City of San Leandro

2017 Local Hazard Mitigation Plan

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2017 Local Hazard Mitigation Plan

April 2017

Access this plan online at:
www.cityofsanleandro.org/mitigation

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1. EXECUTIVE SUMMARY

1.1 OVERVIEW

San Leandro is a vibrant and thriving community, but every aspect of the city – its economic prosperity, social and cultural diversity, and historical character – could be dramatically altered by a serious earthquake or fire. While we cannot predict or protect ourselves against every possible hazard that may strike the community, we can anticipate many impacts and take steps to reduce the harm they can cause.

This Local Hazard Mitigation Plan continues San Leandro's emphasis on hazard mitigation prior to disasters, including maintenance of infrastructure, requirements for new construction beyond the uniform codes and education of residents and community groups. The City has continued to adopt amendments to the uniform building codes with each code cycle to improve seismic safety and fire safety. The City provides extensive public education in emergency preparedness through a variety of means, including classes, community events and the newly created San Leandro Community Emergency Response Training (CERT) program that trains individuals and groups on how to make their homes, businesses and neighborhoods more resilient as well as how to respond in a disaster.

1.2 PURPOSE

The City of San Leandro is located in an urban area and is subject to earthquakes, landslides, urban/wildland fires, urban creek flooding, and major transportation accidents. The City has sustained millions of dollars in damages from earthquakes, flooding and landslides. As a result, in 1991, the Federal Emergency Management Agency (FEMA) named the City of San Leandro as a Project Impact City, which called for the City to:

- Identify and delineate hazards, and assess risk and vulnerability within the City
- Develop a comprehensive risk reduction program for the community that includes information, education, prevention and policy/legislation
- Develop technical and financial assistance for safety efforts that can be made available (including incentives) to facilitate loss-reduction projects
- Document and broadcast the successes of Project Impact

This Local Hazard Mitigation Plan (LHMP) wraps in the many hours of work and outreach devoted to the Project Impact initiative as well as current planning efforts in order to comply with the Disaster Mitigation Act of 2000 requirements.

San Leandro's original Hazard Mitigation Plan, adopted on July 5, 2005 by the City Council, was reviewed and commented on by the State Hazard Mitigation Officer in the Governor's Office of Emergency Services, FEMA, and the public. Upon acceptance by FEMA, the City will gain eligibility for Hazard Mitigation Grant Program funds.

1.3 GOALS

The following goals are the foundation for the objectives detailed below and are considered the basis for hazard mitigation in the City of San Leandro.

LHMP-1. **Protect the community.** Protect the community from unreasonable risk to life and property caused by hazards and/or disaster events.

LHMP-2. **Build local government capacity.** Build local government capacity by hardening facilities, updating, and implementing a continuity of government plan to respond to hazards and disaster events.

LHMP-3. **Protect economic resources.** Protect San Leandro's economic resources to provide assistance in disaster relief and recovery; and sustain an economic base to support services for San Leandro residents, employees and visitors.

LHMP-4. **Establish a comprehensive outreach plan.** Establish a comprehensive outreach plan to empower residents to be better educated about, prepared for, and self-reliant to address hazards or disaster events through multilayered relationships with the community.

1.4 OBJECTIVES

The following objectives are meant to serve as a "measuring stick" upon which individual hazard mitigation projects can be evaluated.

Project Criteria Objectives may include, but are not limited to the following:

- Assuring the Hazard Mitigation Plan is a functional document that identifies short- and long-term strategies and describes each measure including:
- Identification of person, agency or organization responsible for implementation
- Projecting a time frame for implementation.
- Explanation of how the project will be financed including the conditions for financing and implementation as information is available
- Be consistent with, support and help implement the goals and objectives of hazard mitigation plans already in place for the geographic area in question
- Be based on the City of San Leandro's Hazard Vulnerability Analysis
- Have significant potential to reduce damages to public and/or private property or reduce the cost of local, state and federal recovery from future disasters
- Be the most practical, cost-effective and environmentally sound alternative after consideration of the options
- Address a repetitive problem, or one that has the potential to have a major impact on an area, reducing the potential for loss of life, loss of essential services and personal property, damage to critical facilities, economic loss, hardship, or human suffering
- Meet applicable permit requirements
- Develop mitigation standards for development in hazardous areas
- Contribute to both the short-and long-term solution to the hazard vulnerability risk problem
- Assuring the benefits of a mitigation measure is equal to or exceeds the cost of implementation

- Have manageable maintenance and modification costs
- When feasible, be designed to accomplish multiple objectives including improvement of life-safety risk, damage reduction, restoration of essential services, protection of critical facilities, security of economic development, recovery, and environmental enhancement
- Whenever feasible, use existing resources, agencies, and programs to implement the project
- Include regional hazard mitigation concerns and strategies
- Identification of Community Local Background
- Other Factors Impacting Community

1.5 AUTHORITY

Federal Laws

1. " The Federal Civil Defense Act of 1950"
2. Public Law 96-342 "The Improved Civil Defense Act of 1980"
3. Public Law 91-606 "Disaster Relief Act"
4. Public Law 93-288 "The Robert T. Stafford Disaster Relief Act of 1974"
5. Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act
6. Public Law 106-390 enacted by Section 104 of the Disaster Mitigation Act of 2000 (DMA)
7. Interim Final Rule for DMA 2002 as published in the February 26, 2002, at 44 CFR Part 201

State Laws

1. State of California Emergency Services Act, Chapter 7 of Division 1 of Title 2 of the Government Code
    a. Article 2 General Definitions. 8558 - § c. Local Emergency
    b. Article 10 Local Disaster Councils. 8610 – Creation by Ordinance; Plan Development
    c. Article 14 Local Emergency.
        i. 8630 – Proclamation by Local Governing Body; Duration: Review
        ii. 8631 – Provision of mutual aid by political subdivisions
        iii. 8632 – Provision of mutual aid by state agencies
        iv. 8633 – Costs incurred in executing mutual aid agreements as charge against state

v. 8634 – Promulgation of orders and regulations; Curfew
vi.

d. Article 15 Preservation of Local Government
   i. 8635 – Need for local governments to preserve law and order and to continue and restore local services in case of enemy attack
      1. 8636 – Unavailable officer
      2. 8637 – Succession of department heads
      3. 8638 – Stand-by Officers
      4. 8639 – Investigation of qualifications of stand-by officers
      5. 8640 – Oath of Office and tenure of stand-by officers
      6. 8641 – Duties of stand-by officers
      7. 8642 – Meeting of governing body whatever emergency exists
      8. 8643 – Duties of local governing body during state of emergency
      9. 8644 – Appointment of temporary officers

2. Natural Disaster Assistance Act, Chapter 7.5 of Division 1 of the Government Code.

Local Laws

Local building codes are modeled after the:

- 2016 California Building Code (1997 UBC and as amended by City Ordinance)
- 2016 California Fire Code (2000 UFC)
- 2016 California Mechanical Code (2000 UMC)
- 2016 California Plumbing Code (2000 UPC)
- 2016 California Electrical Code (1999 NEC)
- 2016 California Housing Code (2000 UHC)

1.6 DISASTER MITIGATION ACT

The Disaster Mitigation Act of 2000 (DMA 2000) requires that each State develop a hazard mitigation plan in order to receive future funding following a disaster. The new requirement provides some funding to each State to engage in planning activities to prepare the plan. The requirements also call for the development of local or county plans for that particular jurisdiction to be eligible for post-disaster funding. The purpose of these requirements is to have programs and projects in place that will help minimize the loss of life, property, environment, and total cost of disasters.

DMA 2000 §201.6 (c) (3) of the requirements outlines the process for localities in developing their mitigation strategies. Specifically, the Local Hazard Mitigation Plan must "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." These strategies should be built on an assessment of hazard risks and vulnerabilities. The plans should include measures to mitigate hazard risks and demonstrate the benefit of these activities. They should also identify gaps in knowledge and data and a strategy to maintain and update the data, projects, information, and the overall mitigation plan.

1.7 CITY OF SAN LEANDRO GENERAL PLAN

The updated San Leandro General Plan 2035 was adopted by the San Leandro City Council in September 2016. The City is committed to the safety and well-being of all San Leandro residents, businesses, and the ability of the Government to provide essential functions after a major disaster. To reflect the importance of emergency preparedness and hazard mitigation San Leandro has placed two specific sections into the 2016 General Plan pertaining to Hazard Mitigation and emergency preparedness.

1.1 GOAL EH-1 Mitigation of Natural Hazards

Reduce the potential for injury, property damage, and loss of life resulting from earthquakes, landslides, floods and other natural disasters.

Related Policy and Actions:

- **Policy EH-1.2:** **Earthquake Retrofit**
  Action EH-1.2.A: Residential Retrofit program
  Action EH-1.2.B: Change of Occupancy Upgrade
  Action EH–1.2.C Soft-Story Buildings

- **Policy EH-1.3:** **Off-site Impacts of Hillside Development**

- **Policy EH -1.4:** **Code Revisions**

- **Policy EH –1.5:** **Public Awareness**
  Action EH-1.5.A: Educational Materials

- **Policy EH- 1.6:** **Construction of Flood Plain**
  Action EH -1.6.A: FIRM Amendments

- **Policy EH –1.7.A:** **Reduce Flood Hazards**
  Action EH - 1.7.A: Coordination with ACFCWCD
  Action EH – 1.7.B: Increase Flood Channel Capacity

- **Policy EH - 1.8:** **Sea Level Rise**
  Action EH – 1.8.A: Adaptation Plans

1.6.2 GOAL EH - 6: Emergency Preparedness

Attain and sustain comprehensive and highly effective emergency preparedness and recovery programs.

Related Policy and Actions:

- **Policy EH – 6.1:** **Preparedness as a Top Priority**
  Action EH – 6.1.A Essential Service Facility Upgrades

- **Policy EH – 6.2.** **SEMS Planning**
  Action EH – 6.2.A Emergency Operations Plan Update
  Action EH – 6.2.B Local Hazard Mitigation Plan Update

- **Policy EH – 6.7.** **Schools and Hospitals**

- **Policy EH – 6.10** **Funding Sources**
  Action EH - 6.10.A Brace and Bolt Program

- **Policy EH – 6.11:** **Climate Change**

2. PLANNING PROCESS

2.1 PLANNING COMMITTEE

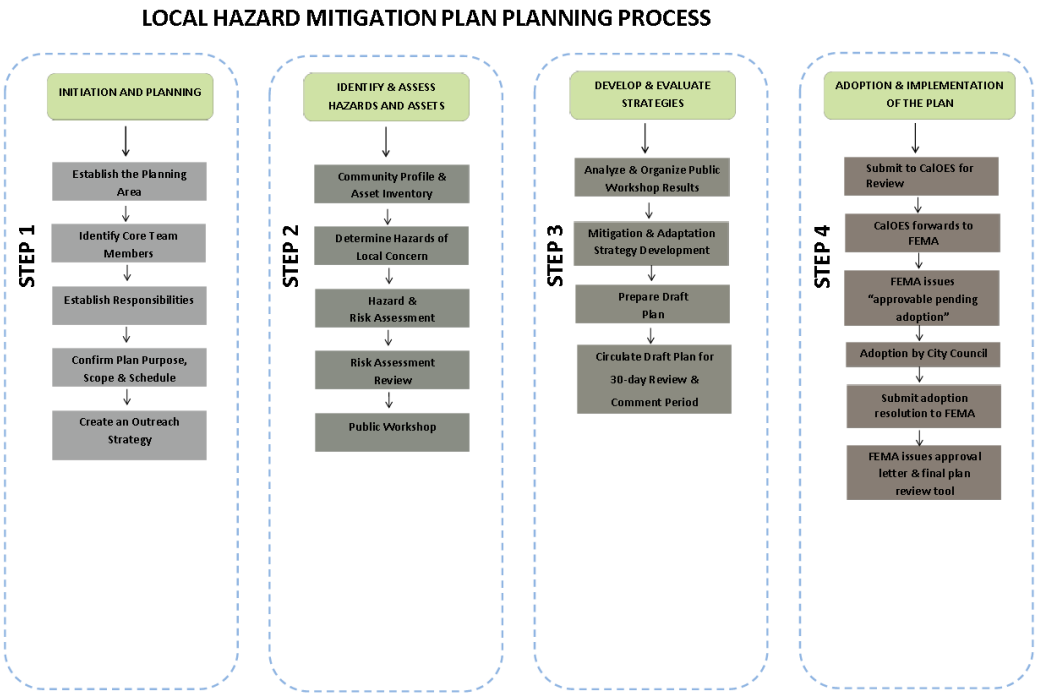
The City of San Leandro's Planning Team was developed to achieve the requirements as outlined in Section 1.6 Disaster Mitigation Act of 2000 Requirements. The planning team members were chosen based on their ability to provide detailed information regarding hazards with in San Leandro due to their subject matter expertise within their field, and develop mitigation strategies related to identified hazards. The Planning Committee participated in multiple group meetings.

Planning Committee Members:

Chief Sandra Spagnoli	San Leandro Police Department
Captain Luis Torres	Emergency Services Manager, SLPD
Chief Terence Carey	Division Chief Alameda County Fire Department

Heidi DeRespini	Emergency Services Specialist, City of San Leandro
Debbie Pollart	Director of Public Works, City of San Leandro
Cynthia Battenberg	Director of Community Development
Jerome A. Smith Jr.	Chief Building Official, Community Development
Nick Thom	City Engineer, Engineering and Transportation
Tony Batalla	Manager of Information Technology

Figure 2-1 Local Hazard Mitigation Planning Process



2.2 REVIEW TIMELINE

The Planning Team (PTM) had its kickoff meeting in July of 2015. During this meeting members were introduced to the Hazard Mitigation process and asked to review the 2005 and 2010 Hazard Mitigation plan and if needed assign other employees to the team.

August 2015 – Risk Assessment Meeting: The PTM was tasked with determining hazards of local concern, summarizing vulnerability, and develop community engagement strategies.

August – December 2015 Public Outreach: PTM designed a multi-tiered outreach plan that included information on the City's website, printed information at city facilities, and a survey online, and also at city facilities and events. The City's Emergency Services specialist staff also presented the draft LHMP at a community outreach meeting on

November 19th as well as presenting information regarding the update to the LHMP at the December 7th San Leandro City Council meeting.

October 2015 – Mitigation and Adaptation Strategies: PTM identified mitigation strategies and adaptation goals. Once strategies and goals were identified PTM were tasked with prioritizing the strategies based on the City's ability to accomplish

December 2015 – January 2016 Review Process: PTM members were given the opportunity to review the mitigation strategies and make changes to plan.

March 2016 – Plan submitted to State Office of Emergency Services.

2.3 REGIONAL PLANNING PROCESS

The City of San Leandro participated in the regional planning process by attending all ABAG workshops, conferences, and meetings. During these meetings, representatives from City of San Leandro were able to discuss and accordingly plan for hazards specific to San Leandro with local partners and stakeholders. ABAG organized and invited all participants via email invite and advertised the meetings on their website. The Cities Emergency Service Specialist was present at all of the meetings mentioned below. Participants were not provided a list of attendee's titles from the meetings, but those attendees who were related to San Leandro LHMP process are notated

The ABAG meetings were held on the following dates:

#1 April 16, 2015 Resilience Planning Process Overview - Redwood City

Representatives from Alameda County Office of Emergency Services –Emergency Coordinator(s), San Mateo County Office of Emergency Services, Emergency Coordinator(s), Cal Trans, Bay Area Rapid Transit (BART), PG&E Public Relations Representative, East Bay Municipal Water District and other local municipalities such as City of Oakland and City of Alameda. During the meeting ABAG walked, the City's planning team through the LHMP process and timeline.

#2 June 23, 2015 Hazard and Risk Assessment – Foster City

Representatives from Alameda County Office of Emergency Services, FEMA Mitigation Specialist, CAL OES, Cal Trans, Bay Area Rapid Transit (BART), PG&E, East Bay Municipal Water District and other local municipalities such as City of Hayward and City of Alameda Public Works. ABAG systematically walked participants at the meeting through the hazard and risk assessment process.

#3 September 16, 2015 Risk Landscape – Oakland

Representatives from Alameda County Office of Emergency Services, FEMA, CAL OES, Cal Trans, Bay Area Rapid Transit (BART), PG&E, East Bay Municipal Water District and other local municipalities such as City of Hayward, City of Oakland and City of Alameda.

City representatives also took part in regional meetings, hosted by ABAG to help the cities in Alameda County to network with agencies such as BART, EBMUD, CAL Trans and PG&E This meeting allowed City of San Leandro representatives to gather regional stakeholder information specific to San Leandro and discuss hazard mitigation planning and efforts in San Leandro with stakeholders.

City of San Leandro Disaster Council

In addition to those agencies and stakeholders mentioned above the City's Disaster Council hosted two meetings to discuss regional partnerships and Hazard Mitigation. Regional stakeholders were invited to the Disaster Council meetings via an email from the city. PTM members compiled information from ABAG regional meetings and San Leandro stakeholder meetings and added them to the 2017 updated LHMP as applicable. The attendees included

Utilities and Public Agencies:

PG&E Disaster Preparedness Coordinator Les Putnam,

East Bay Municipal Water District – Elizabeth Z. Bialck Engineering Manager Association of Bay Area Governments (ABAG) Danielle Meiler, Dana Brechwald, Michael Germeraad,

East Bay Regional Parks District Kenneth Miller (Park Supervisor) provided technical assistance.

School Districts: San Leandro Risk Manager Jason Toro, San Lorenzo Risk Manager Barbara Corrick

2.4 COMMUNITY ENGAGEMENT PROCESS

The involvement and opinion of the City's residents was very important to the hazard mitigation planning process, because of this, the Planning Committee formulated multiple opportunities for the public to learn about the Hazard Mitigation process, the hazards in San Leandro, and provide their input.

1. Public review of San Leandro's 2005 and 2010 Hazard Mitigation plan on the City's website www.sanleandro.org/mitigation. Interested parties could also request a hardcopy of the 2005 and 2010 Hazard Mitigation plan via email or phone call. Hardcopies were at several public outreach venues for people to

access if so requested. The draft copy of the 2015 Hazard Mitigation plan was placed on the City's website in late February 2016.

Figure 2-2 City of San Leandro Hazard Mitigation page with links to 2005 and 2010 LHMP

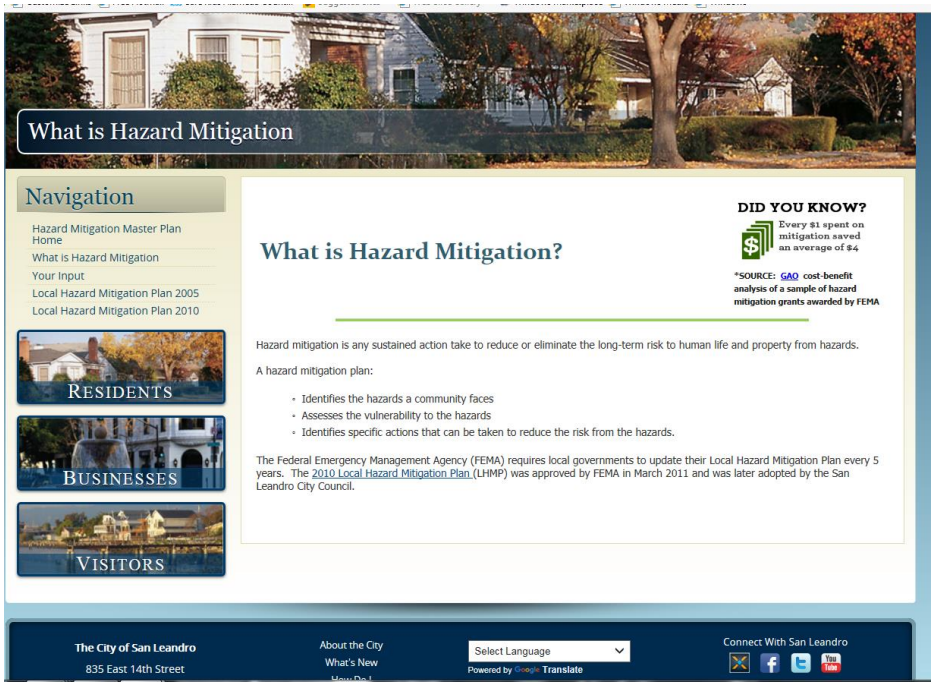


Figure 2-3 City of San Leandro Hazard Mitigation page with link to Hazard Mitigation Survey

2. Survey:

A local hazard mitigation public survey was developed by the planning team and was used to gauge the public's concern about hazards identified by the planning team. In addition to the hard copy of the survey, which was available at the City's public counters in City Hall, the Police Department, Recreation Centers, and the Senior Center, the survey was also available online. From September 15, 2015 through December 15, 2015, community members completed a total of 73 hard copy and online surveys.

Findings from the survey revealed that the majority of those who took the survey identified Earthquake as the most threatening hazard in San Leandro, followed by Chabot Dam failure and flooding. People and public safety was ranked as the highest community asset, followed by community infrastructure and continuity of government. Despite the survey defining the difference between hazard mitigation and preparedness activities a majority of those survey showed that they hoped for more preparedness and outreach activities. The PTM also compared survey results to the City's 2005, 2010 plan and in regards to identified hazards with in the City, the survey did not reveal a change in public perception.

3. Public Forum:

A public workshop was held on November 19, 2015 at the San Leandro Senior Center and was attended by 22 members of the public. The meeting format included an introduction to hazard mitigation; all attendees had access to the 2005 and 2010 LHMP. The format of the meeting allowed for direct conversations between the community and the planning team members. Community members were able to examine maps depicting identified hazards in the city, and review the impacts of specific disasters in San Leandro. Attendees also learned about mitigation efforts the City has already undertaken, hear about the hazard mitigation planning process and potential mitigation priorities.

This event was advertised through a press release to local newspapers (See Appendix item number 8.3, and 8.4.), on the San Leandro Website, various City social media platforms, including Facebook, Twitter and Next door, through flyers posted at various locations throughout the City, and through direct outreach to individuals who had completed the online and/or paper survey.

The planning team compiled and reviewed the top hazards as perceived by the community, from the survey and the public forum; the hazards were earthquakes, drought, flood, dam/levee failure and sea level rise. The planning team ensured that all of the hazards identified by the community were included in the hazard analysis. The planning team also reviewed the recommended mitigation activities identified by

the community and found that an overwhelming majority of the recommendations were related to improving infrastructure that could be susceptible to earthquakes, flooding, and continuity of government and services after a major disaster. Other recommendations related to preparedness and response rather than to the mitigation planning process were recorded and shared with City staff responsible for coordinating those activities.

2.5 PLAN UPDATE

The 2017 LHMP update involved a comprehensive review of each section of the 2010 plan and included an assessment of the plan's goals, objectives and progress of the previous mitigation strategies. Only the information and data still valid from the 2010 plan was carried forward as applicable into this LHMP update.

The 2017 plan contains numerous updates to facts, figures and descriptions. The City has incorporated the newest-available hazard data, including impact maps for particular scenarios. The City and its partners have provided additional descriptions, details and definitions to explain the science of these hazards and their potential impacts. Advances in GIS mapping technology have enabled the City to present maps that help to visualize information.

The 2017 plan now specifically highlights San Leandro's hazard of greatest concern as earthquake coupled with all of the potential side effects such as a tsunami or landslide, and followed by climate change risks such as flooding and sea level rise. These hazards are underscored because of their history in San Leandro, their potential to occur, our community's extensive exposure and many vulnerabilities to these hazards, and the cascading impacts that could result from one of these hazards.

Earthquakes (Section 5.3)

• Two new Hayward Fault earthquake scenario maps illustrate the Bay Area's exposure to seismic shaking, and San Leandro's exposure to liquefaction and seismically-triggered landslides.

• A new map overlays the areas of San Leandro potentially exposed to liquefaction, fault rupture and earthquake-induced landslides. The 2017 plan also contains a new scenario map for seismically-triggered landslide.

• The 2017 plan addresses fire following earthquake in detail: the plan describes significant causes of fire following earthquake, and how earthquake impacts can impede firefighting efforts and promote fire spread.

Earthquake/Rainfall-Triggered Landslide (Section 5.3.7)

Rainfall-triggered landslide is addressed separately of earthquake-induced landslide. Additional information has been provided to describe rainfall-triggered landslide and debris flow.

Tsunami (Section 5.3.8)

The tsunami section describes recent tsunami events and their impacts on San Leandro. It outlines the latest information about the tsunami hazard within the San Francisco Bay, and provides an inundation map showing San Leandro's tsunami exposure.

Flooding (Section 5.4)

The floods section has been rewritten for clarity. The 2017 plan also provides additional information about floods caused by storm drain overflow.

Climate Change (Section 5.8)

Climate change is a newly-introduced hazard of concern for the 2017 plan. The climate change section describes the anticipated impacts to San Leandro from climate change. It also outlines how climate change exacerbates other hazards identified in this plan.

Hazards Not Considered in the Plan

Other natural hazards that are rare in San Leandro are not included in this plan; these include severe storms, which can produce prolonged low temperatures, heavy rainfall and hail; severe heat; high winds; and small tornados and waterspouts. This plan does not focus on these hazards because they are not as likely to occur as the hazards addressed in detail. San Leandro's geographic location and moderate climate shelters it from prolonged storms and extremes of cold and heat. Ocean temperatures moderate the power of tropical storms, lessening the effects of low barometric pressure and storm surge. Naturally-occurring communicable disease outbreaks (e.g. a flu pandemic; SARS) do pose a significant risk to the San Leandro community, but are not addressed in this plan. Mitigation activities for communicable disease are not yet well defined, but they could include, for example, measures to assure a high baseline level of immunization in the community, both for routine childhood immunizations and for annual seasonal flu vaccination. The City of San Leandro continues to work closely with the Alameda County Public Health Department on establishing best practice protocols and training for City staff and public outreach training for the public.

2.6 COMPONENTS OF THE HAZARDS ANAYLSIS

The analysis of hazards in this plan has the following components

Historical Events: Within recent history the city has experienced the effects of all hazards addressed in this plan. Descriptions of the impacts of these disasters help illustrate some of the types of damage they can cause.

Hazard: Describes the ways that each hazard can damage the community, and maps the locations in San Leandro that are particularly prone to specific hazards, such as the "100-year" floodplain. Areas that could experience secondary hazards, such as liquefaction following earthquakes, are also discussed.

Exposure and Vulnerability: This plan identifies the people, buildings and infrastructure that exist in hazard zones. Vulnerability refers to the susceptibility to physical injury, harm, damage, or economic loss of the exposed people, buildings and infrastructure. City elements exposed to each hazard are listed and mapped, and their vulnerability is discussed.

2.7 APPROVAL PROCESS

Following the public's review of the draft Local Hazard Mitigation Plan, the following steps are required prior to final adoption:

- Draft Plan is submitted to California Governor's Office of Emergency Services (CAL OES) for review
- Upon CAL OES approval of plan, CAL OES will forward the Plan to FEMA for review and approval
- FEMA Regional Office conducts its review within 45 days and provides a completed Local Mitigation Plan Review Tool to the State
- FEMA issues "approvable pending adoption" letter
- City Council Public Hearing and adoption

3. COMMUNITY PROFILE

3.1 AREA AT A GLANCE

San Leandro is located in the heart of the San Francisco Bay Area, the fourth largest metropolitan area in the country and home to 7.5 million residents. The city is located in the "East Bay" sub-area, consisting of 33 cities in Alameda and Contra Costa

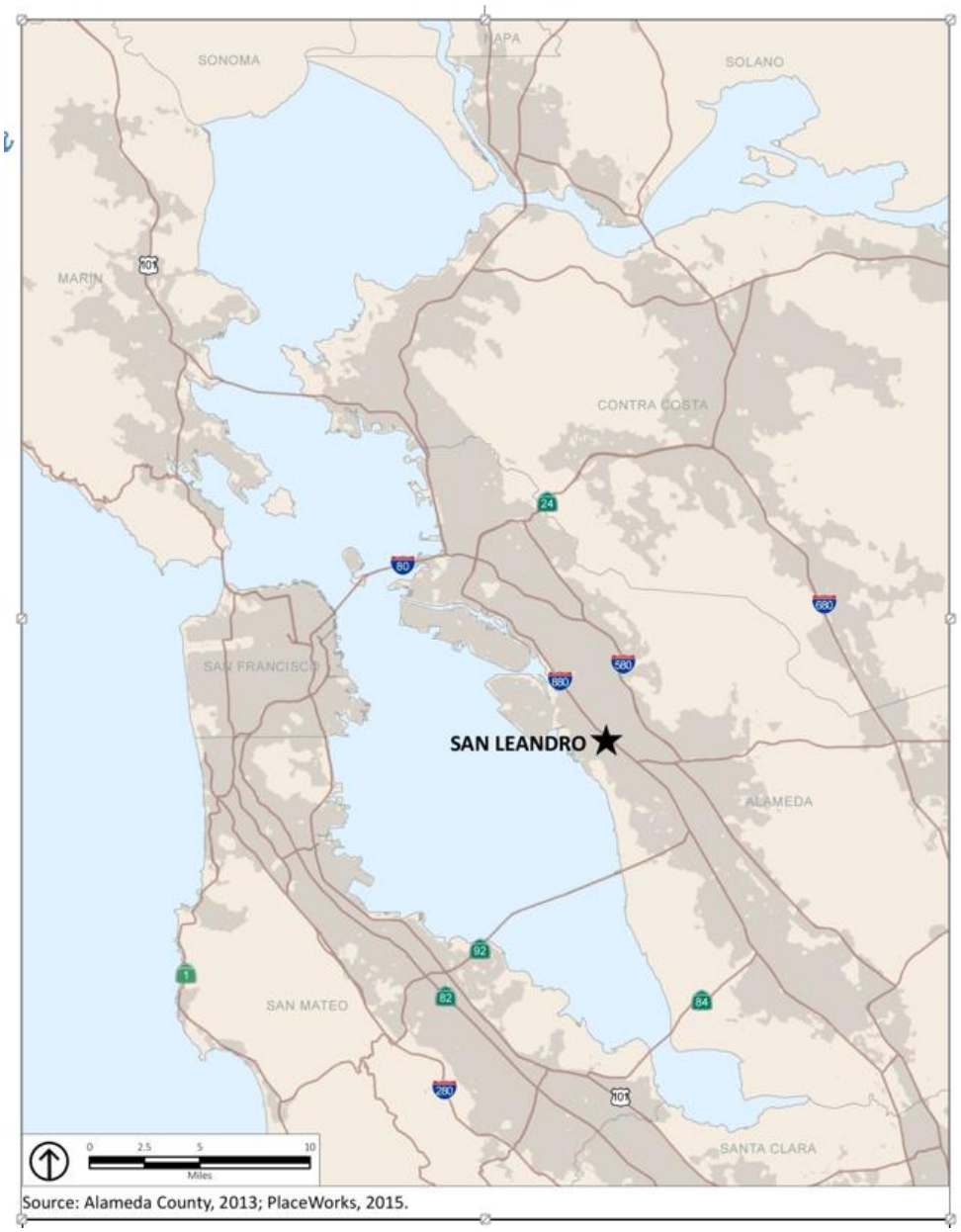
Counties. More than one-third of the Bay Area's population resides in the East Bay. While the area is sometimes perceived as suburban San Francisco, it is a diverse metropolitan area in its own right. In 2016, the East Bay was home to 1.1 million jobs and 2.7 million residents. With 88,441 residents, San Leandro is the fifth largest city in Alameda County in population, following Oakland, Fremont, Hayward, and Berkeley.

Figure 2-1 illustrates San Leandro's position within the Bay Area. The city is located 8 miles south of Downtown Oakland, 15 miles southeast of San Francisco, and 30 miles north of San Jose. It is bound on the north by Oakland and on the south by the unincorporated communities of San Lorenzo and Ashland. The western edge of the city is defined by San Francisco Bay, while the East Bay hills define the eastern edge.

San Leandro is well connected to the region's transportation system, with three freeways (I-880, I-580, and I-238) passing through the city and Metropolitan Oakland International Airport just a few miles away. The city is served by two BART stations, two active railroad lines, and an extensive network of bus and shuttle routes. These transportation advantages have helped define San Leandro's economic base and were a key factor in its development during the second half of the 20th Century.

Over the past 50 years, San Leandro has developed a reputation as a diverse, innovative, business-friendly city. Much of the city's identity dates from the mid-20th Century, when the community was at the leading edge of the Bay Area's development. Many of the city's residents arrived during this era. While some of these residents continue to make San Leandro their home today, tens of thousands of new residents have arrived in the last few decades. This influx of new residents has brought new energy to the city, and shifting perspectives on issues such as growth, transportation, and the environment. The city has found strength in its growing diversity, and is emerging as a center for innovation, creative problem-solving, and new ideas.

Figure 3.1 San Leandro's location on map of San Francisco Bay



3.2 HISTORY

Following some 3,000 years of Native American settlement, the area now known as San Leandro was divided through Spanish land grants between 1820 and 1842. Most of modern-day San Leandro was contained within the vast cattle ranches of Ignacio

Peralta (north of San Leandro Creek) and Don Jose Joaquin Estudillo (south of San Leandro Creek). The ranches gave way to farms as settlers, squatters, and "49ers" arrived in the early 1850s. The town of San Leandro was laid out in 1855 and became the seat of Alameda County in 1856. The original town plan established a grid of streets, with sites set aside for prominent buildings such as the County Courthouse and City Hall.

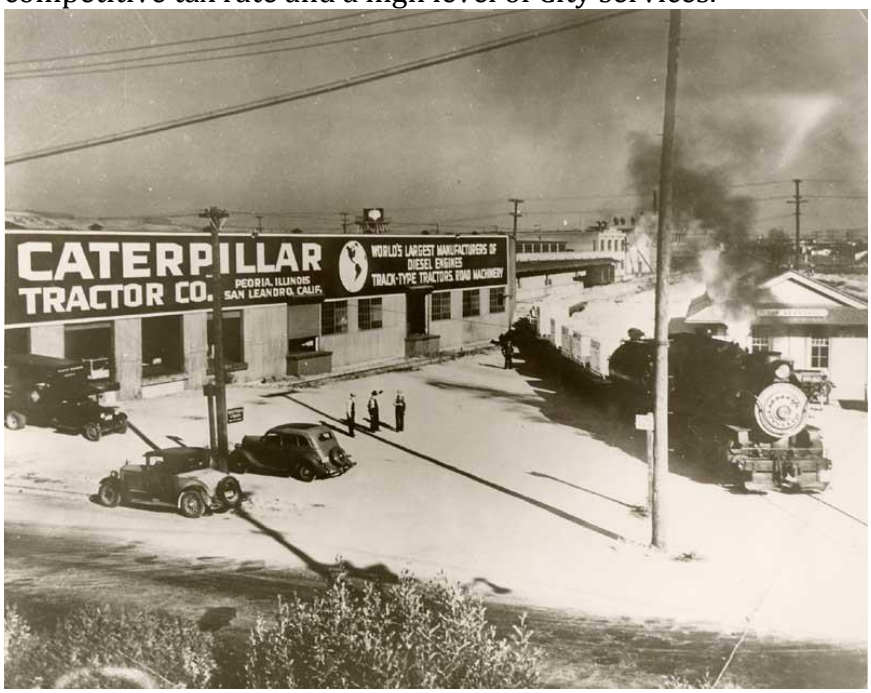
After a catastrophic earthquake destroyed the Courthouse in 1868 and the transcontinental railroad reached Oakland in 1869, the county seat was relocated from San Leandro to Oakland. However, San Leandro continued to prosper as a small agricultural town. The city incorporated in 1872 and had grown to about 2,300 residents by 1900. Farms and orchards surrounding San Leandro produced a variety of fruits and vegetables, including cherries, tomatoes, onions, potatoes, asparagus, sugar beets, rhubarb, and apricots.

San Leandro continued to grow at a moderate pace during the first 40 years of the 20th Century. Many of the neighborhoods in the northeast part of the city, such as Broadmoor and Estudillo Estates, were developed during this time period. The railroad corridors running through the city were developed with industry, while Downtown was the center for commerce and civic life. By 1940, San Leandro had 14,000 residents. Still, the town covered just a few square miles and was surrounded by farms and orchards.

The 1940s and 50s were a time of transformation for the city. A development boom, initially created by the need for wartime housing and then sustained by returning veterans and their families, brought about a 350 percent increase in the city's population in just 20 years. Much of San Leandro's current form and character was defined during this era and nearly half of the city's current housing stock was added.

Most of the neighborhood shopping centers and the commercial strips along East 14th Street and other arterials date from this period.

Despite the suburban character of the development, San Leandro emerged from the boom period as much more than a "bedroom community." The city was among the fastest growing industrial centers in the Bay Area during the post-war years, adding 6,000 manufacturing jobs between 1947 and 1954 alone. Much of West San Leandro was developed with industry and numerous warehousing and distribution facilities were built south of Marina Boulevard. At the same time, early shopping centers such as Pelton Center and Bayfair Mall made the city a thriving retail destination. The favorable balance between jobs and housing enabled San Leandro to offer a competitive tax rate and a high level of City services.



The pace of growth slowed as the city reached its natural limits during the 1960s. On the east, steep hills created a barrier to large-scale development. On the west, most of the shoreline had been acquired for park uses. Established communities lay to the north and south. The focus of new development shifted to smaller infill sites, including greenhouses and nurseries, and other properties that had been bypassed during the boom years.

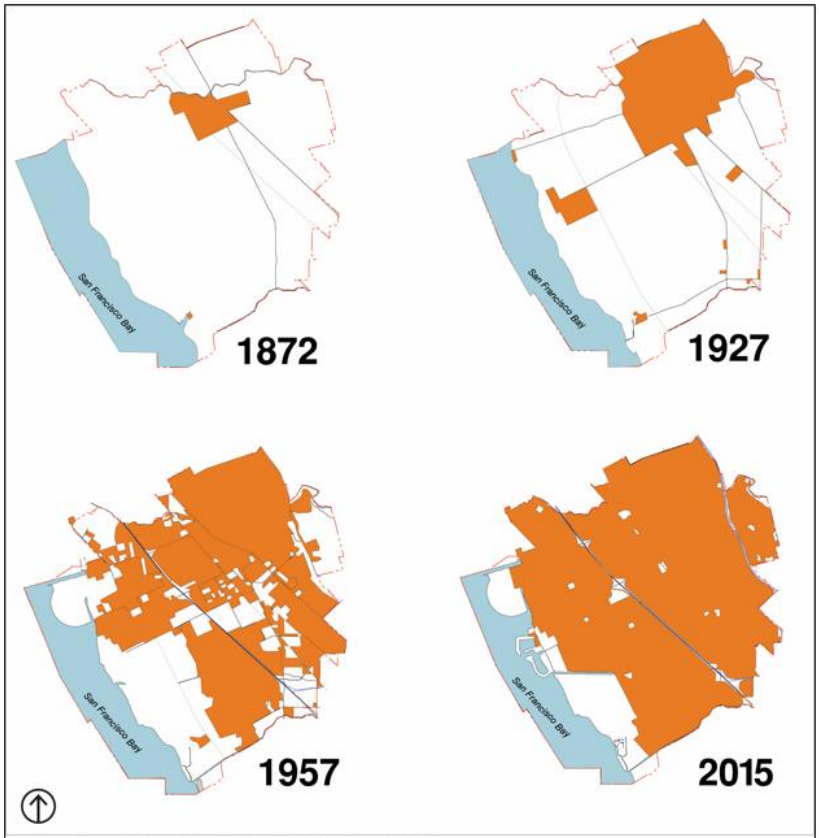
By the 1980s, other factors had begun to shape the form of San Leandro. The Bay Area's economic base shifted from manufacturing to services and technology, and many traditional industries left the city. As the thousands of families who moved to San Leandro during the 1940s and 50s matured, school enrollment dropped and several schools were closed and redeveloped with housing, commercial, and institutional uses. The percentage of senior citizens in the city increased from six percent in 1960 to 20 percent by 1990, giving San Leandro the highest median age in

Alameda County. Local retailers were impacted by these changes and further by competition from new suburban malls.

