

Town of Ross

Local Hazard Mitigation Plan

Adopted by the Town of Ross Resolution 1758 on January 12, 2012.

Our Vision of Ross in Year 2025

The health and safety of the community are critical concerns. We have worked to prepare and practice emergency response and to minimize risks of fire danger by emphasizing responsible landscaping practices (especially in the steeper, less accessible areas of the Town).

Flood control improvements have been made and a new creek management program has been completed. All new structures are above the 100-year flood elevation in the downtown area and in new and remodeled houses located along the creeks and in the low areas. Houses in the floodplain have been granted expedited Council approval to be raised above flood levels and all businesses have installed flood protection mitigation. Specific standards for upstream mitigation and drainage system restoration have been implemented and overall runoff reduced.

– Ross General Plan

Table of Contents

Introduction and background	4
Purpose of the Plan.....	4
Plan Adoption.....	4
Definition of Hazard and Hazard Mitigation	4
Background	4
Town Overview	4
Analyzing Development Trends	5
Infrastructure	5
Critical Facilities	6
Existing Emergency Response and Hazard Mitigation	8
The Planning Process	8
Planning Team.....	8
Public Involvement.....	9
Review of existing plans and reports	9
Plan preparation	9
Risk Assessment	10
Identification of Hazards	10
Flooding.....	13
Hazard Profile.....	13
Assessment of Town Vulnerability	18
Repetitive Loss areas.....	21
Future Development and Flood Control Improvements	29
Earthquakes	31
Hazard Profile.....	31
Assessment of Town Vulnerability	41
Wildfire	44
Hazard Profile.....	44
Assessment of Town Vulnerability	54
Landslide	56
Hazard Profile.....	56

Assessment of Town Vulnerability	57
Hazard Profile.....	62
Assessment of Town Vulnerability	63
Drought	65
Hazard Profile.....	65
Assessment of Town Vulnerability	65
Plan Maintenance Process.....	67
Monitoring, Evaluating, and Updating the Plan.....	67
Incorporation into Existing Planning Mechanisms	67
Continued Public Involvement.....	67
Mitigation Strategy	68
Local Hazard Mitigation Goals	68
Protecting Community Health and Safety, and Preparing for Emergencies.....	68
List of Mitigation Strategies with Priorities and Hazards Mitigated	70
Prioritization of mitigation strategy.....	70
Implementation of Mitigation Actions	70
Appendices.....	84

Disclaimer: This report has been prepared for planning purposes only. The information and maps contained in this report should not be solely relied on for individual property analyses.

Introduction and background

Purpose of the Plan

It is important to recognize that one of Ross' greatest assets could become one of its greatest liabilities. Our tree-covered landscape could become fuel for fires that could char and destroy our land and homes. Our scenic hillsides can fall victim to unrelenting winter rains, causing landslides, mudslides and erosion. Like all of the Bay Area, we are also always at risk from earthquake. Planning is needed to minimize the potential for loss of life, injury and property damage from any natural disaster.

The purpose of the Hazard Mitigation plan is to identify and evaluate hazard risks to which the Town is vulnerable and identify goals, strategies, and actions for reducing future disaster losses. The plan identifies flooding, earthquakes, wildfires, landslides, dam inundation and drought as natural hazards that the Town may experience.

This document is intended implement the Federal Emergency Management Agency's (FEMA) Mitigation Planning regulations (44 CFR 201), the federal Disaster Mitigation Act of 2000, and the Floodplain Management Plan requirements of FEMA's Community Rating System (CRS). The Town is required to have a FEMA-approved hazard mitigation plan to be eligible for disaster recovery assistance and mitigation funding. This plan was also adopted to qualify the Town for increased funding for certain disaster recovery projects under the California Disaster Assistance Act.

Plan Adoption

This Plan was formally adopted by the Ross Town Council on January 12, 2012. The plan adoption documents are contained in the Appendices.

Definition of Hazard and Hazard Mitigation

A "hazard" is defined by FEMA as "any event or condition with the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, environmental damage, business interruption, or other loss." Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects."

Hazard mitigation is aimed at breaking the cycle of damage, reconstruction, and repeated damage.

Hazard mitigation is different than emergency preparedness, which focuses on emergency response in a disaster (equipment, food, shelter, etc.).

Background

Town Overview

See Part I of the *Town of Ross General Plan 2007-2025* and the *General Plan Housing Element*, which provides background information and current demographics for the Town of Ross.

The 2010 U.S. Census reports that the Town of Ross has 2,415 residents and 884 housing units. Existing development in Ross is primarily low density single-family residential. The Town has a small downtown commercial area. The largest employers in Town are the public elementary/middle school, a private high

school, and a residential care facility for adults with developmental disabilities. The Town has no hospitals or medical facilities.

The median income and house values in Ross are above the state average. According to the 2010 U.S. Census, median household income is \$136,833. The Marin County Assessor records indicate that, over the past 10 years, an average of 31 homes were sold per year for an average sales price of \$2.5 million dollars. The Town Building Department estimates that construction costs are high in the Town of Ross, averaging approximately \$350 per square foot for residential projects.

The climate in Ross is mild and dry during summer, temperatures tend to be in the 60's, and cool during winter when temperatures tend to be in the 50's. The warmest month of the year is July with an average maximum temperature of 85 degrees Fahrenheit. The coldest month of the year is December with an average minimum temperature of 41 degrees Fahrenheit. The annual average precipitation at Ross is 48 inches. The wettest month of the year is January with an average rainfall of 9.60 Inches.¹

Analyzing Development Trends

The community has few undeveloped lots and is largely “built out.” The Town does not anticipate a significant increase in population. The Town General Plan plans for land uses to remain the same in the future: primarily single-family residential. Should a major disaster event occur that results in the demolition of existing housing units, it is possible that parcels may be further subdivided for the development of additional housing units. Future development, like current development, will consist primarily of replacement and remodeling of existing residential structures.

Infrastructure

The Town receives all of its potable water from the Marin Municipal Water District (MMWD). Seventy-five percent of the supply is from rainfall collected in 7 reservoirs in Marin. The remaining 25% is from the Russian River in Sonoma County under contract with the Sonoma County Water Agency. The MMWD’s potable water distribution system includes water mains, pump stations, and water storage tanks. The District treats water at three treatment plants, including the Bon Tempe Treatment Plant near Ross. Pipelines are made of various materials, depending on when and where they were installed. Since the late 1970s, the District has installed only welded steel and polyvinyl chloride (plastic) mains due to their expected long life spans. MMWD has ongoing programs to replace older water mains.²

Wastewater is collected and conveyed through a sewer pipeline system operated and maintained by the Ross Valley Sanitary District. The District operates and maintains collection sewer lines and 20 pumping stations which collect, pump and transport wastewater to Central Marin Sanitary Agency for treatment. Approximately 95% of the District’s collection system was installed prior to 1955. The Ross Valley Sanitary District in an October 2011 memo indicates that their two hundred miles of public sewer pipe, and an additional two hundred miles of private laterals, are “mostly past their life expectancy and will

¹ <http://www.idcide.com/weather/ca/ross.htm> accessed November 20, 2011

² MMWD, 2010 Urban Water Management Plan (see Sources in Appendices)

cost \$400-500 million to replace.”³ The RVSD plans to rehabilitate up to two percent (four miles) of the gravity sewer system each year.⁴

Electricity and gas are supplied by PG&E. There are no gas transmission pipelines in the Town of Ross. The closest gas transmission pipeline runs along Red Hill Avenue in San Anselmo/4th Street and 2nd Street/San Rafael. Local phone and long distance service is provided by AT&T.

The Town has a road network of primarily local streets. There are no freeways in the Town. Several of the town streets, including most in hillside areas, are not accepted or maintained by the Town. Sir Francis Drake Boulevard is an arterial route that bisects the Town and is an important transportation route for Ross and the surrounding communities.

Critical Facilities

Critical facilities and infrastructure are those that are vital for the Town to protect life and property and/or the loss of which would have a severe economic or catastrophic impact.

Town-Owned Critical Facilities

Post Office	1 Ross Common	Communication
Town Hall	31 Sir Francis Drake	Communication/Emergency Operations Center
Police/Fire Station	33 Sir Francis Drake	First response/Emergency Operations
Public Works Building and Yard	35 Sir Francis Drake	Records storage and recovery operations
5 concrete bridges		Transportation

As of 2011, the total insured value of all critical facilities is \$2,125,295. Total insured value of contents is \$348,326. The insured value does not represent the replacement cost of the structures under current building codes. Based on current construction costs, the replacement cost of the structures could be over \$20,000,000.

The current police and fire station and Town Hall/town offices were built in 1927. They were designed by John White, Howard & White, and are potentially historic structures. The buildings are located in the FEMA Special Flood Hazard Zone A. The police and fire building is in need of major repairs and renovation to meet the requirements of modern public safety facilities and to minimize exposure to hazards including floods and earthquakes.

The Town owns five bridges which are essential to transportation, particularly emergency service, in Town. These reinforced concrete bridges were all originally constructed in 1908-1909 and designed by

³Ross Valley Sanitary District response to Grand Jury Report Dated June 16, 2011: “Ross Valley Sanitary District: Not Again!” (available at:

http://www.co.marin.ca.us/depts/GJ/Main/cvgrjr/2010gj/Responses/Ross%20Valley%20Sanitary%20District%20%20Not%20Again/ross_valley_sanitary_dist.pdf)

⁴ RVSD 2007 Sewer System Replacement Master Plan

engineer John Buck Leonard, a pioneer in reinforced concrete bridge design.⁵ The bridges could be considered historic structures. The largest bridge in Town, the Lagunitas Road bridge, was reconstructed in 2010 at a cost of approximately \$2,000,000.

