950. Although 225 events were reported to NOAA, only extreme heat, tornadoes, dense fog, thunderstorms with wind speeds over 50 knots, and windstorms with winds over 50 knots are listed in the table.

Date	Type	Deaths or Injuries	Property Damage
April 1, 1958	Tornado	0	$825,030
A tornado with a 0.2 mile length and 67 yard width impacted San Mateo County. This tornado does not have an associated magnitude.			
October 24, 1962	Severe Storms	Not reported	Not reported
Federal disaster declaration issued (DR-138)			
December 19, 1981 – January 8, 1983	Severe Storms, Flood, Mudslides, High Tide	Not reported	Not reported
Federal disaster declaration issued (DR-651)			
January 21 – March 30, 1983	Coastal Storms, Floods, Slides, Tornadoes	Not reported	Not reported
Federal disaster declaration issued (DR-677)			
February 12 – March 10, 1986	Severe Storms, Flooding	Not reported	Not reported
Federal disaster declaration issued (DR-758)			
March 10, 1986	Tornado	0	$30
A F0 tornado with a 0.2 mile length and 50 yard width impacted San Mateo County. The small waterspout moved ashore from the Pacific Ocean, flipped a car, and did minor property damage at a seaside restaurant at Moss Beach.			
December 19, 1990 – January 3, 1991	Severe Freeze	Not reported	Not reported
Federal disaster declaration issued (DR-894)			
January 3 – February 10, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	Not reported	Not reported
Federal disaster declaration issued (DR-1044)			
February 13, 1995 – April 19, 1995	Severe Winter Storms, Flooding, Landslides, Mud Flows	Not reported	Not reported
Federal disaster declaration issued (DR-1046)			
March 4, 1996	Heavy Rain	0	$0
1.48 inches of rain fell in Redwood City. The rain accumulated on the roof of Office Depot causing it to collapse.			
December 28, 1996 – April 1, 1997	Severe Storms, Flooding, Mud, and Landslides	Not reported	Not reported
Federal disaster declaration issued (DR-1155)			
January 2, 1998	Heavy Rain	12 Injuries	$0

Date	Type	Deaths or Injuries	Property Damage
Rain-slick roads caused several car accidents.			
January 11, 1998	Heavy Rain	1 Death	$0
Heavy rain contributed to a car accident. One fatality was recorded as a result of this event.			
February 2 – April 30, 1998	Severe Winter Storms and Flooding	Not reported	Not reported
Federal disaster declaration issued (DR-1203)			
February 7, 1998	Tornado	0	$0
A F0 tornado with a 0.2-mile length and 50-yard width impacted San Mateo County. The weak tornado ripped up some trees. It appears to have begun as a waterspout and moved onshore.			
February 13, 2000	Heavy Rain	0	$2,000,000
Widespread rain with 24-hour accumulations of more than 5 inches occurred over the area on Feb 13 – 14. Urban and small stream flooding occurred in most counties of the area. Many roads including Highway 1 and Highway 116 were closed. Twenty-nine people were evacuated in Pescadero due to high waters. A number of houses in Daly City were abandoned and eventually destroyed due to mudslides. The roof of a Home Depot collapsed due to the accumulation of heavy rain.			
December 15, 2002	Heavy Rain	0	$0
December was one of the wettest on record at many locations throughout the area. The most serious storm episode was December 13 – 21. A very strong and moist jet stream across the Pacific Ocean brought a series of storms into California. Locally heavy rain pounded the North Bay counties for days.			
October 19, 2004	Thunderstorm Wind	0	$50,000
A thunderstorm produced a 60 mph wind gust that snapped two large trees, with one falling on a house.			
March 20, 2005	Tornado	0	$800,000
A F1 tornado with a 3-mile length and 30-yard width impacted San Mateo County. The tornado damaged approximately 60 structures.			
December 1, 2005	High Wind	0	$0
A strong winter storm brought a 64 mph gust to San Francisco Airport.			
December 17, 2005 – January 3, 2006	Severe Storms, Flooding, Mudslides, and Landslides	Not reported	Not reported
Federal disaster declaration issued (DR-1628)			
December 18, 2005	High Wind	0	$0
A wind gust reached 71 mph at Angel Island during a winter storm.			
December 31, 2005	High Wind	0	$0
A wind gust measured 58 mph at San Francisco Airport during a strong winter storm.			
February 27, 2006	High Wind	1 Death	$0
A storm system produced winds of varying levels throughout the region. In Half Moon Bay, wind gusts of 59 mph were recorded. In Daly City, wind gusts of 63 mph were recorded. A 73 year old woman was killed in Boulder Creek when wind gusts estimated at 70 mph tore the top off a redwood tree and hurled it into her yard, where she was walking her dog.			
March 29 – April 16, 2006	Severe Storms, Flooding, Landslides, and Mudslides	Not reported	Not reported
Federal disaster declaration issued (DR-1646)			
July 22, 2006	Heat	0	None Reported
A large dome of High Pressure brought hot conditions to the SF Bay Shoreline - with a moist southeast flow keeping temperatures unusually warm overnight. High temperatures reached as high as 103 degrees with low temperatures at night only falling into the lower 70s.			
January 4, 2008	High Wind	0	$0
A very strong cyclone slammed into the San Francisco and Monterey Bay areas bringing flooding rains, high winds, record high surf and coastal flooding. Hundreds of thousands of residences and businesses were without power, some for several days due to high winds toppling power lines. Property damage in the millions was reported. Winds gusted to 66 mph at Pigeon Point, 67 mph at San Francisco Airport, 58 mph and 81 mph at Pillar Point, 58 mph at Oakland Airport, and 72 mph in Daly City.			
February 15, 2009	High Wind	0	$25,000