San Leandro's evolution continued through the 1990s and early 2000s. Significant reinvestment in the city's housing stock took place, and the city gained almost 20,000 residents in two decades. Much of the city's growth was fueled by an increase in foreign-born residents and young families, transforming many of the city's shopping areas and cultural institutions, and increasing school enrollment. The city's industrial areas also evolved. In 2011, San Leandro launched a public-private partnership to develop an 11-mile fiber optics loop (Lit San Leandro). This investment has put the city on the leading edge of the Bay Area economy and has repositioned the city's businesses to be more technology and innovation focused. At the same time, San Leandro has promoted higher density development around its two BART stations, creating a development pattern that is oriented toward walking, bicycling, and transit use rather than driving.

Figure 3-2 illustrates the stages of San Leandro's development from 1872 to 2015. Chart 2-1 tracks the city's population during the last century. Both the map and the graph clearly illustrate the burst of growth that took place in the city between 1940 and 1960. However, as the following pages point out, the city has continued to grow and change over the past 40 years.

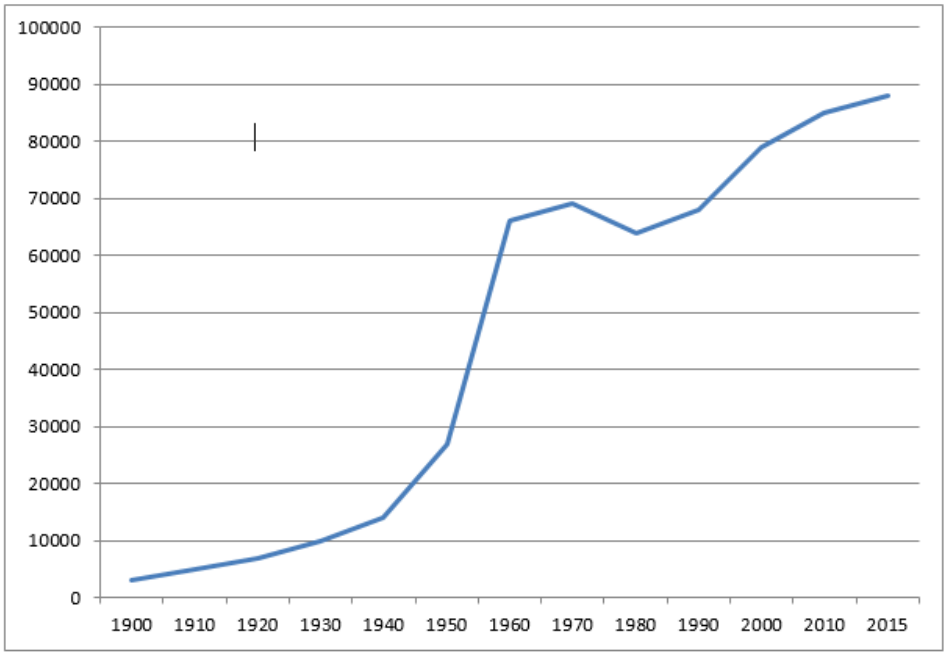
Figure 3.2 San Leandro Stages of Development 1872-2015



Source: San Leandro General Plan Update, 2002; PlaceWorks, 2016.

Urbanized Area

CHART 2-1: SAN LEANDRO POPULATION, 1900-2015



Source: US Census

3.3 POPULATION

The California Department of Finance placed the population of San Leandro at 88,441 residents in 2015. The city's population has increased by 11 percent since 2000. This is a slightly faster rate than Alameda County as a whole, which grew by 9 percent during the same period.

Most of San Leandro's growth during the last 15 years has been the result of increasing household size rather than new construction. The average number of persons in a San Leandro household was 2.57 in 2000 and 2.85 in 2015. This continues a trend underway since 1990, when average household size was just 2.33. During the 2010-2015 period alone, San Leandro added just 120 households while its population increased by 3,500 people.

San Leandro has become much more ethnically diverse over the past two decades. The percentage of Non-Hispanic White residents in the city declined from 79 percent of the city's population in 1980 to 27 percent in 2010. Based on the 2014 American Community Survey, San Leandro's population is 32 percent Asian, 28 percent Hispanic, 24 percent Non-Hispanic White, 11 percent African American, and 5 percent other races or multi-racial. Approximately 24 percent of the city's residents are multi-lingual and 26 percent primarily speak another language at home.

The median age in the city is 40.4, up from 39.3 in 2010 and 37.7 in 2000. The city experienced remarkable growth in its youth population during the 1990s, with a 36 percent increase during the decade. The rate slowed to about 9 percent in 2000-2010. In 1990, nearly one in five San Leandro residents was over 65. That percentage declined in the 1990s and 2000s, and the percentage of seniors now stands at 13.7 percent of the population.

In recent years, the fastest growing segment of the population has been the 45-64 age cohort. There were 25,600 people in this cohort in 2014 compared to 14,000 in 1990. A substantial increase in the senior population is anticipated as the "baby boomer" generation advances. The so-called "millennial" generation is somewhat under-represented in San Leandro, with persons aged 20-34 comprising 19.7 percent of the population, compared to 22.4 percent in Alameda County.

In 2014, the median household income in San Leandro was estimated to be about $63,400. Although this represents a substantial increase over 2000, it is still about 16 percent below the Alameda County median of $73,775. Based on data provided to the city by ABAG in 2013, about 44 percent of the city's households meet the US Department of Housing and Urban Development (HUD) definition of "low" or "very low" income. The cost of housing is particularly vexing for lower income households, with some San Leandro families spending more than 50 percent of their monthly incomes on their housing costs. The Housing Element of the General Plan addresses this issue in detail.

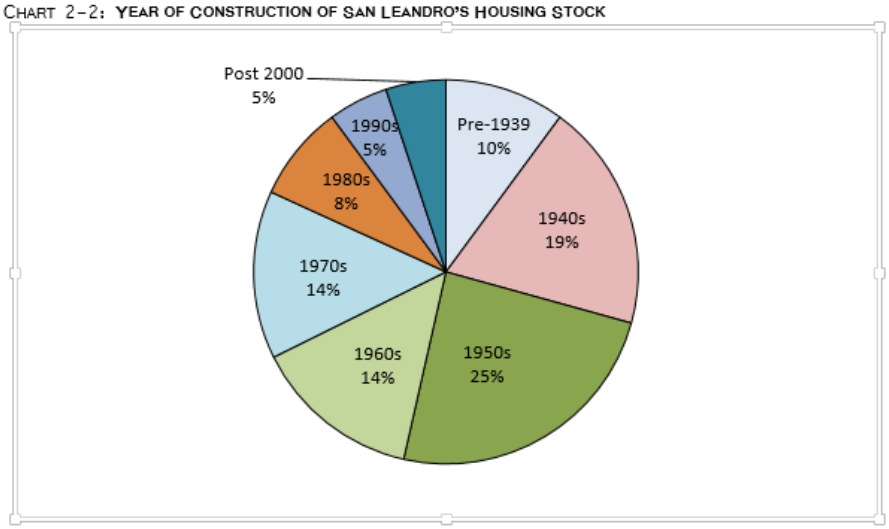
Charts 2-2 and 2-3 illustrate the characteristics of San Leandro's housing stock. Nearly half of the housing in San Leandro was built during the 1940s and 50s. However, the city also contains more than 3,500 dwelling units which pre-date 1940. About two-thirds of San Leandro's dwelling units are single family homes and about a quarter are in multi-family buildings with five or more units.

San Leandro is more affordable than other East Bay communities, but has experienced dramatic swings in housing costs in the last 15 years. Between 2001 and 2006, the estimated market value of a single family home in the city nearly doubled, rising from $330,000 to $582,000. San Leandro was severely impacted by the real estate depression in the 2008-2011 period and saw its median home value plummet to $310,000 in February 2012. Prices have risen steadily since that time. As of 2016, the median value was $539,000.

Rents did not decline as steeply as home prices during the downturn and have increased at an accelerating rate during the economic recovery since 2012. The median rent for a one-bedroom apartment rose from $1,000/month in October 2011 to $2,100 in October 2015. Roughly 55 percent of the dwellings in San Leandro are occupied by owners and about 45 percent are occupied by renters.

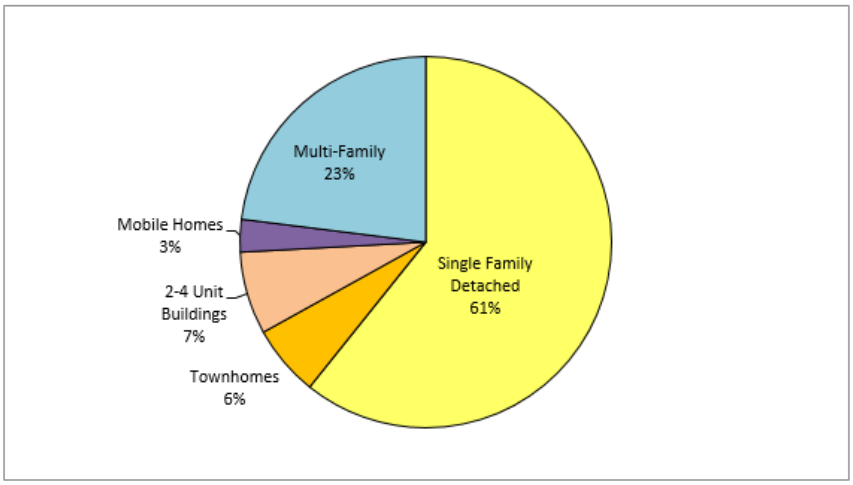
The Association of Bay Area Governments (ABAG) projects that the Bay Area's population will increase by 2.1 million residents between 2010 and 2040. ABAG and the Metropolitan Transportation Commission (MTC) envision fundamental changes in where this growth occurs, with most of it taking place in cities at the center of the region rather than communities on the suburban fringe. ABAG's *Plan Bay Area* forecasts for San Leandro indicate the city will add 7,600 new households between 2010 and 2040. This General Plan accommodates this growth, primarily through infill and redevelopment of underutilized parcels. San Leandro's Community Development Department, Engineering and Transportation Department, and Building Department have carefully accessed the possible effects of redevelopment on existing city resources, and how it could affects the City's vulnerability, and found no further tax on resources than with current development.

CHART 2-2: YEAR OF CONSTRUCTION OF SAN LEANDRO'S HOUSING STOCK



Source: US Census, 2015

CHART 2-3: COMPOSITION OF SAN LEANDRO'S HOUSING STOCK



Source: California Dept of Finance, 2015

3.4 PEOPLE

People experience hazards through damage to buildings and interruption of infrastructure services. While some people will be directly injured or killed by hazards, this is a small portion of the impacts on people. The vast majority of impacts will be felt through a person's ability to manage the secondary impacts from the hazard. The character of San Leandro residents is responsible for the strong community vitality, distinctive culture, and its unique economy. San Leandro is especially diverse, showcasing many different lifestyles, cultures, and languages that provide a wide variety of cultural experiences. Longtime residents of the San Leandro have special knowledge, social networks, and cultural memories that make

them strong stewards for neighborhoods, parks, and trails. If a disaster forces San Leandro residents from their homes, social networks will be broken, and the diverse culture of the region will change.

San Leandro's economy relies on service, labor, creative, and professional workers. The Bay Area economy is unique in that it is home to one of the fastest growing and most innovative economic sectors in the world. If a disaster impedes the ability of employees of any sector to stay in the region or get to work, the impact will cascade beyond individual businesses and be felt not just across the region, but globally. Employees from all sectors are needed to support one of the strongest and most specialized economies in the world.

People are a critical asset for the functioning of a community and the economy; without residents a jurisdiction loses its tax base and employers lose employees and customers. More importantly, jurisdictions lose the culture, vibrancy, and sense of cohesiveness that make it unique. People are the nexus of a resilient community, and many other assets are designed to serve and support people.

3.4.1 SOCIAL VULNERABILTY

Social vulnerability describes characteristics that make people less able to adequately withstand and adapt to a hazard, such as limited mobility, income, and educational attainment. Social vulnerabilities are largely independent of the hazard type and can be applied similarly to any type of disaster.

Unlike other asset classes like buildings and infrastructure, the vulnerability of people is not just due to physical characteristics but rather social characteristics that make them less able to adequately withstand and adapt to a hazard. People are also highly dependent upon the physical environment that they are surrounded by; community members are much more vulnerable if the buildings and infrastructure that they live in, work in, and rely upon fail.

In 2015, ABAG and BCDC published *Stronger Housing, Safer Communities*, a report that identified ten primary indicators that represent characteristics of individuals and households that affect their ability to prepare for, respond to, and recover from a disaster.[1] These indicators collectively present a picture of a community's vulnerability to stressors. Concentration of these indicators, or areas with multiple indicators, can inhibit the recovery of a community. Key themes that emerged included age-related vulnerabilities, language and ethnicity vulnerabilities, cost-

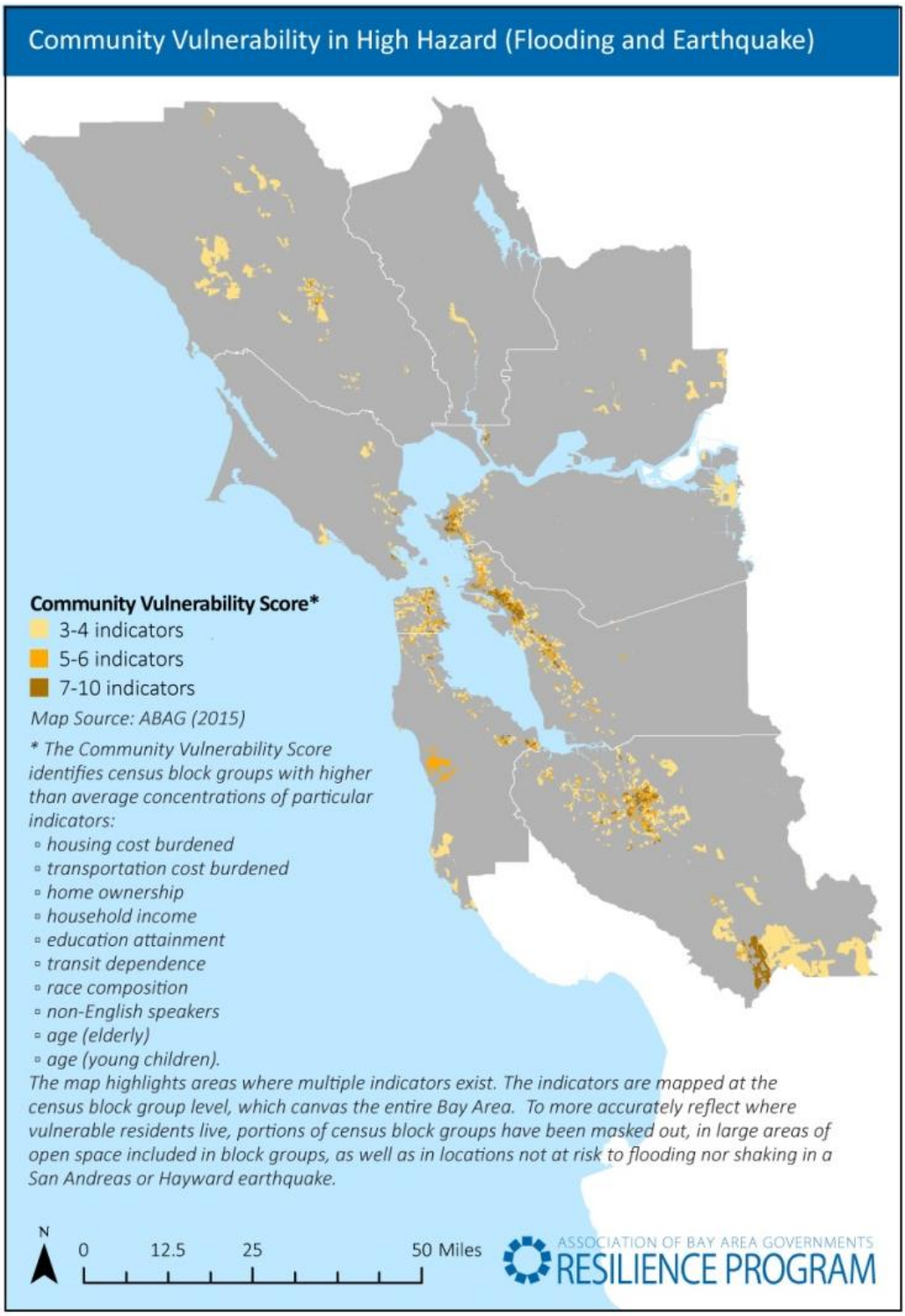
[1] ABAG and BCDC, 2015

burdened residents, housing tenure issues, and access to resources. Indicators were measured and scored using the method developed by the Metropolitan Transportation Commission (MTC) to identify Communities of Concern (CoC). This is meant to identify block groups with higher than average concentrations of the particular indicator and therefore may have higher concentrations of vulnerability. The following table includes the ten indicators that contribute to the vulnerability of people and households.

Figure 3-3 Community Vulnerability Characteristics

Indicator	Measure
Housing cost burden	% household monthly housing >50% of gross monthly income
Transportation cost burden	% household monthly transportation costs >5% of gross monthly income
Home ownership	% not owner occupied housing
Household income	% households with income less than 50% AMI
Education	% persons without a high school diploma >18 years
Racial/Cultural Composition	% non-white
Transit dependence	% households without a vehicle
Non-English speakers	% households where no one ≥ 15 speaks English well
Age – Young children	% young children under 5 years
Age – Elderly	% elderly, over 75 years

Figure 3-4 Community Vulnerability in High Hazard Areas



3.5 ECONOMY

San Leandro has a diverse economy, with a substantial number of jobs in manufacturing, wholesaling, retail, office, hospitality, health care, construction, and personal and professional services sectors. During the post-war area, the City invested in infrastructure to support significant industrial growth, including a municipal sewer plant and wastewater collection system. Among San Leandro's major employers during the 1950s and 60s were Caterpillar, Dodge/Plymouth, Friden Calculator, California Packing Corp, General Foods, Kellogg, Western Electric and Hudson Lumber. Tax revenues from this strong industrial base enabled the City to maintain a relatively low tax rate and provide a high level of municipal services.

While many of the traditional manufacturers are gone today, the City continues to invest in infrastructure to support economic growth. Today the emphasis is on high-speed data and communication. Investment in fiber optics systems continues to fuel the growth of traditional industries such as food processing and manufacturing, but with the added benefits and productivity of new technologies.

Several factors have contributed to San Leandro's economic repositioning. The city is centrally located in the Bay Area, has one of the fastest rates of internet connectivity in the country, and has numerous transportation and freight options, including interstate highways, ports, and airports. It has a business friendly reputation, a skilled and diverse work force, and a substantial inventory of industrially zoned and underutilized land. Prices in San Leandro are also competitive, making the city an attractive investment and an excellent location for start-ups and emerging industries.

The number of jobs in the city was estimated by ABAG to be 43,000 in 2015. While employment rose slightly between 2000 and 2005, San Leandro was hard hit by the economic recession and experienced a net loss of approximately 7,000 jobs between 2005 and 2011. The city has rebounded since 2011, adding an estimated 3,400 jobs in the last four years.

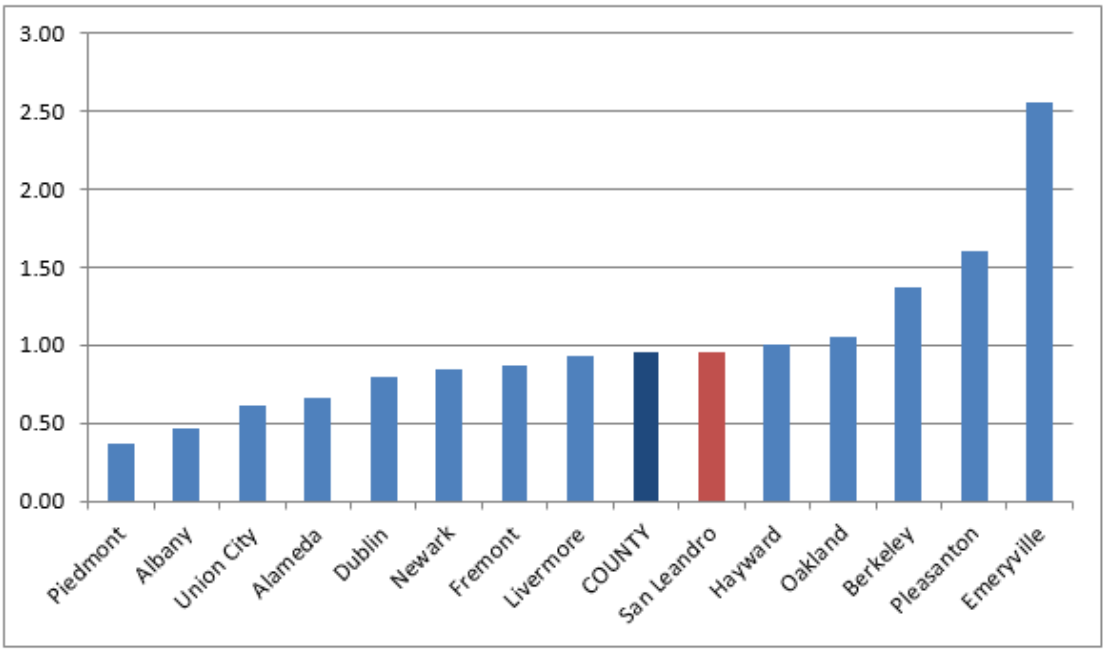
In 2010, about 22 percent of the city's jobs were manufacturing and wholesale jobs, compared to 15 percent countywide. The percentage of total jobs in manufacturing has been declining in the city, while the percentage of jobs in the service sector has increased. Retail jobs have remained relatively constant, representing about 16 percent of the city's jobs. The Economic Development Element of the General Plan includes a complete profile of the local employment base, as well as a discussion of labor force and labor characteristics.

ABAG projects that San Leandro will gain 13,000 jobs between 2010 and 2040, with a total of 52,900 jobs projected for 2040. Some of this growth represents the continued recovery of jobs lost during the recession, but much of it is net new growth. The city has long recognized that its economic health was linked to a favorable balance between the number of jobs and housing units in the community. In 2015, there were about 0.96 jobs for each employed resident in the city. Although this

appears to be a good balance, most San Leandro residents work in other cities and most San Leandro jobs are filled by residents living elsewhere. Looking to the future, the city strives to reduce "external" work trips and create a community where residents can find jobs within the city, and employees can find housing without long commutes.

Chart 2-4 Ratio of Jobs to Employed Residents in Alameda County Cities

CHART 2-4: RATIO OF JOBS TO EMPLOYED RESIDENTS IN ALAMEDA COUNTY CITIES



Source: ABAG, 2013

3.6 LAND USE

The City of San Leandro encompasses 15.4 square miles, including 13.3 square miles (about 8,500 acres) of land and 2.1 square miles of water. There are approximately 25,000 parcels of land in the city, about three-quarters of which contain single family detached homes. Chart 2-5 illustrates the existing composition of land uses in San Leandro.

Excluding streets and freeways, 45.7 percent of San Leandro's land area is in residential uses. San Leandro's neighborhoods include about 2,620 acres of single family detached homes, 280 acres of townhomes and duplexes, 300 acres of apartments and condominiums, and 70 acres of mobile homes. These areas contain about 32,500 housing units, for an average residential density of 10 units per acre. This density creates a more urban character than the newer communities of the East Bay (like Dublin and Fremont) but a more suburban character than Berkeley, Oakland, and other cities closer to San Francisco. In fact, many of San Leandro's

neighborhoods have a comfortable “small town” quality that is created in part by mixed density housing.

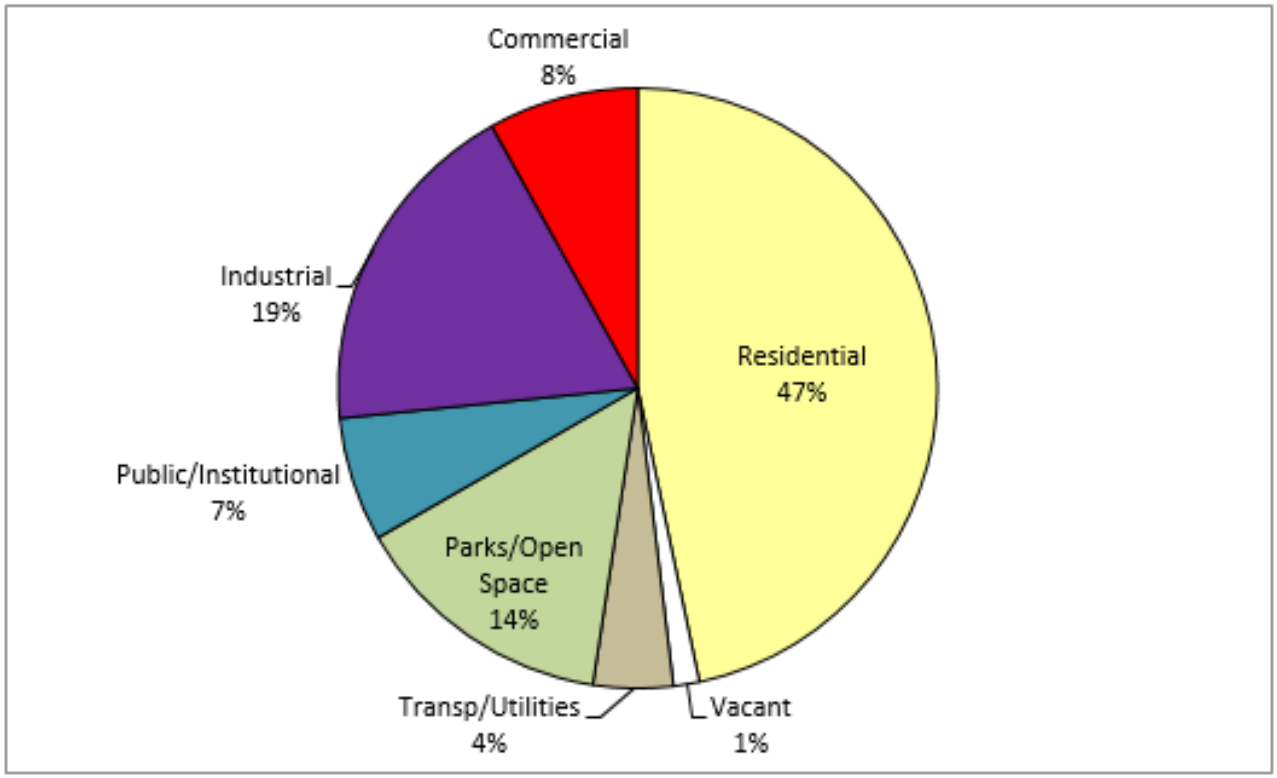
The mean single-family lot size in the city is 6,200 square feet. Rectangular lots measuring about 50' x 100' comprise most of the city’s post-war neighborhoods (such as Washington Manor) but are also typical in older areas such as Estudillo Estates and Farrelly Pond. Slightly larger lots prevail in the Bay-O-Vista, Broadmoor, and Mulford Gardens areas, while smaller lots are more common in the post-1990 subdivisions such as Heron Bay and Cherrywood.

Although many San Leandro neighborhoods are perceived as being homogeneous, the housing stock is actually quite diverse. The city’s neighborhoods include view-oriented hillside homes, craftsman bungalows and Mediterranean cottages, apartment buildings and garden apartment complexes, mid-rise condominiums, ranch-style tract homes, century-old Victorians, mobile home parks, California contemporaries, and even semi-rural ranchettes. Many single family neighborhoods include pockets of higher-density housing, along with other uses such as parks, schools, and churches. Densities as high as 100 units per acre can be found on some blocks around Downtown San Leandro, although most multi-family housing is in the range of 25 to 50 units per acre. The major concentrations of higher density housing are located around Downtown, along East 14th Street and Washington Avenue, in the Springlake area, along Orchard Avenue, at the west end of Marina Boulevard, around San Leandro Hospital, and around the Greenhouse Marketplace Shopping Center.

Commercial (retail, service, and office) uses in San Leandro comprise 564 acres, or about 8 percent of the city. Although Downtown is the city’s historic retail center, the largest retail parcels in the city are the community and regional shopping centers such as Bayfair and Marina Square. Much of the city’s retail acreage is contained in commercial strips along East 14th Street, Washington Avenue, MacArthur Boulevard and Marina Boulevard. The city also contains a number of small neighborhood-oriented shopping centers. About 108 acres of the city’s commercial land consists of offices. The largest concentrations are located around the Downtown BART Station, along East 14th Street, and just east of Downtown.

Chart 2-5 Existing Land Uses in San Leandro, 2015

CHART 2-5: EXISTING LAND USES IN SAN LEANDRO, 2015 (*)



Source: City of San Leandro, 2015
Note (*) = excludes street rights of way

San Leandro contains about 1,300 acres of industrial uses. This is a reduction of about 60 acres in the last 15 years. Industrial areas are generally located in the west and northwest parts of the city, and in the central area just east of I-880 and south of Marina Boulevard. During the late 19th and early 20th centuries, San Leandro's major industries were located along the rail line just west of Downtown. This pattern changed with the construction of the Nimitz Freeway and the large-scale subdivision of lands further west. Today, developments like The Gate and the 21st Amendment Brewery are repurposing former heavy manufacturing buildings for modern industrial uses. While the city still contains general industrial uses such as wrecking yards, warehouses, and foundries, the mix of activities has become more innovation-driven.

The city also contains 466 acres of public and institutional uses and 303 acres of transportation, communication, and utilities land. Public and institutional uses include schools, hospitals, libraries, community centers, municipal buildings, and other civic uses. These uses tend to be scattered around the city within neighborhoods and business districts. The transportation, communication, and

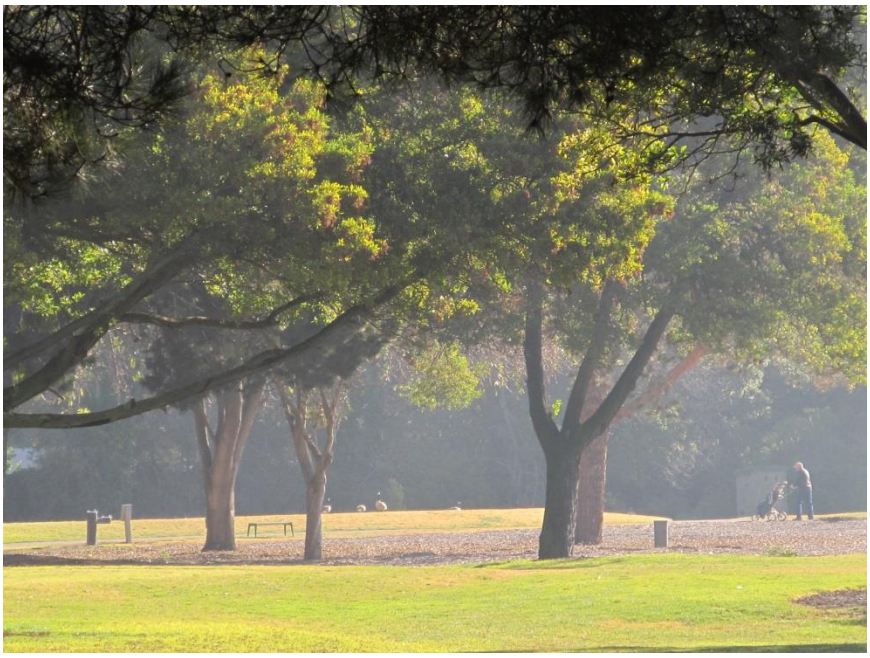
utilities land consists mostly of railroad rights-of-way. This land also includes the BART stations, PG&E rights-of-way, the Davis Street Transfer Station, and wastewater treatment facilities.

Open space and parks comprise 1,000 acres in San Leandro. City parks such as Marina Park and Washington Manor Park represent about 77 acres of this total. Public golf courses and Oyster Bay Regional Shoreline make up another 450 acres. The remainder of the land—about 474 acres—consists mostly of wetlands in the southwestern part of the city.

3.7 ENVIRONMENT

San Leandro is located on the East Bay Plain, a flat area that extends 50 miles from Richmond in the north to San Jose in the south. The Plain is about three miles wide in the San Leandro area. At its eastern edge, the plain transitions into low hills, rising to 526 feet at the highest point in the city's Bay-O-Vista neighborhood. On its western edge, the Plain slopes down to San Francisco Bay, the largest estuary on the California coast.

San Leandro's rich alluvial soils and temperate climate support a wide variety of plants and animals. Wetlands in the southwest part of the city provide habitat for the salt marsh harvest mouse and other special status species. San Leandro Creek remains one of the few waterways in the urbanized East Bay that retains its natural character along most of its course. Elsewhere in the city, street trees, parks, large yards, and other open spaces provide both aesthetic and environmental benefits. Just beyond the eastern city limits, thousands of acres of grasslands, woodlands, and coastal scrub are protected in regional park and watershed lands. These open spaces have great environmental importance and scenic value and are a significant amenity for San Leandro residents.



The city's environment is vulnerable to the impacts of urban development, particularly air and water pollution. Air quality in the region has improved significantly in the last 30 years, but transportation emissions still result in ozone and particulate levels that exceed state and federal standards. Burning of fossil fuels—whether through motor vehicles, industry, or energy generation—also generates greenhouse gases, which contribute to global climate change. The General Plan include policies and actions to improve air quality and reduce greenhouse gas emissions, primarily by reducing dependence on motor vehicles, shifting to renewable energy, and using energy more efficiently.

Like air quality, water quality has improved as a result of stronger controls over point sources such as wastewater treatment plants and heavy industry. Significant advances have also been made in the control of urban runoff from streets, parking lots, and yards. However, storm events, litter, improper disposal of household products, and other human activities still pose a threat to the health of the Bay and its tributaries. The General Plan provides a framework for the City's storm water management and water quality programs, including trash reduction, containment and pre-treatment of runoff, reduced pesticide use, and greater public education on environmental quality.

San Leandro's environment also creates a number of natural hazards. The Hayward Fault, considered by some seismologists to be the most dangerous hazard in the Bay Area, traverses the eastern edge of the city. Ground shaking and liquefaction in a major earthquake could cause serious damage and injury. Even in the absence of an earthquake, some of the city's steep hillsides are prone to landslides and erosion. Other parts of the city are subject to shallow flooding. Man-made hazards, such as noise from airplanes, trains, and trucks, also exist in the city.

Climate change also poses a long-term hazard. During the next century, the western shore of San Leandro will be affected by rising sea level, with increased frequency of flooding and higher water levels in wetlands and tidal areas. The City will need to adapt to this reality, making its shoreline more resilient while also regulating the

character of construction in vulnerable areas. Climate change may also result in more severe storms, wildfires, rain-induced landslides, changes in habitat, reduced potable water supply, and greater temperature extremes.

A substantial part of the General Plan is dedicated to environmental and natural hazard issues. Policies and actions in the Open Space, Parks, and Conservation Element (Chapter 6), and in the Environmental Hazards Element (Chapter 7), address the management of natural resources and protection of the public from these hazards

3.8 Access to Housing

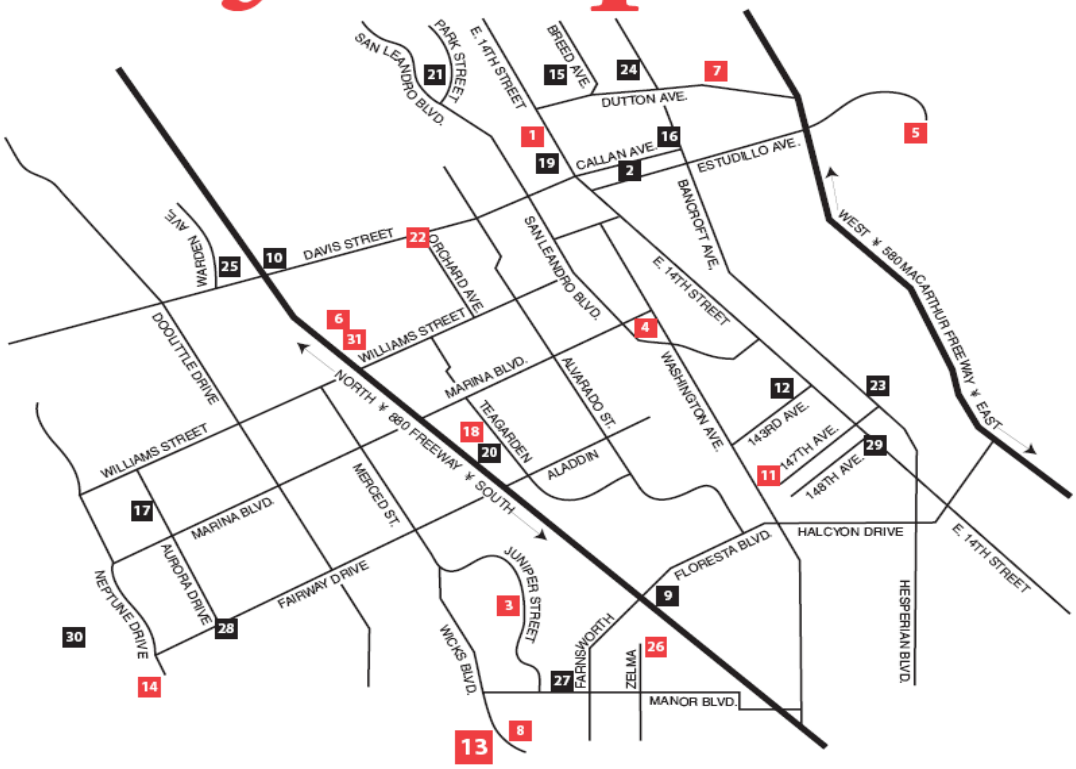
Unaffordable housing also contributes to the vulnerability of residents and will become significantly exacerbated after a disaster. After a disaster, if many housing units are lost, a constrained market may drive up the cost of housing even further. Loss or damage of housing that results in increased costs to either renters or home-owners will likely increase the number of permanently displaced San Leandro residents as finding housing that is affordable and near jobs, schools, medical facilities, and other services on which they rely will be challenging.

It is generally more difficult for residents in multi-family housing (either renters or owners) to retrofit their housing and many do not have insurance to protect themselves and their belongings in case of a disaster. In many communities, renters are also more likely to be resource-limited (low income, cost burdened, or lacking savings) and will need assistance both during a disaster (e.g., with shelter-in-place facilities), as well as post-disaster with finding interim, affordable housing to avoid the permanent displacement of low income or cost-burdened renters from communities due to damaged housing.

3.9 Access to Information

The ability to reach out to those who live and work in San Leandro is important to the City; therefore the City of San Leandro has multiple information outlets for residents and businesses to access information. The City's website and social media accounts, and the local television and radio channels are all updated with emergency preparedness information as well as timely, safety information in the event of a disaster. In an effort to make sure that information is available and the information is whole community inclusive, the City's preparedness information is translated into multiple languages and distributed through the City's website, social media accounts, trainings, and public outreach venues. In the event of a disaster the City would translate all critical information and distribute via social media, radio, television and the City's mass notification system.