There are no hospitals in Ross and no ancillary health-related facilities (including medical offices, pharmacies, free-standing or specialty clinics, etc.). No fuel tanks or pump stations are located within the Town of Ross.

There is no mail delivery to most of the Town residents and businesses. Residents and businesses receive mail at post office boxes at the U.S. Post Office in downtown Ross, in a building owned by the Town. The Ross Post office was inundated with approximately 2 feet of water in the 2006 New Years flood.

⁵ See Leonard, John B. The Concrete Bridge, <http://www.archive.org/details/concretebridgebo00leonrich>

Existing Emergency Response and Hazard Mitigation

The Town has one fire department, Station 18, and one police department at 33 Sir Francis Drake Boulevard. A paramedic ambulance managed by the Ross Valley Paramedic Authority is based at the station. Ross is a partner in Community Emergency Response Team (CERT) training program. Fire safety education is an important part of RFD's service and includes home and business inspections, vegetation management, ensuring access and clearance, and home construction/remodel plan checks. Community education is ongoing and includes group CPR instruction, flood and wildfire education, a yearly Disaster Awareness Fair, and Get Ready community preparedness training.

The Town of Ross building, public works and planning departments enforce the most recent California Building Code and the Ross Municipal Code, which contains numerous provisions designed to protect property from hazards and preserve the natural environment. The Ross Municipal Code includes requirements for grading permits, regulates development in the floodplain and also stormwater management. The Town zoning regulations include a Hillside Lot Ordinance and design review requirements and guidelines, which include many provisions specific to preventing development from creating hazards, reducing the risk of hazards on development, and for protection of the environment.

The Planning Process

Planning Team

The development of this plan was directed by a planning team consisting of Town Staff supported by outside consultants. Ross Town staff consists of approximately 30 part time and full time personnel, including fire, police and town administration. The Town also retains a number of consultants. The planning team:

<i>Name</i>	<i>Title</i>	<i>Department</i>
Gary Broad	Town Manager (to November 2011)	Town Administration
Tom Vallee	Fire Chief	Fire Department (Chair)
Jim Reis	Police Chief (retired Dec. 2010)	Police Department
Erik Masterson	Police Chief	Police Department
Mel Jarjoura	Public Works Director and Building Official (retired Dec. 2010)	Public Works and Building Department
Bob Hemati, PE	Public Works Director and Building Official	Public Works and Building Department
Robert Maccario	Streets Superintendent	Public Works
Elise Semonian	Senior Planner, AICP	Planning Department
Christine O'Rourke	Project Planner	Consultant

The planning team was assisted by Janice Rogala and Azlina Harun of Dimensions Unlimited, Inc. The consultants assisted with preparation of minutes, agendas, presentation materials, workshops and initial drafts of the plan.

Public Involvement

The Town of Ross engaged the public in the hazard mitigation planning process and provided opportunities for the public to comment during the drafting stage and prior to plan approval. The planning team identified stakeholders in the planning area, including neighboring communities, local and regional agencies involved in hazard mitigation activities, as well as businesses, academia, and other private and non-profit interests, and gave them an opportunity to be involved in the planning process.

The planning team used a workshop, questionnaire and emails to involve citizens and stakeholders in the process and to solicit comments on hazards, mitigation, and the draft plan. The planning team used the Town of Ross email list to email a survey and to announce meetings on the planning process and draft plan. The email list is used to email important public agendas and other communication from the Town. The Ross email list has over 1,000 addresses, which include residents and non-residents that are interested in Town issues.

The planning team developed the list of hazards, mitigation strategies and priorities using the results of the questionnaires and incorporating input received at public meetings.

Review of existing plans and reports

The primary planning document for the Town is the *Town of Ross General Plan 2007 – 2025*. Part IV of the Ross General Plan is the safety chapter, which includes the vision statements for the Town regarding public safety and goals and policies to implement the vision. The safety chapter is intended to address hazards that could impact the Town and the goals in the *General Plan* for hazard risk reduction were used as the goals for this plan.

The Association of Bay Area Governments (ABAG) completed a multi-jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area in 2010 (“ABAG Plan”). This plan incorporates information and hazard maps from the ABAG Plan. The planning team also consulted other plans and documents, detailed in the Source Document List.

Plan preparation

The planning team held nine meetings over eleven months, beginning in January 5, 2010, to draft the plan. Prior to drafting the plan, the planning team surveyed the public to gauge the public’s concern about hazards, preparedness for hazards, and the level of knowledge about tools and techniques for reducing loss from hazards. The survey also gauged support for Town programs, as well as other information that the planning team felt would be relevant to the planning process and establishing goals and mitigation strategies for this plan. The planning team emailed the survey to the Town email list, posted it on the Town website and announced the survey at public meetings. The team distributed printed copies of the survey at public places in the Town of Ross including the Town Hall, Fire Department and the Town website. Within two months a total 87 surveys were completed (83 online and 4 hard copies). For a small town with less than 2,500 residents, the response rate was very high, indicative of an engaged community. Eighty four of the respondents indicated that they reside in the Ross zip code 94957. A copy of the survey and summary of the responses is included in the Appendices.

The planning team held a public workshop on October 7, 2010, at 7 pm to solicit input on hazards and hazard mitigation prior to drafting the plan. The team invited the public to the workshop through an email to the Town email list and public notices in prominent places in Town. The team sent invitations by regular mail to stakeholders in the community and surrounding communities, as well as posted on the Town's website. Eleven people attended the workshop, including Town employees and a council member.

The planning team worked together to identify potential hazards and determine which to include in the hazard mitigation plan. The team also identified potential mitigation measures. The draft Local Hazard Mitigation Plan was placed on the Town website for public review.

The Town Council held two public meetings on the draft plan. The Town Council adopted the plan at a public meeting in January 2012.

Risk Assessment

Identification of Hazards

This section identifies and describes all natural hazards that can affect the Town of Ross. In order to identify the type of hazards that may affect Ross, the planning team considered the historical natural hazards, conducted internet research and considered recent State, regional and County hazard mitigation plans. The planning team considered the range of hazards that could affect the Town:

Hazard	Profiled?	Explanation
Avalanche	No	The weather in Ross is not cold enough for snow.
Coastal Erosion	No	The Town has no coastal areas.
Coastal Storm	No	The Town has no coastal areas.
Dam Failure	Yes	The Phoenix Lake Dam in the Marin Municipal Water District (Marin County) outfalls into the Town of Ross.
Drought	Yes	The Town has experienced droughts.
Earthquake	Yes	The Town is located in a seismically active region.
Expansive Soils	No	Areas of Mt. Baldy have a "moderate" risk. However, there is no development in the area.
Levee Failure	No	There are no levees in or near the Town.
Flood	Yes	Areas of the community are located in flood prone areas.
Hailstorm	No	Hailstorms are not known to occur in the Town.
Hurricane	No	No hurricanes occur in the area.
Land Subsidence	No	Not a hazard in the Town.
Landslide	Yes	The Town is vulnerable to landslides and slope instability, particularly after prolonged rainfall.
Severe Winter Storm	No	Hazards associated with winter storms (landslides and flooding) are addressed under those hazards.
Tornado	No	No tornadoes occur in the area.
Tsunami	No	Based on available "worst case scenario" mapping by the Association of Bay Area Governments, the Town of Ross is not within an area that is anticipated to be directly affected by a tsunami.

Volcano	No	Not a hazard in the Town.
Wildfire	Yes	The Town may be subject to wildfires. The Town is adjacent to large areas of undeveloped land and the climate, vegetation and topography lead to fire risks.
Windstorm	No	Not a hazard in the Town.
Hazardous material incident	No	The Town of Ross follows the Marin County Hazardous Materials Area Plan. The Area Plan is the principal guide for agencies of Marin County, its incorporated cities, and other local entities in mitigating hazardous materials emergencies.
Terrorism	No	The small residential Town is unlikely to be a target of terrorism that rises to the level of a community hazard.

The Town will analyze other hazards that are not addressed in this plan if they are determined to be of greater significance in the future. The Disaster Mitigation Act of 2000 does not mandate that the Town include human-caused hazards in the hazard mitigation planning and they have been excluded from this hazard mitigation plan because the size and characteristics of the residential community make it unlikely that a human-caused hazard will create a significant risk to the Town.

The impacts of climate change on hazards are discussed in the individual sections, where applicable. Climate change has never been directly responsible for any declared disasters in Ross. The potential effects of climate change are varied and include warmer and more varied weather patterns and sea level rise. Based on ABAG maps, a 55 inch sea level rise will not be a direct hazard for the Town of Ross. However, sea level rise may exacerbate flooding in the Town. In November 2010 the Ross Town Council approved a Climate Action Plan that details Town actions to reduce greenhouse gas emissions.