Date	Type	Deaths or Injuries	Property Damage
An eastern Pacific storm produced strong wind and heavy rain as it moved through the San Francisco Bay Area. Over 61,000 Bay Area customers lost power. High wind knocked down numerous trees in the Santa Cruz Mountains causing Highway 9 at Highway 236 to close at 6:30 a.m. and knocked down power lines closing Thurber Lane at Twelfth Avenue during the morning. Trees and branches slowed traffic along Highway 17, Bear Creek Road and Middle Ellen Road.			
April 14, 2009	High Wind	0	$80,000
High winds along the San Francisco Bay Area shoreline caused numerous power outages and downed trees. A big-rig blew over in the westbound lane of the San Mateo Bridge closing the entire bridge for more than an hour. Shortly afterwards a 70-foot fishing vessel was blown into the bridge after losing power. The Redwood City Mesonet observation site reported a gust to 50 knots.			
May 2, 2009	Dense Fog	0	$25,000
Dense fog along with a slippery road surface caused eight traffic collisions along Highway 17 in the Santa Cruz County mountains. No major injuries were reported.			
May 17, 2009	Heat	0	$10,000
High pressure aloft centered over Reno, NV along with weak offshore flow at the surface caused temperatures to rise to near 100 degrees in the inland valleys of north-central California. Heat exhausted individuals, blown electric transformers and power outages accompanied the heat. Temperatures rose into the upper 80s to mid-90s across the peninsula of the San Francisco Bay Area.			
October 13, 2009	High Wind	0	$3,400,000
Heavy rain combined with very strong wind through Northern and Central California to cause numerous trees, tree limbs, and power and telephone poles to fall. Pacific Gas and Electric reported over 277,000 customers had lost power in the San Francisco and Monterey Bay areas with $13 million dollars in damage. Record-breaking heavy rain led to flooding and debris flows. Fierce winds downed trees on Rapley Ranch Road near State Route 35, on State Route 35 near Mountain House Restaurant in Kings Mountain, and along State Route 84 at the junction of State Route 35. A huge oak tree crushed a house in Redwood City and brought down power lines. Also in Redwood City, dozens of trees were toppled, including at least two that hit houses or parked cars. In San Mateo County, at least 47 trees and 31 sets of power lines were knocked over. In Pescadero, a large tree was blown onto North Street at Pescadero Road, blocking both lanes of traffic. Wind also caused power outages all across San Mateo County. About 58,000 community members lost power during the storm.			
October 13, 2009	Heavy Rain	3 Injuries, 1 Death	$100,000
This powerful rainstorm overwhelmed pipes and manholes in San Mateo, San Carlos, and Millbrae causing over 127,000 gallons of untreated sewage to flow into streets and creeks. Over 55,000 gallons of raw sewage spilled into San Francisco Bay. The California Highway Patrol responded to a three car collision on Highway 1 at Devil's Slide. Heavy rain and strong winds were a contributing factor of the crash. A 74-year-old woman lost her life in the accident.			
January 18, 2010	Thunderstorm Wind	0	$0
Squall line thunderstorms moved across the San Francisco International Airport producing wind gusts to 59 mph. Numerous power lines and trees were knocked down when strong wind combined with saturated soil.			
January 18, 2010	High Wind	0	$230,000
High wind knocked over power poles along San Mateo County's coast causing 12,000 customers to lose power. Downed power lines were reported in Half Moon Bay, at the intersection of Cedar and Acacia Avenues, along the 700 block on Main Street, and at Park Avenue in Moss Beach; and in Pacifica. The wind also caused damage to fixtures on the roof at the Half Moon Bay City Hall, and it dislodged a patio roof behind Sam's Chowder House, damaging solar panels used to power the restaurant. The Half Moon Airport Mesonet site reported a wind gust of 69 mph at 10:00 a.m. PST. At least 12,000 customers lost power in San Mateo County.			
January 19, 2010	High Wind	0	$40,000
High wind blew an oak tree down onto a car while a woman was driving it along Old La Honda Road near Woodside. The woman was unhurt and the car sustained minor damage. In Woodside, State Route 84 was closed at Grandview Drive due to downed trees. The ASOS at the San Francisco International Airport reported a peak wind gust of 62 mph at 6:09 a.m. PST. And, the Bay Area Air Quality Management District's Point San Pablo Mesonet site reported a peak wind gust of 59 mph at 6:00 a.m. PST. The Spring Valley RAWS site reported a peak wind gust of 73 mph at 6:00 a.m. PST. And, the Pigeon Point automated site reported a peak wind gust of 62 mph at 5:00 a.m. PST. Power outages occurred throughout the area forcing Canada College in Redwood City, the College of San Mateo and Stanford University to cancel classes.			