City Map



1	Civic Center/City Hall 835 E. 14th Street	9	Floresta Park 3750 Monterey Blvd.	17	Mulford Park 13051 Aurora Dr.	25	Warden Ave. Park Warden Ave. & Tudor Rd.
2	Main Library 300 Estudillo Ave.	10	Grover Cleveland Park O'Donnell & Wrin	18	Pacific Recreation Complex Teagarden & Marina Blvd.	26	Washington Manor Park & Pool 14900 Zelma
3	Bonaire Park Juniper & Sagewood	11	Halcyon Park 1245 147th Ave.	19	Root Park East 14th & Hays St.	27	Manor Branch Library 1307 Manor Blvd.
4	Boys & Girls Club Pool 401 Marina Blvd.	12	Heath Park 1220 143rd Ave. at Rose	20	San Leandro Ball Park Teagarden & Marina Blvd.	28	Mulford Marina Branch Library 13699 Aurora Drive
5	Chabot Park 1698 Estudillo Ave.	13	Marina Community Center 15301 Wicks Blvd.	21	Siempre Verde Park Park St. & San Leandro Blvd.	29	South Branch Library 14799 E. 14th Street
6	Cherry Grove Park Leonard Dr. at Williams St.	14	Marina Park 13801 Neptune Dr.	22	Thrasher Park 1300 Davis St.	30	San Leandro Marina Office 40 San Leandro Marina
7	Farrelly Pool 864 Dutton Ave.	15	McCartney Park Breed Ave. & Sunnyside	23	Toyon Park 1500 Bancroft Ave.	31	Muir Soccer Field Leonard Dr. at Williams St.
8	F.J. Stenzel Park 15300 Wicks Blvd.	16	Memorial Park Bancroft & Callan	24	Victoria Park Victoria & Bancroft	32	Girls Inc. 13666 E. 14th St.

3.10 Transportation System

Interstates 880 and 580—the Nimitz and Macarthur Freeways—bisect San Leandro in a north-south direction. Interstate 238—the Castro Valley Freeway—provides an east-west link between 880 and 580 in the southern part of the Planning Area. I-880 is one of the busiest freeways in California, carrying 215,000 vehicles through San Leandro on an average day and serving as the major north-south truck corridor through the East Bay. Traffic volumes on I-580 are about 160,000 vehicles per average day. Both of the freeways are four lanes in each direction and both provide several interchanges connecting to local streets in San Leandro. San Leandro is located midway between the Bay Bridge and the San Mateo Bridge, the two major transbay crossings between the San Francisco Peninsula and the East Bay.

The 107-mile Bay Area Rapid Transit (BART) system includes four miles of track within San Leandro. Two of the system's 45 stations are located within the city, at Downtown San Leandro and Bay Fair. About 400,000 commuters ride BART to work on a typical weekday. About 6,000 passengers a day exit the two stations in San Leandro on a typical weekday, a ridership increase of 40 percent in the last 16 years. San Leandro does not currently have an AMTRAK station, although AMTRAK's trains pass through the city between Oakland and San Jose. Most San Leandro residences are within one-half mile of an AC Transit bus route, providing links to the BART station and major destinations within the city and East Bay. The city is also served by two active freight-rail lines and is approximately one mile from Metropolitan Oakland International Airport.

3.11 Critical Facilities

Some services such as healthcare, schools, and police and fire, are crucial for the functioning of communities, especially in the immediate post disaster environment. Other essential facilities for community functioning include public buildings that house community services such as libraries, or privately owned grocery stores, gas stations, banks, parks, places of worship, and many others. Understanding where these facilities are, and which communities they serve, is crucial to understanding the consequence if they are damaged. Directly following a disaster, first responders will be called into action. Local fire and police will be supported by mutual aid from California Highway Patrol, Coast Guard, search and rescue units, and other emergency responders. These services help limit the impact of the disaster and reduce community losses.

Critical Facilities

Building	Address	Built	Type of Construction	Building	Contents	Assessed Value
City Hall	835 E. 14th	1997	Reinforced Concrete	$ 11,979,143	1,905,174	$13,884,317
EOC – Public Works Office	14200 Chapman	1983	Steel Frame	133,521	29,115	162,655
Fire Station 9	450 Estudillo	1970	Joisted Masonry	1,115,012	6,298	1,121,310
Fire Station 10	2194 Williams	2003	Joisted Masonry	4,240,000	21,200	4,261,200
Fire Station 11	14903 Catalina	2002	Masonry-Non Combustible	3,057,040	218,360	3,275,400
Fire Station 12	1065 143rd Ave.	1953	Joisted Masonry	1,298,972	6,298	1,298,972
Fire Station 13	637 Fargo Ave.	1954	Joisted Masonry	443,335	4,498	447,854
Police Dept.	901 E. 14th	1997	Joisted Masonry	3,537,015	820,604	4,357,619
Water Treatment Plant	3000 Davis	Various	Several structures- Steel Frame and Reinforced Concrete	11,503,347	4,599,455	16,102,802

Main Library	300 Estudillo	1999	Joisted Masonry	17,992,864	5,622,770	23,615,634
		1999	Joisted Masonry	2,249,108	1,124,554	3,373,662
Marina Community Center	15301 Wicks	1962	Wood Frame	3,409,961	65,280	3,594,918
Senior Community Center – EOC	13909 East 14th Street	2010	Non Combustible	11,075,000	225,000	11,600,000

3.12 Public Facilities

For small jurisdictions, a single facility may house all fire or police services. Larger jurisdictions may have multiple facilities, each with unique roles. When there are multiple facilities for each department, it is important to know which functions are housed where. All facilities may be reliant on a single station's dispatch center, or one facility may house the only hazardous waste team. Understanding the services each facility is responsible for is crucial when prioritizing mitigation strategies, or when there are decisions on where new equipment or services are housed.

3.13 Critical Infrastructure

3.13.1 Water

Water service to San Leandro is provided by the East Bay Municipal Utility District (EBMUD), a publicly-owned utility. San Leandro comprises about 6 percent of EBMUD's customer base and uses about 5 percent of its water. About 95 percent of the EBMUD water supply originates from the melting snowpack of the Sierra Nevada, with the remaining five percent coming from reservoirs in the East Bay Hills. There are also about 800 private wells in San Leandro, many of which were originally used for agriculture. Most of these wells are dormant, and those that are still active are used for landscape irrigation and industry.

EBMUD distributes its water through a system of pipeline, storage reservoirs and pumping plants. The utility operates and maintains all storage, pumping and distribution facilities within its service area and is responsible for all facilities up to the location of the water meter. In 1999, San Leandro's metered water demand was 12.0 million gallons per day.

Although there are no major water service constraints in the city, regular maintenance and upgrading of the water delivery system is essential to provide adequate firefighting capacity and ensure reliable service delivery. The water system remains vulnerable to disruption in an earthquake. EBMUD's pipelines cross active earthquake faults at 200 locations within the service area. The utility is in the midst of a major seismic improvement program, including upgrades to reservoirs, anchoring of equipment, improvements to water treatment and pumping plants, and retrofitting of pipelines at fault line crossings.

The City of San Leandro and EBMUD have undertaken a number of programs to conserve water and reduce the need for developing new supplies.

3.13.2 Wastewater

San Leandro is served by two different sanitary sewer systems. About two-thirds of the city, including most of northern and central San Leandro, is served by a City-owned and operated system. The remainder of the city, including Washington Manor and most of southern San Leandro, is served by the Oro Loma Sanitary District. The Oro Loma District also includes a large portion of unincorporated Alameda County encompassing Ashland, Cherryland, and San Lorenzo. Most of San Leandro's commercial and industrial land uses are served by the City of San Leandro system.

3.13.3 City of San Leandro System

The City of San Leandro constructed its initial wastewater treatment plant at the west end of Davis Street in 1939. The plant has been upgraded substantially over the last 60 years in response to changes in demand and more stringent state and federal water quality standards. Today, the plant has a dry weather capacity of about 7.9 million gallons per day and treats about 5.2 million gallons per day. Flows sometimes exceed capacity during major winter storms, in part due to the infiltration of winter storm run-off into the 130 miles of pipes that comprise the collection system. The City is presently undertaking an extensive program to reduce wet weather infiltration problems by replacing deficient links in the collection system.

Once at the plant, wastewater is treated and dechlorinated. Most of the effluent is discharged to San Francisco Bay through an outfall pipe shared by other communities in Alameda County. Some of the effluent is directed to a recycled water system owned by EBMUD and is used to irrigate golf courses in Oakland and Alameda. Sludge from the treatment plant is used as an agricultural soil conditioner. The treatment system is enhanced by an aggressive industrial waste pre-treatment program serving industrial customers.

The City is in the process of undertaking significant capital improvements to the wastewater system, including the replacement of undersized pipes beneath the I-880 Freeway. Future improvements could include the expansion of the recycled water system to serve the City's Monarch Bay Golf Course. Administrative changes, including the possible transfer of wastewater services to EBMUD or another agency, also have been discussed as a means of achieving greater economies of scale and adding wet-weather capacity to the treatment system.

3.13.4 Oro Loma Sanitary District

The Oro Loma Sanitary District was formed in 1911 and today provides wastewater collection and treatment services, garbage collection, and recycling services for the 44,000 customers within its 13 square mile service area. Approximately 20 percent of the District's customers are located within the city of San Leandro. Oro Loma treats approximately 15 million gallons of sewage per day, including flow from the Castro Valley Sanitary District. The District's treatment plant is located at the end of Grant Avenue in San Lorenzo, just south of the San Leandro city limits.

As at the San Leandro plant, wastewater is treated to a secondary level through an activated sludge process. Treated effluent is disposed to the deep waters of San Francisco Bay through the collectively owned East Bay Dischargers Authority pipeline. An average of 230,000 gallons a day of treated effluent is reused for irrigation on the Skywest Golf Course in Hayward. The District has a Renewal & Replacement and Capital spending program which covers ongoing repair and replacement of system components. Revenues for this program are generated through sewer connection fees and user fees.

3.13.5 Drainage

The City of San Leandro Department of Public Works owns and maintains 175 miles of storm drainage conduits. The City's storm drain system feeds into a larger system owned and operated by the Alameda County Flood Control and Water Conservation District (ACFCWCD). This system includes the lower reaches of San Leandro and San Lorenzo Creeks, as well as a number of channels extending into San Leandro neighborhoods west of I-880. The District's drainage facilities include levees, pump stations, erosion control devices, and culverts.

3.14 Hospitals and Health Care Facilities

Hospitals and health care buildings are important for two reasons: they treat those injured during the hazard event, and they are housing or serving patients with specific medical needs. In a severe disaster event, there may be thousands of injuries that require immediate health

care. Hospitals need to be operational to fulfill this need during the response phase of the disaster. Additionally, hospitals and other health care facilities (general practice, pharmacies, assisted living homes, etc.) must continue to support the patients they were serving before the event. Hospitals and assisted living homes cannot be evacuated like other buildings because of the detrimental impact it could have on patients. Pharmacies and non-acute care facilities must remain functional to provide those with existing health needs with necessary services.

In 1973, as a direct result from the 1971 Sylmar earthquake, during which a hospital collapsed, California passed the Alfred E. Alquist Hospital Seismic Safety Act, to require acute care hospitals be designed to remain standing and operational immediately after an earthquake.[2] The law was amended after the 1994 Northridge earthquake, to include the evaluation and rating of hospital compliance with the law. All hospitals are required to be compliant with the law by 2030. This law is specific to acute care hospital buildings, and only addresses the earthquake hazard. Other health care facilities are not required to be designed or retrofit to a higher level.

San Leandro Hospitals

San Leandro Hospital
13855 E 14th St, San Leandro, CA
510-357-6500

Kindred Hospital-SFBay Area
2800 Benedict Dr, San Leandro, CA
510-357-8300

Kaiser Permanente
2500 Merced Street
San Leandro 94577

3.15 Schools

Schools are particularly important community assets, as residents highly value the safety and education of their children. Safe schools are important for the safety of children inside. A functional school following a disaster is also important to continue providing educational services during a community's recovery. If they are not operational families may choose to move in order to enroll their children in school. For families that stay, parents may be unable to return to work if schools are not in session.

[2] OSHPD (2005)

The important role of a school expands beyond education. Schools can be the center of a community's social fabric. They are not just a space for youth, but a place for the community as a whole. Schools are often where community meetings, performances, and events are held. Following disasters, some schools can serve as temporary shelter sites, while others might house social services to support disaster stricken communities.

While many of the critical facilities already listed may be located in publicly owned buildings, there are a number of other public services and operations that are critical for a jurisdiction to properly recover. City administrative services will be crucial to meet the surging demand for approvals, permits, and financing. Many public services outside the scope of emergency response will also need to be restored and operating soon after an event. Any social services that local governments administer will need to be restored quickly. Lastly, many local governments operate a number of infrastructure systems (local roads, water distribution, sewer, etc.) that will need departments to quickly repair damaged components and restore service to residents. Without a place to continue working, or without the resources or records needed to complete the tasks, a jurisdiction may be ill equipped to meet the increased workload expected in the aftermath of a disaster event.

San Leandro Schools:

- Corvallis Elementary School
  14790 Corvallis Street
  San Leandro 94579

- Garfield Elementary School
  13050 Aurora Drive
  San Leandro 94577

- Jefferson Elementary School
  14300 Bancroft Avenue
  San Leandro 94577

- Madison Elementary School
  14751 Juniper Street
  San Leandro 94577

- McKinley Elementary School
  2150 East 14th Street
  San Leandro 94577

- Monroe Elementary School
  3750 Monterey Boulevard
  San Leandro 94578

- Roosevelt Elementary School
  951 Dowling Boulevard
  San Leandro 94577

- Washington Elementary School
  250 Dutton Avenue
  San Leandro 94577

- Wilson Elementary School
  1300 Williams Street
  San Leandro 94577

- St. Felicitas Catholic School
  1650 Manor Boulevard
  San Leandro 94579

- Assumption Catholic School
  1851 136th Avenue
  San Leandro 94577

- St. Leander's Catholic School
  451 Davis Street
  San Leandro 94577

- Bancroft Middle School
  1150 Bancroft Avenue
  San Leandro 94577

- Washington Manor Middle School
  1170 Fargo Avenue
  San Leandro 94579

- John Muir Middle School
  1444 Williams Street
  San Leandro 94577

- San Leandro High School
  2200 Bancroft Avenue
  San Leandro 94577

- Lincoln High School
  2600 Teagarden Street
  San Leandro 94577

4. CAPABILTY ASSESSMENT

The City of San Leandro conducted an analysis of its hazards and developed a hazard mitigation master plan which is located in Section 7. To address existing local capabilities to aid in mitigation of natural and man-made hazards of non-emergency and emergency situations, the following capabilities and services exist.

Figure 4.1 Existing Plans, Studies and Reports

Existing Plans, Studies, Reports and Technical Information	Method of Incorporation into the LHMP/Safety Element (Environmental Hazards Element)
ABAG Open Data (2015)	Hazards
ABAG Risk Landscape template document (2015)	Hazards, Risk Assessment/Vulnerabilities
Annex to 2010 Association of Bay Area Governments Local Hazard Mitigation Plan – Taming Natural Disasters (2010)	Risk Assessment, Mitigation Programs
Capital Improvement Plan	Risk Assessment, Capabilities, Mitigation Policies and Programs
Climate Action Plan	Mitigation Policies and Programs
County of Alameda Emergency Operations Plan	Capabilities, Hazards, Risk Assessments/Vulnerabilities
City of San Leandro Emergency Operations Plan	Capabilities
FY 2015-2016 Budget	Mitigation Programs
General Plan Environmental Hazards Element	Community Profile, Capabilities, Mitigation, Policies and Programs, Hazards
San Leandro Municipal Code	Capabilities

State of California Multi-Hazard Mitigation Plan (2013)	Hazards, Risk Assessment/Vulnerabilities

4.1 PLANS AND PROGRAMS IN PLACE

Table 4-2 Capabilities to Implement Hazard Mitigation Strategies

Planning and Regulatory	Administrative and Technical	Financial	Education and Public Outreach
• General Plan • Capital Improvement Plan • Emergency Operations Plan • Climate Action Plan • Building Codes • San Leandro Municipal Codes • Flood Insurance Rate Maps • Environmental Safety Codes	• Planning Commission • Mutual Aid agreements • Disaster Council • Staff: Engineering and Building, Community Development, Floodplain Administrator, Emergency Services Division, GIS, Police, Fire, Public Works, Sustainability Manager	• Capital Improvement Project funding • Authority to levy taxes for specific purposes • Fees for water and sewer services • Federal grants • Other state and federal funding programs	• Local citizen groups and non-profit orginizations • Ongoing public education and information programs • Public-private partnerships addressing disaster related issues.

Plans	Yes/No Year	1. Does the plan address hazards? 2. Does this plan identify projects to include in the mitigation strategy? 3. Can the plan be used to implement mitigation actions?
General Plan	Yes 2016	1. Yes 2. Yes 3. No
Capital Improvement Plan	Yes 2017	1. Yes 2. Yes 3. No
Economic Development Plan	Yes 2035	1. No 2. No 3. No General Plan – Economic Development Element
Local Emergency Operations Plan	Yes 2010	1. Yes 2. No 3. No
Continuity of Operation Plan	N/A	Not recently updated
Water Pollution Control Plant Contingency Plan and Lift Station Manual	Yes 2016	1. Yes 2. No 3. Yes
Climate Action Plan	Yes 2009	1. Yes 2. Yes 3. Yes
Building Code, Permitting, and Inspections	**Yes/No**	**Are codes adequately enforced?**
Building code	Yes	Version/Year: 2016 California Building Code
Building Code Effectiveness Grading Schedule (BCEGS)	Yes	8 ISO CRS 2/2 BCEGS
Fire Department ISO rating	Yes	2
Site Plan review requirements	Yes	Building Department

Land Use Planning and Ordinances	Yes/No	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Subdivision ordinance	Yes SLMC 7-1	Yes Yes
Floodplain ordinance	Yes	Yes SLMC Title 7, Chapter
Natural hazard specific ordinance (storm water, steep slope, wildfire)	Yes	Geologic Hazard SLMC 7-10 Yes Yes
Flood insurance rate maps	Yes	Effective date 8/3/2009

Administration	Yes/No	Describe Capability Is coordination effective?
Planning Commission	Yes	Commission analyzes development projects and effects they may have.
Mitigation Planning Team	Yes	With new plan, team will meet once every six months to verify progress, and address any new changes in vulnerability.
Maintenance programs to reduce risk	Yes	Maintenance programs affiliated with the City designed to maintain daily functions but also to assist with reducing risk specific hazards.
Mutual Aid agreements	Yes	The City works with county agencies, surrounding cities, and local businesses to create pre emergency relationships and contracts and to work on LHMP grants and projects.

Staff	Yes/No FT/PT	• Is staffing adequate to enforce regulations? • Is staff trained on hazards and mitigation? • Is coordination between agencies and staff effective?
Chief Building Official	Yes	Yes Yes Yes
Floodplain Administrator	Yes	Yes Yes Yes
Emergency Manager	Yes	Yes Yes Yes
Community Planner	Yes	Yes Yes Yes
Civil Engineer	Yes	Yes Yes Yes
GIS Coordinator	Yes	Yes Partially Yes

4.2 CODES, LAWS, AND ORDINANCES

The building codes of San Leandro are contained in the San Leandro Municipal Code. The codes that are currently in effect were formally adopted and went into effect in November 2016.

2016 California Building Code	2016 California Plumbing Code
2016 California Fire Code	2016 California Electrical Code
2016 California Mechanical Code	2015 International Property Code (2016-14)

It should be noted that these model codes are amended by the State of California and the City of San Leandro to include various additional requirements. For instance, the plumbing code is amended to prohibit the use of plastic pipe within the drain, waste and vent system of a building.

The best place to view these codes is the San Leandro Permit Center or the Library. Because of the vast amount of information contained in these codes and their technical nature, they can be difficult to navigate. Standard questions can be answered by the City of San Leandro permit center staff.

4.3 ENVIROMENTAL SERVICES

The City of San Leandro's Environmental Services Division is a full service environmental agency serving the community of San Leandro. The division is one of a handful of agencies in California to oversee such a broad range of environmental programs at the local level. The Environmental Services Division takes pride in serving as a one-stop environmental contact point for the city's residents and businesses.

The Environmental Division is responsible for

- Contaminated Site Cleanup - overseeing the cleanup and remediation of contaminated sites within San Leandro.
- Hazardous Materials - regulating the storage, use and disposal of hazardous materials and hazardous wastes above and below ground.
- Recycling - promoting recycling, pollution prevention and waste reduction programs.
- Refuse - overseeing the city's refuse collection program.
- Sewer/Pretreatment - monitoring and regulating discharges of wastewater into the City's sanitary sewer system.
- Site Information & Review - maintaining and making available files and information about businesses that handle hazardous materials and contaminated sites.
- Storm Water Program - safeguarding the City's storm water system through regular inspections, and responding to reports of spills and illegal discharges of hazardous materials or other potentially harmful substance.

4.4 EARTHQUAKE RETROFIT PROGRAMS

The City of San Leandro includes earthquake safety as one of the top priorities in its public safety mission. There are currently two retrofit programs in effect within the city. One program addresses the seismic strengthening of older unreinforced masonry buildings, while the other program addresses the strengthening of older wood-frame homes.

The retrofitting of unreinforced masonry buildings throughout the city is nearly complete thanks to the diligence and commitment of the building owners. This retrofit work has improved the earthquake resistance of these buildings, thus enhancing the safety of the occupants. The owners are to be commended for their efforts.

The seismic strengthening of older wood-frame homes throughout the city is progressing with the help of the HOME EARTHQUAKE STRENGTHENING PROGRAM. This is a comprehensive residential seismic strengthening program that provides property owners with simple and cost-effective methods for strengthening their wood-frame houses for earthquake survival. San Leandro's Home Earthquake Strengthening Program includes six fundamental elements, each of which is described below.

Earthquake Strengthening Workshops - This popular workshop series, provided to homeowners on a quarterly basis, reviews common residential construction weaknesses and introduces the average citizen to basic repair techniques that can significantly improve a home's performance in earthquakes. The course is offered through the City's Building Division and consists of four evening sessions for homeowners who wish to learn how to "do-it-yourself" or learn how to get the best service if they hire a contractor.

The City also offers similar classes for contractors. A major obstacle to homeowner participation in earthquake strengthening is the difficulty in hiring qualified retrofit contractors. To increase homeowner confidence in finding a qualified retrofit professional, another element of San Leandro's Home Earthquake Strengthening Program is the Contractor Workshop. This quarterly 8-hour course is aimed at optimizing and regulating the quality of services that retrofit contractors provide to San Leandro homeowners.

The San Leandro Earthquake Handbook - This is a high-impact, full-color, 16-page booklet that provides residents with a plain-English explanation about earthquake risks in the community. It contains easy-to-follow illustrations and step-by-step instructions for evaluating and strengthening a wood-frame house against earthquakes (anchor-bolting, plywood shear-paneling, nailing, blocking, etc.), guidance for strapping a water heater, as well as preventing the collapse of a brick chimney. It also contains information about the City's over-the-counter permit for home-earthquake strengthening, references to other resources in the community, and frequently asked questions and answers.

A Prescribed Retrofit Standard & Free Plan Set - Improving upon a concept that originated with the City of Santa Barbara, San Leandro developed a recommended standard for regulating the quality of home retrofit procedures undertaken in the San

Leandro community. This standard, published as a Prescriptive Plan Set for Strengthening Wood-frame Houses for Earthquakes, provides San Leandro homeowners or their contractors with a simple and rapid procedure for obtaining a permit to bolt and brace a typical home foundation system. The Prescriptive Standards are similar to those published in the Uniform Code for Building Conservation and are based on standards which were developed by the "Residential Retrofit and Repair Committee" of the California Building Officials. This committee consisted of structural engineers, building officials and architects, and was organized and supported by both the California Seismic Safety Commission and the California Governor's Office of Emergency Services. The Prescriptive Plan Set - free to any San Leandro resident - is actually a blueprint showing the seismic retrofit details needed for typical wood-frame houses in San Leandro neighborhoods. Once the easy-to-use Plan Set is filled out, the homeowner can take it to the City's "one-stop" permit center, get a few tips from the plan-check engineer (if appropriate), pay a fixed home-retrofit permit fee, and be out the door ready to start work.

Homeowner's List of Earthquake Contractors - Because of potential liability, municipal agencies generally will not certify or recommend private contractors for residents. For homeowners concerned about earthquakes, however, this lack of local guidance adds yet another obstacle in the way of home strengthening. In San Leandro, residents interested in finding qualified contractors to bid on their home-retrofit job can obtain the Homeowner's List of Earthquake Contractors. This is a reference file, maintained by the City's Building Regulations Division, that lists general contractors who have "successfully completed" the City's home-retrofit Contractor Workshop. Homeowners who would like to hire a contractor to perform their seismic upgrades now have ready access to detailed references and background information about contractors which simplifies the hiring process. Contractors must maintain top quality standards in order to remain on file with the City. The Association of Bay Area Government (ABAG) also maintains a list of contractors that have attended the ABAG One Day Workshop on Seismic Retrofit of Wood-Frame Buildings.

Tool-Lending Library - As an incentive to "do-it-yourselfers" who want to strengthen their own homes - but who lack the necessary tools - the City maintains a Tool Lending Library. This resource, administered by the City's Building Regulations Division, allows residents who use the Prescriptive Home-Strengthening Plan Set to borrow, free of charge, most of the tools they may need to complete the retrofit job.

Limited Financial Assistance Available - Strengthening single-family homes is a "private property issue" that cannot easily be paid for through local tax measures or encouraged through penalties. At the present time, the City is exploring options for a community-wide financial incentive program to encourage home earthquake strengthening. In the meantime, low-income residents are already benefiting from a financial assistance program. The City's Housing Division has set aside a portion of its block-grant funding from the U.S. Department of Housing and Urban Development for grants and low-interest loans to low-income homeowners specifically for home earthquake strengthening. For San Leandro homeowners in the Earthquake

Strengthening Workshop, materials used for retrofitting are provided for a number of lucky homeowners chosen through a drawing.

By taking similar steps, communities across the country are duplicating San Leandro's efforts to establish their own community-based, home seismic retrofitting programs. San Leandro's program is one of the most extensive of its kind ever developed. With the help of private industry, it encourages all homeowners to protect their investment, protect their family and protect their future as quickly and efficiently as possible.

4.5 EMERGENCY OPERATIONS PLAN

In compliance with the State of California Emergency Services Act, Chapter 7 of Division 1 of Title 2 of the Government Code, the City of San Leandro has an emergency plan that is based on the State Emergency Management System and addresses all of the requirements of the law to safely respond to emergencies and to protect life, property and the environment. The City of San Leandro employees a full time Emergency Services Specialist (ESS) who coordinates the activities of all City agencies relating to planning, preparation and implementation of the City's Emergency Operations Plan. The City's ESS also supports the coordination of response efforts with San Leandro's Police, Fire and other first responders in the City's Emergency Operations Center (EOC) to ensure maximum results for responders by providing up-to-date public information and ensuring coordinated resource management during a crisis. Additionally, the ESS coordinates with the Alameda County Operational Area and other partner agencies to guarantee the seamless integration of federal, state and private resources into local response and recovery operations.

The City of San Leandro continues to make forward progress in comprehensive emergency management planning through the development of previously adopted federal and state-compliant Local Hazard Mitigation Plans (LHMP), and Emergency Operations Plan (EOP). The 2005-2015 LHMP assisted in the mitigation of future disasters by identifying risk vulnerabilities and measures to alleviate the impact of hazards. The EOP is an all-hazards emergency preparedness, response and short-term recovery plan designed to: serve as a basis for effective response to any hazard threatening San Leandro using capabilities for the protection of citizens from the effects of disasters; facilitate the integration of mitigation in response and recovery activities; and facilitate coordination with cooperating private or volunteer organizations and County, State and Federal government in disaster situations.

Each emergency plan follows the principles and processes outline in the National Incident Management System (NIMS), California Standardized Emergency Management System (SEMS), and the Incident Command System (ICS). This provides a consistent, flexible and adjustable framework for the City to work to manage

disasters regardless of their cause, size, location or complexity across all phases of emergency management: preparedness, response, recovery and mitigation.

4.5.1 TRAINING AND EXERCISE

The Emergency Services Specialist is responsible for training and exercise planning for City employees that incorporates and complies with the Standard Emergency Management (SEMS), National Incident Management Systems (NIMS) and EOC Incident Command System (ICS).

4.5.2 EMERGENCY OPERATIONS CENTER

The ESS is tasked with maintenance of the Emergency Operations Center (EOC).
In 2017, the EOC was outfitted with new laptop computers and a virtual operating system that allows information to funnel into the EOC from the field, permits those employees who aren't able to respond to the EOC to connect virtually, and promotes interoperability with mutual aid partners.

4.5.3 MASS NOTIFICATION SYSTEM

The City of San Leandro uses various mass notification systems to communicate important and concise information and instructions to San Leandro employees, residents, visitors and businesses including the type of incident and instructions or actions to take to remain safe.

4.5.4 DISASTER COUNCIL

The City of San Leandro's Disaster Council is an executive-level advisory body established to facilitate the development and implementation of policies, programs and plans that protect persons and property within San Leandro during times of emergencies and disasters. The Council membership consists of the Mayor (chair), City Administrator (vice chair), Emergency Services Specialist (secretary), city agency, department or division heads and representatives from the general public, businesses, civic and community organizations, local agencies, utilities, and neighboring cities.

4.5.5 COMMUNITY EMERGENCY RESPONSE TEAM C.E.R.T

The newly created San Leandro C.E.R.T Community Emergency Response Team is a free emergency preparedness and disaster response training program for individuals, neighborhood groups and community based organizations in San Leandro. CERT teaches

self-reliance skills and helps neighborhoods establish response teams to take care of the neighborhood until professional emergency personnel arrive.

4.6 HAZARDOUS MATERIALS PLAN

The City of San Leandro is the administering agency for Health and Safety Code Division 20, Chapter 6.95, Article 1 which mandates that the administering agency develop and maintain an Area Plan which describes the jurisdiction's plan for the prevention of, preparation for and response to hazardous materials incidents and threatened incidents.

The City entered into a contract with the Alameda County Fire Department (ACFD) for fire and hazardous materials services on July 1, 1995 and is the primary and first emergency responder for the control of hazardous materials incidents in the city of San Leandro.

The area plan and its components were based upon the nature of the community, the businesses located in it, the transportation routes traversing it, and the resources available for addressing hazardous materials issues. The information contained in the Hazardous Materials Business Plans and the Risk Management Plans was utilized in this process.

The plan contains the following sections: purpose and objectives, administration, agency coordination and other plans, planning and the community right to know, reporting and notification, finance and cost recovery, communication, training, supplies and equipment, emergency response procedures, post incident analysis and follow-up, incident investigation, medial interface, and baseline medical monitoring.

4.7 PREVIOSLY IMPLEMENTED MITIGATION STRATEGIES

There are a number of hazard-reduction and mitigation measures San Leandro has accomplished in the years 2005- 2015. Mitigation actions and strategies completed from San Leandro's 2005 LHMP have not be included in the matrix below.

2010 Mitigation Actions	**Completed**	**On Going**
Retrofit of Seismically Deficient Road Structures	**X**	
Participation in Interoperable Communication Systems	**X**	
Wildland Fire Mitigation		**X**
Coordination with State Division of Safety to Dams		**X**

Long Range Earthquake Hazard Reduction Plan		**X**
Computerized Data Base and Mapping	**X**	

On Going Project Update -

- **Wildland Fire Mitigation** – The City of San Leandro contracts with Alameda County Fire Department for fire services and fire prevention. The wildland fire mitigation program is an ongoing effort due to yearly regrowth of vegetation and the nature of fire season.

- **Coordination with State Division of Safety to Dams-** Continued mitigation project lead by East Bay Municipal Water District.

- **Long Range Earthquake Hazard Reduction Plan –**The San Leandro Building Department continues to create programs that mitigate the potential loss of property and life from major earthquake due to aging and improperly retrofitted infrastructure.

5. HAZARD ANALYSIS

5.1 OVERVIEW

This chapter defines and maps significant natural hazards that impact the people, built environment, economy and society of San Leandro. Each section describes a different natural hazard, including how it has affected the Bay Area and San Leandro in the past and how it is likely to impact San Leandro in the future. Most of the information in this chapter is adapted from the "Risk Landscape" document prepared by ABAG to assist local governments in the preparation of their LHMPs, also included is CAL OES's My Hazards data.

In the Bay Area, earthquakes are the hazard that have the highest combined likelihood to cause extensive, multi-jurisdictional damage. Disruptive earthquakes also have high likelihood of occurring at any given time. With the combined likelihood and extent of earthquakes, much of the focus of this chapter is on earthquake hazards.

Flooding is another major hazard that the Bay Area and San Leandro are exposed to. Although San Leandro has not been susceptible to major flooding, studies predict that due to climate change and sea level rise, flooding in San Leandro and across the bay area could increase.

Other hazards beyond earthquakes and flooding/sea level rise may be less widespread or less frequent in the Bay Area and San Leandro, but can still cause significant local impacts and have cascading effects on the region. Other hazards potentially affecting San Leandro include dam failure of the Chabot Dam, drought, extreme heat, fire and hazardous materials.

Climate change has begun to increase the severity of some hazards. Changes in extreme weather events are the primary way that most people experience climate change. Human-induced climate change has already increased the number and strength of some of these extreme events. Over the last 50 years, much of the United States has seen an increase in prolonged periods of excessively high temperatures, more heavy downpours, and in some regions, more severe droughts. [7]

5.2 HAZARD IDENTIFICATION AND SCREENING

The Local Hazard Mitigation Planning Team considered the full range of potential hazards and their relevance to San Leandro and determined which hazards warranted further discussion, as indicated in Table 5-1. For each hazard detailed in Table 5-1, the planning team identified the geographic areas, the extent, previous occurrences and probability of future events. While multiple hazards were identified, earthquakes (particularly shaking) and flooding were ranked as highest priorities based on past disasters and expected future impacts, as they pose the most significant risk for potential loss.

The planning team defined the probability of hazards as "high" which is defined as occurring every 1-10 years, "medium" as occurring every 10-50 years, and "low" as occurring at intervals greater than 50 years. For some hazards, due to the wide variations of type and magnitude, there is no formal way to estimate the probability of these events, which will be noted throughout this section.

7 U.S. Global Change Research Program (2014), Climate Change Impacts in the United States, p. 15. http://nca2014.globalchange.gov/

Figure 5-1. Identification and Screening of Hazards

Hazard Type	Explanation	Risk Probability
Earthquake	The Hayward Fault runs directly through the City of San Leandro, parallel to Highway 580 and Highway 880. An earthquake on the Hayward Fault would have significant impact on San Leandro and could lead to further disasters such as liquefaction, tsunami, and earthquake-induced landslides.	High
Dam Failure	San Leandro sits directly below Upper Chabot Dam. Failure of the Dam would cause catastrophic damage to the City.	Low
Fire –Urban Wildland	San Leandro has small areas of wildlands, which are subject to local responsibilities. Urban fires and fire following earthquakes could potentially affect San Leandro.	Medium
Flood	San Leandro could potentially be affected by flooding from the San Francisco Bay and heavy rain.	Medium
Levee Failure	A failure of City's levee would result in flooding from San Francisco Bay	Low
Landslide	San Leandro has a history of landslide due to rain fall.	Medium
Sea Level Rise	San Leandro is potentially affected by sea level rise.	Low
Drought	Prolonged drought could limit water availabilty.	High
Extreme Heat	Climate change experts predict more extreme heat days in the future.	Low

5.3 EARTHQUAKES

Earthquakes occur when two tectonic plates slip past each other beneath the earth's surface, causing sudden and rapid shaking of the surrounding ground. Earthquakes originate on fault planes below the surface, where two or more plates meet. As the plates move past each other, they tend to not slide smoothly and become "locked," building up stress and strain along the fault. Eventually the stress causes a sudden release of the plates, and the stored energy is released as seismic waves, causing ground acceleration to radiate from the point of release, the "epicenter."

The Bay Area is in the heart of earthquake country. Major faults cross through all nine Bay Area counties. Every point within the Bay Area is within 30 miles of an active fault, and 97 of the 101 cities in the Bay Area are within ten miles of an active fault. Figure 5-2 shows the location of active faults that are mapped near San Mateo under the Alquist-Priolo Act. The Hayward Fault runs directly through San Leandro, and has the potential for significant damage to the city if a major earthquake were to occur (as expected) along the Hayward Fault. The San Andreas Fault, located approximately 14 miles west of the San Leandro, depending upon magnitude, could produce similar damage to the City as the 1989 Loma Prieta earthquake did.

The total amount of energy released in an earthquake is described by the earthquake magnitude. The moment magnitude scale (abbreviated as M) is logarithmic; the energy released by an earthquake increases logarithmically with each step of magnitude. For example, a M6.0 earthquake releases 33 times more energy than a M5.0, and a M7.0 earthquake releases 1,000 times more energy than a M5.0 event.

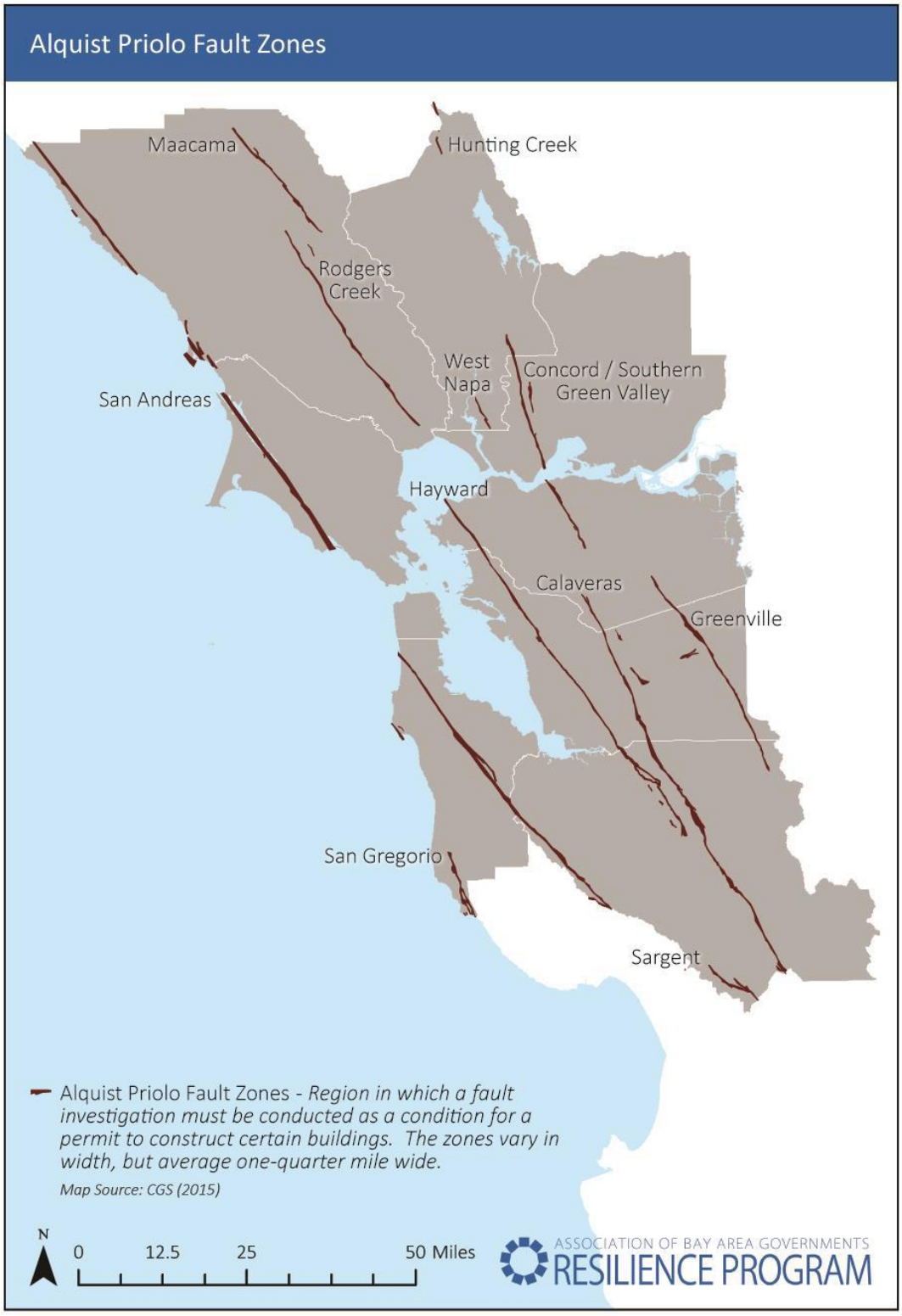
The quantified size or measurement of an earthquake is dependent on factors that include the length of the fault and the ease with which the plates slip past one another. In the Bay Area, technical specialists have observed varied fault behaviors, giving some sense of which faults may or may not produce a large, damaging earthquake. Earth scientists are most concerned about the San Andreas and Hayward faults, believed most likely to produce large, regionally damaging earthquakes. There are, however, many other Bay Area faults that can produce localized damage.