Shoreline Areas Vulnerable to Sea Level Rise in the San Francisco Bay Region

- Area vulnerable to an approximate 16-inch sea level rise
- Area vulnerable to an approximate 55-inch sea level rise
- Urbanized Area

Shaded to show topographical relief

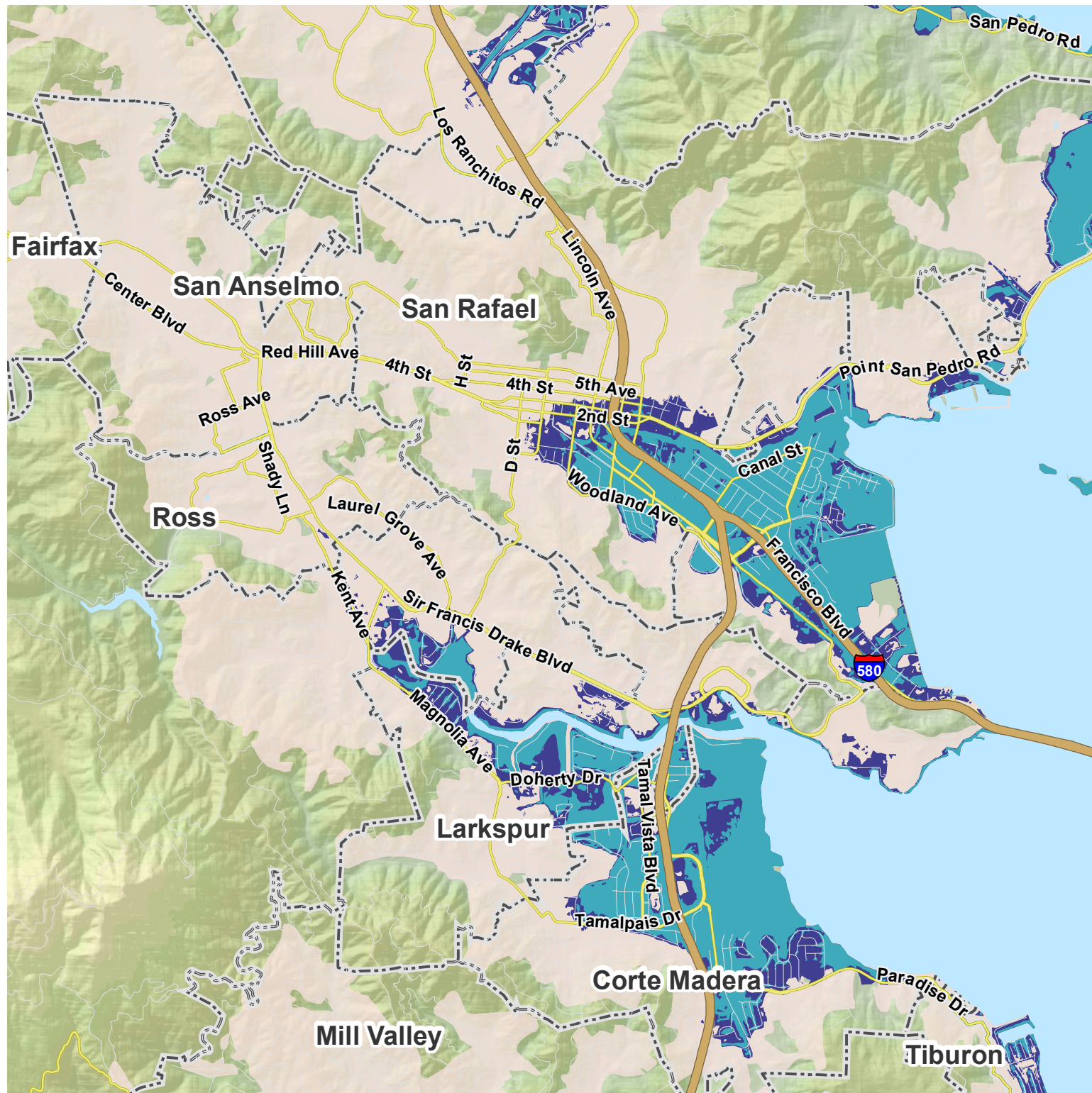


Scale: 1 inch = 0.84 miles

Source: Inundation data from Knowles, 2008.
Additional salt pond elevation data by Siegel and Bachand, 2002.

This map is available at
<http://quake.abag.ca.gov>

Disclaimer: Inundation data does not account for existing shoreline protection or wave activity. This map is for informational purposes only. Users, by their use, agree to hold harmless and blameless the Association of Bay Area Governments along with the State of California and its representatives and its agents for any liability associated with its use in any form. The maps and data shall not be used to assess actual coastal hazards, insurance requirements, or property values or be used in lieu of Flood Insurance Rate Maps issued by the Federal Emergency Management Agency (FEMA).



Flooding

Hazard Profile

Description

The Town of Ross is subject to periodic flooding from Corte Madera and Ross Creeks. Throughout history, and most recently during the New Year's Eve Flood of 2005, there was massive and widespread flooding in the low-lying areas of Town when the creek overflowed its banks in Ross and San Anselmo. A recent engineering study describes the Ross flooding hazard:

Ross Valley is naturally prone to flooding by its location, geologic and geomorphic setting: rainfall can be intense, soils are shallow with limited absorption capacity, slopes are steep, stream channels are entrenched and in many places narrow with relatively little storage capacity. The watershed has been altered from its natural condition and many sections of creeks and streams have been placed in culverts and the natural pattern of runoff has been changed.

During prolonged and heavy storms the watershed can become saturated. If rainfall is sufficiently intense, heavy runoff can result in high flows exceeding the capacity of the creek in places where conveyance is constrained. Floodwaters escape the creek capacity and breach the creek bank in downtown San Anselmo, north of the Town, and above the Lagunitas Bridge in the Town of Ross.⁶

Local flooding in Ross is exacerbated where the storm water drainage network has inadequate capacity for peak flows. This is particularly true on Bolinas Avenue, where runoff causes excessive ponding and overflow onto lower-lying residential properties even during 5-year storm events when there are high flows on receiving Corte Madera Creek. The problem of flooding on Bolinas Avenue is also attributed to the diversion of peak flows from the adjacent community of San Anselmo to Bolinas Avenue.⁷

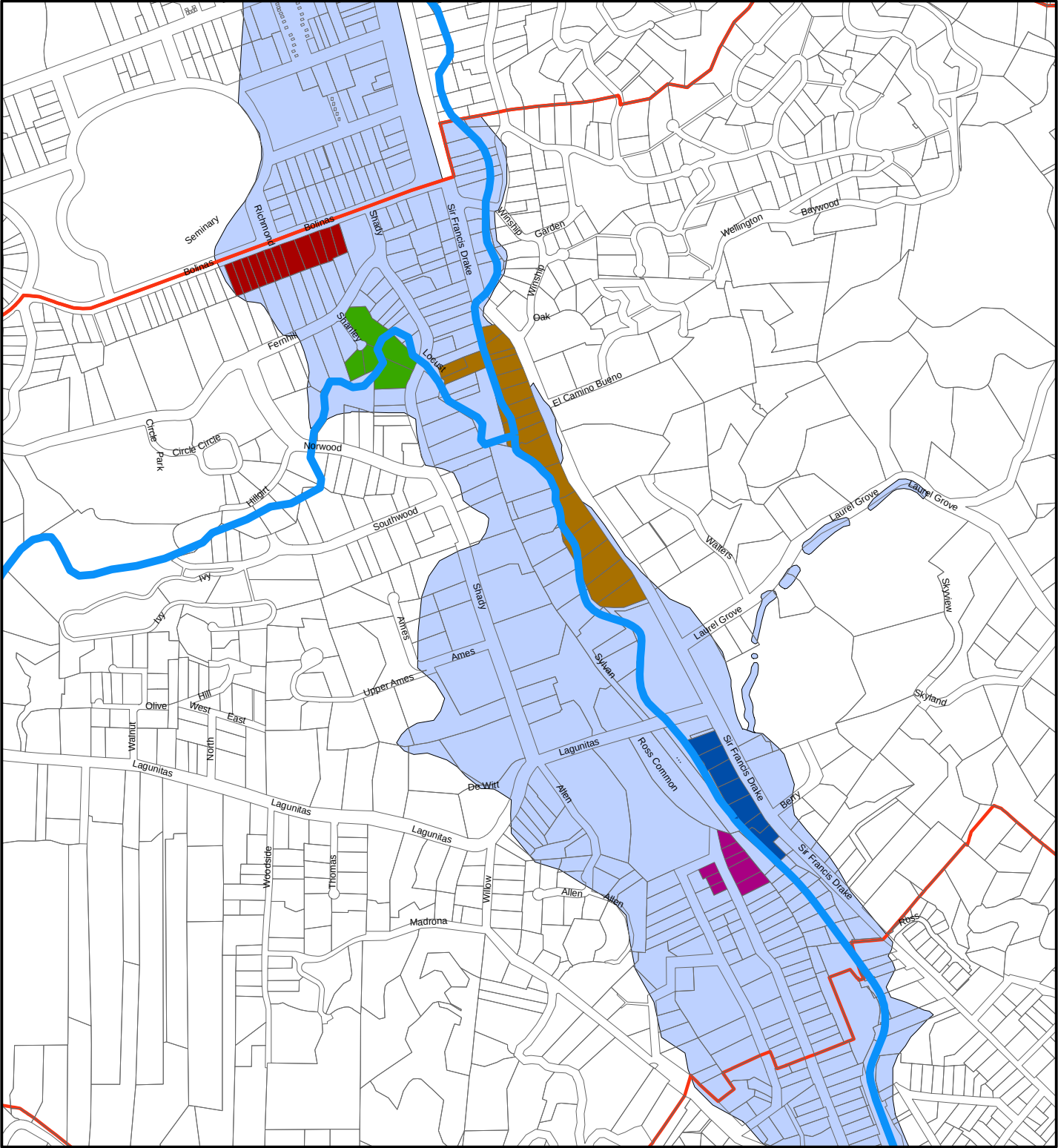
Location

Generally, the areas in the Town of Ross east and west of Corte Madera Creek are subject to periodic flooding. With the exception of the properties that lie east of Sir Francis Drake Boulevard, where development is elevated above the level of the Sir Francis Drake roadway and creeks, the Special Flood Hazard Area identified on the Federal Emergency Management Agency Flood Insurance Rate Maps (FIRMs), updated in 2009, fairly identifies the locations that are subject to flooding in the Town.