Date	Type	Deaths or Injuries	Property Damage
January 20, 2010	High Wind	0	$260,000
Strong winds brought trees and power lines down across the San Francisco Bay Area. In Menlo Park, a driver was injured when the top of a Redwood tree came crashing through his windshield as he was driving on Santa Cruz Avenue near Hillview Middle School. Strong wind brought trees and power lines down onto State Route 1 just north of the Santa Cruz and San Mateo County line. The road was closed for two hours.			
January 20, 2010	Thunderstorm Wind	1 Injury	$0
The third in a series of significant storms brought strong winds and heavy rain to the San Francisco and Monterey Bay areas. This storm, the strongest of the week, developed over the Pacific Ocean with a strong parent low pressure based in the Gulf of Alaska. Around 159,000 customers lost power across the San Francisco Bay area with nearly 22,000 customers without power in the Monterey Bay area. Numerous power lines and trees were knocked down when strong wind combined with saturated soil. Also, areas of flooding occurred causing mainly problems for vehicles. A RAWS site at Spring Valley reported a wind gust to 64 mph at 9:19 a.m. PST.			
February 16, 2010	Dense Fog	N/A	N/A
The NWS issued a dense fog advisory for the Bay Area, with notice of visibility being less than a quarter-mile in many areas.			
December 28, 2010	High Wind	0	$15,000
Damaging wind brought a tree down onto State Route 9 causing its closure from one mile south to 2.9 miles south of the south Junction of State Route 236. The Highway was closed from 6:20 p.m. to 10:29 p.m. PST.			
February 15, 2011	High Wind	0	$150,000
Strong and gusty wind developed ahead of a long wave trough. Southwesterly to westerly winds began to increase late in the afternoon and peaked in the late evening. A mesonet automated weather reporting system measured a wind gust of 60 mph at midnight. Other automated observation systems around the area above 1,000 feet in elevation reported gusts up to 83 mph. The wind caused large trees and power lines to fall. Also, road closures occurred due to the downed trees and power lines. Overall, more than 6,500 customers lost power in the San Francisco Bay Area.			
November 27, 2011	Dense Fog	N/A	N/A
Dense fog advisories were issued for multiple bridges around the Bay Area, including the San Mateo Bridge, the Dumbarton Bridge, the Benicia Bridge and the Carquinez Bridge. Inland roads were expected to have heavy fog and poor visibility until mid-afternoon.			
November 29, 2011	Dense Fog	N/A	N/A
Dense fog advisories were issued for Bay Area bridges, including the San Mateo and Bay Bridges. Overall visibility for the region ranged between a half-mile to 300 feet.			
March 14, 2012	Heavy Rain	5 Injuries	$50,000
Two accidents shut down Highway 1 for brief periods. One occurred on March 14 which was a head-on crash just south of Devil's Slide. Two sedans were involved with minor injuries to the two drivers. The other occurred on March 16 when two trucks collided at 10:45 am west of the turnoff for Ox Mountain landfill. Three riders suffered minor cuts and bruises.			
November 28, 2012	High Wind	0	$1,000
A wind gust of 61 mph was measured at Spring Valley RAWS, at elevation of 1,075 feet, causing numerous downed trees and some power outages.			
December 21, 2012	Heavy Rain	0	$0
A series of storm systems, part of a large Atmospheric River type of pattern, impacted the area during late December 2012. From December 21 through 26, heavy rain, gusty winds, flooding, and mudslides occurred across the Bay Area in these consecutive events. Downed trees, powerlines, and flooded roadways impacted community members over the Christmas holiday season.			
April 8, 2013	Heavy Rain	0	$1,000
High winds impacted operations at San Francisco International Airport overnight with wind gusts measured at 60 mph. High winds blew out the front window of a house in Daly City.			
February 28, 2014	Heavy Rain	0	$0
A Pacific storm system moved across the Bay Area on February 28. It dropped several inches of rainfall and brought gusty winds to the area. This resulted in flooding of urban areas, small streams and creeks, and damage to power lines and trees, and a few localized mud and rockslides.			
November 10, 2014	Dense Fog	N/A	N/A
Dense fog surrounded the San Francisco Bay Area, including San Mateo County.			