Additionally, earthquakes are often not isolated events, but are likely to trigger a series of smaller aftershocks along the fault plane, which can continue for months to years after a major earthquake, producing additional damage.

The energy released in earthquakes can produce five different types of hazards:

- Surface Fault rupture
- Ground shaking
- Liquefaction
- Earthquake-induced landslides
- Tsunamis and seiches

Figure 5-2 Faults and Alquist-Priolo Fault Zones



5.3.1 HISTORIC BAY AREA EARTHQUAKE OCCURANCES

The Bay Area has experienced significant, well-documented earthquakes. In 1868, a significant earthquake occurred on the Hayward fault with an estimated magnitude of 6.8-7.0. The fault ruptured the surface of the earth for more than 20 miles and significant damage was experienced in Hayward and throughout Alameda County, and as far away as San Francisco, Santa Rosa, and Santa Cruz. The M7.8 1906 earthquake on the San Andreas Fault, centered just off the coast of San Francisco, devastated San Francisco and caused extensive damage in Oakland, San Jose, and Santa Rosa. More recently, the M6.9 1989 Loma Prieta earthquake caused severe damage in Santa Cruz and the surrounding mountains, where it was centered, as well as fatal damage 50 miles away in Oakland and San Francisco. Moderate earthquakes are much more common in the Bay Area; twenty-two have occurred in the last 178 years, averaging every eight years.[3] The 2014 South Napa earthquake is a reminder of the strong shaking that even a moderate magnitude 6.0 earthquake can produce in a localized area. Because the 1906 earthquake released so much energy and stress on regional faults when it ruptured, the last 100 years have been relatively seismically quiet. As faults restore their stress and energy builds again, the region may have a more seismically active future.

There have been six earthquake-related declared disasters in the Bay Area since 1950. Only the 1989 Loma Prieta Earthquake directly affected San Leandro. San Leandro had no reported deaths or injuries due to the Loma Prieta earthquake, and no major damage. Most of the reported damage was personal belongings, and minor to moderate structural damage to dwellings. San Leandro's Emergency Operations Center was open to observe and assist as needed.

5.3.2 EARTHQUAKE HAZARDS

Earthquakes can trigger multiple types of seismic hazards, causing varying severity of damage in different locations. The following sections describe each earthquake hazard in greater detail, including where and how it is likely to affect the Bay Area and more specifically, San Leandro.

Figure 5-3 Timeline of Earthquake and Population Growth in the San Francisco Bay Area

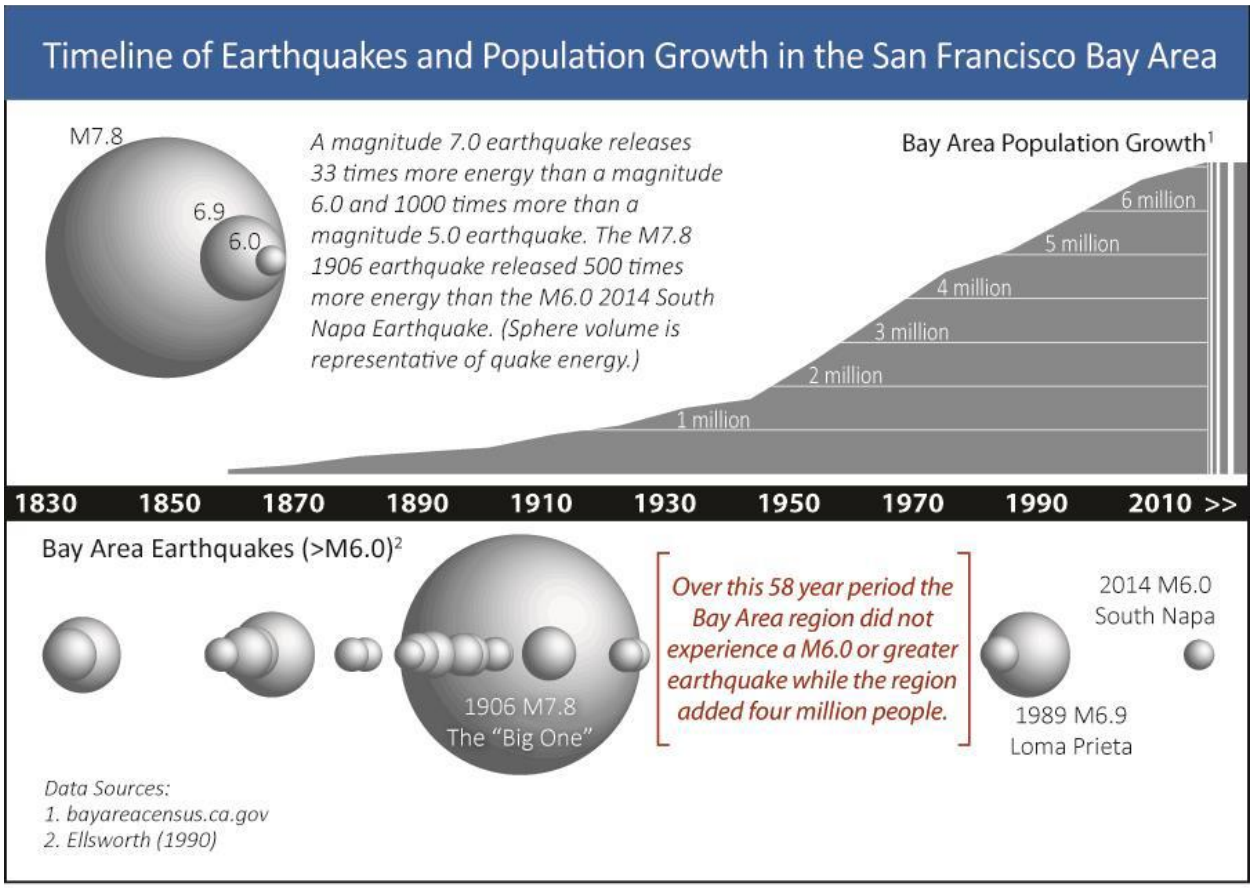


Figure 5-4 Earthquake Related Disasters in the Bay Area Since 1950

Disaster	Counties Declared	State Proclamation	Federal Declaration	Damage
M6.0 South Napa earthquake	Napa and Solano Counties	August 24, 2014	September 11, 2014	$362 million - $1 billion in damage
Tsunami resulting from M8.9 Honshu, Japan earthquake	Del Norte, Monterey, Santa Cruz	March 11, 2011	April 18, 2011	$39 million in damage
M5.2 Napa earthquake	Napa County	September 6, 2000	September 14, 2000	$15-70 million in estimated damage
M7.1 Loma Prieta earthquake	Alameda, Monterey, San Benito, San Mateo, Santa Clara, Santa Cruz, San Francisco, Contra Costa, Marin, Solano	October 18, 1989	October 18, 1989	$5.9 billion in damage, 23,408 homes damaged, 3,530 businesses damaged, 1,018 homes destroyed, 366 businesses destroyed
M6.2 Morgan Hill earthquake	Santa Clara County	N/A	April 25, 1984	$7.265 million in damage to public, business, and private sectors
Tsunami warning resulting from Good Friday earthquake in Alaska	Marin County	September 15, 1964	Not declared	No damage

[10] State of California Multi-Hazard Mitigation Plan, Appendix M, California Governor's Office of Emergency Services

5.3.3 SURFACE FAULT RUPTURE

A fault is a point of displacement along the fractures of the earth's crust caused by shifting tectonic plates. When an earthquake occurs, there is a rupture on a fault as built-up energy is suddenly released. Active faults are those that have ruptured in the past 11,000 years.[12] Often the rupture occurs deep within the earth, but it is possible for the rupture to extend to the surface and create visible above-ground displacement, called "surface rupture." The California Geological Survey (CGS) publishes maps of active Bay Area faults that could produce surface rupture, as required by the Alquist-Priolo Earthquake Fault Zoning Act (1972).[13] These maps show the most comprehensive depiction of fault traces that can rupture the surface, and the zones directly above and surrounding the fault traces. Cities and counties require special geologic studies within these zones to prevent construction of human-occupied structures.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE:
As previously indicated, The Hayward Fault runs directly through San Leandro, and has the potential for significant damage to the city if a major earthquake were to occur. In the 1868 Hayward earthquake San Leandro experienced major damage to infrastructure, since that time significant improvements in building safety has been made. The San Andreas Fault is 14 miles west of San Leandro, depending upon the magnitude and epicenter of the earthquake, an earthquake along the San Andreas could produce similar damage to the City as the 1989 Loma Prieta earthquake did. Due to the proximity of the Hayward Fault, and its history of producing large destructive earthquakes, San Leandro faces a potential threat of surface fault rupture. The City's primary concerns after a large earthquake would be:

- Loss of life and injury due to infrastructure failure
- Water main breaks due to aging water line infrastructure
- Fire due to ruptured gas lines and infrastructure failure
- Roadway failure
- Need for mass shelter

5.3.4 GROUND SHAKING

When faults rupture, the slip generates vibrations or waves in the earth that are felt as ground shaking. Larger magnitude earthquakes generally cause a larger area of ground to shake, and to shake more intensely. As a result, one principal factor in determining anticipated levels of shaking hazard in any given location is the magnitude of expected earthquakes. The intensity of ground shaking felt in one area versus another, however, is based on the magnitude and other factors including distance to the fault; direction of rupture; and, the type of geologic materials at the site. For example, softer soils tend to amplify ground shaking, while denser materials limit ground shaking impacts at the site surface.

Ground shaking is commonly characterized using the Modified Mercalli Intensity (MMI) scale, which illustrates the intensity of ground shaking at a particular location by considering the effects on people, objects, and buildings. The MMI scale describes shaking intensity on a scale of 1-12. MMI values less than 5 don't typically cause significant damage; MMI values greater than 10 have not been recorded.

As described, there are a number of different faults that contribute to the seismic hazard in the Bay Area. ABAG and the United States Geological Survey (USGS) worked collaboratively to characterize which fault contributes most to an area's seismic hazard. Figure 5-6 maps which fault contributes most to an areas seismic risk, taking into account the locations proximity to various faults, and the likelihood and severity of each fault. The map characterizes the fault with the greatest hazard, but many locations in the region can be severely impacted by multiple faults.

Figure 5-5 MMI Intensity

Intensity	Building Contents	Masonry Buildings	Multi-Family Wood-Frame Buildings	1&2 Story Wood-Frame Buildings
MMI 6	Some things thrown from shelves, pictures shifted, water thrown from pools.	Some walls and parapets of poorly constructed buildings crack.	Some drywall cracks.	Some chimneys are damaged, some drywall cracks. Some slab foundations, patios, and garage floors slightly crack.
MMI 7	Many things thrown from walls and shelves. Furniture is shifted.	Poorly constructed buildings are damaged and some well-constructed buildings crack. Cornices and unbraced parapets fall.	Plaster cracks, particularly at inside corners of buildings. Some soft-story buildings strain at the first floor level. Some partitions deform.	Many chimneys are broken and some collapse, damaging roofs, interiors, and porches. Weak foundations can be damaged.
MMI 8	Nearly everything thrown down from shelves, cabinets, and walls. Furniture overturned.	Poorly constructed buildings suffer partial or full collapse. Some well-constructed buildings are damaged. Unreinforced walls fall.	Soft-story buildings are displaced out of plumb and partially collapse. Loose partition walls are damaged and may fail. Some pipes break.	Houses shift if they are not bolted to the foundation, or are displaced and partially collapse if cripple walls are not braced. Structural elements such as beams, joists, and foundations are damaged. Some pipes break.
MMI 9	Only very well anchored contents remain in place.	Poorly constructed buildings collapse. Well-constructed buildings are heavily damaged. Retrofitted buildings damaged.	Soft-story buildings partially or completely collapse. Some well-constructed buildings are damaged.	Poorly constructed buildings are heavily damaged, some partially collapse. Some well-constructed buildings are damaged.
MMI 10	Only very well anchored contents remain in place.	Retrofitted buildings are heavily damaged, and some partially collapse.	Many well-constructed buildings are damaged.	Well-constructed buildings are damaged.

Figure 5-6 Scenario Earthquake with Greatest Contribution to Seismic Hazard

5.3.5 EARTHQUAKE SHAKING SCENARIOS

In addition to this effort, ABAG and USGS have developed several shaking scenario maps that depict shaking intensity for specific, plausible earthquake scenarios with a given magnitude on a fault. These maps show possible levels of ground shaking throughout the Bay Area in a single likely earthquake, taking into consideration the earthquake magnitude; rupture location and direction; and soil conditions throughout the region. The scenarios that are most likely to cause strong shaking in **San Leandro** are shown in Figures 5-7 and 5-8. The maps indicate that an earthquake on the Hayward Fault has the greatest contribution to seismic hazard for San Leandro, with an earthquake on the San Andreas Fault having additional contribution to seismic hazard.

Scenario maps are helpful to model the expected shaking of an individual event, but they do not depict the likelihood of the event occurring or whether it is the most significant event for a particular location. A Probabilistic Seismic Hazard Assessment (PSHA) Map incorporates the likelihood of ground shaking from all nearby fault sources, and accounts for the frequency of each event. The PSHA Map in Figure 5-6 illustrates the 10 percent or greater chance in a 50-year period that each location on the map will exceed the MMI shown at least once.

In terms of risk characterization, it is equivalent to a 500-year flood. A 10 percent in 50 years hazard level was chosen as it most closely aligns to the levels of shaking used in the current building code. Seismic hazard maps are not intended to be site-specific but depict the general risk within neighborhoods and the relative risk from community to community.

Events with strong shaking can still occur in areas with low probabilities shown in a PSHA map. The area damaged by the 2014 South Napa Earthquake is one example of a strong earthquake occurring in a location with lower risk probability than other areas within the region.

12 Bryant, W.A., and Hart, E.W., (2007)
13 California Public Resources Code, Division 2, Geology, Mines and Mining, Chapter 7.5, Earthquake Fault Zoning, sections 2621-263
14 ABAG, (2013). Modified Mercalli Intensity Scale

Figure 5-7 Earthquake Ground Shaking Severity- M 7.8 San Andreas Fault

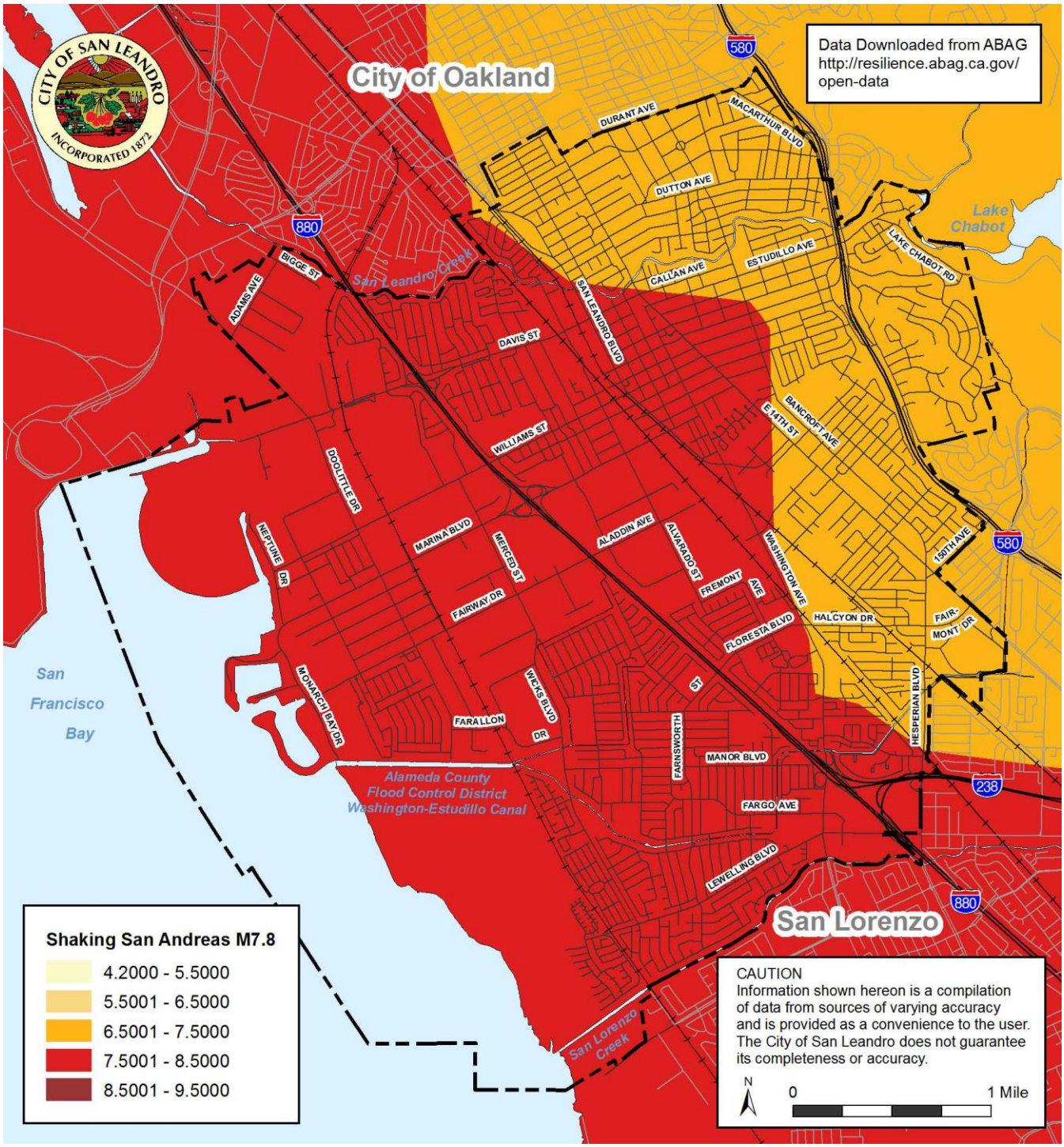


Figure 5-8 Earthquake Ground Shaking Severity- M 7.0 Hayward Fault

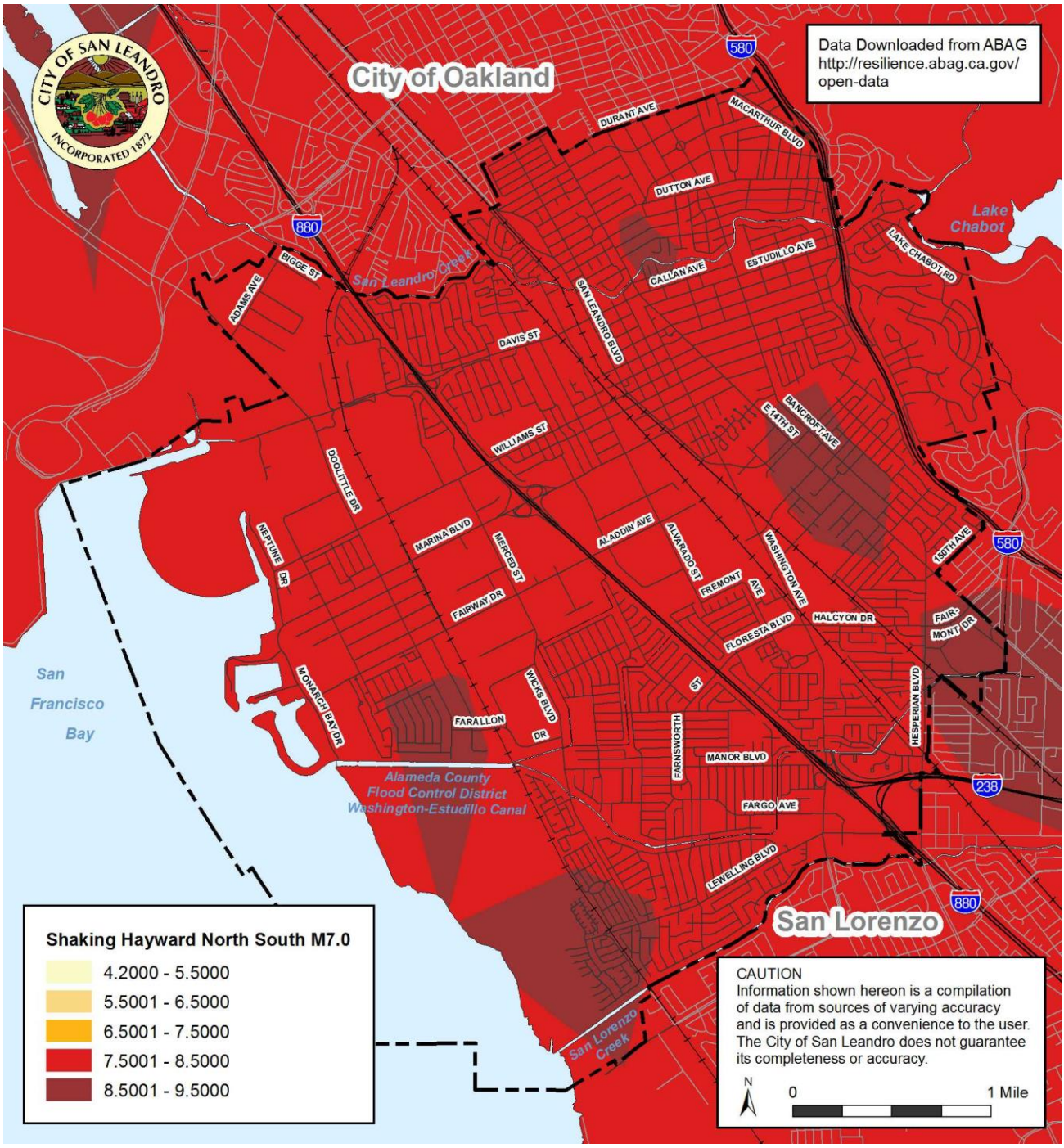
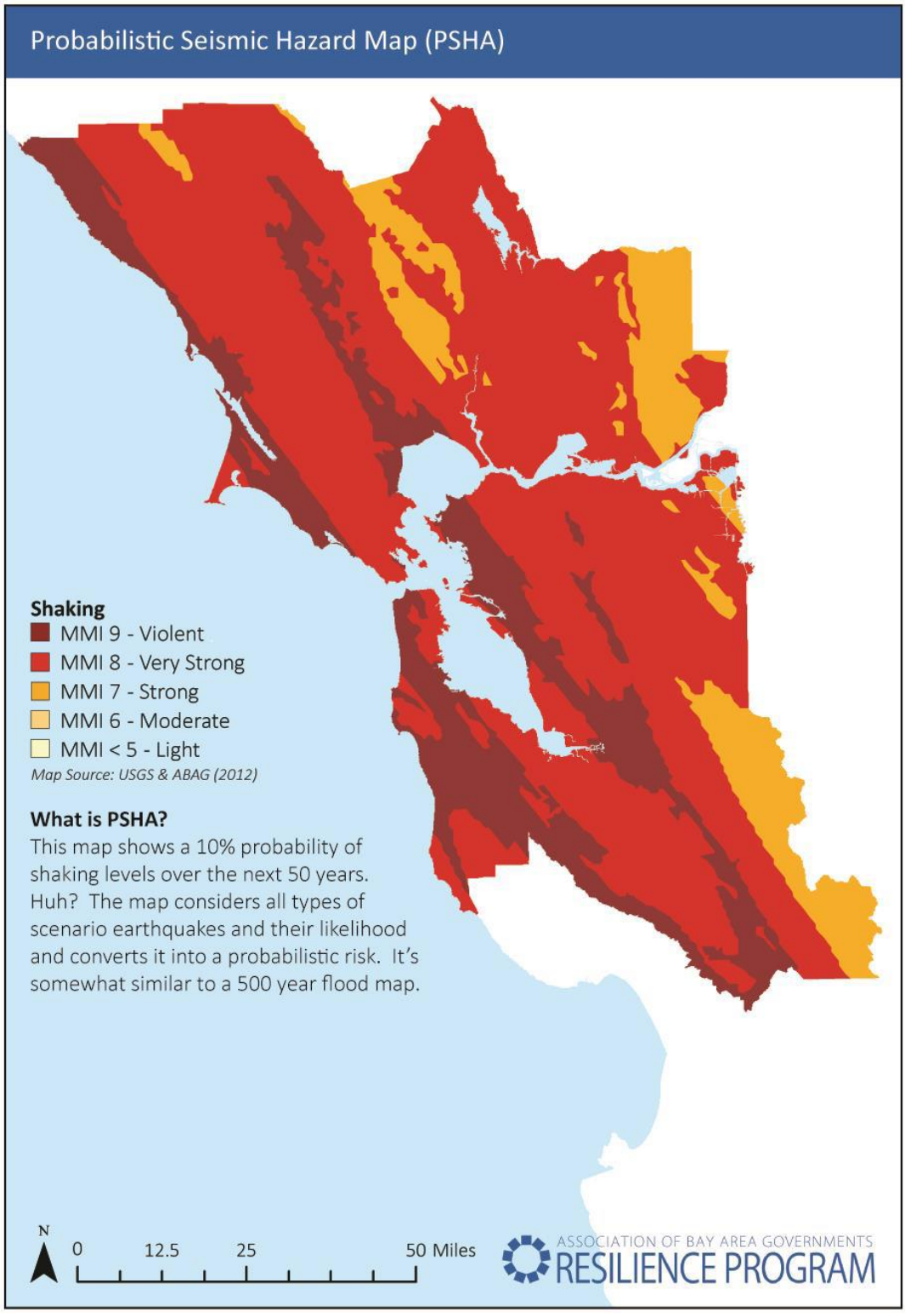


Figure 5-9 Probabilistic Seismic Hazard Map (PSHA)



5.3.6 LIQUEFACTION

Soil that is loose, sandy, silty, or saturated with water can result in soil liquefaction if it is shaken intensely for an extended period. When ground liquefies in an earthquake, it behaves like a liquid and may sink, spread, or erupt in sand boils. This can cause pipes to break, roads and airport runways to buckle, and building foundations to be damaged. Liquefaction can only occur under certain circumstances:[4]

Loose Soils The soils must be loose, such as uncompacted or unconsolidated sand and silt without much clay. This happens most often in the Bay Area along the Bay shoreline, near creeks or other waterways, on dry creek beds, and in areas of man-made fill, such as the Marina District in San Francisco or parts of Alameda.

Soggy Soils The sand and silt must be soggy and saturated with water due to a high water table.

Ground Shaking The ground must be shaken long and hard enough by the earthquake to trigger liquefaction.

Liquefaction may not necessarily occur even if all three conditions are present. Additionally, if liquefaction does occur, the ground may not move enough to have significant impact on the built environment. As with ground shaking, several types of maps depict liquefaction potential. Liquefaction susceptibility maps show areas with soil types known to have the potential to liquefy with intense shaking.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE:
Figure 5-10 illustrates liquefaction susceptibility for San Leandro based on USGS soil type maps in comparison to the entire bay area. However, site-specific investigations are needed to confirm liquefactions susceptibility on any given site. Despite having areas within the city that are susceptibility to liquefaction, San Leandro has no historical occurrences of liquefaction. The risk of liquefaction is highest on former bay lands which were filled in and built upon.17. Unless areas of liquefaction susceptibility are subject to significant ground shaking, they are not likely to liquefy. Liquefaction hazard maps express where the ground is both susceptible to liquefaction, and where the ground is likely to be shaken long and intensely in an earthquake. In 2015, ABAG produced maps that combine liquefaction susceptibility with USGS-generated earthquake scenario maps to identify areas where there is a significant hazard of liquefaction. Figure 5-11 represents an example which shows the liquefaction potential in a M7.0 Hayward earthquake respectively. The maps combine the liquefaction susceptibility and shaking information into a scenario-based liquefaction potential map.

[4] Perkins, J.B., (2001)

Figure 5-10 Earthquake Liquefaction Susceptibility

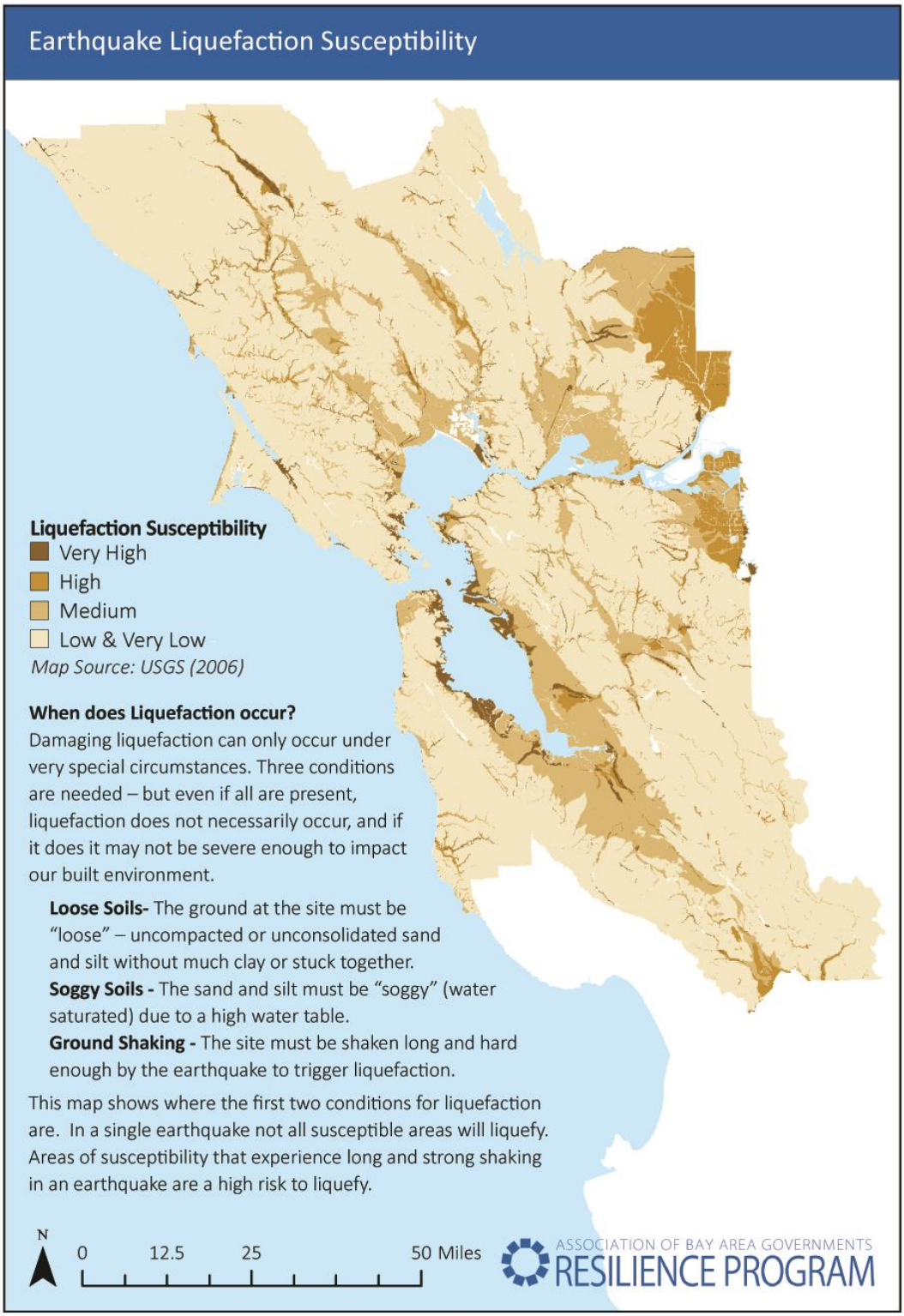
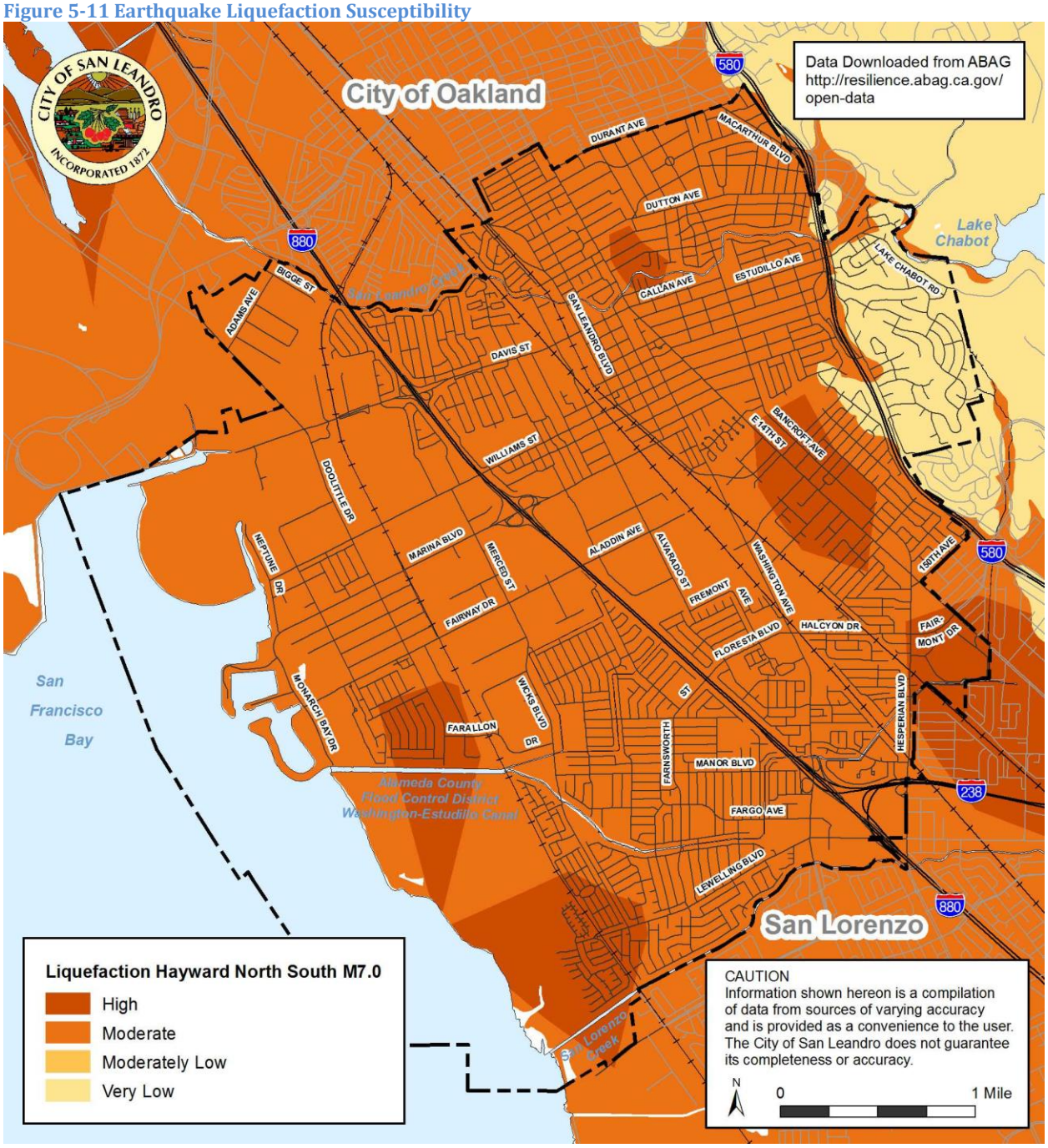


Figure 5-11 Earthquake Liquefaction Susceptibility



5.3.7 Landslide

In the Bay Area landslides typically occur as a result of either earthquakes (earthquake-induced landslides), or during heavy and sustained rainfall events. A given area can be at risk for both earthquake-induced landslides as well as landslides caused by rain-saturated soils but the variables that contribute to each landslide risk are different. Typically, an earthquake-induced landslide occurs when seismic energy at the top of a slope gets concentrated and breaks off shallow portions of rock. In rainfall-induced landslides, the slide can begin much deeper in the slope, in very-saturated layers of soil.

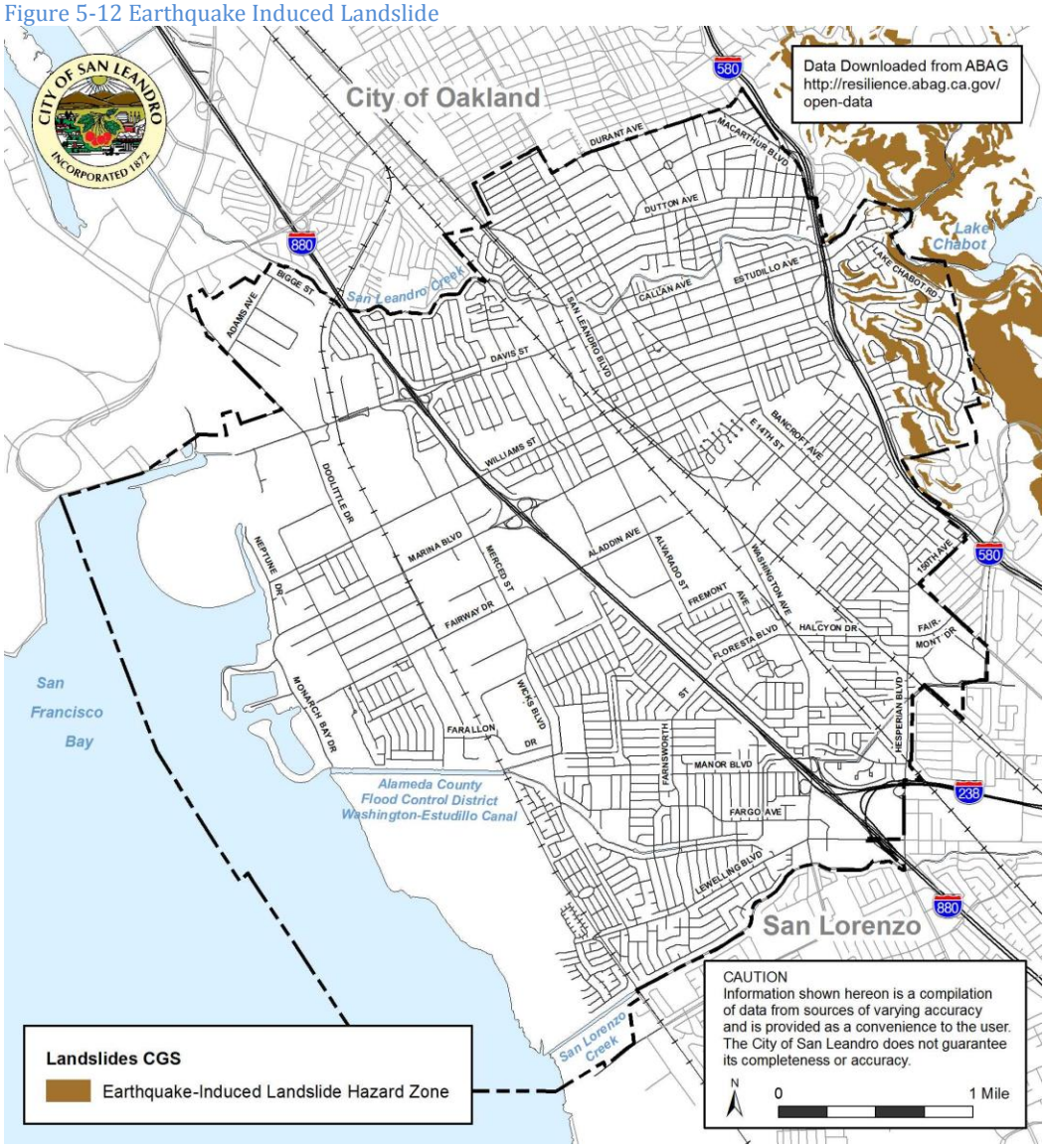
For both types of landslides, there are not currently methods available to estimate the probabilities of future landslides at a local, or jurisdictional, scale. Steep slopes and varied types of underlying soils can influence the likelihood of landslides. Additionally, surface and subsurface drainage patterns also affect landslide hazard, and vegetation removal can increase landslide likelihood. Future landslides are most likely to occur within and around the places where they have previously occurred.[5]

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE:

San Leandro has not experienced any landslides from past earthquakes. The eastern hills are generally stable and not susceptible to sliding due to earthquake, but the Bay O' Vista region of San Leandro, pictured in Figure 5-12, has been effected by rain related slides in the past. In 1997/1998 during an Atmospheric River period of rain two homes located on Hillside Drive were pushed from their foundation due to moving soil from the hillside. There were no injuries or death from the incident, but both homes had major damage and had to be demolished.