⁶ Stetson, Technical Memorandum No. 1

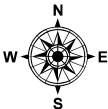
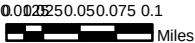
⁷ Smeltzer, Final Draft Report

Town of Ross Special Flood Hazard Area and Repetitive Loss Areas



Legend

- Bolinas Avenue R.L.A.
- Downtown Ross R.L.A.
- Shanley Lane R.L.A.
- SFD Repetitive Loss Area 2
- SFD Repetitive Loss Area 1
- Town Limit
- FEMA SFHA Floodplain



Extent

Floods in the Town of Ross develop rapidly, generally within 24 to 36 hours after the beginning of the flood-producing storm, but are short in duration. Flood conditions usually subside within 24 hours. In 1982, flood depths of 4 to 5 feet were reported (U.S. Army Corps of Engineers, 1983).⁸

Floods in Ross usually occur during large storm events. High winds and mudslides compound the flood problems from the flood hazard. A U.S. Army Corps of Engineers report noted that the total storm damage was far greater than flood damage during the flood of 1982.⁹ Local counties were declared Major Disaster Areas.

Typical winter peak discharges have been measured below 3,500 cubic feet per second (cfs). The two most severe floods occurred in the winters of 1982 and 2005, with peak discharges of approximately 7,200 cfs and 6,834 cfs, respectively.¹⁰

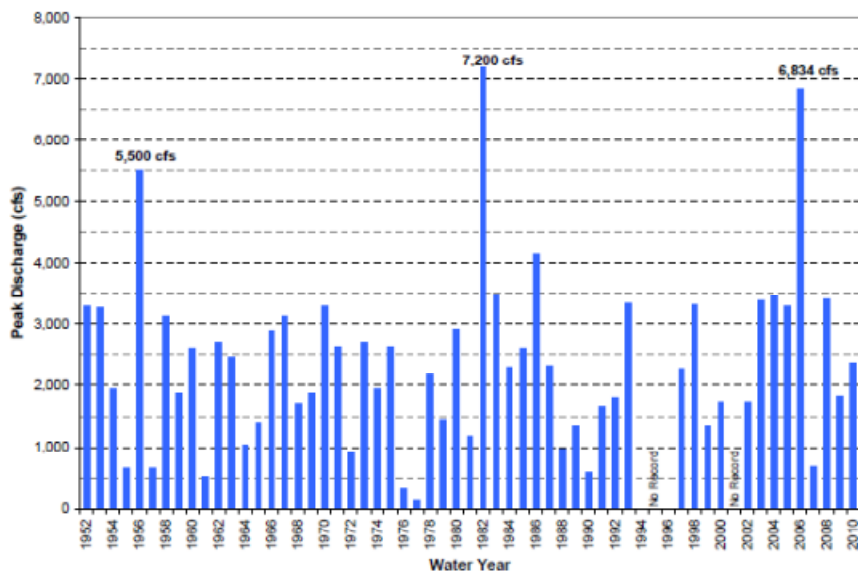


Figure 1 Historical Annual Peak Discharges
Recorded at the Flood Zone 9 Streamflow Gage in Ross, Corte Madera Creek

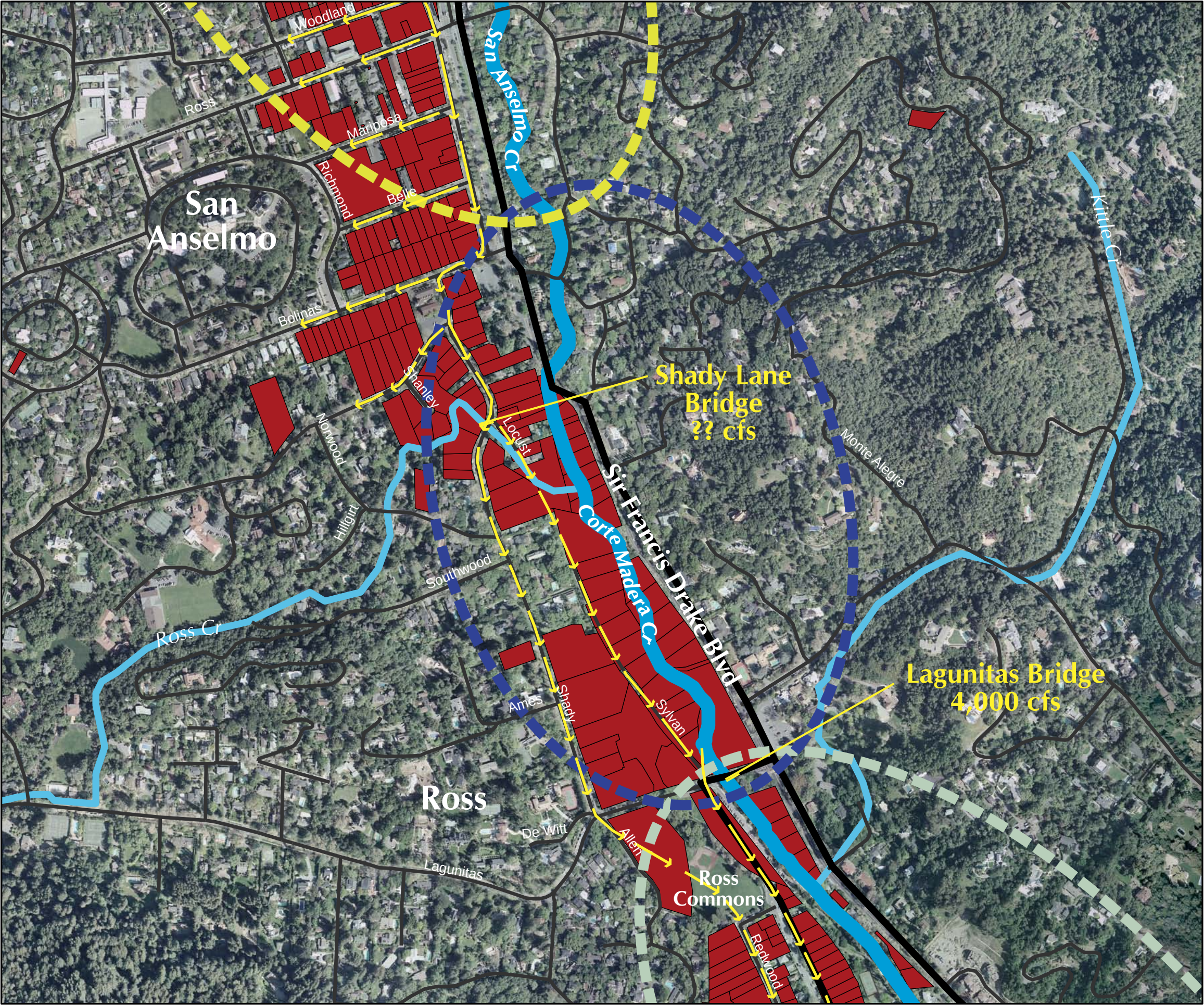
The following map identifies the flood levels and flow of floodwater during the 2006 New Years Eve flood event. The flow of Ross Creek beneath the Shady Lane Bridge is estimated at 5,600 cfs.¹¹ This map does not represent the 100-year flood.

⁸ US Army Corps of Engineers Report, p. 8

⁹ US Army Corps of Engineers, p. 3.

¹⁰ Stetson, Technical Memorandum No. 1, Attachment A, page 2

¹¹ Email from Jack Curley, Marin County Flood Control and Water Conservation District, January 18, 2011



Reach 3 - Ross Creek

ROSS VALLEY FLOOD PROTECTION
and WATERSHED PROGRAM

- Legend**
- Creek
 - General Flood Flow
 - Flood Affected Parcel
 - Highway/Major Road
 - Minor Road/City Street
 - Reach 2
 - Reach 3
 - Reach 4

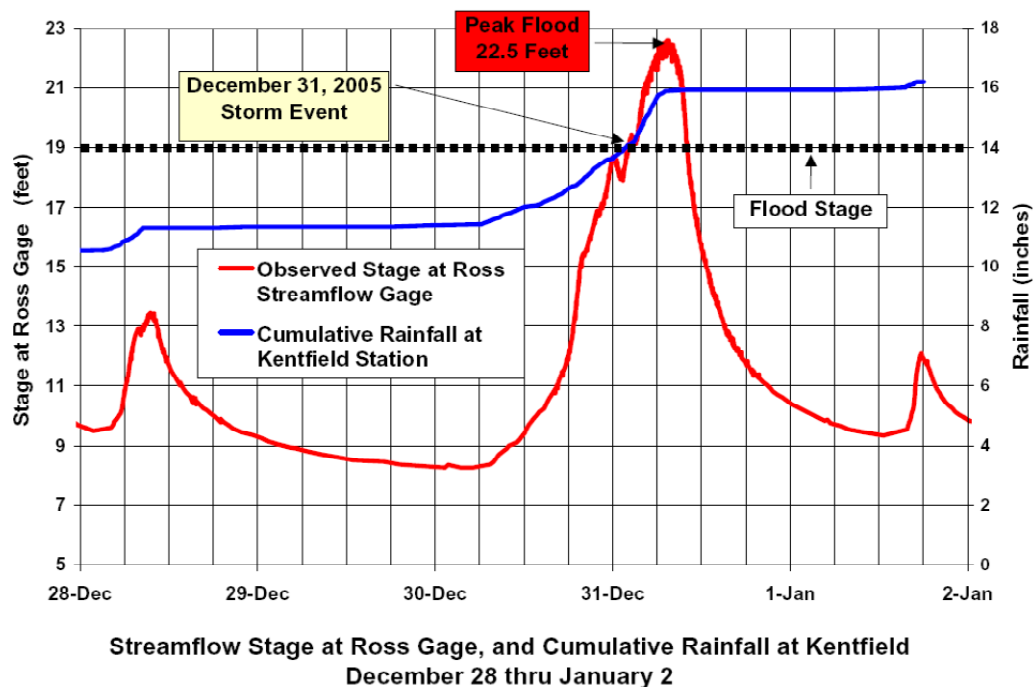
0 200 400 600 1000 1400 Feet

  
MOORE IACOFANO GOLTSMAN INC.
800 Hearst Avenue
Berkeley, CA 94710
510.845.7549

Previous occurrences

There is a long history of flooding in Ross. The two most severe floods occurred in the winters of 1982 and 2005. Prior to establishment of the USGS stream flow gauging station in Ross on Corte Madera Creek in February 1951, flooding was reported in calendar years 1914, 1925, 1937, and 1942. Since the Ross gage has been in operation, flood flows have been recorded in 1951, 1955, 1958, 1967, 1969, 1970, 1982, 1983, 1986, 1994 (flooding was reported, but the stream flow gage was not in operation), and 2005. The flood in December 2005 - January 2006, was a federally declared disaster DR-1628.