Date	Type	Deaths or Injuries	Property Damage
November 28, 2014	Dense Fog	N/A	N/A
The California Highway Patrol issued dense fog advisories for a number of Bay Area bridges, including San Mateo Bridge, and on U.S. Highway 101. Patchy, thick fog and poor visibility was reported and estimated to last until 9 a.m.			
December 11, 2014	Heavy Rain	0	$0
An Atmospheric River event brought heavy rain and gusty winds with a strong winter storm that impacted the Bay Area for several days in mid-December.			
February 9, 2015	Heavy Rain	0	$0
A strong winter storm finally impacted California following nearly a month and a half of no rain and the driest January on record. The storm brought heavy rain, gusty winds, and damage to trees and power lines along with some minor flooding of urban areas. A 72 hour rainfall total of 5.43 inches was measured from Emerald Lake Hills at elevation 472 feet. This was the highest storm total in San Mateo County.			
March 10, 2015	Dense Fog	N/A	N/A
The NWS issued dense fog advisories for all valleys and coastal locations in the San Francisco and Monterey Bay areas. Visibility reports were estimated to be a quarter-mile or less, and officials noted that visibility could drop to zero in parts of the San Francisco Bay Area.			
January 18 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	Not reported	Not reported
Federal disaster declaration issued (DR-4305)			
February 1 – 23, 2017	Severe Winter Storms, Flooding, and Mudslides	Not reported	Not reported
Federal disaster declaration issued (DR-4308)			
September 1, 2017	Excessive heat	3	None reported
A strong upper level ridge brought widespread hot temperatures to the Bay Area leading up to and through Labor Day Weekend. Numerous daily and monthly records were broken as well as a few all-time record max temperatures. Three San Mateo county community members died over the weekend as a result of the heat.			
October 2018	PSPS	N/A	N/A
PG&E induced outage dure to extreme weather conditions			
June 10, 2019	Excessive Heat	0	None reported
The combination of high pressure and strong offshore flow resulted in an early season heat wave across the Bay Area from June 9th to the 11th. Multiple daily records were broken across the region and multiple power outages were reported due to the heat. The heat wave across the region triggered power outages knocking out service to 26,400 people across 9 counties on Monday followed by an additional 30,400 on Tuesday			
August 19, 2020	Excessive Heat	0	None reported
A prolonged and oppressive heat wave swept the Central Coast and Bay Area for almost a week from August 14th to August 19th with widespread record-breaking temperatures observed across the region. This was caused by a strong high-pressure system over the Desert Southwest that expanded westward into California. This dome of heat brought hot temperatures to the area for several days. Multiple days of triple digit afternoon highs were recorded inland with some coastal locations even reaching the mid-90s. Several days of hot and dry weather further dried fuels over the area increasing fire danger. During this event, a surge of monsoonal and tropical moisture from a former Tropical Storm advected northward with sufficient instability to generate multiple high based and dry thunderstorms that produced several thousand lightning strikes over the Greater Bay Area.			
September to November 2019	PSPS	N/A	N/A
PG&E induced outage dure to extreme weather conditions			

Notes: ASOS = Automated Surface Observing Systems; F# = Fujita Scale, followed by magnitude of tornado; mph = miles per hour; N/A =– Not Applicable; NWS = National Weather Service; PST = Pacific Standard Time; RAWS = Remote Automatic Weather Stations

Sources: NOAA, 2021; San Francisco CBS Local, 2014; Patch.Com, 2011, 2015, Banjo.com, 2014, ABC30.com, 2011; Inside the Bay Area, 2010

Appendix G. FEMA Approval and Partner Adoption Resolutions

G. FEMA APPROVAL AND PARTNER ADOPTION RESOLUTIONS

To be provided with final draft