[5] USGS (1999)

Figure 5-12 Earthquake Induced Landslide



5.3.8 TSUNAMIS & SEICHES

The terms tsunami or seiche are described as ocean waves or similar waves usually created by undersea fault movement or by a coastal or submerged landslide. Since tsunamis have high velocities, the damage from a particular level of inundation is far greater than in a normal flood event.

A seiche occurs when resonant wave oscillations form in an enclosed or semi-enclosed body of water such as a lake or bay. Seiches may be triggered by moderate or larger local submarine earthquakes and sometimes by large distant earthquakes. The greatest hazard results from the inflow and outflow of water, where strong currents and forces can erode foundations and sweep away structures and equipment.

Tsunamis can result from off-shore earthquakes within the Bay Area or from distant events. It is most common for tsunamis to be generated by offshore subduction faults such as those in Washington, Alaska, Japan, and South America. Tsunami waves generated at those far-off sites can travel across the ocean and can reach the California coast with several hours of warning time. Local tsunamis can also be generated from offshore strike-slip faults. Because of their close proximity, we would have little warning time. However, the Bay Area faults that pass through portions of the Pacific coastline or under portions of the Bay are not likely to produce significant tsunamis because they move side to side, rather than up and down, which is the displacement needed to create significant tsunamis. They may have slight vertical displacements, or could cause small underwater landslides, but overall there is a minimal risk of any significant tsunami occurring in the Bay Area from a local fault. The greatest risk to the Bay Area is from tsunamis generated by earthquakes elsewhere in the Pacific. But, a tsunami or seiche originating in the Pacific Ocean would lose much of its energy passing through San Francisco Bay.

Though the Bay Area has experienced tsunamis, it has not experienced significant tsunami damage. In 1859, a tsunami generated by an earthquake in Northern California generated 4.6-meter wave heights near Half Moon Bay.

The M6.8 1868 earthquake on the Hayward fault is reported to have created a local tsunami in the San Francisco Bay. In 1960, California experienced high water resulting from a magnitude 9.5 earthquake off the coast of Chile. The tsunami generated by the 1964 Alaskan earthquake caused wave heights of up to 1.1 meters along the coasts of San Francisco, Marin and Sonoma Counties.

Although the 2011 tsunami created by the M9.0 Tohoku earthquake did not cause damage inside the San Leandro marina, the marina did experience a 4 inch run-up. California has been fortunate in past distant-source tsunamis (1960, 1964, and 2011) that the events occurred during low tides. [18] In 2013, the USGS, in partnership with the US Department of the Interior, published a tsunami scenario as part of the Science Application for Risk Reduction (SAFRR) series.[20] In the scenario, the multi-disciplinary team modeled a M9.1 offshore Alaskan earthquake to study impacts to California. Assuming that the tsunami reaches the central coast at high tide, the Bay Area can expect heights ranging from two to seven meters near the shore. The study suggests that this scenario inundation is only likely to occur once in a 100-year period.

20 Ibid

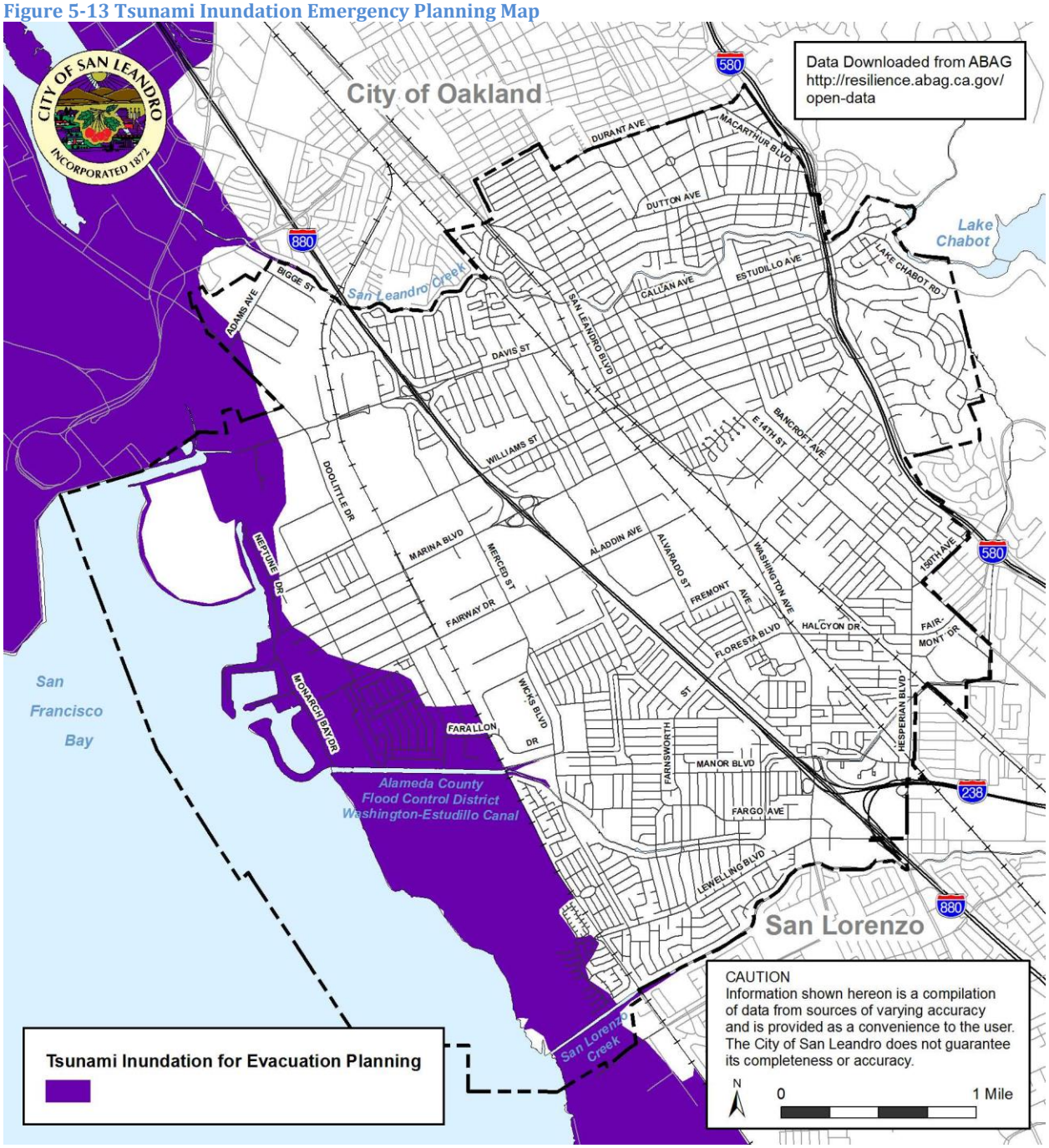
In addition to the scenario inundation maps, CalOES developed tsunami evacuation maps indicating areas that should evacuate if a warning is given. The CalOES tsunami maps are not associated with a particular event but instead represent the worst-case scenario at any given location by combining a suite of extreme, but plausible, inundation scenarios. Additionally, the maps include no information about the probability of a tsunami affecting an area at any given time. Because of this, it is not intended to show locations of probable inundation but should be used for evacuation planning only. In general, the CalOES tsunami evacuation map is more conservative than the USGS SAFRR study; however, there are a few locations where the SAFRR study shows greater inundation.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE:

The likelihood of a major tsunami created near Alaska or Japan causing flooding of the San Leandro bayfront is very remote since a wave 20 feet in height at the Golden Gate would be necessary to reach the northern most point of San Leandro bayfront with a minimum run-up of five feet at higher high tide. The highest tsunami affecting the area during the last 120 years had a height of 7.4 feet at the Golden Gate, causing a two-foot run-up along the San Leandro shoreline.[21] For San Leandro, the tsunami maps prepared by CalOES in Figure 5-13 indicate that only the areas outside of the City's levee system are at risk for tsunamis, including the adjacent marshlands, tidal flats and former bay margin lands that are now artificially filled but are still at or below sea level.

20 Ibid
21Ibid.
22 Placer County Local Hazard Mitigation Plan Update (December 2015). p. 4-119.
http://www.placer.ca.gov/departments/ceo/emergency/local-hazard-mitigation-plan

Figure 5-13 Tsunami Inundation Emergency Planning Map



5.3.9 FIRE FOLLOWING EARTHQUAKES

Earthquakes are often responsible for igniting fires which can contribute to a considerable share of the overall damage in a disaster. The fires can start from a variety of sources: appliances with natural gas pilot lights may tip, damaged electrical equipment may spark, and gas line connections may break. Recently in the South Napa Earthquake a number of mobile homes were destroyed and damaged when the gas connection to a home broke. In the Loma Prieta Earthquake, 36 fires broke out in San Francisco alone, but luckily were contained quickly in large part due to the abnormally calm wind that evening, and the fires' proximity to the bay which allowed a fire boat to pump water to the fire where the water lines had failed. In the 1906 earthquake over 3.5 square miles of San Francisco burned, representing 80% of San Francisco's property value at the time.

Fire following earthquake is especially sensitive because there are often multiple ignitions at once (overwhelming fire crews), typical water supply for fighting fire may be reduced or unavailable, and maneuvering fire crews to the ignition can be difficult if streets are blocked by road damage or by debris. Fire following earthquake is an issue that could impact any Bay Area community that experiences an earthquake – both urban and rural. The problem is heightened for urban environments, where many simultaneous ignitions can lead to a firestorm, and single fires can more quickly and easily move structure to structure.

A few characteristics can make a specific community more vulnerable to fire following earthquake. If there is a higher likelihood of building damage, there is also a higher likelihood that an ignition occurs. If a building collapses, there is a high risk for gas or electrical lines to start "seed" fires that then impact undamaged neighboring structures. Areas of liquefaction are more vulnerable to fire because of the greater potential for underground gas mains to break due to the ground displacements, and because the water lines in the area may also be damaged – preventing the ability to fight a fire with regular water resources. Areas that are largely wood frame or shingle roof may be less prone to earthquake damage, but are a heightened risk for the spread of fires. There is added concern in areas with hazardous materials with the potential for explosion, or with the potential to produce toxic smoke. Industrial facilities and labs are a high concern because of the hazardous and flammable materials they store at their facilities.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE:
San Leandro has no historical occurrences of large multistructure or multi acre fires in the city. San Leandro has a large industrial area, mostly centered in the western portion of the city. The businesses in this area include manufacturing, waste management, and food supply to name just a few. Some of the businesses in San Leandro deal directly with hazardous materials. The emergency services specialist for the City, works closely with businesses that house hazardous materials and confirms that each business has an emergency management plans that includes earthquake and fire as one of their potential dangers. San Leandro's biggest concern

in regards to fire after an earthquake is the lack of water supply due to water main breakage. San Leandro is diligent about its partnership with EBMUD and monitoring improvements made in San Leandro to improve the chances of adequate water supply after a major earthquake. The building and fire codes have been strengthened over time to include additional safety features, such as flexible utility connections, leak detection systems, more advanced sprinkler systems, more stringent ventilation requirements and spill notification systems.

5.4 FLOODING

Potential flooding hazards in San Leandro are associated with overbank flooding of creeks and drainage canals, tidal flooding from San Francisco Bay, ponding and sheet flow runoff and rising sea level. Although isolated flooding has occurred in San Leandro, there are no repetitive or severe repetitive loss properties in the City of San Leandro. San Leandro is a proud participant of NFIP's CRS program since October of 2006, and has just successfully completed a CAV conducted by ISO, which resulted in retaining our class 8 rating. San Leandro continues to develop strategies and programs to better inform the citizens of our flood program benefits. We are also training additional Staff members to become CFM's to better comply with FEMA requirements. Our Staff is trained to verify a property's flood zone designation prior to permit issuance, and if the property is within 500' of a flood boundary, they must confirm the property's flood designation with the Floodplain Administrator prior to permit issuance. The City enforces FEMA and NFIP regulations through the San Leandro Municipal Code, Title 7, §7-9, Floodplain Management. Any unpermitted work in an SFHA is immediately "red tagged" and enforcement proceedings are administered as per our Enforcement and Abatement procedures contained in §7-5, articles 11, 12, 13 and 14 of the San Leandro Municipal Code.

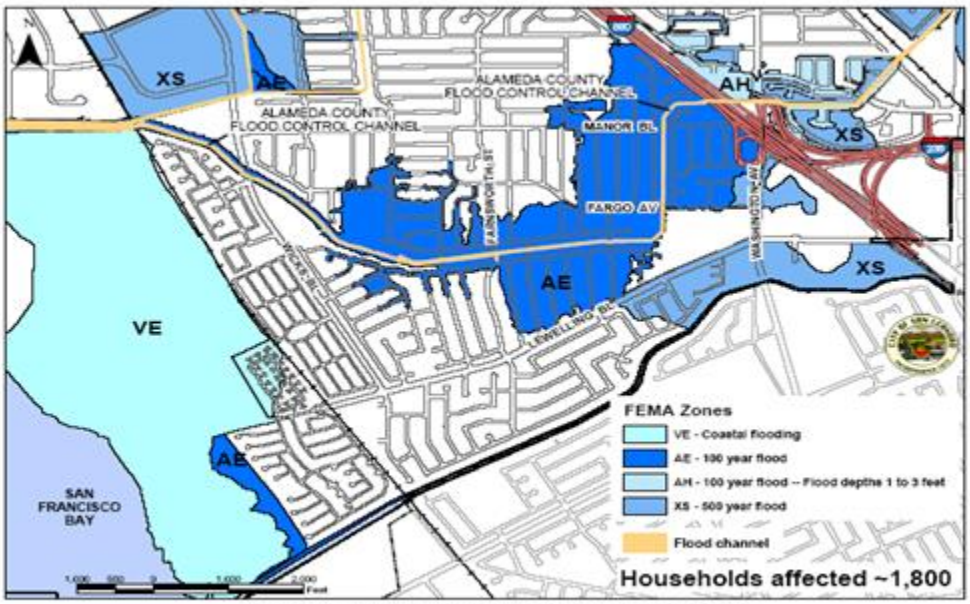
5.4.1 OVERBANK FLOODING

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE

At one time, flooding along creeks and streams was relatively common in San Leandro. These hazards were greatly reduced during the 1960s and 1970s when the Alameda County Flood Control and Water Conservation District (ACFCWCD) channelized the lower portions of San Leandro Creek and constructed flood control ditches in the southern part of the City.

Although the flood control channels were effective, they did not eliminate flood hazards entirely. During the last 40 years, urbanization in the watersheds has increased impervious surface area, which has resulted in faster rates of runoff and higher volumes of storm water in the channels. Recent maps published by the Federal Emergency Management Agency (FEMA) indicate that a 100-year storm (e.g., a storm that has a one percent chance of occurring in any given year) could cause shallow flooding in parts of southwest San Leandro.

In 1999, the City appealed the flood zone boundaries established by FEMA, believing that the number of flood prone properties had been overestimated. Revised maps became effective in February 2000. Although the revised maps show fewer properties in the flood zone than the 1999 maps did, the zones may still be overstated. According to FEMA, there are still 1,870 homes in the Manor, Floresta and Springlake neighborhoods within the 100-year floodplain. Flood insurance costs for these residents' amounts to over one million dollars a year. The City is presently working with impacted homeowners to verify the elevations of their homes, possibly enabling some residents to have their properties removed from the floodplain boundary. Additional appeals of the boundaries have been filed.



Flooding risk in southern San Leandro

The principal consequence of a property's designation within the 100-year flood zone is that flood insurance is required for federally insured mortgage loans. Insurance also may be required by other mortgage lenders. Moreover, the City's Floodplain Management Ordinance requires that new construction, additions and major home improvement projects are raised at least one foot above the base flood elevation — this can be a significant expense for homeowners making alterations to existing structures.

While the City works with FEMA to improve the accuracy of the flood zone maps, it is also working with the ACFCWCD to increase the carrying capacity of the channels. Measures being pursued include redesign of the channels, replacing undersized culverts, and keeping the channels well-maintained and free of debris. Steps should be taken to identify additional funding sources and expedite the reconstruction of the channels. The most current flood maps have been added to the Appendix of this document as Appendix items 9.6.

5.5 DAM FAILURE

According to CAL OES inundation information and maps, most of San Leandro would be flooded in the event of complete dam failure at the Lake Chabot or Upper San Leandro Reservoirs. As figure 5-16 and 5-17 indicates flood waters from a dam failure would reach the western portion of the city in under 25 minutes. Such a flood could produce catastrophic damage and casualties in the city. The dams at both reservoirs have been seismically strengthened during the last 30 years, making the risk of failure extremely low. EBMUD is currently completing a seismic reinforcement to the dam wall and will continue to reinforce as needed. San Leandro does not have any historical events associated with the failure or partial failure of Chabot Dam.

Figure 5-14 Map of Chabot Dam

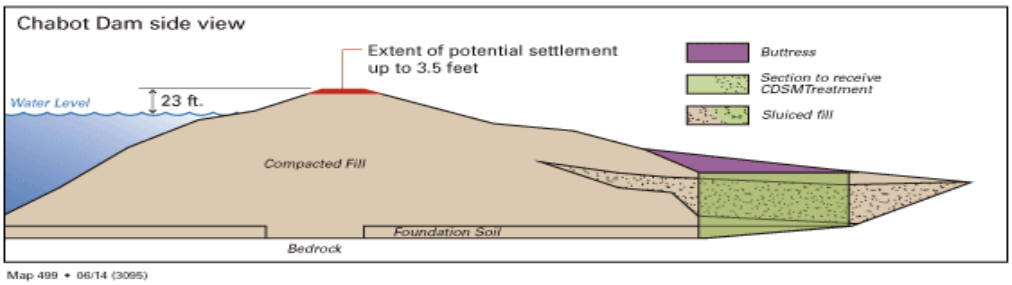
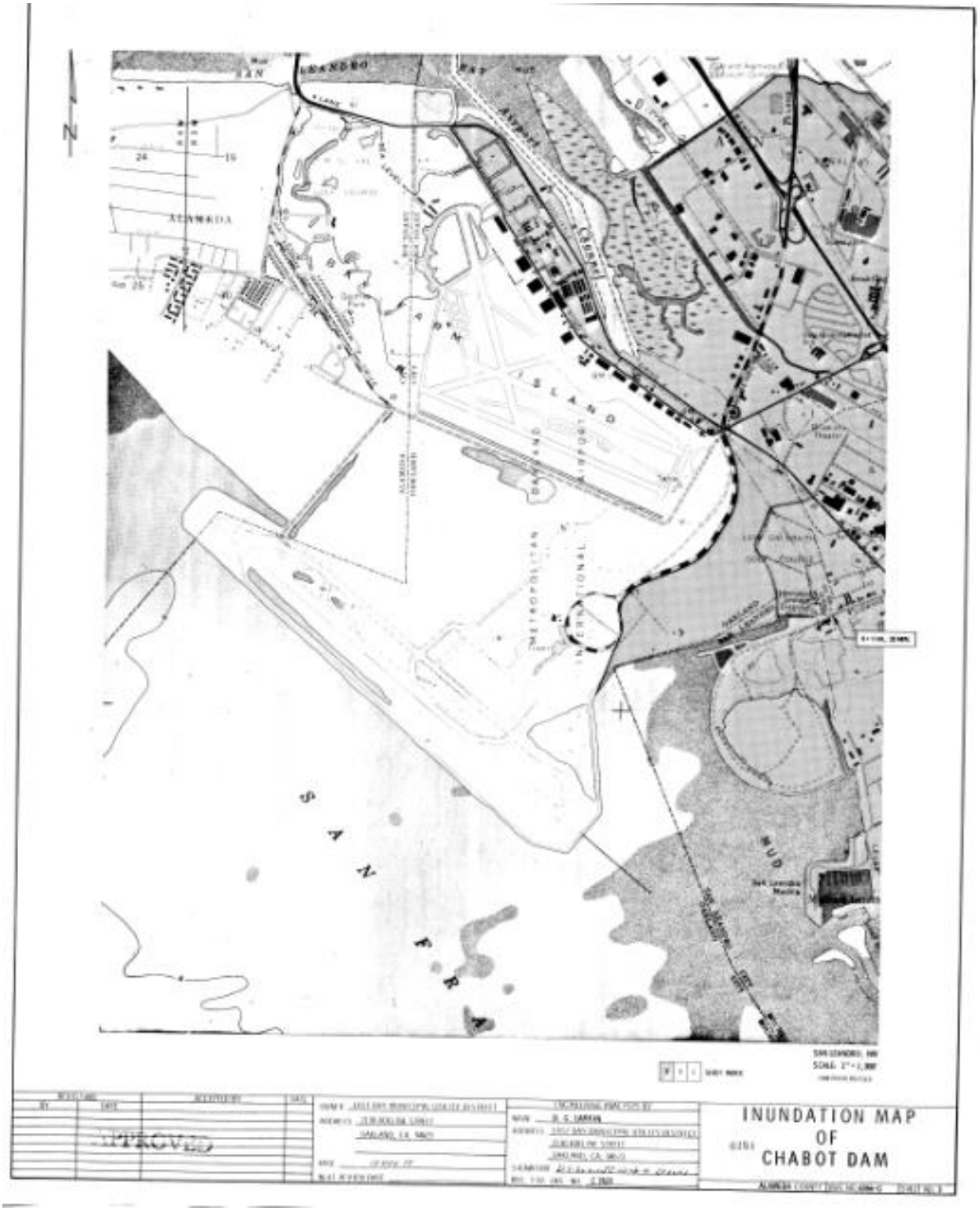


Figure 5-15 Dam Failure Inundation Map 1 of 2 – CAL OES

Map images provided in figure 5-15, 5-16 by CAL OES

Figure 5-16 Chabot Dam Failure Inundation Map 2 of 2 – Western portion of San Leandro – CAL OES



5.6 FIRE

Fires are typically characterized into three categories: urban fires, wildland-urban interface fires, and wildland fires.

- Urban fires occur within a developed area and pose a direct risk to development.
- Wildland-urban interface (WUI) fires occur where the built environment and natural areas are intermixed (the fringe of urban areas).
- Wildland fires exist in wilderness land.

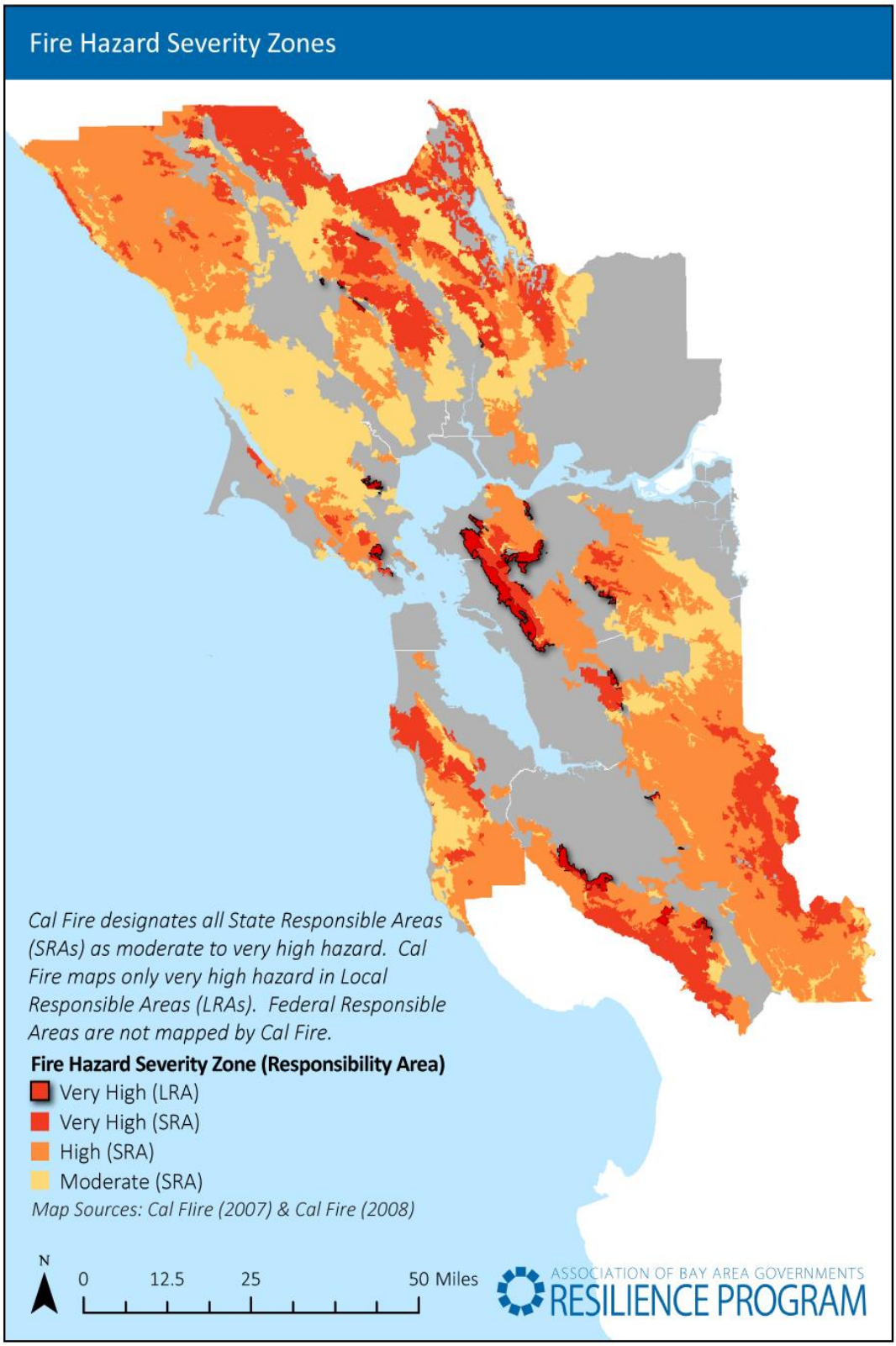
Fires in the urban environment and in the wildland-urban interface result in direct damage to the built environment and can injure or kill residents. Wildland fires can cause damage to linear infrastructure systems that serve the Bay Area, causing outages downstream of the failure; can impact the air quality in cities during the duration of the fire; and can impact water quality in watersheds impacted by a wildland fire. Wildland and wildland-urban interface fires can also damage natural environments, such as recreational areas, and can cause lasting impacts to slopes and soils. In the Bay Area, fire areas generally fall into two categories – State Responsibility Areas, where CALFIRE is responsible for fire protection, and Local Responsibilities, where local fire departments and fire protection districts have responsibility.

5.6.1 WILDLAND URBAN CONFLAGRATION

The risk of urban wildfire in California has increased dramatically as a result of population growth on fire prone hillsides. The danger is not just limited to rural areas. In fact, one of the costliest wildfires in U.S. history took place just eight miles north of San Leandro in 1991. That fire caused $3 billion in property damage, caused 25 deaths, and resulting in the loss of some 3,000 homes in the Oakland and Berkeley Hills.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE: Fortunately, the risks are less severe in the San Leandro hills. The San Leandro hills contain approximately 1,500 homes valued between $700,000 and over $1,000,000. The area east of I-580 is classified as a "moderate" fire hazard by the California Department of Forestry. The lack of a dense tree canopy is a mitigating factor as are the relatively wide streets, gentle slopes and grassland vegetation. Nonetheless, the city lies adjacent to thousands of acres of potentially flammable coastal scrub and forested open space. There are also a number of locations in the city, particularly along San Leandro Creek, with large eucalyptus trees and other highly flammable vegetation and combustible litter. The Uniform Fire Code specifies additional requirements that are enforced by the City's Building Division. The City also requires fire-resistant roofing materials in new construction and major remodeling projects. As mentioned in the *Fire After Earthquak*e section, San Leandro has no history of large scale structure or acreage fires.

5-17 Fire Hazard Severity Zones



5.6.2 PROBABILTY OF FUTURE FIRE –CLIMATE INFLUENCED

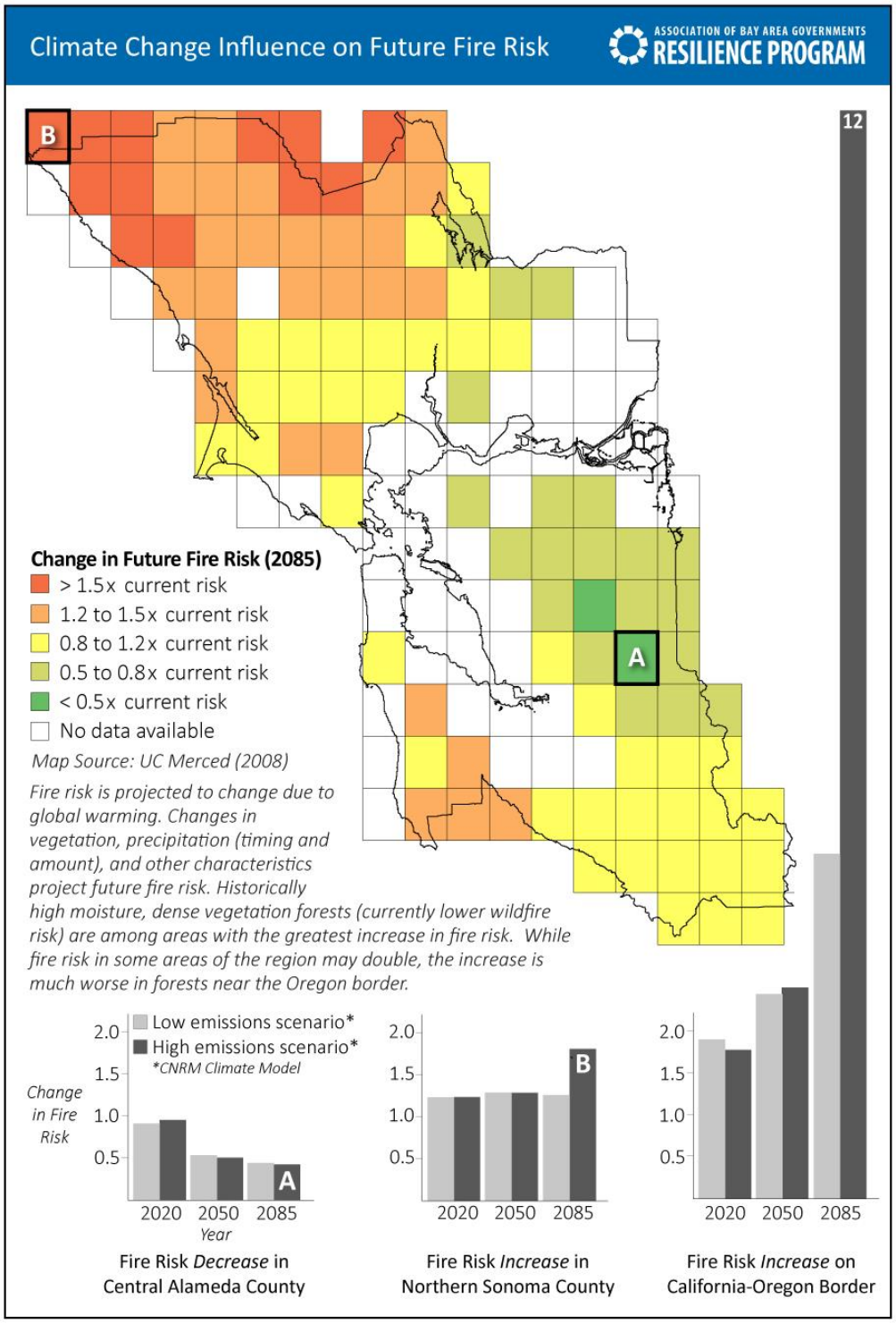
Wildfire risk increases due to climate change because of higher temperatures and longer dry periods over a longer fire seasons. Additionally, wildfire risk will also be influenced by potential changes in vegetation.[6] Research out of UC Merced has projected the future fire risk, impacted by climate change, compared to existing fire risk. In the Bay Area the results are mixed. The research projects some locations in the East Bay and South Bay to exhibit decreased fire risk, while areas on the Peninsula and North Bay exhibit a 150 percent increase in fire risk by 2085.

Generally, across the Bay Area there is fairly limited change in fire risk in the year 2050, with the greatest change in occurring between 2050 and 2085, especially in the high emission scenario. The Cal Adapt data suggests that some jurisdictions might have to adapt more aggressively compared to others. Figure 5-18 shows the projected fire risk increase for the Bay Area with the greatest increase and decrease areas highlighted.

The future fire risk model analyzes two primary variables: fuel availability and flammability of fuel. In California the change in fire risk is a result of either a densely forested ecosystem becoming drier, or a dry climate experiencing large vegetation growth after a year of above average precipitation. In the first scenario the suite of climate impacts (higher temperatures, less snow pack, earlier springs) result in previously wet dense fuel ecosystems becoming dry – increasing the fire risk. In the second ecosystem, dominated by grass and low density shrubs, the risk is often unchanged or decreased because the availability of fuel is the governing variable for fire risk, which remains unchanged or decreases as a result of projected precipitation.[7] These modeling characteristics are reflected in the Bay Area's future fire risk map.

[6] California Climate Change Center, (2012)
[7] Westerling, A.L., Bryant, B.P. (2008)

5-18 Climate Change Influence on Future Fire Risk



5.7 LEVEE FAILURE

The Sacramento-San Joaquin River Delta and Suisun Marsh are vitally important to the Bay Area economy and environment and contain many levees. The Delta region contains critical infrastructure including pipelines, highways, and power and communication lines. The Delta is the hub of the California water system, providing water to 25 million people in the State and 3 million acres of farmland.[8] The probability of levee failure is increasing over time due to sea level rise, increased flooding potential due to early winter snow melts, and the likelihood of an earthquake.

An earthquake is the single biggest risk the Delta Region faces. If an earthquake occurs, levees may fail and as many as 20 or more islands could be flooded instantaneously. This would result in an economic impact of $15 billion or more. While local Delta faults contribute most significantly to the hazard at longer return periods, and will produce stronger shaking due to their proximity to the levees, the major Bay Area faults pose a greater risk to the Delta levees. While they are farther away and will produce smaller ground motions at Delta sites, earthquakes occur much more frequently on these faults. The Hayward fault, in particular, is the greatest concern for the Bay Area. It is capable of producing large earthquakes that will be devastating to the Bay Area and is close enough to the Delta to damage levees. Other Bay Area faults, such as the Concord and Green Valley, are also likely to produce earthquakes that will damage Delta levees. Additionally, the soils in the western delta are extremely weak and liquefaction will trigger at even low levels of shaking.

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE

San Leandro does not have any levees due to land adjacent to the bay lying above sea level. San Leandro's shoreline has been armored with rip rap to ensure that bay water does not erode away the shoreline.

[8] ABAG, (2010)

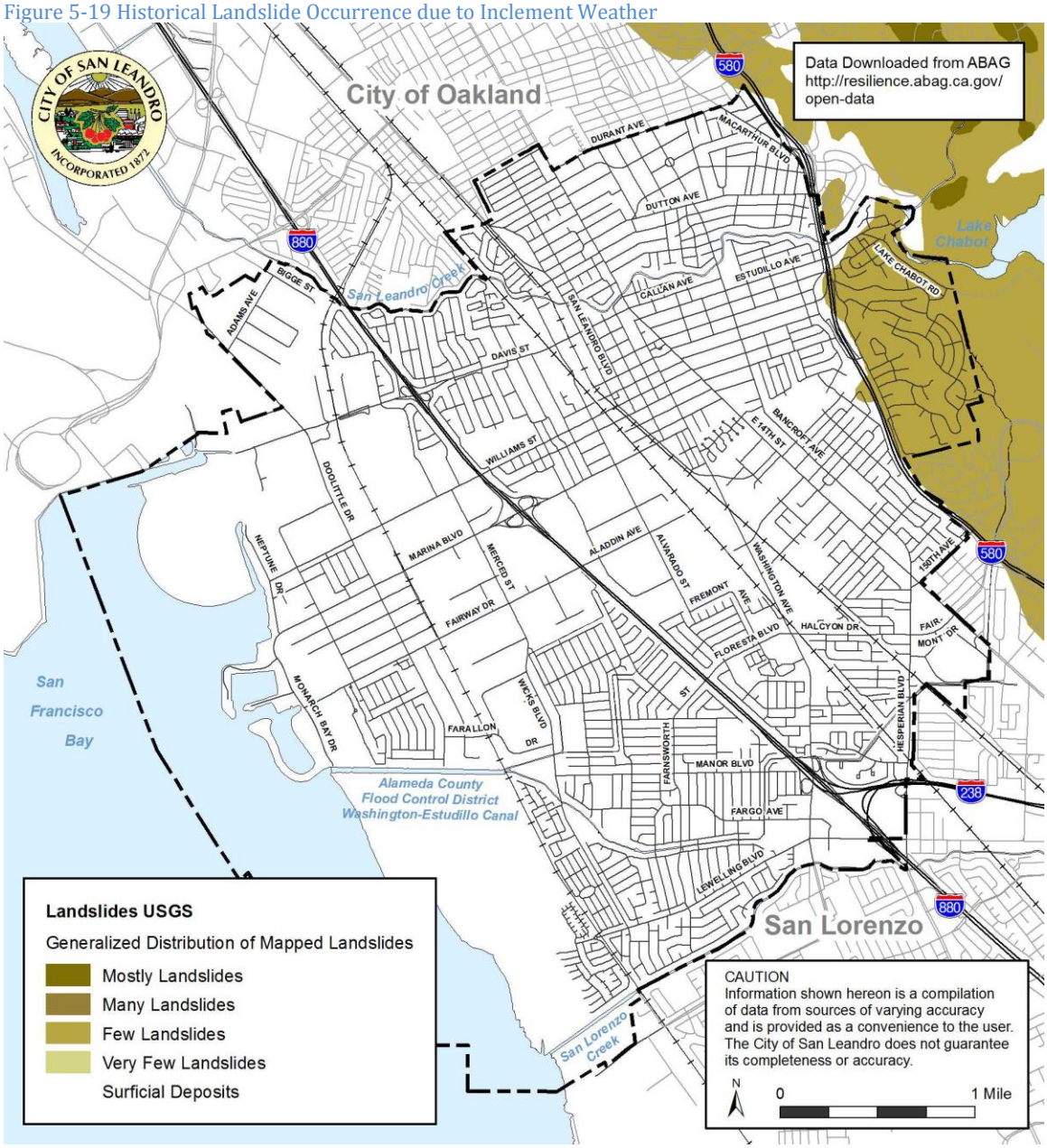
8 ACFC website

5.8 Landslide

PAST OCCURANCE AND POTENTIAL FOR OCCURANCE

Although San Leandro has no history of landslide due to earthquake, the Bay O' Vista region of San Leandro, pictured in Figure 5-19, has been effected by rain related slides in the past. In 1997/1998 during an Atmospheric River period of rain two homes located on Hillside Drive were pushed from their foundation due to moving soil from the hillside. There were no injuries or death from the incident, but both homes had major damage and had to be demolished. The land where the two demolished homes stood have been designated as a no build zone to mitigate any potential landslides in the future.