Seven inches of rain fell on the Ross Valley Watershed in the two weeks prior to the 2005 flood. Because of this near-saturated condition, the earth had little or no capacity to absorb storm water on December 31, 2005. At 2:00 am on December 31, 2005, Corte Madera Creek was already at flood stage of 19 feet. The strongest part of the storm occurred from 3:00 am to 6:00 am. Flood waters topped the banks at Ross and San Anselmo at the same time. The flood crested at 22.5 feet, 3.5 feet above flood stage at



Ross.¹²

Probability of future events

Flooding in Ross is a probable event and occurs for storms greater than a 40-year recurrence flood event.¹³

¹² Marin County Department of Public Works, Marin County Watershed Program, accessed February 9, 2011

¹³ Marin County Operational Area Hazard Mitigation Plan 2006

Assessment of Town Vulnerability

The Town is vulnerable to flood hazards since the flood hazard area is developed with residences, a downtown business area and elementary school. Public facilities are also located in the flood hazard area. There is a stream gauge in Town that allows the Town to monitor when flooding is imminent.

Floods result in loss of property, health and safety hazards, disruption of commercial and governmental services, expenditures for flood recovery, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare. Most flood losses are caused by structures that are inadequately elevated, flood proofed, or protected from flood damage. Sites along the creek may have issues with bank erosion.

Health and safety may be protected by alerting residents in advance of a flood hazard. By monitoring the creek gauge, the Town may warn residents through the Town email system when severe storms are expected and when flood warnings are issued. The Town may alert residents of a flood by using an air horn at the fire house. The Town would send recorded emergency announcements by phone to subscribers in the Marin Emergency Alert Notification System (MEANS). Although no deaths from flooding have been reported, drowning is the number one cause of flood deaths. Currents can be deceptive, and only six inches of moving water can knock a person off of their feet. Mud on surfaces creates a slipping hazard. Persons may attempt to drive through flooded areas and drown. Power lines and electrical wires may create electrocution hazards and electrical current can travel through water. When electrical communication is down, the Town cannot warn residents of flood hazards through emails and telephones that work on electricity will not function.

Newspaper articles and historical accounts provide an indication of the types and extent of the flood problem in Ross:

[A resident] barely escaped with his family and lost just about all their belongings in 2005 when water rushed through their Ross home. It took him two years and \$1.5 million to rebuild his home five-and-a-half feet higher than it was.”¹⁴

The man on Shady Lane in Ross who arose at 4:30 a.m. and felt a damp carpet under his feet thinking that the dog had had an accident, only to find himself two minutes later thigh-deep in mud and water.

The woman on Bolinas Avenue whose back yard was strewn with boxes of cigarettes and liquor bottles - unopened - that had been swept through her house from the Stop and Go on the other side of the street.

There were cars on every corner that looked as though they had been dredged up from the bottom of the ocean.¹⁵

¹⁴ Brent Ainsworth, "4 years after Ross Valley flood, frustration reigns," *Marin IJ*, December 31, 2009

¹⁵ Barry Tompkins, "For many, tears mix with floodwaters," *Marin IJ*, January 5, 2006

Flood waters are powerful and may pick up and carry large and small debris, including broken glass and sharp objects. Debris may contribute to flooding where the debris blocks streams or storm drains.

In addition to debris, flood waters may carry hazardous and toxic materials, including raw sewage, animal wastes, oil, gasoline, solvents, and chemicals. During the peak of the 2005 flood, four of the five pumps at the Ross Valley Sanitary District's Kentfield pumping station (which pumps the sewage to a treatment plant) unexpectedly shut down for 3 1/2 hours. Approximately 5,100,000 gallons of sewage contaminated storm water stopped flowing to the treatment plant and may have contaminated areas in the Ross Valley, including schools, parks and other public places.¹⁶ However, due to heavy rains associated with flooding events, hazardous and toxic materials may be diluted.

Mold and mildew from flood damaged materials also present a significant health hazard.

Critical facilities and infrastructure

The Ross fire station, police station, Ross Valley Paramedic ambulance and administrative offices are all located adjacent to Corte Madera Creek and within the special flood hazard area. The Town built the structures in the 1920s, prior to the FIRM and Town floodplain development regulations. The buildings have experienced water damage from flooding and are inaccessible during major flood events. Personnel move vehicles and necessary equipment to higher elevations when a flood is imminent.



The Ross Elementary school was recently rebuilt and elevated to protect against flooding. The Town has plans to move the Emergency Operations Center (EOC) to the new structure.

Town electrical equipment is on poles and elevated from floodwaters, although the electrical service may be interrupted by trees falling on power lines and other problems associated with storms. Pipelines, as underground lines, should not be impacted by flooding. The main Town thoroughfares are inaccessible during flood events.

¹⁶ 2005-2006 Marin County Civil Grand Jury Report, "Stuck in the Muck: The Ross Valley Sanitary District," May 2006, p. 9

Medical facilities are located outside of the Ross Town limits but may be inaccessible for some residents due to impassible roads.

Economy and tax base

Ross floods have a devastating impact on the downtown business. Businesses, many of whom do not own the structures and may not be aware of the extent of the flood problem, lose inventory and must close their doors during and after flood events, if they return to business at all. As reported in the *Marin Independent Journal*:

Eddie's grocery store owner, who lives next door to his Ross market, said he removed all the food, liquor and other merchandise from the lower shelves in the store Friday night. Although that helped limit the damage, mud still covered the floor. In the back stockroom, which is a few feet lower than the main store floor, cases of soda and bags of food floated in floodwater. "I was up all night watching in agony," he said. Ahrens said he wasn't sure if he would stay in business.¹⁷

Dennis Kemp, owner of Sam the Butcher in Ross, throwing his hands up in despair. "I just can't go through this anymore," he confides. After 40 years, Saturday's deluge will close his doors."¹⁸

The Town receives the majority of revenue from the residential tax base and not from commercial businesses. However, Town residents lose the convenience of shopping at local stores and also the community that the business district creates.

Review of all flood insurance claims

As of November 2010, there are 219 National Flood Insurance Program (NFIP) policies in place in the Town of Ross with total coverage of \$58,016,600 insurance in force and \$271,832 of premiums in force. FEMA loss statistics provide that there were 236 losses as of November 2010, with total payments of \$9,562,272.24. There have been 26 substantial damage claims since 1978.

Identification of Structures Subject to Hazard

There are approximately 200 residential structures within the special flood hazard area in Ross (excluding accessory structures). There are approximately 10 commercial structures, 4 public buildings, two churches and an elementary school site.

Estimating Potential Losses

According to FEMA flood insurance claims data, approximately \$8.5 million dollars in flood claims were paid after the 2005/2006 Ross flood. The claims ranged from \$2,000 to \$623,000. Several residences and the elementary school were elevated after the 2005/2006 flood. However, it is estimated that future floods would result in similar losses within the town.

It is estimated that a flood may cost the town up to \$50,000 to clean up and repair facilities after a flood event, including cleaning, repair and replacement of finishes and building contents.

¹⁷ Tad Whitaker, "Storm's surreal mess shocks Ross Valley," *Marin IJ*, January 1, 2006

¹⁸ Barry Tompkins, "For many, tears mix with floodwaters," *Marin IJ*, January 5, 2006

Repetitive Loss areas

This plan must evaluate “repetitive loss areas” for the Town participation in the FEMA Community Rating System program. A Repetitive Loss Property is a property insured under the National Flood Insurance Program that has had two or more claim payments of more than \$1,000 within a 10-year period since 1978. FEMA’s list of Repetitive Loss Properties includes 13 addresses in Town. There are many properties within the Town that have suffered repeated flood damage that are not considered Repetitive Loss Properties.

Repetitive Loss Property addresses and flood insurance claim history are protected by the Privacy Act and are not listed in this public document. However, the Town Planning Department reviewed the Town files for the 13 properties and viewed the sites from the street. The earliest claim record is dated in 1980. Approximately 70% of the properties had claims for the 1982, 1986 and 1995 floods. At least two of the properties have been elevated since the 1995 flood.

For the purposes of complying with the Community Rating System requirements for flood hazard plans, the Town grouped the sites into five Repetitive Loss Areas: 1.) Bolinas Avenue; 2.) Shanley Lane; 3.) Sir Francis Drake Boulevard Areas 1; 4.) Sir Francis Drake Boulevard Area 2; and 5.) the Downtown Commercial District. With the exception of Bolinas Avenue, which has flooding caused by inadequate drainage, these Repetitive Loss Areas are not subject to flooding any more frequently than the remainder of the flood zone properties. As noted above, these areas are only specifically detailed in this report since there have been repetitive insurance claims for certain properties in these areas.

Bolinas Avenue Repetitive Loss Area

The east end of Bolinas Avenue is within the special flood hazard area and is subject to periodic flooding by infrequent large floods and more frequent smaller storm events. There have been repetitive losses for property on Bolinas Avenue. There are 13 housing units within this Repetitive Loss Area. No new housing units are expected to be built.



Ross Public Works Superintendent Robert Maccario clearing storm drains on the San Anselmo side of Bolinas Avenue

The Bolinas Avenue area is frequently flooded because of inadequate storm water drainage. A 2011 planning report cites two main problems with the storm water drainage in this area. First, street-

conveyed storm water on upper areas of Bolinas Avenue swiftly flows and frequently flows “curb to curb” and in places overflows the south sidewalk onto lower lying residential properties. Second, the existing concrete box culvert in the east area of Bolinas Avenue, originating at the intersection with Richmond, frequently has inadequate conveyance capacity to drain storm water flows delivered to the intersection area from upper/west Bolinas Avenue, causing excessive ponding at the intersection and overflow on to lower-lying residential properties south of the intersection. The existing system may backflow when there are high flows on receiving Corte Madera Creek. Under existing conditions, an approximately 5-year storm produces a Corte Madera Creek water surface elevation at the Winship Avenue Bridge outfall that is the same as the catch basin grate elevations at the Richmond intersection with Bolinas Avenue.

While many of the structures on Bolinas are elevated to prevent flood damage, there are still residential properties that are not elevated or that have lower level storage areas or at-grade garage and storage sheds. The materials, contents and any utilities located in areas that are not elevation are subject to damage from flooding.

The Town is studying several strategies for reducing or eliminating the flooding in this area. These strategies have been included as mitigation measures in this plan.¹⁹

Shanley Lane Repetitive Loss Area

The property adjacent to Shanley Lane is subject to periodic flooding from large storm events. There are five residential structures in this Repetitive Loss Area, including one used as a small family day care. Certain structure are not elevated to prevent flood damage. Residents constructed additions to the homes and improved areas below the base flood elevation prior to the Town floodplain development regulations. This placed habitable spaces and storage areas below the base flood elevation and subject to damage from flooding. Some residential property in this area has been elevated to prevent flood damage since the last major flood event.

Sir Francis Drake Boulevard Repetitive Loss Area Nos. 1 and 2

There are two areas of repetitive flood claims along the west (creek) side of Sir Francis Drake Boulevard. Residential structures are adjacent to Corte Madera Creek and within the special flood hazard area. Some structures have primary living spaces that are elevated or at an elevation that is not subject to flooding, but the structures have under-floor areas that are used for storage, laundry and mechanical equipment rooms that are subject to damage from flood waters. There are approximately 26 residential units within this Repetitive Loss Area. Some of the residences were constructed in the 1940s and 1950s, prior to the Town FIRM and floodplain development regulations and are not elevated to prevent flood damage. Some insurance claims may also be associated with bank erosion along Corte Madera Creek.

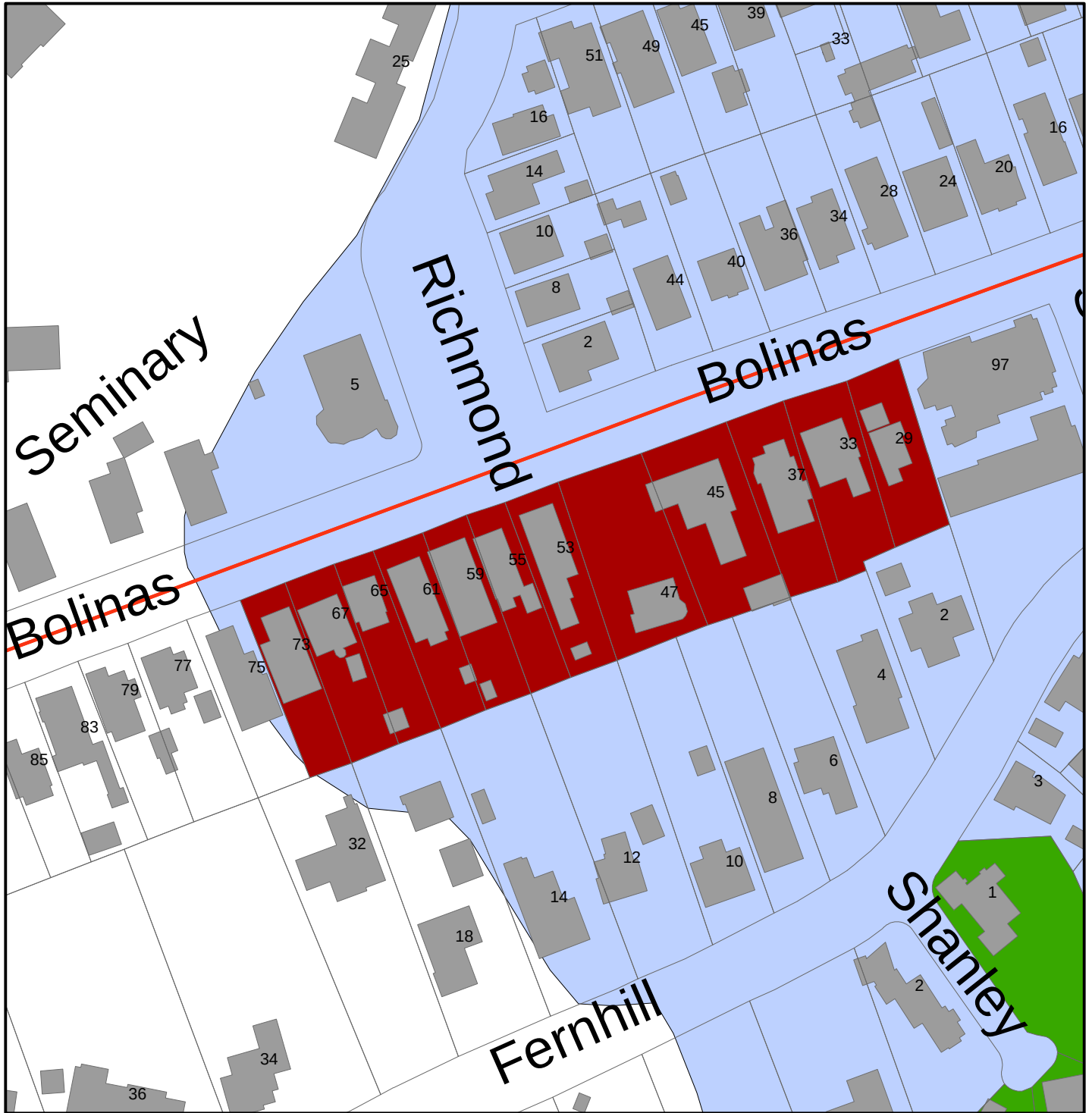
Downtown Commercial District Repetitive Flood Claim Area

The Downtown Commercial Area is 1.37, which includes ten commercial buildings. Nearly all of the structures were built prior to the FIRM and have floors that are near grade and are subject to periodic

¹⁹ Smeltzer, Final Draft Report, p. 2

flooding. The areas below the base flood elevation are not flood-proofed. The downtown businesses are subject to property damage, losses from business closure, and damage to retail inventory.

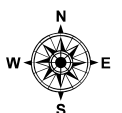
Bolinas Avenue Repetitive Loss Area



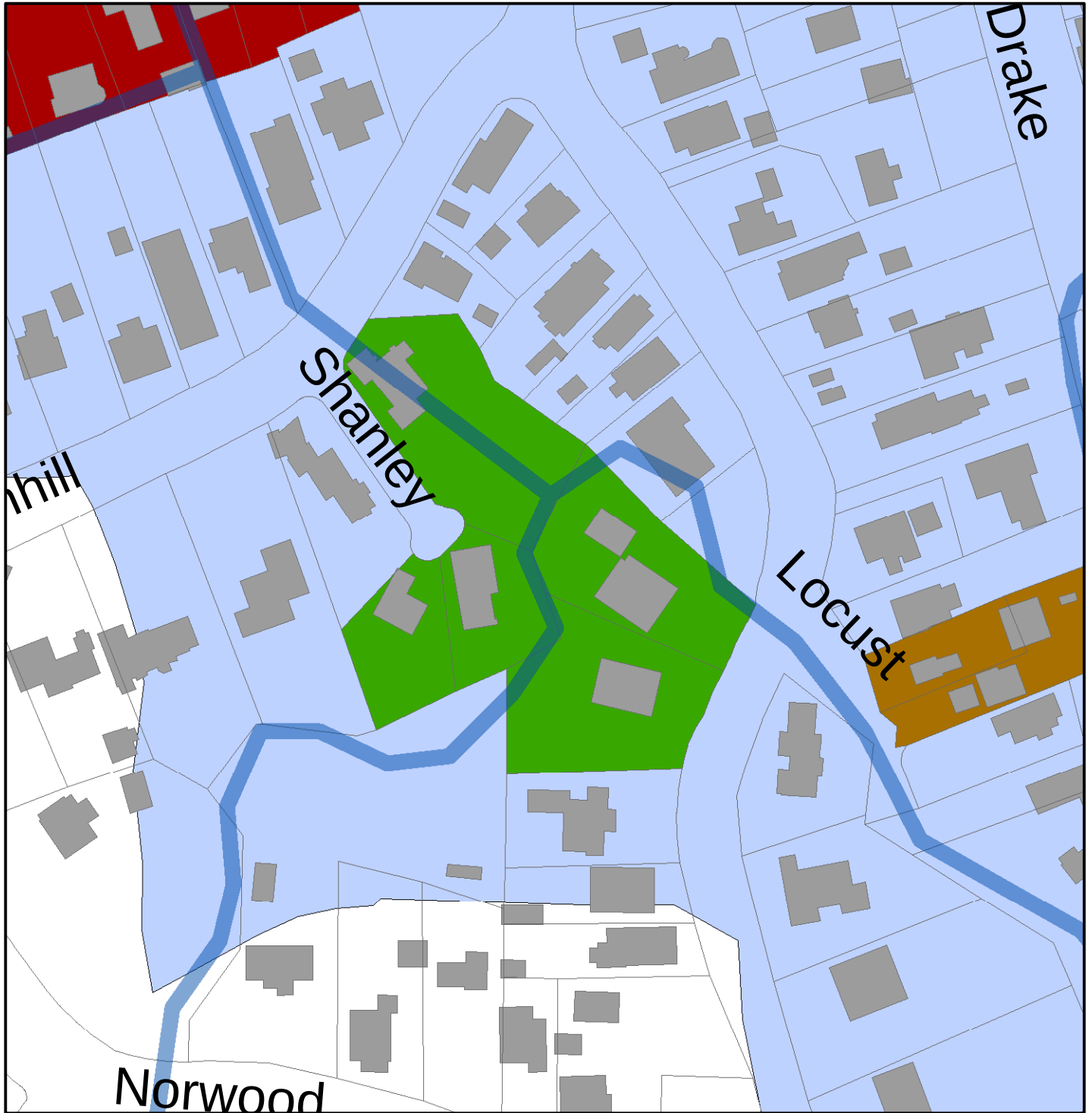
Legend

- Bolinas Avenue R.L.A.
- Downtown Ross R.L.A.
- Shanley Lane R.L.A.
- SFD Repetitive Loss Area 2
- SFD Repetitive Loss Area 1
- Town Limit
- FEMA SFHA Floodplain