Figure 5-19 Historical Landslide Occurrence due to Inclement Weather



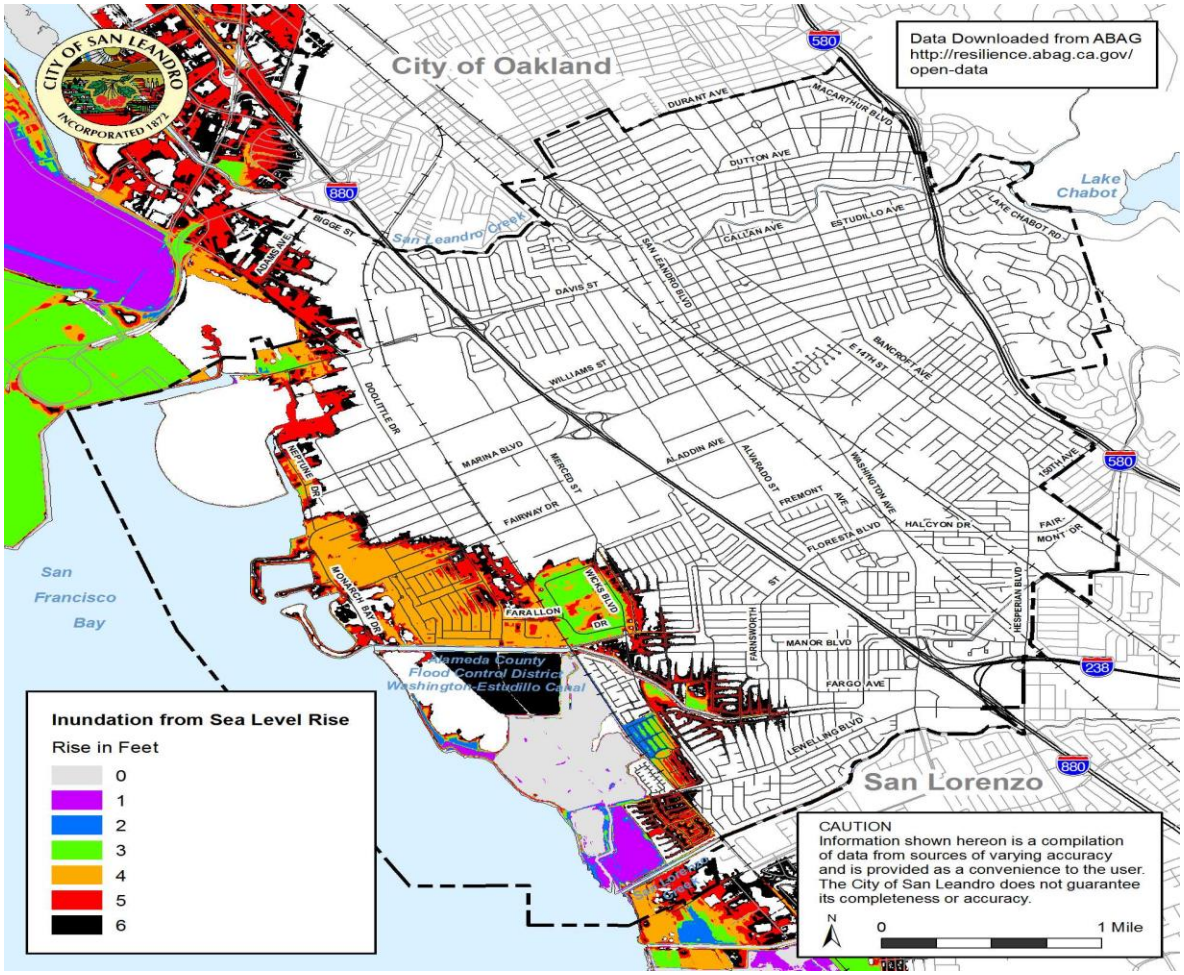
5.9 Climate Change

5.9.1 RISING SEA LEVEL

POTENTIAL OCCURANCE:

Rising sea level is a developing, global issue that will affect San Leandro later in the 21st century. Environmental studies indicate that global warming could lead to a sea level rise of one to six feet during the next 100 years as illustrated in figure 5-20. This could have significant effects on the ecology of San Leandro's Shoreline Marshlands. It could also increase erosion along the waterfront and raise the hazard of tidal flooding along Neptune Drive and nearby streets. The City will remain involved in state and regional discussions about this issue and the ways to mitigate its effects on the Bay shoreline. San Leandro has made a strong commitment to studying the effects that climate change and rising sea level could have on the city. The City's Sustainability Manager is currently working on updating the 2009 San Leandro Climate Action. In 2020, during the next rewrite of this hazard mitigation plan findings from the Climate Action and Adaptation Plans will be incorporated in depth.

Figure 5-20 Projected Sea Level Rise



5.9.2 DROUGHT

A drought is a gradual phenomenon that occurs over several dry years, depleting reservoirs and groundwater basins without the expected annual recharge from winter precipitation. While drought does not have any primary impacts in the Bay Area, prolonged periods of drought can cause secondary impacts that can affect the region, including:

- Reduced water supply for crops and livestock feed, impacting the economy centered around the agriculture industry
- Increased wildfire hazard, including more fire starts and more prolonged conflagrations fueled by excessively dry vegetation and reduced water supply for firefighting purposes
- Subsidence due to a lowering water table
- May be correlated to high heat conditions.

Drought is not localized, but occurs simultaneously across the region, and may extend statewide or across a larger expanse of western states. This has been the case in California since 2013. While the drought exists in every county, the impacts of the drought are locally unique, based on local water supply systems, soil conditions, and the typical climate and vegetation land covering. The effects of drought are managed in the Bay Area through the importation of water and the storage of water in reservoirs.

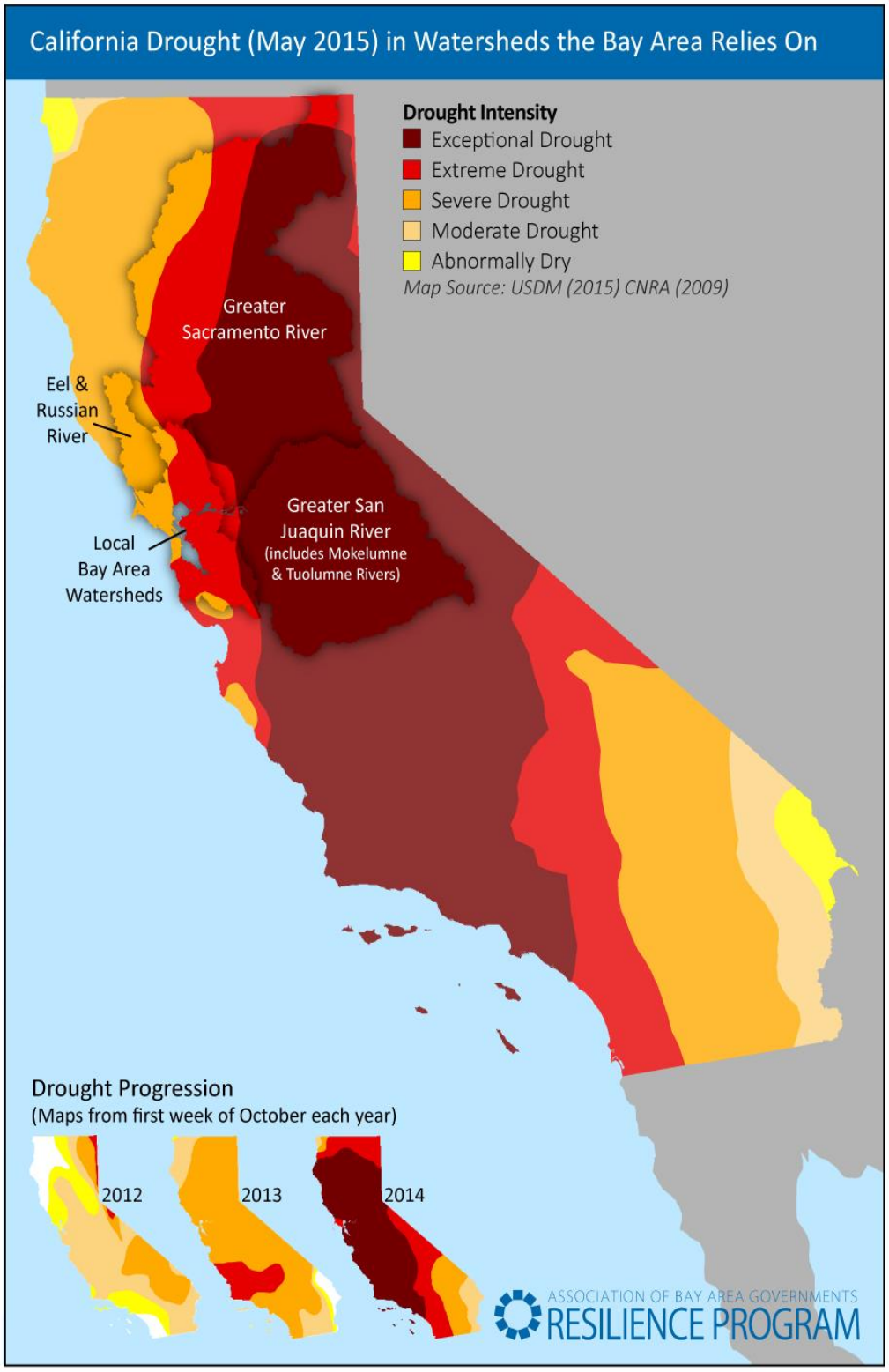
The *United States Drought Monitor* is produced by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Department of Agriculture. The Monitor releases weekly maps of current drought conditions. NOAA also publishes one year outlook maps for temperature and precipitation.[9] The maps project temperature and precipitation twelve months out – describing the conditions as likely below, above, or average.

PAST OCCURANCES AND POTENTIAL FOR OCCURANCE:

In January 2014, the Governor declared a State of Emergency in California in response to current drought conditions, which began in 2012. Thus far, 2015 has surpassed 1977 as the driest year on record in California. As of June 2015, statewide reservoirs are at 18-67 percent of average and Sonoma County has declared a local Emergency Proclamation.[10] During 2015 and 2016 upon the direction and lead of EBMUD, San Leandro enacted water rationing and promoted alternative measures to conserve water. EBMUD also assigned a fee and fine schedule for those who did comply with the mandatory ration order. EBMUD offered residents and businesses in San Leandro financial assistance with the removal of landscape and replacement with drought resistant plants. Figure 5-21 illustrates the severity of the drought in 2015.

[9] http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.php
[10] California Governor's Office of Emergency Services (2015)

5-21 California Drought as of May 2015



Probability of Future Drought – Climate Influenced

Climate change is likely to increase the number and severity of future droughts in San Leandro. The cumulative impact of climate change impacts will result in drier conditions, and will alter the timing and efficiency of San Leandro's water supply. An increase in temperature and a reduction in snow pack are the two most direct effects of climate change that will result in a drier state with fewer natural water resources than historically have been available.

Increased Fire Hazard

Fire hazard increases where drought conditions are high. There are multiple drought related factors that contribute to increased fire hazard: longer fire season, drier vegetation, and hot days. Additionally, drought reduces the water supplies available to fight wildfires, leading to larger and more extended fires.

5.9.3 EXTREME HEAT

The Bay Area, especially away from the coast and bay, can experience extreme heat days, where the Heat Index, a function of heat and relative humidity, is high. Extreme heat days pose a public health threat, causing symptoms such as exhaustion, heat cramps, and sunstroke if the Heat Index is over 90°F. The National Weather Service has developed a Heat Index Program Alert which gets triggered when high temperatures are expected to exceed 105° to 110° for at least two consecutive days. Heat emergencies occur when residents are subject to heat exhaustion and heatstroke, and are more likely to occur in areas not adapted to heat and without air conditioning, cooling centers, or vegetation to mediate heat impacts in exposed areas. Certain populations are typically the most at risk during extreme heat emergencies, including people with disabilities, chronic diseases, the elderly, and children.[11]
Extreme heat emergencies typically build over time with cumulative effects. Because of this, and the fact that they do not cause substantial physical damage to the built environment, they do not elicit the same immediate response that other hazards do. However, they claim many lives in comparison to other disasters. The California Climate Adaptation Strategy, citing a California Energy Commission Study, states that heat waves have claimed more lives in California than all other disaster events combined.[12]

Historic Extreme Heat

No heat emergencies in California have been declared a disaster at the state or federal level between 1960 and 2008.[13] The Spatial Hazard Events and Loss Data for the United States estimates approximately 47 heat events in California during this time.

[11] State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services
[12] Messner, S. et al. (2009)
[13] State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services

In 2006 a notable heat wave spread throughout most of the United States and Canada, causing 140 fatalities in California.[14]

Probability of Future Extreme Heat

Climate change is expected to generate an increase in ambient average air temperature, particularly in the summer. The outer Bay Area will likely experience greater temperature increases than coastal or bayside jurisdictions, though likely not as great as in the eastern-most inland communities. The frequency, intensity, and duration of extreme heat events and heat waves are also expected as regional climate impacts.[15]

According to California Climate Change Center, by mid-century, extreme heat in urban centers could cause two to three times more heat-related deaths than occur today.[16] Statewide, temperatures could increase anywhere from 3 to 10.5° depending on CO2 emission levels, leading to more frequent, hotter days throughout the year.

Extreme Heat Hazard in the Bay Area

The Bay Area has historically experienced 4 extreme heat days a year.[17] Depending on low and high emission scenarios, and the location within the region, in the future a city may experience an average of anywhere from 20 to 80 extreme heat days in a year. Cal-Adapt, California's database of climate data and visualization tools provides five different ways to define the extreme heat hazard: (1) number of extreme heat days by year, (2) number of warm nights by year, (3) number of heat waves by year (heat wave is defined as 5 consecutive extreme heat days), (4) timing of extreme heat days by year (i.e. which months do extreme heat hazards occur), (5) the maximum duration of heat wave by year. These metrics are projecting both the intensity and the temporal nature of extreme heat.

[14] Ibid
[15] Drechsler D. M., et al, (2006)
[16] California Climate Change Center (2006)
[17] Cayan, D., et al. (2009)

5.10 References

Aagaard, B., Lienkaemper, J., Schwartz, D. (2012). Probabilistic Estimates of Surface Coseismic Slip and Afterslip for Hayward Fault Earthquakes. Bulletin of the Seismological Society of America, Vol. 102, No.3 pp. 961-979. June 2012. ftp://ehzftp.wr.usgs.gov/jlienk/reprints/AagardEtAl2012HF_afterslip.pdf

ABAG, (2010). Taming Natural Disasters: Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, http://resilience.abag.ca.gov/2011mitigation/

ABAG, (2013). Modified Mercalli Intensity Scale. http://resilience.abag.ca.gov/shaking/mmipopup/

Brocher, T.M., et al, (2015) The M6.0 24 August 2014 South Napa Earthquake. https://profile.usgs.gov/myscience/upload_folder/ci2015Jan2212351337182SRL%20Paper%20Brocher%20et%20al.pdf

Bryant, W.A., and Hart, E.W., (2007). Fault-Rupture Hazard Zones in California: Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps. California Department of Conservation, California Geological Survey, Supplement No. 1 to Special Publication 42, Interim Revision 2007, ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sp/Sp42.pdf

California Climate Change Center (2006). Our Changing Climate: Assessing the Risks to California. A Summary Report from the California Climate Change Center http://meteora.ucsd.edu/cap/pdffiles/CA_climate_Scenarios.pdf

California Climate Change Center, (2012). Our Changing Climate 2012: Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center, http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf

CDF Fire and Resource Assessment Program, Characterizing the Fire Threat to Wildland–Urban Interface Areas in California, http://frap.cdf.ca.gov/projects/wui/525_CA_wui_analysis.pdf

California Governor's Office of Emergency Services (2015), Drought Update, Tuesday, June 2, 2015, http://ca.gov/drought/pdf/archive/WeeklyDroughtUpdate(06-02-15).pdf

California Public Resources Code, Division 2, Geology, Mines and Mining, Chapter 7.5, Earthquake Fault Zoning, sections 2621-2630, http://www.conservation.ca.gov/cgs/codes/prc/Pages/chap-7-5.aspx

Cayan, D., et al. (2009). Climate Change Scenarios and Sea Level Rise Estimates for California - 2008 Climate Change Scenarios Assessment - Final Report. Scripps Institution of Oceanography - California Nevada Applications Program. http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-500-2009-014-F

Committee on Sea Level Rise in California, Oregon, and Washington, and Board on Earth Sciences and Resources and Ocean Studies Board, Division on Earth and Life Studies, (2012). Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future, The National Academies Press, http://ssi.ucsd.edu/scc/images/NRC%20SL%20rise%20W%20coast%20USA%2012.pdf

Department of Conservation, Seismic Hazards Zonation Program Fact Sheet, California Geological Survey, http://www.conservation.ca.gov/cgs/shzp/Documents/SHZ_FactSheet.pdf
Department of Water Resources, (2015). California Department of Water Resources Groundwater Information Center Map Interface. http://gis.water.ca.gov/app/groundwater/

Drechsler D. M., et al, (2006). Public health-related impacts of climate change in California. California Climate Change Center, CEC-500-2005-197-SF. http://www.energy.ca.gov/2005publications/CEC-500-2005-197/CEC-500-2005-197-SF.PDF

Ellen, S.D., and Wieczorek, G.F., eds., (1998). Landslides, Floods, and Marine Effects of the Storm of January 3-5, 1982, in the San Francisco Bay Region, California, U.S. Geological Survey Professional Paper 1434 Version 1.0, http://pubs.usgs.gov/pp/1988/1434/
Ellsworth, W.L. (1990) Earthquake History, 1976-1989, chapter 6 of Wallace, R.E., ed., The San Andreas Fault System, California: U.S. Geological Survey Professional Paper 1515, p. 152-187.
Field, E.H., et al, (2013), Uniform California earthquake rupture forecast, version (UCERF3)—The time-independent model: U.S. Geological Survey Open-File Report 2013–1165, California Geological Survey Special Report 228, and Southern California Earthquake Center Publication 1792, http://pubs.usgs.gov/of/2013/1165/

Godt, J.W., ed., (1999) Maps showing locations of damaging landslides caused by El Niño rainstorms, winter season 1997-98, San Francisco Bay region, California, Pamphlet to accompany Miscellaneous Field Studies Maps MF-2325-A-J, http://pubs.usgs.gov/mf/1999/mf-2325/
Leake, S.A., (2013) Land Subsidence from Ground-Water Pumping, U.S. Geological Survey, http://geochange.er.usgs.gov/sw/changes/anthropogenic/subside/
Messner, S. et al. (2009). Climate Change Related Impacts in the San Diego Region by 2050. California Climate Change Center, CEC- 500-2009-027-F. http://www.energy.ca.gov/2009publications/CEC-500-2009-027/CEC-500-2009-027-F.PDF
National Drought Mitigation Center, (2015) US Drought Monitor National Drought Summary for February 10, 2015 and December 16, 2014. http://droughtmonitor.unl.edu/MapsAndData/NarrativeArchive.aspx
Perkins, J.B., (2001). The Real Dirt on Liquefaction: A Guide to the Liquefaction Hazard in Future Earthquakes Affecting the San Francisco Bay Area, Association of Bay Area Governments, http://resilience.abag.ca.gov/wp-content/uploads/2010/10/Lq_rept.pdf
Ross, S.L., and Jones, L.M, eds., (2013). The SAFRR (Science Application for Risk Reduction) Tsunami Scenario, USGS Open-File Report 2013-1170 and CGS Special Report 229, http://pubs.usgs.gov/of/2013/1170/
San Francisco Bay Landslide Mapping Team, (1997). San Francisco Bay Region, California, Landslide Folio, California, U.S. Department of the Interior, U.S. Geological Survey, Open-File Report 97-745, http://pubs.usgs.gov/of/1997/of97-745/
Schiff, A. (1990). Lifelines, Earthquake Spectra: May 1990, Vol. 6, No. S1, pp.239-338

Scripps Institute of Oceanography (2012) Projected Snow Water Equivalent. Scripps Institute of Oceanography - California Nevada Applications Program. http://cal-adapt.org/snowpack/decadal/

State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services, http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2013.pdf

Thatcher W., Marshall, G., Lisowski, M., (1997) Resolution of Fault Slip Along the 470-km-long Rupture of the Great 1906 San Francisco Earthquake and its Implications. Journal of Geophysical Research. Vol. 102, No. B3, p. 5353-5367. March 10 1997.

USGS (1999) Land Subsidence in the United States. Circular 1182 U.S. Department of the Interior, U.S. Geological Survey http://pubs.usgs.gov/circ/circ1182/pdf/05SantaClaraValley.pdf

USGS (2014) Earthquake Topics for Education: How much bigger calculator. U.S. Department of the Interior, U.S. Geological Survey. September 29, 2014. http://earthquake.usgs.gov/learn/topics/calculator.php

Westerling, A.L., Bryant, B.P. (2008). Climate Change and Wildfire in California. Climatic Change Vol. 87. Suppl. 1 s231-s247. http://ulmo.ucmerced.edu/pdffiles/08CC_WesterlingBryant.pdf

5.11 RISK ASSESSMENT

The City examined the exposure of City urban land to the natural hazards studied. For the 2017-2022 LHMP, the City reviewed the hazard exposure of San Leandro's urban land, based on the 2010-2015 LHMP, which used ABAG data [64]. The PTM then compared the 2010 results with more recent GIS data, when available, for each of the hazards. The findings of these comparisons are illustrated in figure 5-21 and hazard comparison matrix below.

Figure 5-22 Hazards Summary

HAZARD	VULNERABILTY	IMPACT IF HAZARD OCCURS
Earthquake	High likely	High: residential and commercial structures, critical civic facilities, schools, utilities, hospitals, transportation infrastructure
Liquefaction	High likely after major earthquake	High: residential and commercial structures, critical civic facilities, schools, transportation infrastructure
Landslides	Not likely	Medium: specific, localized impact to residential properties, or public rights of way
Floods	Likely	Medium: specific, localized impact to residential, commercial and industrial properties
Dam Failure	Not likely	Critical: residential and commercial property, schools, hospitals, city government, emergency services
Sea Level Rise	Likely	High: residential, commercial and industrial Property, critical civic facilities, transportation infrastructure
Tsunami/Seiches	Low risk	High: residential, commercial and industrial Property, critical civic facilities, transportation infrastructure
Fire	Likely	High: residential and commercial property

Drought	Highly likely	Medium: impacts to private and public landscaping. Increases fire danger
Extreme Heat	Likely	Medium: impacts to specific populations (to the elderly and to children under five)

5.11.1 URBAN LAND EXPOSURE

The City of San Leandro examined the hazard exposure of San Leandro urban land based on information on ABAG's website. The 2015 Open Data File were used for this evaluation.

Similar to San Leandro's 2010 hazard annex findings hazard exposure remains steady without much increase, most of this can be attributed to San Leandro's urban land use remaining constant. The following table described the exposure of urban land within the unincorporated County to various hazards.

Figure 5-23 EXPOSURE – ACRES OF URBAN LAND

Hazard	2010	2015	Change
Total acres of urban land	9,924	9,924	None
Earthquake faulting (with CGS zone)	46	52	6
Earthquake shaking (within highest two shaking categories)	2,541	2238	303
Earthquake-induced landslides (within CGS study-zone)[2]	93	93	None
Liquefaction Susceptibility (within moderate, high, or very high liquefaction susceptibility)	7,501	7501	None
Liquefaction Hazard (within CGS study zone)[1]	N/A	48	48
Flooding (within 100 year floodplain)	1,341	1341	None
Flooding (within 500 year floodplain)	407	407	None
Landslides (within areas of existing landslides)	385	385	None
Wildfire (subject to high, very high, or extreme wildfire threat)	10	10	None
Wildland-urban interface fire threat	2,462	2,462	None
Dam Inundation (within inundation zone)	9,922	9,922	None
Sea Level Rise [3]	N/A	18	18
Tsunamis (within inundation area)[4]	N/A	24	24
Drought [5]	9,924	9,924	None

5.11.2 INFRASTRUCTURE EXPOSURE

The City of San Leandro examined the hazard exposure of infrastructure within the jurisdiction based on the information on ABAG's website. Of the 255 miles of roadway in the City of San Leandro, the following are exposed to the various hazards analyzed.

Figure 5-24 EXPOSURE – MILES OF INFRASTRUCTURE

Hazard	**Roadway**		**Transit**		**Rail**	
	2010	2015	2010	2015	2010	2015
Total miles of infrastructure	255	258	7	9	17	17
Earthquake shaking (within highest two shaking categories)	74	76	1	1	1	1
Liquefaction susceptibility (within moderate, high, or very high liquefaction susceptibility)	215	213	7	9	17	17
Liquefaction hazard (within CGS study zone) [1]	229	213	7	9	197	197
Earthquake induced landslides within CGS study zone [2]	1	1	0	0	0	0
Earthquake faulting (within CGS zone)	1	1	0	0	0	0
Flooding (within 100 year floodplain)	10	9	0	0	0	0
Flooding (within 500 year floodplain)	14	13	0	0	0	0
Landslides (within areas of existing landslides)	12	12	0	0	0	0
Wildfires (subject to high, very high, or extreme wildfire threat)	0	0	0	0	0	0
Wildland-urban interface fire threat	71	71	0	0	4	1
Dam Inundation (within inundation zone)	206	217	6	6	16	16
Sea Level Rise	N/A		N/A		N/A	
Tsunamis (within inundation area)	N/A		N/A		N/A	
Drought	N/A		N/A		N/A	

5.11.3 EXPOSURE OF CITY OWNED BUILDINGS PLUS CRITICAL FACILITES

The PTM examined the hazard exposure of critical facilities located within San Leandro and city-owned buildings based on the information on ABAG's website.

Figure 5-25 **EXPOSURE BY FACILITY TYPE**

Hazard	Hospitals		Schools		Locally Owned Critical Facilities		Locally owned bridges and interchanges	
	2010	2015	2010	2015	2010	2015	2010	2015
Total miles of Facilities	2	3	24	22	11	14	22	22
Earthquake shaking (within highest two shaking categories)	2	3	24	22	10	14	22	22
Liquefaction susceptibility (within moderate, high, or very high liquefaction susceptibility)	1	2	23	22	10	14	21	22
Liquefaction hazard (within CGS study zone) [1]	1	2	23	21	10	13	21	21
Earthquake induced landslides within CGS study zone [2]	0	0	0	0	0	0	0	2
Earthquake faulting (within CGS zone)	0	0	0	0	0	0	0	0
Flooding (within 100 year floodplain)	0	0	2	2	1	3	2	20
Flooding (within 500 year floodplain)	0	0	2	2	4	0	0	0
Landslides (within areas of existing landslides)	1	1	0	0	0	0	1	1
Wildfires (subject to high, very high, or extreme wildfire threat)	0	1	0	0	0	0	0	3
Wildland-urban interface fire threat	1	1	7	7	6	7	5	5

Dam Inundation (within inundation zone)	2	2	22	22	8	14	17	18
Sea Level Rise (subject to 6' rise)	0		4		3		9	
Tsunamis (within inundation area)	0		0		2		1	
Drought	N/A		N/A		N/A			

References

1. Two county-owned critical facilities are outside the area that has been evaluated by CGS for this hazard.
2. The California Geological Survey continues to map Alameda County and added the Livermore-Altamont area in late 2009. Though some areas of the County have not yet been completely mapped, the densely populated areas in Alameda County are mostly done.
3. Sea level rise data was not available in 2010
4. Sea level rise data was not available in 2010
5. Tsunami evacuation planning maps were not available inside the San Francisco Bay in 2005. This map became available in 2009. Miles of exposed infrastructure is not an appropriate analysis for this hazard. It should be noted that this map is not a hazard map and should be used be used for evacuation planning purposes only. The inundation line represents the highest inundation at any particular location from a suite of tsunami sources. It is not representative of any single tsunami.
6. Drought will not affect locally owned facilities directly. 1,083 miles of roadway, 3 miles of transit, and 21 miles of rail are outside the area that has been evaluated by CGS for this hazard
7. The California Geological Survey continues to map Alameda County and added the Livermore-Altamont area in late 2009. Though some areas of the County have not yet been completely mapped, the densely populated areas in Alameda County are mostly done. 1,083 miles of rail are outside the area that been evaluated by CGS for this hazard
8. The sea level rise map is not a hazard map. It is not appropriate to assess infrastructure exposure to sea level rise.
9. Tsunami evacuation planning maps were not available inside the San Francisco Bay in 2005. This map became available in 2009. Miles of exposed infrastructure is not an appropriate analysis for this hazard. It should be noted that this map is not a hazard map and should be used be used for evacuation planning purposes only. The inundation line represents the highest inundation at any particular location from a suite of tsunami sources. It is not representative of any single tsunami.
10. Drought is not a hazard for roadways.

6. Mitigation Strategy

6.1 INTRODUCTION

San Leandro aims to be a resilient community that can survive, recover from, and thrive after a disaster, while maintaining its unique character and way of life. San Leandro envisions a community in which the people, buildings, and infrastructure, in and serving San Leandro, are resilient to disasters; City government provides critical services in the immediate aftermath of a devastating event of any kind; and basic government and commercial functions resume within a reasonable amount of time, so as to not affect those that reside and conduct business in San Leandro

In 2017, the City is continuing this effort: this plan outlines a five-year strategic plan to bring San Leandro closer to that vision. This plan identifies three disaster mitigation approaches to increase San Leandro's resilience:

1. The City will continue to evaluate and strengthen all City-owned structures, particularly those needed for critical services, to ensure that the community can be served adequately after a disaster.

2. The City will establish and maintain incentive programs and standards to encourage local residents and businesses to upgrade the hazard-resistance of their own properties.

3. The City will actively engage other local and regional groups to collaboratively work towards mitigation actions that help maintain San Leandro's way of life and its ability to be fully functional after a disaster event.

This plan has three objectives for reducing disaster risk in San Leandro:

A. Reduce the potential for loss of life, injury and economic damage to San Leandro residents and businesses from earthquakes, wildfires, landslides, floods, tsunamis, climate change, and their secondary impacts.

B. Increase the ability of the City government to serve the community during and after hazard events by mitigating risk to key city functions such as response, recovery and rebuilding.

C. Encourage mitigation activities to increase the disaster resilience of institutions, private companies and lifeline systems that are essential to San Leandro's functioning.

Actions specified in the 2017 mitigation strategy were inspired by multiple elements of the City's General Plan, and specified through collaborative planning processes among City staff and key institutional partners.

2017 mitigation actions are presented in *high*, *medium*, and *low* priority categories. Generally, *high* and *medium* priority actions address San Leandro's hazards of greatest concern—earthquake and flooding . *High* and *medium* priority actions can be completed in the five-year time frame covered by this strategy. Implementation of *medium* and *low* actions is dependent on outside sources of funding becoming available. Resource availability and project funding will strongly influence the pace of achievements.

6.2 LINKS TO CITY PLANS

This plan is part of an ongoing process to build San Leandro's disaster resilience. The City's long-standing commitment and approach to community safety and disaster resilience is demonstrated in the General Plan. The San Leandro General Plan 2035, adopted in September 2016, directly guides the objectives and actions in this plan. One of the General Plan's major goals is to make San Leandro a disaster-resilient community. Significant effort will be made to ensure that the City's Environmental Hazards Element of the General Plan, and disaster issues are also addressed in other elements, including the Land Use, , Transportation and Open Space, Conservation, and Parks Elements. The objectives in this mitigation plan are guided by the major goals of the General Plan and the objectives of the Environmental Hazards Element.

Many of the actions in this plan are directly taken from the Environmental Hazards Element. Section 2.3 identifies specific General Plan Policies guiding this mitigation strategy.

6.3 PRIORITIZATION OF ACTIONS

The City's Planning Team assigned actions a *High, Medium* or *Low* priority level. Eight key factors were used to determine each action's priority:

1. Support of goals and objectives
2. Cost/benefit relationship
3. Funding availability
4. Hazards addressed
5. Public and political support
6. Adverse environmental impact
7. Environmental benefit
8. Timeline for completion

6.4 DETAILS OF MITIGATION STRATEGY

Mitigation strategies identified by the San Leandro Planning Committee are presented in the following pages. Actions are presented per their high, medium- or low-priority designation. Although additional hazards have been identified as potential threats in the Hazard Analysis chapter, not all threats to the City can be mitigated.

The following information is provided for each strategy:

- **Strategy Name:** Short title to identify the action
- **Problem Statement:** Specific projects or efforts that support the action
- **Hazards Addressed:** Lists hazards whose impacts would be mitigated by the action
- **Strategy Type*:*** Defines program development.
- **Process/Implementation Mechanism:** Funding potential
- **Responsible Agency:** City departments and divisions, along with particular City staff positions that will lead implementation of the action
- **Partners:** If any applicable agencies will be involved.
- **Priority:** High, Medium or Low priority assigned to the action using criteria outlined in Appendix E: *Prioritization Structure*
- **Staff Lead:** who will lead project
- **Action:** Proposed action
- **Cost Estimate:** Cost of project
- **Benefits (losses avoided):** Loss avoided by completing the mitigation strategy
- **Potential Funding Sources:** Identifies potential funding sources to complete the action; includes all sources that could possibly fund any element of the action: staff time, vendor contracts, equipment purchase, etc.
- **Timeline:** Timeline and milestones to implement the action
- **Related Policies:** Links to other city plans or policies.

6.5 NATURAL HAZARDS STRATEGIES

Mitigation Strategy #1							
Strategy Name*	**Point Source** Perform analysis of existing point sources of flooding as reflected by FEMA's proposed new FIRM maps as a result of the Bay Area Coastal Study conducted by FEMA and formulate a plan to mitigate the identified sources from potential flooding points.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Tsunami	Current Flooding	Future Flooding	Wildfire	Landslide	Climate Change
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency*	Engineering and Transportation						
Partners*	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority	HIGH						
Actions/ Activities	Identify all point sources of flooding related to the proposed FEMA map changes. Analyze various scenarios to effectively prevent/mitigate the flooding from these point sources of flooding. Develop a plan of action to prevent flooding at these points through the most efficient and effective method. Construct the necessary barriers to prevent flooding. Submit all required documentation to FEMA to have properties removed from the newly identified S.F.H.A.						
Staff Lead	City Engineer						
Cost Estimate*	$500,000.00						
Benefits (losses avoided)*	Resiliency and use of critical facilities, following a disaster.						
Potential Funding Sources*	Grant, Property Assessment, General Fund of City of San Leandro						
Timeline*	Completed within 3 years of funding.						

MITIGATION STRATEGY #2							
Strategy Name	Shoreline Flood Protection						
Problem Statement	Reduce the risk of flooding by identifying low points along shoreline with SF Bay. Raise elevation of low points by importing dirt or re-grading existing soil. Install elements to reduce erosion of shoreline.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Tsunami	Current Flooding	Future Flooding	Wildfire	Landslide	Climate Change
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	City of San Leandro Engineering and Transportation Department, City of San Leandro Community Development Department						
Partners	FEMA						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)*	HIGH						
Actions/ Activities	Reduce the risk of flooding by identifying low points along shoreline with San Francisco Bay. Raise the elevation of low points by importing dirt or re-grading existing soil. Install elements to reduce erosion of shoreline.						
Staff Lead	City of San Leandro Engineering and Transportation Department						
Cost Estimate	513,545						
Benefits (losses avoided)	6,527,698						
Potential Funding Sources	Grant, Property Assessment, General Fund of City of San Leandro						
Timeline	Completed within 3 years of funding						

MITIGATION STRATEGY #3							
Strategy Name	Hillside Road Protection						
Problem Statement	Reduce risk of road failures/closures by assessing slope stability adjacent to collector and arterial roads on hillsides including Lake Chabot Road. Remediate or stabilize high risk slopes.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Engineering and Transportation						
Partners	None						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)*	HIGH						
Actions/ Activities	Funding for design included in FY17-18 budget						
Staff Lead	San Leandro Engineering and Transportation						
Cost Estimate	TBD						
Potential Funding Sources*	TBD						
Timeline	3 years from funding						
Related Policies	General Plan						

Mitigation Strategy #3							
Problem Statement*	Mature eucalyptus (and other species) trees occurring on the banks of San Leandro Creek are failing and/or in need of preventive maintenance work. Where large trees need to be removed, bank restoration would be installed.						
Strategy Name*	**Vegetation Management Plan and Bank Restoration Project Along City-Owned Portions of San Leandro Creek**						
Hazard(s) Addressed	Earthquake Ground Shaking	**Earthquake Tsunami**	Current Flooding	**Future Flooding**	Wildfire	Landslide	**Climate Change**
Strategy Type	Evaluation	**Program/ Operation**	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	**Operations**	**Emergency & Hazards Planning**	Project Planning & Design	New Initiatives
Responsible Agency*	City of San Leandro Public Works Department						
Partners*	Alameda County Flood Control; California Department of Fish & Wildlife						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)*	HIGH						
Actions/ Activities	Assessment of all trees located on City-owned properties that encompass San Leandro Creek by a certified arborist. Resulting work would include a Vegetation Management Plan that would score each tree and provide short/long term planning and maintenance, including possible removal and/or trimming work needed for each tree. In cases where removal is recommended, creek bank restoration plantings would be proposed.						
Staff Lead	Debbie Pollart, Public Works Director						
Cost Estimate*	$60,000 for Vegetation Management Plan; Up to $150,000 for implementation of plan, including tree removal, tree trimming, and bank restoration.						
Benefits (losses avoided)*	Reduction in possible blockage of flow of San Leandro Creek, potentials for loss/damage of life and property due to falling trees.						
Potential Funding Sources*	Grant, City Capital Improvement Project (CIP)						
Timeline*	Completed within 3 years of funding						

Mitigation Strategy #5							
Strategy Name	Green Infrastructure Plan Development						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	Engineering and Transportation, Public Works, Emergency Services Specialist						
Partners	Unknown						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	HIGH						
Actions/ Activities	This strategy would allow San Leandro to research and potentially develop a Green Infrastructure Plan to identify areas of opportunity and standards for inclusion of green infrastructure in public capital projects - such as streetscape renovations, park projects, and parking lot retrofits among others. Green infrastructure is a term for storm water detention systems - such as rain gardens, tree wells, bio swales, green roofs, living walls, and permeable pavement.						
Staff Lead	Engineering and Transportation, Public Works, Emergency Services Specialist						
Cost Estimate	Unknown						
Potential Funding Sources	Grant funding, General Fund						
Timeline	2 years after funding						
Related Policies	General Plan						

Mitigation Strategy #6							
Strategy Name	Climate Action and Adaptation Plan						
Problem Statement	Cities must identify their long-term strategies to reduce greenhouse gas emissions and protect their built and natural environment in the face of changing environment due to climate change						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	Public Works						
Partners	Stop Waste (Alameda County Waste Management Authority)						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	HIGH						
Actions/ Activities	Develop a greenhouse gas emissions reduction strategy and climate hazard assessment that identifies climate change hazards, potential exacerbation of existing natural hazards due to climate change, identify vulnerable assets, and create a plan for climate change adaptation best practices						
Staff Lead	Sustainability Manager						
Cost Estimate	$50,000.00						
Potential Funding Sources	Grant funding, General Fund						
Timeline	5 years						
Related Policies	General Plan						

Mitigation Strategy #7							
Strategy Name	Water Supply						
Problem Statement	Regional water supplier EBMUD has indicated that water main breaks after a major earthquake in Alameda County could significantly impact water supply in San Leandro.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	EBMUD						
Partners	Emergency Services, Alameda County Fire Department						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	HIGH						
Actions/ Activities	Ensure a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow) for existing and new development. This is an ongoing program to coordinate between fire jurisdictions and EBMUD to identify needed improvements to the water distribution system.						
Staff Lead	Emergency Services Specialist						
Cost Estimate	Unknown						
Potential Funding Sources	Unknown						
Timeline	Continual						

6.6 CONTINUITY OF GOVERNMENT STRATEGIES

Mitigation Strategy #8							
Strategy Name	Continuity of Government						
Problem Statement	San Leandro wants to ensure that after an emergency they City can continue to provide the same level of service to its residents and local businesses.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	City Manager's Office, Finance Department, San Leandro Engineering and Transportation, Police Department						
Partners	Alameda County Fire Department						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	HIGH						
Actions/ Activities	• The City of San Leandro will develop a continuity of operations plan that includes back-up storage of vital records, such as plans and back-up procedures to pay employees and vendors if normal finance department operations are disrupted, as well as other essential electronic files. • The City will expand on its plan for the emergency relocation of government-owned facilities critical to recovery, as well as any facilities with known structural deficiencies or in hazardous areas. • The City will continue to conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters. Such contents and equipment includes computers and servers, phones, files, and other tools used by staff to conduct daily business. • Maintain the local government's emergency operations center in a fully functional state of readiness.						
Staff Lead	Emergency Services Specialist						
Cost Estimate & Potential Funding Sources	Estimated $25,000 -$100,000 for analysis and potential update of equipment or storage. Storage of vital records estimated $500.00 monthly						
Timeline	3 years from funding						
Related Policies	General Plan						

MITIGATION STRATEGY #9							
Strategy Name	Wireless Network at Emergency Operations Center						
Problem Statement	Deploy high powered wireless network system at EOC Current wireless network at EOC is underpowered and fails when too many client devices connect.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Information Technology						
Partners	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	HIGH						
Actions/ Activities	This plan would include designing, procuring, and implementing new wireless system based on 802.11AC technology for maximum strength and range with ability to handle thousands of client devices. Internet accessibility has become critical for EOC operations. -Consultant will be needed for work to be completed.						
Staff Lead	Information Technology – Anton D. Batalla Emergency Services Division						
Cost Estimate & Potential Funding Sources	$15,000 - $25,000 capital costs, depending on complexity of design $5,000 annual maintenance Capital Improvement						
Timeline	5 years from funding						

MITIGATION STRATGEY #10							
Strategy Name	Redundant Phone System at Emergency Operations Center (EOC)						
Problem Statement	Enable full redundancy of City phone system at Emergency Operations Center (EOC). Current phone system is based on Cisco technology and requires City Hall to be online and operational (the "primary location").						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Information Technology						
Partners	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)*	Medium						
Actions/ Activities	This plan would include designing, procuring, and implementing a second, fully redundant phone system at the Emergency Operations Center (EOC) (the "secondary location") and configuring and testing the necessary hardware, software, systems, and processes to enable a complete failover of the primary location to the secondary location in the event of a disaster.						
Staff Lead	Information Technology – Anton D. Batalla Emergency Services Division						
Cost Estimate & Potential funding sources	$100,000 - $250,000 depending on complexity of design $25,000 - $30,000 annual maintenance Capital Improvement						
Timeline	5 years from funding						
Related Policies	General Plan						

Mitigation Strategy #11							
Strategy Name	Energy Assurance Plan						
Problem Statement	Ensuring critical facilities have electricity after a disaster is an important part of response and recovery as well as continuity of government.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Tsunami	Current Flooding	Future Flooding	Wildfire	Landslide	Climate Change
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	Emergency Management Services Division; San Leandro Public Works, Engineering and Transportation						
Partners	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority	HIGH						
Actions/ Activities	Energy Assurance Plan is a key part of the City's emergency and recovery planning efforts. The Energy Assurance Plan ensures that electricity is provided to key City facilities during post-disaster energy outages, to keep essential functions of the City operating. Components of the Plan which are to be implemented under this strategy are: • Analyze other sources of energy storage, such as solar • Energy Assessment of Key Facilities (i.e. pre-wire for rapid connection and provision of supplemental backup generators for sustained re-occupation and continuing use of City Hall, Police Administration Building, etc.) • Community charging stations • Energy backup at Emergency Shelters and communication hubs: (1) Identify methods to connect portable generators of unknown sizes to existing building infrastructure at shelter sites such as recreation centers and at communication hubs such as libraries that are near shelter sites (2) Create electric load management strategies that disaster recovery teams can implement to operate equipment in a clear order of priority to power their sites with portable generator of various sizes (3) Practice the load management strategies						
Staff Lead	Emergency Services Specialist, Public Works Deputy Director						
Cost Estimate	Energy Assessment of Key Facilities & Emergency Services component estimated $5 million • Community Charging Stations Pilot Project: $600,000 • Emergency Shelters energy backup: unknown Capital Improvement Plan, Grant						
Timeline	Once funded 5 years						

Mitigation Strategy #12							
Strategy Name	Redundant Computer Aided Dispatch (CAD) and Law Enforcement System						
Problem Statement	Enable full redundancy of Computer Aided Dispatch (CAD) and related Law Enforcement information systems (Records, Corrections, Data Entry and Sharing) at Emergency Operations Center (EOC)						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Information Technology						
Partners	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	Medium						
Actions/ Activities	Current CAD and related Law Enforcement information systems are operational on information technology infrastructure in a datacenter on site at the City of San Leandro Police Department (the "primary location"). This plan would include designing, procuring, and implementing a second, fully redundant information technology infrastructure at the Emergency Operations Center (EOC) (the "secondary location") and configuring and testing the necessary hardware, software, systems, and processes to enable a complete failover of the primary location to the secondary location in the event of a disaster.						
Staff Lead	Information Technology – Anton D. Batalla Police Department IT – Ron Clark Emergency Services Division						
Cost Estimate	$100,000 - $250,000 capital costs, depending on complexity of design $10,000 - $20,000 annual maintenance						
Potential Funding Sources	Capital Costs						
Timeline	5 years from funding						
Related Policies	General Plan						

Mitigation Strategy #13							
Strategy Name	Redundant radio system						
Problem Statement	In the event that a major disaster caused a complete radio failure, create a redundant radio system.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Emergency Services						
Partners	N/A						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	Low						
Actions/ Activities	Create a backup radio system that does not operate on the City/County's 800mhz system. The newly created back up radio system would ensure that San Leandro had a clear operating picture after a major disaster. The redundant radio system would have interoperability between emergency services, the police department and the public works department. Radio system will also be interoperable with School District radio system that is currently in place and allow the City to communicate with the local schools. Included in this proposed mitigation strategy would be additional Amateur Radio (HAM) equipment for the EOC.						
Staff Lead	Emergency Services Division, Police Department, Public Works Department						
Cost Estimate & Potential Funding Sources	$50,000 - 150,000 mitigation grants, Cost dependent upon how many departments request radios. $5000 potential annual cost. Capital Improvement Costs						
Timeline	5 years from funding						
Related Policies	General Plan						

Mitigation Strategy #14							
Strategy Name	Emergency Siren System						
Problem Statement	San Leandro's emergency siren system requires a system update due to non-compatibility with new emergency radio channel.						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Emergency Services						
Partners	Alameda County Office of Emergency Services						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	High						
Actions/ Activities	• Conduct analysis of siren systems current status and determine what needs to be done to make sirens operable again. • Make any needed upgrades to system • Design a public awareness plan to make San Leandro residents and businesses aware of sirens						
Staff Lead	Emergency Services Division						
Cost Estimate & Potential Funding Sources	Estimated Capital Improvement Costs						
Timeline	3 years from funding						
Related Policies	General Plan						

6.7 PUBLIC OUTREACH

Mitigation Strategy #15							
Strategy Name	Get Prepared San Leandro – Adopt –A-Drain						
Problem Statement	San Leandro has over 2200 storm drain inlets in the city. Residents are often more aware of debris build up and flooding in their						
Hazard(s) Addressed	Earthquake Ground Shaking	Earthquake Liquefaction	Current Flooding	Future Flooding	Wildfire	Landslide	Other Hazards
Strategy Type	Evaluation	Program/ Operation	Policy Development	Coordination	Education/ Outreach		
Process/ Implementation Mechanism	Long-Range Planning	Land Use Planning	Capital Planning	Operations	Emergency & Hazards Planning	Project Planning & Design	New Initiatives
Responsible Agency	San Leandro Public Works						
Partners	Cities of Service						
STRATEGY IMPLEMENTATION INFORMATION							
Priority (Evaluation Score)	Medium						
Actions/ Activities	Through the Adopt-A-Drain program residents can assist the city with cleanup of debris collected on city streets around storm drain inlets. This program helps to mitigate potential flooding on city streets and encourages residents to become more aware of flood prevention and preparedness.						
Staff Lead	Debbie Pollart – Public Works Director						
Cost Estimate	$25000 one time grant						
Potential Funding Sources	Cities of Service Grant funding						
Timeline	Continual						
Related Policies	General Plan						

7. PLAN MAINTENANCE

7.1 IMPLEMENTING, MONITORING, AND UPDATING THE PLAN

This Plan will be well-integrated into the City's existing plans and planning mechanisms. Upon its adoption, it will be an appendix to the City's Environmental Hazards Element of the City's General Plan. The City's Emergency Services Specialist (ESS) in the City Manager's Office will manage the plans future updates. The ESS will be responsible for working with LHMP PTM and guiding them through bi yearly meetings where the PTM will verify the progress of mitigation strategies, assess the need for additional mitigation strategies, and will conduct a yearly threat assessment to verify that there are no new natural hazards, not already identified in the 2017 LHMP. The ESS will also conduct progress checks on the plans identified mitigation strategies with City staff indicated under "Lead Organizations and Staff Leads". Additionally, each year, the City assesses potential capital improvement projects and available funding as it implements its Five-Year Capital Improvement Plan. Capital improvement actions in this Plan will be assessed as part of this annual process. Implementation of many of these actions will be dependent on outside funding sources.

7.2 IMPLEMENTING ACTIONS AND REPORTING ON PROGRESS

The Emergency Services Specialist (ESS) will conduct monitoring, evaluation and updates to the mitigation plan on an annual basis within the five-year cycle. Lead staff identified in each action will meet with the ESS at the beginning of each calendar year to address the City's overall progress on this Mitigation Strategies. In these meetings, staff will:

- Provide qualitative and quantitative performance data related to actions
- Identify any necessary changes to existing Plan actions
- Identify new Plan actions to be incorporated into the Strategy

The City's Disaster Council will serve as the advisory body for implementation of this Plan. This group was created by ordinance to advise the City Council on disaster-related issues. All meetings of this Commission are held in public. Staff will present progress on mitigation strategy implementation to this group on an annual basis. The City will maintain the www.sanleandro.org/Mitigation website. Additionally, community members are able to email and mail or hand-deliver feedback to the City Manager's Office at any time. The City will also use the website as one means of reporting implementation progress to the community.

7.3 UPDATING THE PLAN

Per federal regulations, this Plan must be updated once every five years. To ensure future compliance with these regulations, the 2019 mitigation strategy meeting will commence the comprehensive process to create the 2020 Plan update. This process will be similar to the annual plan update as described in Section 6.2. Implementing, monitoring, and updating the Local Hazard Mitigation Plan but will be expanded to address all sections of
the Plan:

1. City staff will consult with subject matter experts, and ABAG to conduct a thorough evaluation and update of this Plan's hazard analysis. The update will include any new scientific research about San Leandro's hazards, the city's exposure and vulnerabilities, as well as a thorough review of all loss estimates.

2. City staff will measure and report progress on actions since the plan's inception.

3. Items 1 and 2 together will inform the assessment of the updated mitigation strategy.

- City staff will assess incomplete actions to determine if they should be removed, retained or rewritten
- City staff will propose new actions for the updated plan.

4. City staff will perform another community review process, including input opportunities for institutional community partners and individual members of the public.

5. City staff will incorporate appropriate public feedback and will conduct an outreach and adoption process, involving City commissions and City Council.

8.0 APPENDIX

8.1 Appendix Item I:

Public Presentation of FEMA Flood Maps on November 16, 2015 at San Leandro City Council meeting. Announced in November 12, 2015 San Leandro Times City Corner add, Volume 25, No. 46.

VOL. 25 NO. 46 SLTIMES 11/12.

CITY CORNER

CURRENT ISSUES AND INFORMATION FROM THE CITY OF SAN LEANDRO

FEMA's Presentation of San Leandro's Flood Hazard Area on FEMA's Flood Insurance Rate Map

The City of San Leandro is sponsoring a community meeting for those property owners that may be affected by the special flood hazard area on FEMA's Flood Insurance Rate Map. FEMA will be giving a presentation to the City Council and residents on November 16th. Please attend to learn more about FEMA's Flood Insurance Rate Map and the impact it may have on your property. Officials from the City of San Leandro, Alameda County, FEMA and other agencies will be available to answer your questions.

Monday, November 16 • 7:00 p.m.
Council Chambers, San Leandro City Hall
835 E. 14th St.

DEPARTMENT OF HOMELAND SECURITY FEDERAL EMERGENCY MANAGEMENT AGENCY Proposed Flood Hazard Determinations for Alameda County, California and Incorporated Areas

The Department of Homeland Security's Federal Emergency Management Agency has issued a preliminary Flood Insurance Rate Map (FIRM), and where applicable, Flood Insurance Study (FIS) report, reflecting proposed flood hazard determinations within Alameda County, California and Incorporated Areas. These flood hazard determinations may include the addition or modification of Base Flood Elevations, base flood depths, Special Flood Hazard Area boundaries or zone designations, or the regulatory floodway. Technical information or comments are solicited on the proposed flood hazard determinations shown on the preliminary FIRM and/or FIS report for Alameda County, California and Incorporated Areas. These flood hazard determinations are the basis for the floodplain management measures that your community is required to either adopt or show evidence of being already in effect in order to qualify or remain qualified for participation in the National Flood Insurance Program. However, before these determinations are effective for floodplain management purposes, you will be provided an opportunity to appeal the proposed information.

Property owners that may be affected were sent information in the mail notifying them of such. For information on the statutory 90-day period provided for appeals, as well as a complete listing of the communities affected and the locations where copies of the FIRM are available for review, please visit FEMA's website at www.fema.gov/plan/prevent/fhm/bfe, or call the FEMA Map Information eXchange (FMIX) toll free at 1-877-FEMA MAP (1-877-336-2627).

Si require servicios de traducción, por favor comuniquese a la Oficina del City Clerk en el (510) 577-3351.

如果您需要翻译服务，请联系市秘书办公室在 510-577-3351.

TDD 510-577-3343.

8.2 Appendix Item II

Information regarding City of San Leandro's participation in the FEMA Flood Map program. Presented in San Leandro Times November 12, 2015, Volume 25, No. 46.

FLOOD ZONE

IS YOUR HOME IN THE FLOOD ZONE?

The City of San Leandro continues to participate in the FEMA (Federal Emergency Management Agency) Flood Insurance Rating System and achieved a Class 8 designation that enables residents in FEMA-designated flood zones or Special Flood Hazard Area (SFHA) to receive discounts of up to 10 percent on flood insurance.

Properties in the flood zone that have federally backed loans are required to have flood insurance. If you are unsure whether your home is in the flood zone, we will gladly provide you with flood zone information. Please send your name, email address, phone number and the site address you are inquiring about by:

- Email to: jsmithjr@sanleandro.org -or-
- Phone: City's Flood Zone Information Hotline at 510-577-3413

Flood zone maps can be viewed at https://msc.fema.gov/portal or at the City's Division of Building & Safety Services located on the 1st Floor, City Hall at 835 E. 14th Street.

Ways to Reduce Flood Risks

There are approximately 3,000 homes that are in San Leandro's flood zone, the following are steps all residents can take to reduce flood risks.

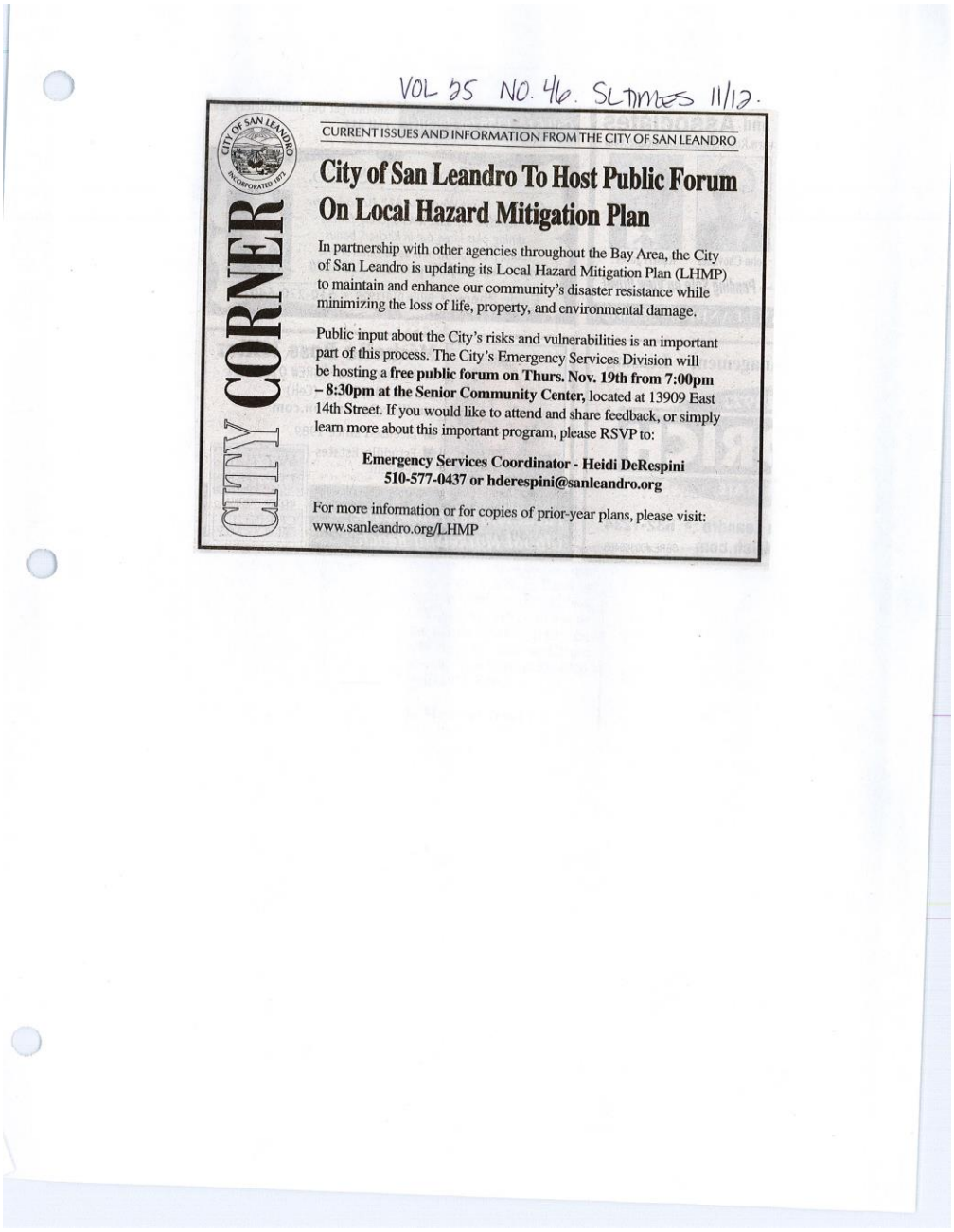
- Residents are encouraged to assist in maintaining the flood control channels in their areas by removing or reporting obstructions (such as shopping carts, leaves, debris, trash, etc.). To report obstructions or illegal dumping, or for questions regarding flood control channels, please contact Alameda County Public Works Agency's Maintenance and Operations Department at (510) 670-5500.
- Keeping storm drains free of obstructions reduces flooding in the event of heavy rains. To report obstructions or illegal dumping, or for questions regarding the City's drainage system maintenance, please contact Public Works – Water Pollution Control Plant at (510) 577-3434.
- Do not drive or walk around road barriers where roads or pathways may be flooded or washed out.
- Stay away from downed power lines and electrical wires.
- In the event of home flooding, turn off electricity.
- Do not use appliances or motors that get wet unless they are taken apart, cleaned and dried.
- Elevate or relocate electrical panels, furnaces, water heaters, washers and dryers.

Building in the Flood Zone

Though all development within the city requires a permit, there are very specific requirements when building in the flood zone. Always check and fulfill permitting requirements with the Division of Building & Safety Services at (510) 577-3405 and/or the Engineering Division at (510) 577-3428 before you build on, alter, fill, or re-grade on any portion of your property and/or within any easement or right-of-way. To report any suspected permitting violations, please contact Division of Building & Safety at (510) 577-3405.

8.3 Appendix Item III:

Add announcing City of San Leandro Hazard Mitigation Public Forum. Announced in November 12, 2015 San Leandro Times City Corner add, Volume 25, No. 46.



VOL 25 NO. 46. SLTIMES 11/12.

CITY CORNER

CURRENT ISSUES AND INFORMATION FROM THE CITY OF SAN LEANDRO

City of San Leandro To Host Public Forum On Local Hazard Mitigation Plan

In partnership with other agencies throughout the Bay Area, the City of San Leandro is updating its Local Hazard Mitigation Plan (LHMP) to maintain and enhance our community's disaster resistance while minimizing the loss of life, property, and environmental damage.

Public input about the City's risks and vulnerabilities is an important part of this process. The City's Emergency Services Division will be hosting a **free public forum on Thurs. Nov. 19th from 7:00pm – 8:30pm at the Senior Community Center,** located at 13909 East 14th Street. If you would like to attend and share feedback, or simply learn more about this important program, please RSVP to:

Emergency Services Coordinator - Heidi DeRespini
510-577-0437 or hderespini@sanleandro.org

For more information or for copies of prior-year plans, please visit: www.sanleandro.org/LHMP

8.4 Appendix Item IV

Article in San Leandro Times on November 12, 2015 regarding City's Hazard Mitigation Public Forum. Vol. 25 No. 46

VOL. 25 NO. 47 11/19

City Disaster Planning Meeting Tonight

The city is hosting a meeting on disaster plans tonight (Thursday) from 7 p.m. to 8:30 p.m. to go over San Leandro's hazard mitigation plan at the Senior Center, 13909 East 14th Street.

If you would like to provide feedback, but are unable to attend the meeting, a hazard mitigation survey is available on the city's website as well as in paper format at City Hall.

For more information, or to RSVP for the public forum, please contact emergency services coordinator Heidi DeRespini at 577-0437.

8.5 Appendix Item V

San Leandro Hazard Mitigation Survey

The City of San Leandro and other cities in Alameda County are required, in response to the Federal Disaster Mitigation Act of 2000, to complete and review their Hazard Mitigation Plan once every 5 years. The act calls for San Leandro, to develop a comprehensive plan illustrating how communities will identify, manage, and reduce the risk of potential hazards in a disaster.

The purpose of San Leandro's plan is to ensure that programs and projects are in place that will help minimize the loss of life, property, and environmental damage. This will allow the City to continue operations after a major emergency.

Your input about the City's risks and vulnerabilities is an important component of San Leandro's Hazard Mitigation Plan. If you are interested in reviewing the City's existing Mitigation Plans, they are available for review on the City's website under "Hazard Mitigation Planning" www.sanleandro.org

Thank you for taking this survey. Your opinions will be used to better prepare the City of San Leandro for a major disaster.

Please return this survey to the front desk staff.

Or

Mail/drop off to:

San Leandro Police Department
901 E. 14th Street
San Leandro, CA 94579
Attention: Heidi DeRespini

Natural and Other Hazards

***1. What hazards in San Leandro most concern you?**

- [ ] Dam/Levee Failure
- [ ] Drought
- [ ] Earthquake
- [ ] Flood
- [ ] Tsunami
- [ ] Hazardous Material event
- [ ] Landslide
- [ ] Sea Level Rise
- [ ] Wildland Fire
- [ ] Other (please specify)

Community Assets

In order to assess community hazard risk, we need to understand which community hazards may be vulnerable. Community assets are features, characteristics, or resources that either made the community unique or allow it to function.

2. In your opinion, which of the following categories of assets are most vulnerable to natural hazards in San Leandro? Please rank the community assets in order of vulnerability, with 1 being the most vulnerable and 6 being the least vulnerable.

	Cultural/Historic: Damage or loss of libraries, museums, historic properties, etc.
	Economic: Business interruptions or closures, loss of jobs, etc.
	Environmental Damage: contamination or loss of property, such as wetlands, and waterways.
	Governmental: Ability to maintain order and continue providing public services, etc.
	Infrastructure: Damage or loss of roads, bridges, utilities, schools, etc.
	People: Loss of life and or/injuries.

Preparedness Activities

4. In your household, has anyone done any of the following preparedness activities?

	Have Done	Plan to Do	Have not Done	Unable to Do	Not Applicable
Anchored service utilities to your home (water heater, furnace, wood stove, etc.)	○	○	○	○	○
Established a defensible space around your home.	○	○	○	○	○
Purchases hazard insurance (flood, earthquakes, etc.)	○	○	○	○	○
Strengthened your home through mitigation retrofits from when your home was constructed.	○	○	○	○	○
Made an emergency kit or assembled emergency supplies.	○	○	○	○	○
Prepared a family emergency plan.	○	○	○	○	○
Talked about what to do in case of an emergency or natural disaster.	○	○	○	○	○
Attended a course dealing with emergency preparedness (e.g. Get Ready, CERT, PEP, First Aid, CPR)	○	○	○	○	○
Identified and understand how and when to shut off utilities.	○	○	○	○	○

Preparedness Activities

5. Do you think you are well informed about the dangers of the hazards affecting the City of San Leandro?

- ◯ Yes
- ◯ No

6. How do you plan to get important information from the City of San Leandro after a major disaster?

- ☐ Nixle 360
- ☐ City of San Leandro website
- ☐ Twitter
- ☐ Facebook
- ☐ Nextdoor
- ☐ Radio Station 1610 AM
- ☐ UVerse - Channel 99
- ☐ Comcast - Channel 13

Other (please specify)

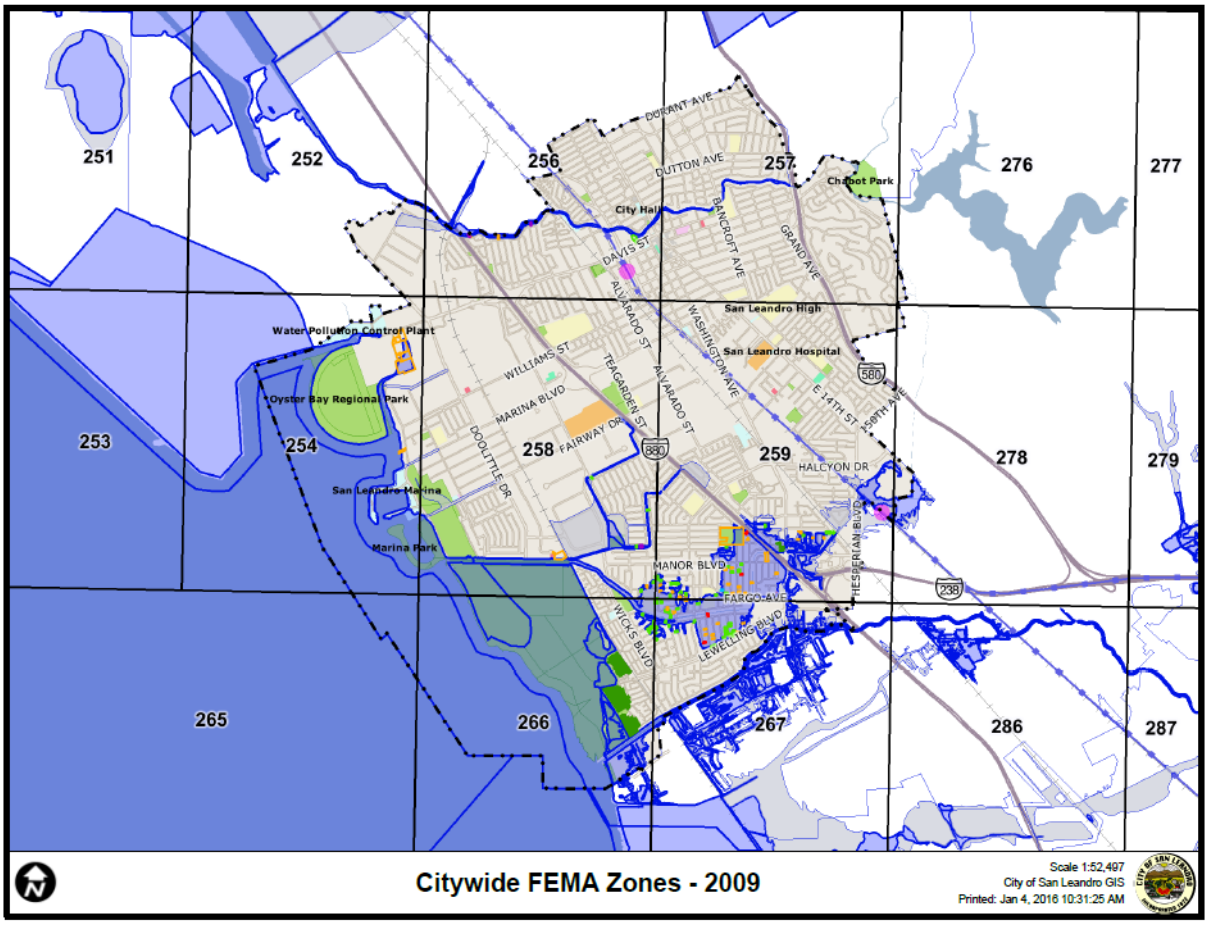
Preparedness Activities

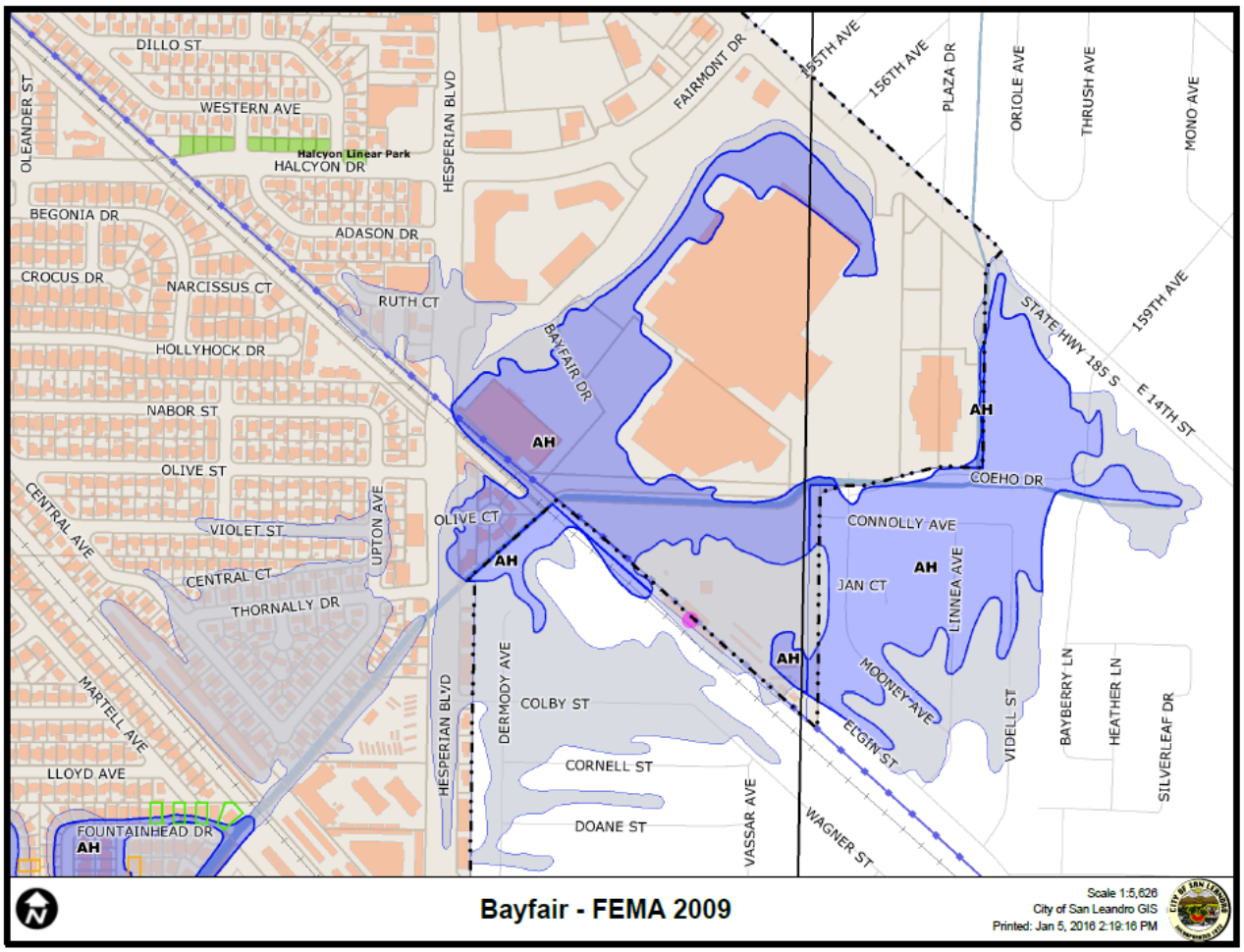
8. Would you attend public education classes dealing with emergency preparedness and hazard awareness if they were offered?