0.00005 0.01 0.015 0.02
Miles



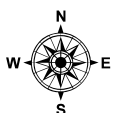
Shanley Lane Repetitive Loss Area



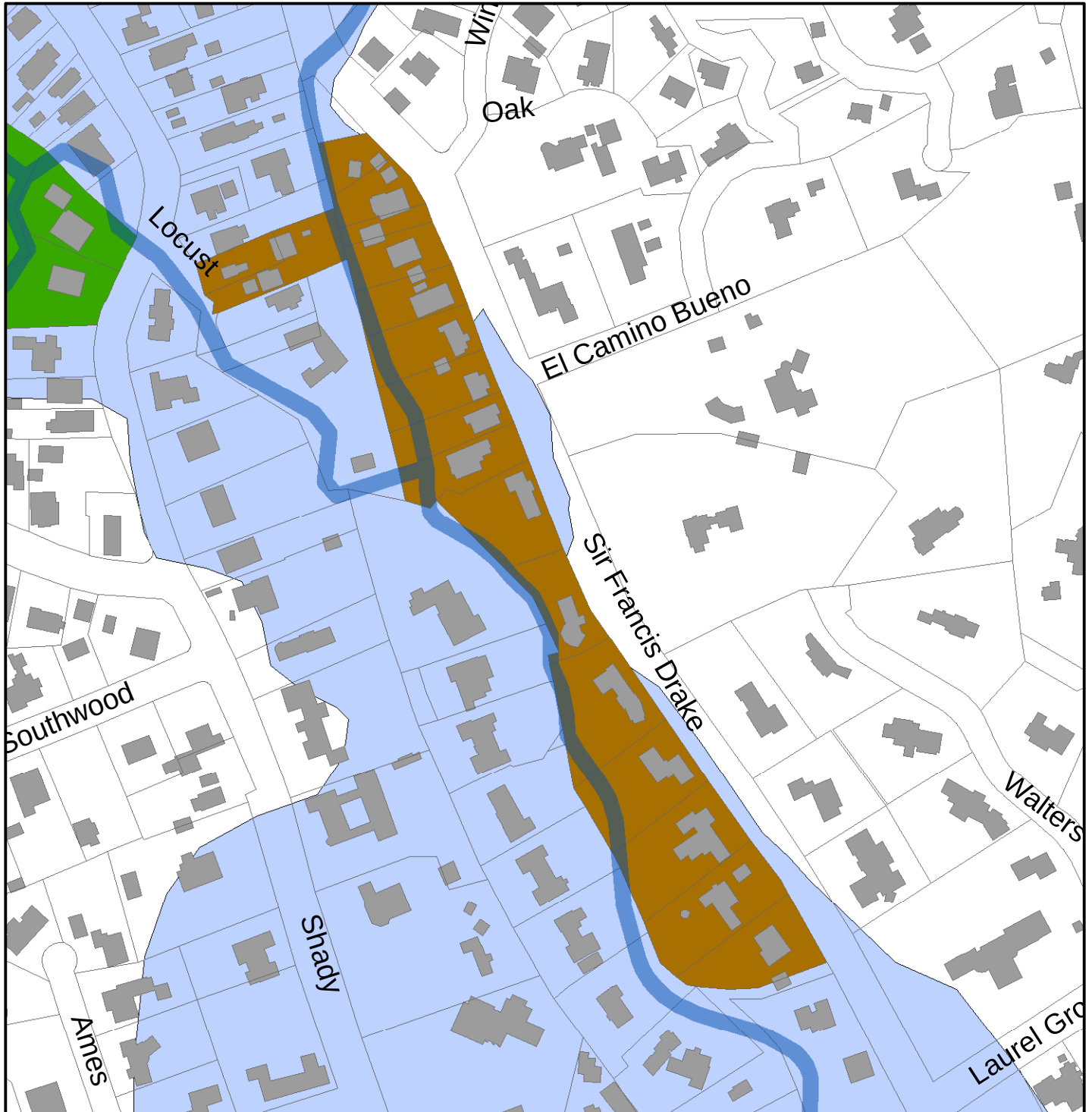
Legend

-  Creek
-  Bolinas Avenue R.L.A.
-  Downtown Ross R.L.A.
-  Shanley Lane R.L.A.
-  SFD Repetitive Loss Area 2
-  SFD Repetitive Loss Area 1
-  Town Limit
-  FEMA SFHA Floodplain

0.00 0.005 0.01 0.015 0.02
Miles



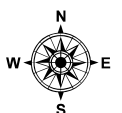
Sir Francis Drake Boulevard Repetitive Loss Area No. 1



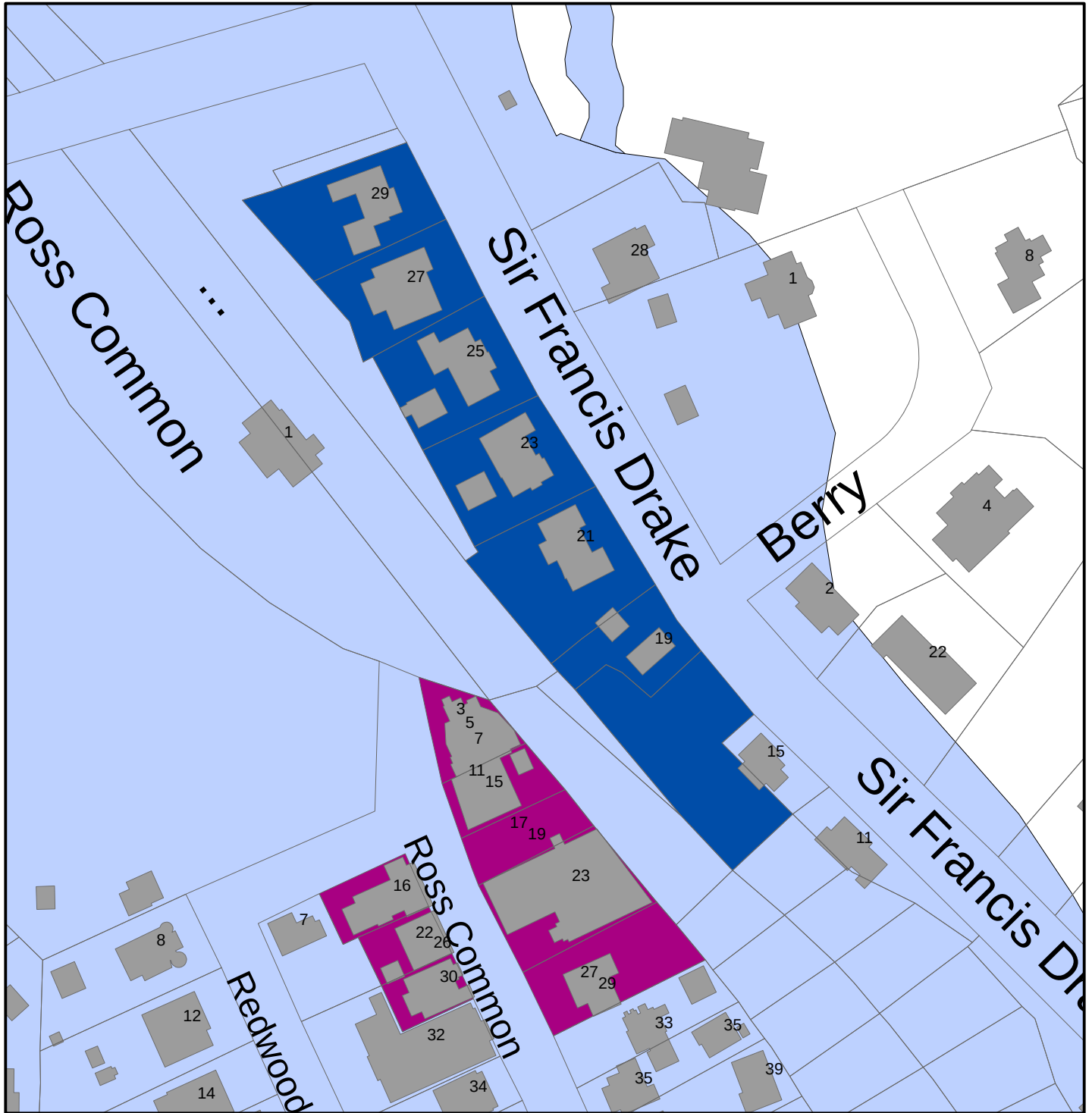
Legend

-  Creek
-  Bolinas Avenue R.L.A.
-  Downtown Ross R.L.A.
-  Shanley Lane R.L.A.
-  SFD Repetitive Loss Area 2
-  SFD Repetitive Loss Area 1
-  Town Limit
-  FEMA SFHA Floodplain

0.00000.010.020.032
Miles



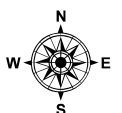
Sir Francis Drake Boulevard Repetitive Loss Area No. 2



Legend

-  Bolinas Avenue R.L.A.
-  Downtown Ross R.L.A.
-  SFD Repetitive Loss Area 1
-  SFD Repetitive Loss Area 2
-  Shanley Lane R.L.A.
-  Town Limit
-  FEMA SFHA

00.008507 0.014 0.021 0.028
Miles



This map shows the layout of Ross Common, a residential development. The lots are numbered 3 through 43. A pink highlighted area encompasses lots 3, 5, 7, 11, 15, 16, 17, 19, 20, 22, 23, 26, 27, 29, 30, and 32. A blue highlighted area is located in the upper right corner, containing lot 19. The map also shows a road labeled 'Redwood' and a road labeled 'Ross Common'.