- ◯ Yes
- ◯ No
- ◯ Unsure

8.6 Appendix Item VI

FEMA Flood Maps for City of San Leandro

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OLEANDER ST
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HALCYON DR
HESPERIAN BLVD
FAIRMONT DR
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156TH AVE
PLAZA DR
ORIOLE AVE
THRUSH AVE
MONO AVE
BEGONIA DR
ADASON DR
CROCUS DR
NARCISSUS CT
RUTH CT
BAYFAIR DR
159TH AVE
STATE HWY 185 S
E 14TH ST
HOLLYHOCK DR
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MARTELL AVE
DERMODY AVE
COLBY ST
MOONEY AVE
BAYBERRY LN
HEATHER LN
LLOYD AVE
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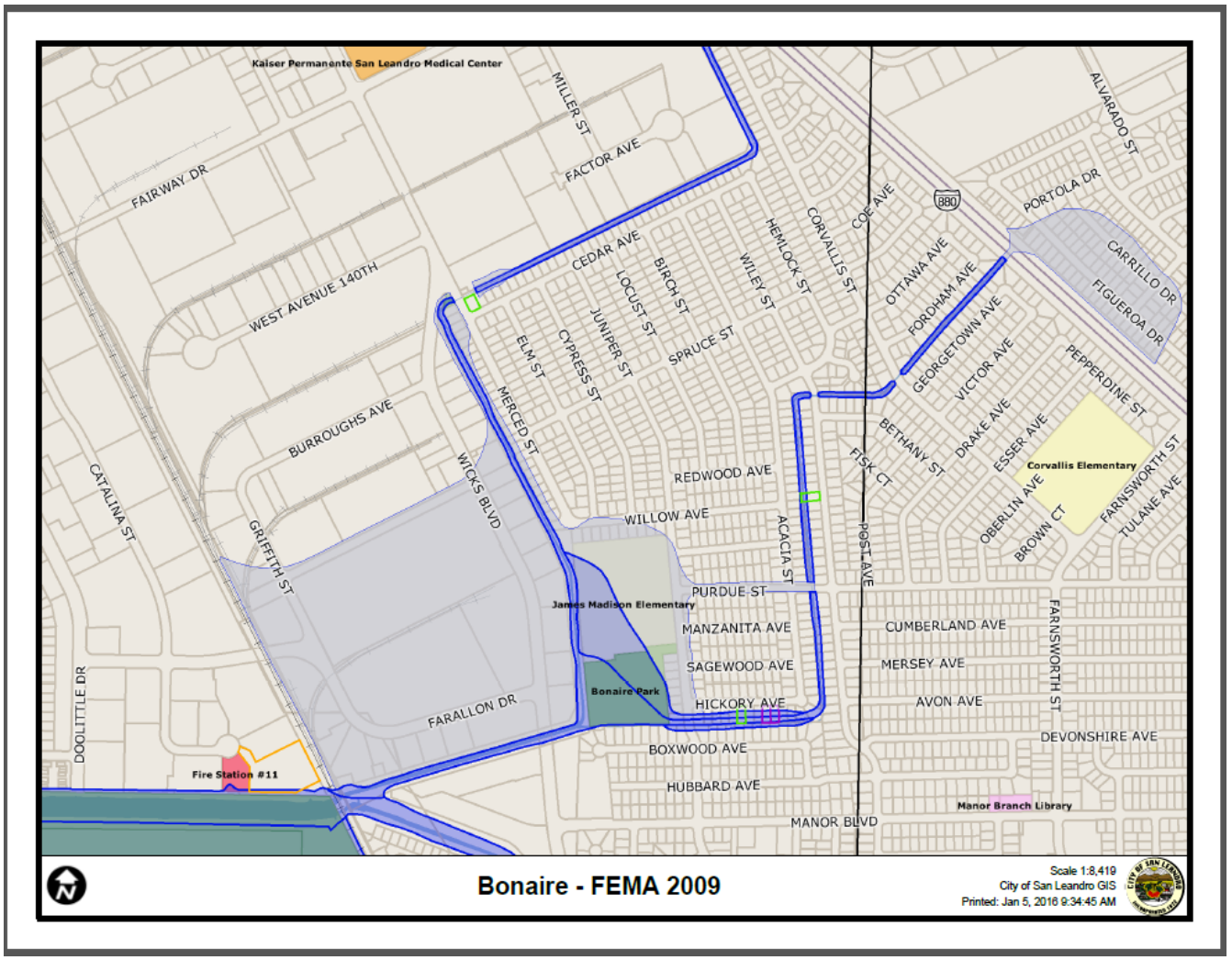
Kaiser Permanente San Leandro Medical Center
MILLER ST
FACTOR AVE
FAIRWAY DR
WEST AVENUE 140TH
BURROUGHS AVE
CATALINA ST
GRIFFITH ST
WICKS BLVD
MERCED ST
ELM ST
CYPRESS ST
JUNIPER ST
LOCUST ST
BIRCH ST
CEDAR AVE
SPRUCE ST
WILEY ST
HEMLOCK ST
CORVALLIS ST
COE AVE
880
ALVARADO ST
PORTOLA DR
CARRILLO DR
FIGUEROA DR
OTTAWA AVE
FORDHAM AVE
GEORGETOWN AVE
VICTOR AVE
PEPPERDINE ST
DRAKE AVE
ESSER AVE
Corvallis Elementary
OBERLIN AVE
BROWN CT
FARNSWORTH ST
TULANE AVE
BETHANY ST
FISK CT
POST AVE
REDWOOD AVE
WILLOW AVE
ACACIA ST
PURDUE ST
James Madison Elementary
MANZANITA AVE
SAGEWOOD AVE
Bonaire Park
HICKORY AVE
CUMBERLAND AVE
MERSEY AVE
AVON AVE
FARNSWORTH ST
DEVONSHIRE AVE
FARALLON DR
DOOLITTLE DR
Fire Station #11
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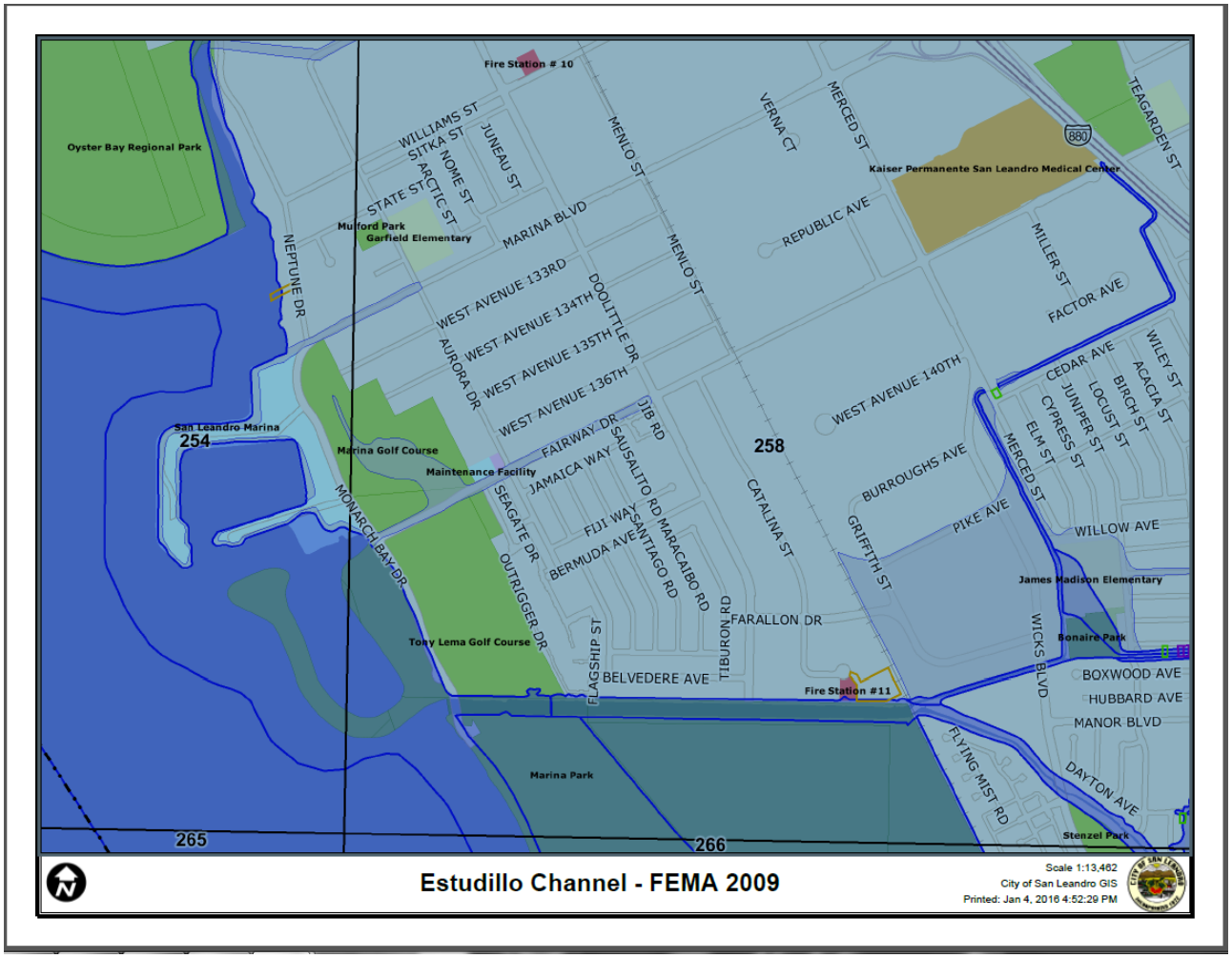
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SITKA ST
NOME ST
ARCTIC ST
STATE ST
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VERNA CT
MERCED ST
TEAGARDEN ST
880
Kaiser Permanente San Leandro Medical Center
Mulford Park
Garfield Elementary
MARINA BLVD
REPUBLIC AVE
NEPTUNE DR
WEST AVENUE 133RD
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AURORA DR
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WILEY ST
ACACIA ST
BIRCH ST
LOCUST ST
JUNIPER ST
CYPRESS ST
ELM ST
CEDAR AVE
San Leandro Marina
254
Marina Golf Course
Maintenance Facility
FAIRWAY DR
JAMAICA WAY
SAUSALITO RD
JIB RD
258
WEST AVENUE 140TH
BURROUGHS AVE
PIKE AVE
WILLOW AVE
MERCED ST
MONARCH BAY DR
SEAGATE DR
OUTRIGGER DR
BERMUDA AVE
FIJI WAY
SANTIAGO RD
MARACAIBO RD
CATALINA ST
GRIFFITH ST
James Madison Elementary
Bonaire Park
Tony Lema Golf Course
FLAGSHIP ST
TIBURON RD
FARALLON DR
WICKS BLVD
BELVEDERE AVE
Fire Station #11
BOXWOOD AVE
HUBBARD AVE
MANOR BLVD
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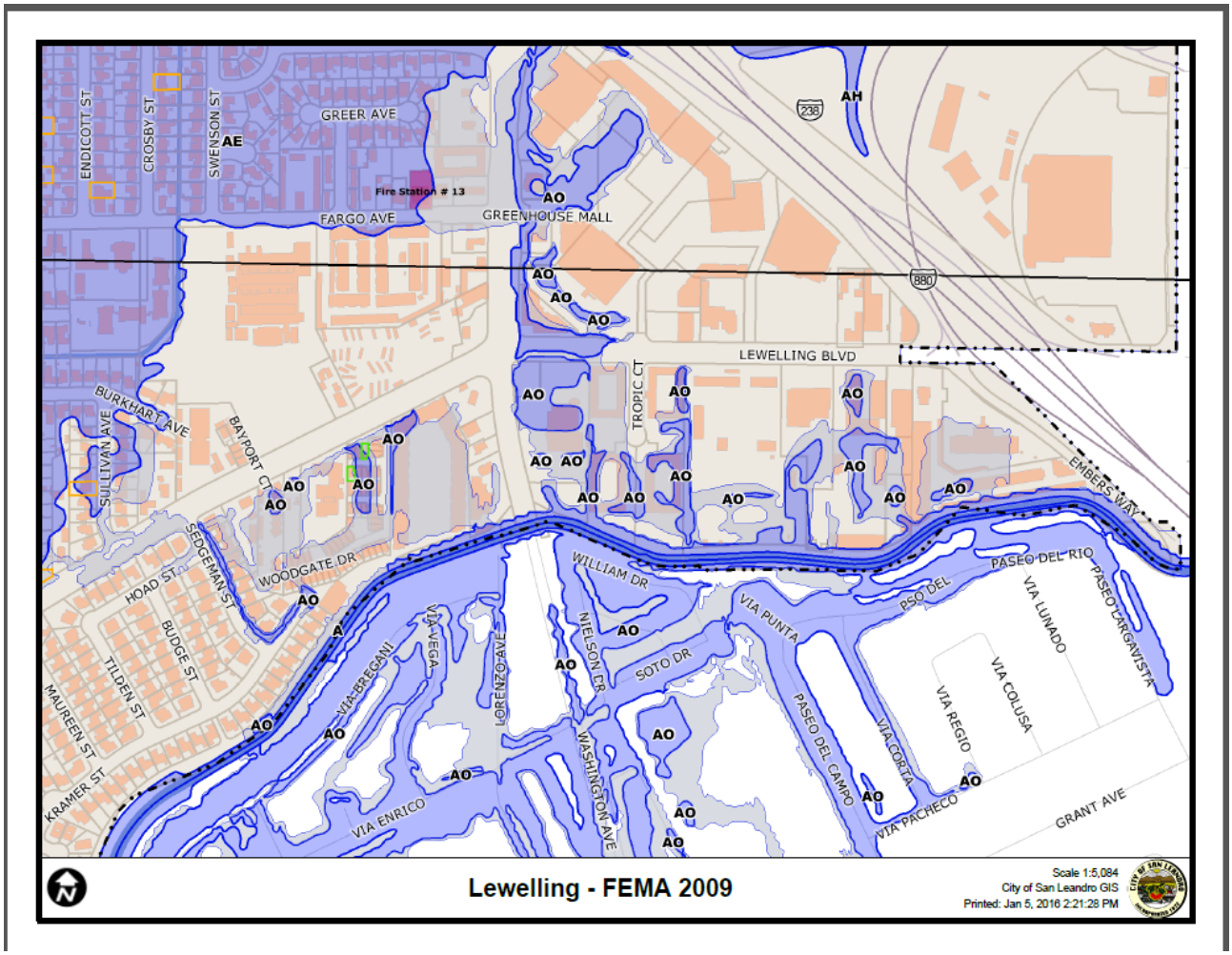
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CROSBY ST
SWENSON ST
AE
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GREENHOUSE MALL
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TROPIC CT
BURKHART AVE
SULLIVAN AVE
BAYPORT CT
EMBERS WAY
SEDGEMAN ST
HOAD ST
WOODGATE DR
WILLIAM DR
PASEO DEL RIO
PSO DEL
VIA LUNADO
PASEO LARGAVISTA
VIA PUNTA
VIA COLUSA
VIA REGIO
VIA CORITA
PASEO DEL CAMPO
VIA PACHECO
GRANT AVE
SOTO DR
NIELSON CR
LORENZO AVE
WASHINGTON AVE
VIA BREGANI
VIA VEGA
VIA ENRICO
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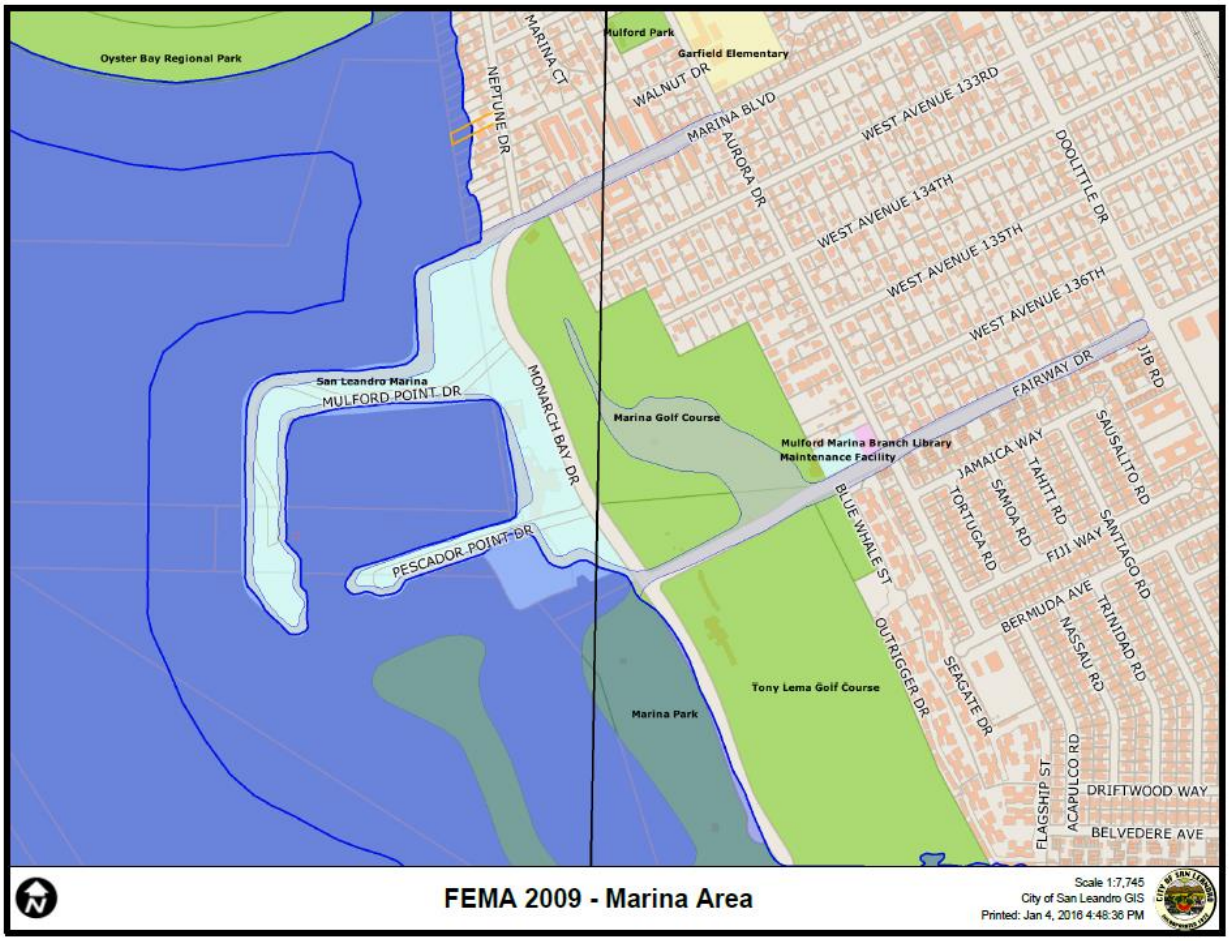
Oyster Bay Regional Park
MARINA CT
NEPTUNE DR
Mulford Park
Garfield Elementary
WALNUT DR
MARINA BLVD
AURORA DR
WEST AVENUE 133RD
WEST AVENUE 134TH
WEST AVENUE 135TH
WEST AVENUE 136TH
DOOLITTLE DR
JIB RD
FAIRWAY DR
San Leandro Marina
MULFORD POINT DR
MONARCH BAY DR
Marina Golf Course
Mulford Marina Branch Library
Maintenance Facility
JAMAICA WAY
TAHITI RD
SAMOA RD
TORTUGA RD
SAUSALITO RD
FIJI WAY
SANTIAGO RD
BLUE WHALE ST
PESCADOR POINT DR
BERMUDA AVE
TRINIDAD RD
NASSAU RD
OUTRIGGER DR
SEAGATE DR
Tony Lema Golf Course
Marina Park
FLAGSHIP ST
ACAPULCO RD
DRIFTWOOD WAY
BELVEDERE AVE
FEMA 2009 - Marina Area
Scale 1:7,745
City of San Leandro GIS
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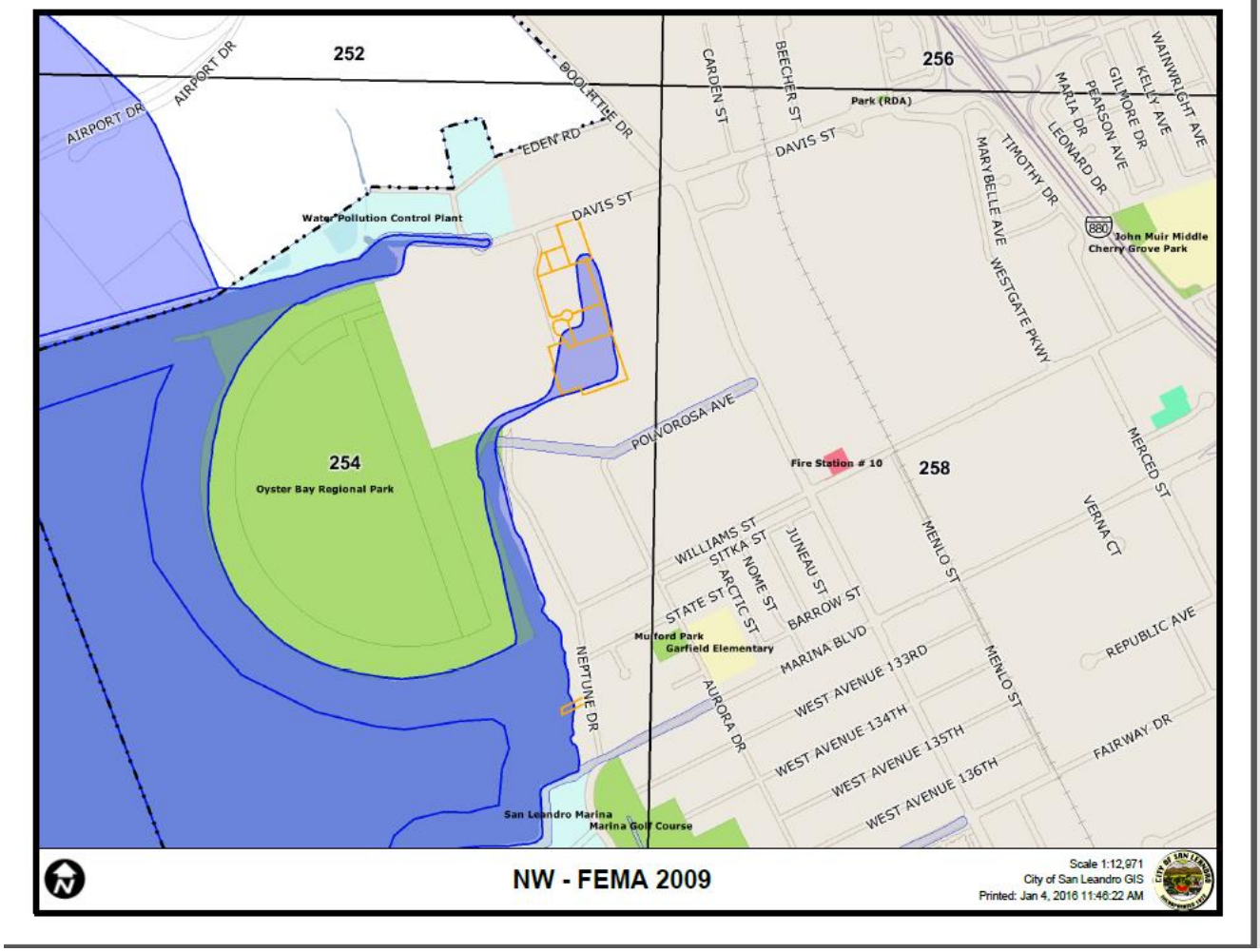
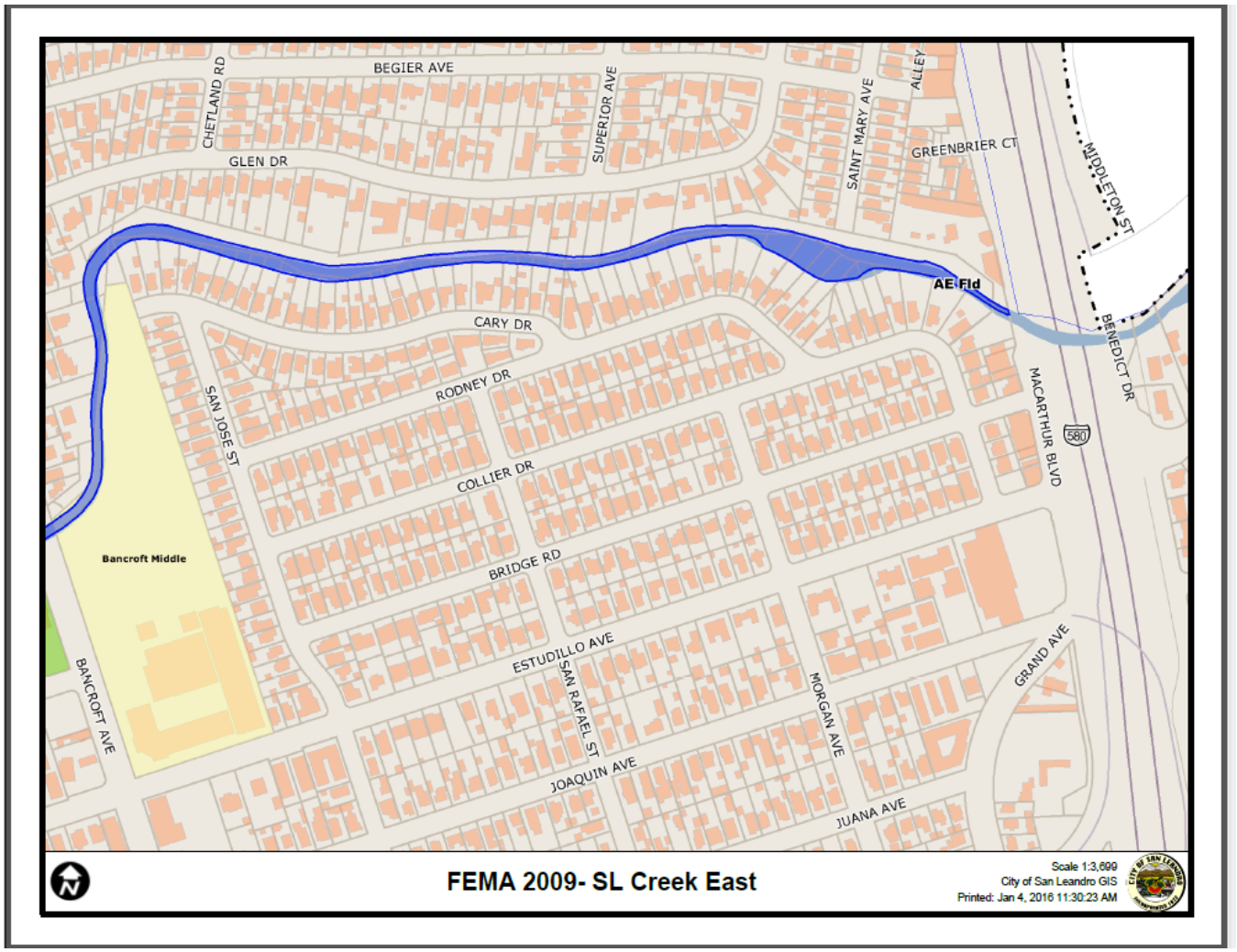

252
256
254
258
AIRPORT DR
BOOLARTHE DR
EDEN RD
DAVIS ST
CARDEN ST
BEECHER ST
Park (RDA)
MARIA DR
PEARSON AVE
GILMORE DR
KELLY AVE
WAINWRIGHT AVE
LEONARD DR
TIMOTHY DR
MARY BELLE AVE
WESTGATE PKWY
John Muir Middle
Cherry Grove Park
Water Pollution Control Plant
Oyster Bay Regional Park
POLVOROSA AVE
Fire Station # 10
MERCED ST
VERNA CT
WILLIAMS ST
SITKA ST
NOME ST
ARCTIC ST
JUNEAU ST
BARROW ST
MENLO ST
STATE ST
Mulford Park
Garfield Elementary
MARINA BLVD
REPUBLIC AVE
NEPTUNE DR
AURORA DR
WEST AVENUE 133RD
WEST AVENUE 134TH
WEST AVENUE 135TH
WEST AVENUE 136TH
FAIRWAY DR
San Leandro Marina
Marina Golf Course
NW - FEMA 2009
Scale 1:12,971
City of San Leandro GIS
Printed: Jan 4, 2016 11:46:22 AM


FEMA 2009 SL Creek Central
Scale 1:8,829
City of San Leandro GIS
Printed: Jan 4, 2016 11:28:59 AM
Roosevelt Elementary
Bancroft Middle
City Hall
Memorial Park
Fire Station # 9
Main Library
Parking Lot
Parking Garage
Pedestrian Mall
Vacant Building (RDA)
Open Space - Creek Walk
S.L. Creek
Casa Peralta, Museum/Gallery
Parking (RDA)
Estudillo Post Office
Parking
Thrasher Park
Thrasher Park/Skateboard Park
LEXINGTON AVE
FARRELLY DR
W BROADMOOR BLVD
GARCIA AVE
LAFAYETTE AVE
BELLEVIEW DR
PERSHING DR
STOAKES AVE
SUNNYSIDE DR
GEORGIA WAY
EUCLID AVE
BREED AVE
EUCLID CT
MAPLE CT
BEVERLY AVE
WARWICK AVE
DUTTON AVE
OAKES BLVD
CHETLAND RD
BEGIER AVE
APRICOT ST
NAPOLEON DR
MATOZA LN
JUBILEE LN
BURIAT ST
BLOOM ST
BIXCO ST
TIVOLI ST
CHERRYWOOD AVE
ALLEY
LEO AVE
PARK ST
BEST AVE
PERALTA AVE
LORRAINE BLVD
LILLE AVE
CALIFORNIA AVE
LAFAYETTE AVE
TOLER AVE
ARROYO AVE
ARDEN ST
BEGIER AVE
HAAS AVE
KAROL WAY
RAMONA WAY
WOODLAND AVE
LEE AVE
GLEN DR
ARBOR DR
PALA AVE
CARY DR
SAN JOSE ST
RODNEY DR
BRIDGE RD
BANCROFT AVE
CHUMALIA ST
CALLAN AVE
ESTUDILLO AVE
HARRISON ST
SANTA ROSA ST
JOAQUIN AVE
JUANA AVE
DOLORES AVE
MAUD AVE
ELSIE AVE
SYBIL AVE
E 14TH ST
WASHINGTON AVE
WILLIAMS ST
HAYS ST
PARROTT ST
THORNTON ST
W JUANA AVE
SAN LEANDRO BLVD
CARPENTER ST
CLARKE ST
ALVARADO ST
ANTONIO ST
TULIP LN
LOLA ST
CAMELLIA CT
MINERVA ST
LUCILLE ST
PREDA ST
DARNER ST
DAVIS ST
PACIFIC AVE
ORCHARD AVE


BEGIER AVE
CHETLAND RD
GLEN DR
SUPERIOR AVE
SAINT MARY AVE
ALLEY
GREENBRIER CT
MIDDLETON ST
AE Fld
CARY DR
RODNEY DR
SAN JOSE ST
COLLIER DR
BENEDICT DR
MACARTHUR BLVD
580
Bancroft Middle
BRIDGE RD
ESTUDILLO AVE
GRAND AVE
BANCROFT AVE
SAN RAFAEL ST
MORGAN AVE
JOAQUIN AVE
JUANA AVE
FEMA 2009- SL Creek East
Scale 1:3,699
City of San Leandro GIS
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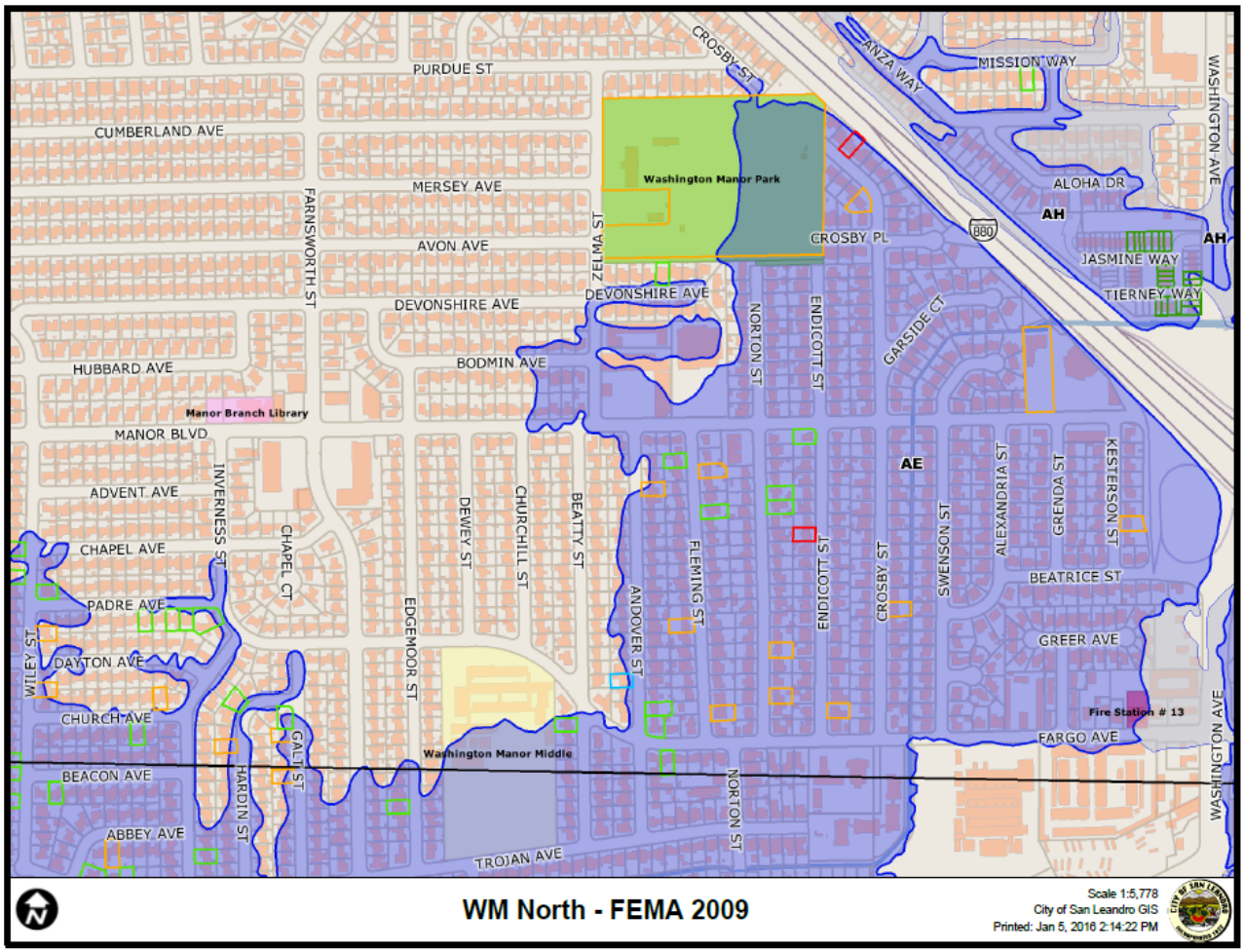
PURDUE ST
CUMBERLAND AVE
MERSEY AVE
AVON AVE
DEVONSHIRE AVE
HUBBARD AVE
MANOR BLVD
ADVENT AVE
CHAPEL AVE
PADRE AVE
DAYTON AVE
CHURCH AVE
BEACON AVE
ABBEY AVE
TROJAN AVE
FARNSWORTH ST
ZELMA ST
INVERNESS ST
CHAPEL CT
DEWEY ST
CHURCHILL ST
BEATTY ST
EDGEMOOR ST
WILEY ST
GALT ST
HARDIN ST
ANDOVER ST
FLEMING ST
NORTON ST
ENDICOTT ST
CROSBY ST
SWENSON ST
GARSIDE CT
ALEXANDRIA ST
GRENDA ST
KESTERSON ST
CROSBY ST
ANZA WAY
MISSION WAY
WASHINGTON AVE
ALOHA DR
CROSBY PL
JASMINE WAY
TIERNEY WAY
BEATRICE ST
GREER AVE
FARGO AVE
Washington Manor Park
Manor Branch Library
Washington Manor Middle
Fire Station # 13
AH
AE
880
WM North - FEMA 2009
Scale 1:5,778
City of San Leandro GIS
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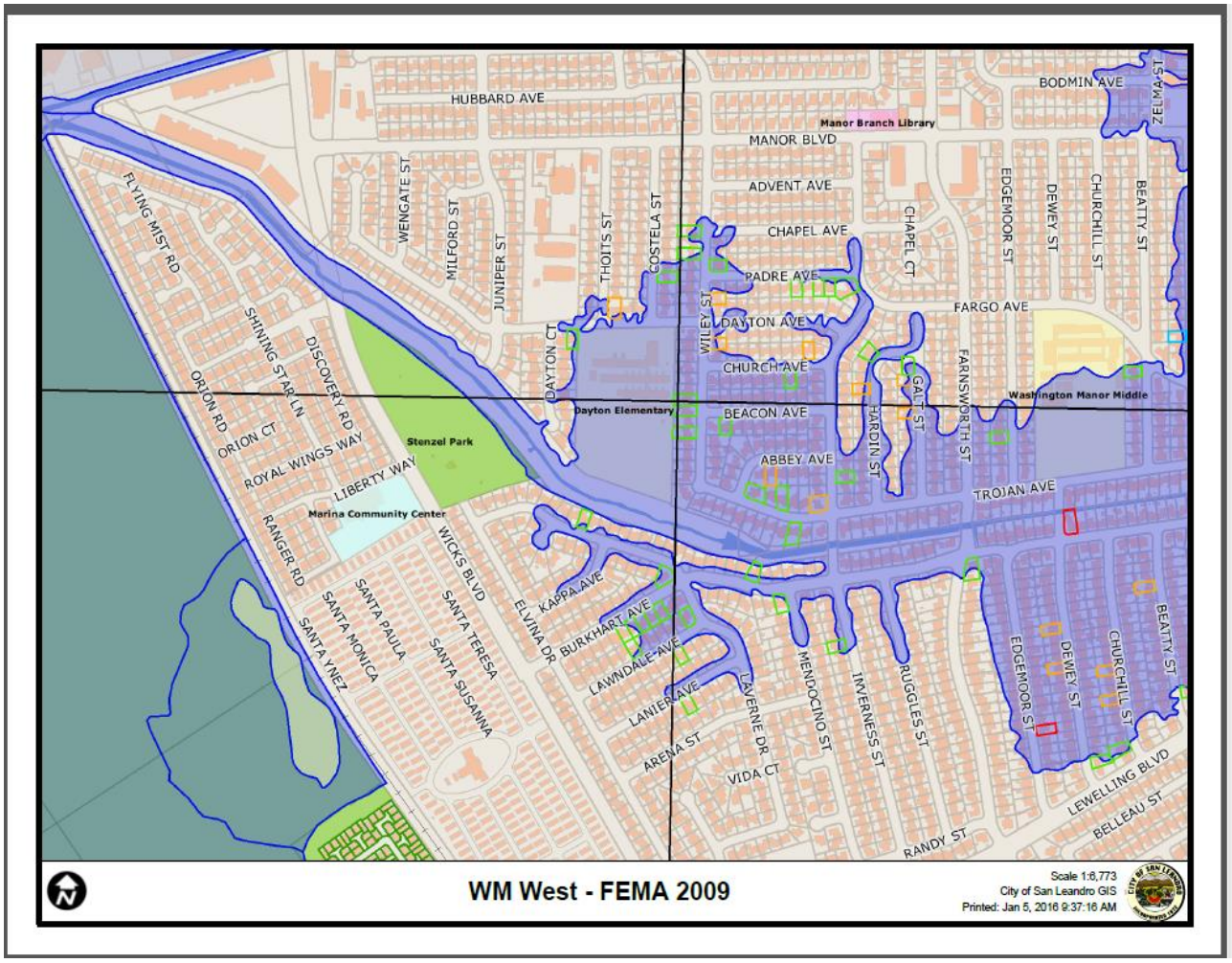
HUBBARD AVE
Manor Branch Library
MANOR BLVD
BODMIN AVE
ADVENT AVE
CHAPEL AVE
PADRE AVE
DAYTON AVE
CHURCH AVE
BEACON AVE
ABBEY AVE
TROJAN AVE
FARGO AVE
Washington Manor Middle
Dayton Elementary
Stenzel Park
Marina Community Center
FLYING MIST RD
SHINING STAR LN
DISCOVERY RD
ORION RD
ORION CT
ROYAL WINGS WAY
LIBERTY WAY
RANGER RD
SANTA YNEZ
SANTA MONICA
SANTA PAULA
WICKS BLVD
SANTA TERESA
SANTA SUSANNA
ELVINA DR
KAPPA AVE
BURKHART AVE
LAWNDALE AVE
LANIER AVE
ARENA ST
LAVERNE DR
VIDA CT
MENDOCINO ST
INVERNESS ST
RUGGLES ST
HARDIN ST
GALT ST
FARNSWORTH ST
EDGEMOOR ST
DEWEY ST
CHURCHILL ST
BEATTY ST
LEWELLING BLVD
BELLEAU ST
RANDY ST
WENGATE ST
MILFORD ST
JUNIPER ST
THOITS ST
COSTELA ST
WILEY ST
DAYTON CT
CHAPEL CT
WM West - FEMA 2009
Scale 1:6,773
City of San Leandro GIS
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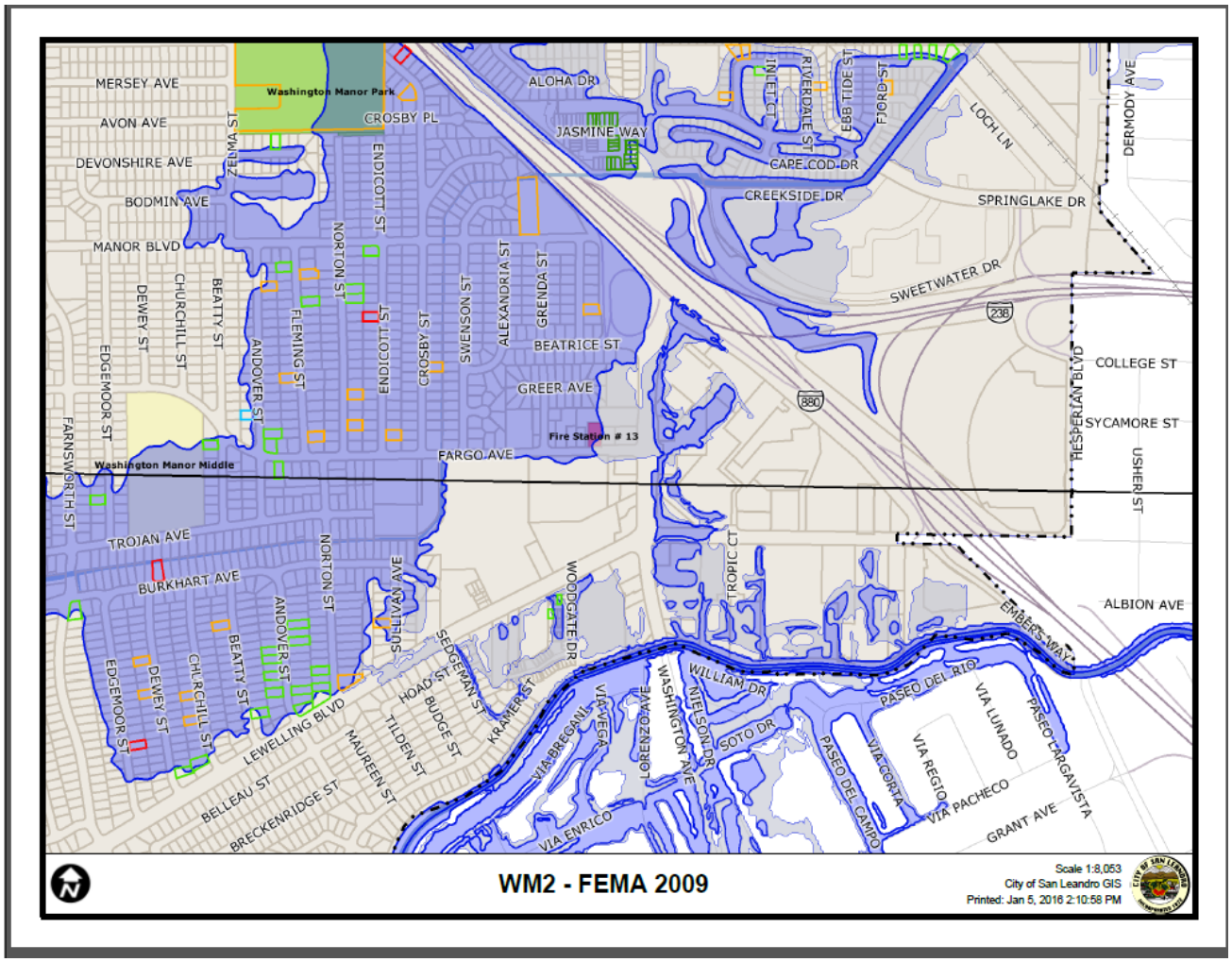
MERSEY AVE
AVON AVE
DEVONSHIRE AVE
BODMIN AVE
MANOR BLVD
Washington Manor Park
CROSBY PL
ALOHA DR
JASMINE WAY
CAPE COD DR
CREEKSIDE DR
SPRINGLAKE DR
SWEETWATER DR
LOCH LN
DERMODY AVE
COLLEGE ST
SYCAMORE ST
HESPERIAN BLVD
USHER ST
ALBION AVE
EMBERS WAY
PASEO DEL RIO
VIA LUNADO
PASEO CARGAVISTA
VIA REGIONAL
VIA PACHECO
GRANT AVE
VIA GORRA
PASEO DEL CAMPO
WILLIAM DR
SOTO DR
NIELSON DR
WASHINGTON AVE
LORENZO AVE
VIA VEGA
VIA BREGANTI
VIA ENRICO
KRAMER ST
SEDGEMAN ST
HOAD ST
BUDGE ST
TILDEN ST
MAUREEN ST
LEWELLING BLVD
BELLEAU ST
BRECKENRIDGE ST
WOODGATE DR
TROPIC CT
SULLIVAN AVE
NORTON ST
ANDOVER ST
BEATTY ST
CHURCHILL ST
DEWEY ST
EDGEMOOR ST
FARNSWORTH ST
TROJAN AVE
BURKHART AVE
Washington Manor Middle
FARGO AVE
Fire Station # 13
GREER AVE
BEATRICE ST
GRENDA ST
ALEXANDRIA ST
SWENSON ST
CROSBY ST
ENDICOTT ST
FLEMING ST
THELMA ST
RIVERDALE ST
INLET CT
EBB TIDE ST
FJORD ST
880
238
WM2 - FEMA 2009
Scale 1:8,053
City of San Leandro GIS
Printed: Jan 5, 2016 2:10:58 PM

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