 Bolinas Avenue R.L.A.
 Downtown Ross R.L.A.
 SFD Repetitive Loss Area 1
 SFD Repetitive Loss Area 2 FEMA SFHA
 Shanley Lane R.L.A.
 Town Limit



Future Development and Flood Control Improvements

New Development

The flood prone areas are “built out” and few vacant lots exist. Current zoning and land use regulations would allow approximately 24 new residential units to be developed within the flood plain, including 4 units on a site owned by the Town (Town of Ross *Housing Element 2009-2014*). The majority of the potential new units could be located above commercial uses in the small downtown commercial area, where they would be safe from flood damage. Based on the age and condition of the existing structures, it is likely that any development of new residential units over existing commercial structures would trigger the requirement to flood proof or elevate the ground level commercial structures.

Elevating residences and flood proofing commercial structures can mitigate flood damage in the Town of Ross. Development of property within the Special Flood Hazard Areas must comply with the Town Flood Damage Prevention Ordinance, Ross Municipal Code Chapter 15.36. This ordinance includes special development requirements such as requiring new and substantially improved structures to be flood proofed or elevated. Several structures were elevated after the last flood event in December 2005. Many of the residences that have not been elevated have long-term property owners. Property values in the area are above average. The Town anticipates that when properties change hands, future owners will seek to upgrade residences and elevate structures.

The existing Town design review guidelines recommend that new development be setback from creeks and drainage ways. The Town goals and design guidelines recommend protection of existing creek and riparian vegetation and improving fish passage and habitat.

Flood Control and Storm Drainage Improvements

The Town is actively participates and supports the construction of flood control improvements consistent with the natural environment and the design character of the Town. The Town is working with other jurisdictions within the Ross Valley watershed to develop a comprehensive approach to flood protection and resource preservation.

In 2011, the Town completed reconstruction of the Lagunitas Road Bridge. The single span bridge was designed to improve the flood capacity within Corte Madera Creek by eliminating bridge piers in the waterway and increasing the elevation of the bridge deck. The design reduced the potential for debris to trap at the bridge during floods. The Lagunitas Road Bridge now has a storm water capacity of 5,400 cfs.

In 2010, the Town adopted new requirements for drainage plans and storm water runoff and design review criteria related to low impact development. The new regulations will help to minimize storm water runoff from new development by reducing impervious surfaces, encouraging the use of permeable surfaces, dispersing storm water runoff on site, and storing storm water for reuse or slow release so it can naturally infiltrate the ground. Projects that create over 1,000 square feet of impervious surfaces are now subject to design review, and projects valued at over \$250,000 that increase site runoff need to include a storm water management plan.

The U.S. Army Corps of Engineers is working on a project to contain floodwaters in Corte Madera Creek and lower Ross Creek, the Unit 4 Project. The Corps' design will include: removal and replacement of the fish ladder; lowering and widening the channel bed and re-grading the bed to obtain a smooth transition from Lagunitas Road Bridge to the beginning of the concrete channel; constructing a natural sediment basin within the existing concrete channel; constructing flood walls and raising existing floodwalls approximately 1-3 feet in some locations; and improving fish passage and drainage facilities. In August of 2010 the Corps reported that they were working on environmental reports and cost estimates plan alternatives. Two of the alternatives would increase channel flood capacity from the existing 3,300 cfs to 5,400 cfs, which is equivalent to the 38-year flood level. Environmental review is expected to be completed in 2012. As of the date of this plan, Federal budget issues have limited funding of the project.

Ross participates with the communities in the Ross Valley Watershed on a watershed-wide flood control effort that is funded by a Ross Valley Flood Fee, which began in 2007. A capital improvement study has been completed that include analysis of a suite of projects throughout the watershed that will work as a system to reduce flooding, with a design objective of containing the 100-year-flood and restoring health and function of the creeks. The projects would be implemented over the next 10-20 years.²⁰

In December 2011, the California Department of Water Resources awarded a \$7.66 million grant to the Marin County Flood Control District's Ross Valley Watershed Flood Protection program to fund a \$15.6 million project to retrofit the Phoenix Lake reservoir into a facility that will function as a flood control detention basin. The reservoir is just west of the Town limits and is currently a water supply storage facility and public recreation area. This project will be developed in partnership with the Marin Municipal Water District, who owns and operates Phoenix Lake.

²⁰ Stetson, Capital Improvement Plan

Earthquakes

Information for the earthquake hazard in the Town of Ross was obtained primarily from the Association of Bay Area Governments (ABAG) Regional Hazard Mitigation plan (2011) and maps and other information available from the ABAG web site at <http://www.abag.ca.gov/>.

This section details the affect that major earthquakes may have locally in Ross. Even if major damage is not experienced in Ross, a large Bay Area earthquake will cause hundreds of deaths; leave thousands homeless; will cause widespread damage and destruction to roads and other infrastructure; damage businesses, housing, schools and healthcare facilities; will impair government services and social services; and will devastate the regional economy. Any major Bay Area earthquake has the potential to affect the quality of life of Ross residents.

Hazard Profile

Description

Ross is near several active faults that have the potential to cause earthquakes that would be a hazard for the Town. The San Andreas Fault runs north and south in the western side of Marin County, approximately 8 miles southwest from Ross. The San Andreas Fault is considered capable of generating a magnitude 8.0 earthquake. The northern section of the Hayward fault is less than 10 miles northeast of Ross. The entire Hayward fault may generate magnitude 7.2 and 7.4 earthquakes. The Rodgers Creek fault is less than fifteen miles northeast of Ross and may generate a magnitude 7.0 earthquake. The San Gregorio fault is less than 10 miles south of Ross and may generate a magnitude 7.3 earthquake.

Earthquakes may cause several different hazards: surface rupture, ground shaking, liquefaction, landslides and tsunamis.

Surface Rupture

In general, earthquakes occur as a result of movement along active faults. If a fault rupture extends to the surface, there is visible movement on a fault, surface rupture. The Town of Ross is not located over any faults and will not experience surface rupture hazards.

Tsunamis

Tsunamis can occur in the Bay Area as a result of off-shore earthquakes, even distant earthquake events. Tsunami inundation is estimated to extend from the San Francisco Bay to College Avenue in Kentfield, which is approximately one-half mile from the Town limits. The 2009 Tsunami Inundation Map for Emergency Planning (by CalEma, CGS, and USC) is a “worst-case scenario” map that combines inundation results for a suite of realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Since the Town is not within the tsunami inundation area on this map, tsunamis are not considered a hazard in Ross. A tsunami could potentially exacerbate the flood hazard in Ross.

Ground Shaking

The fault rupture of the ground generates vibrations or waves in the rock known as ground shaking. A principal factor in determining shaking hazard is the magnitude of expected earthquakes. Larger

magnitude earthquakes generally cause a larger area of ground to shake hard, and to shake longer. However, an earthquake shakes harder in one area versus another based not only on the magnitude, but also on other factors, including the distance of the area to the fault and the type of geologic materials underlying the site, with stronger shaking occurring on softer soils.

Liquefaction

Ground shaking can lead to liquefaction. When the ground liquefies in an earthquake, sandy or silty materials saturated with water behave like a liquid, instead of solid ground. The “recipe” for liquefaction is: 1.) the ground at the site must be “loose”, uncompacted or unconsolidated sand and silt without much clay or stuck together; 2.) The sand and silt must be “soggy”, water saturated, due to a high water table; and 3.) the site must be shaken long and hard enough by the earthquake to “trigger” liquefaction.

Location

According to ABAG maps, all areas of the Town will experience strong to very strong shaking from a major earthquake. Low lying areas, which are on softer soils, will experience greater ground shaking. The hillside areas could experience earthquake-induced landslides.

Ground Shaking

ABAG and the U.S. Geological Survey (USGS) have developed several maps to aid in depicting shaking intensity, and ground shaking hazard in Ross. The following map indicates in red the general areas of the Town that are likely to experience very strong shaking.

Liquefaction

The land in the Bay Area that is most vulnerable to liquefaction are areas in San Francisco Bay filled since 1845 to transform tidal and submerged areas into land, and areas along existing and filled stream channels and flood plains, particularly those areas with deposits less than 10,000 years old. In Ross, the areas along the existing and filled stream channels may be subject to liquefaction.

ABAG has developed maps to aid in depicting this hazard using a combination of liquefaction susceptibility maps and ground shaking scenario maps depicting modified Mercalli intensity. These maps indicate that areas in Town, primarily the low-lying areas adjacent to the Town creeks, have a “moderate” liquefaction susceptibility level. However, liquefaction susceptibility should be considered on a site-by-site basis. A 2009 engineering report for the replacement of the Lagunitas Road Bridge, which is adjacent to the Ross Post Office, Ross Town Hall and the police and fire station, indicated that the potential for liquefaction at the bridge project site was high.

Earthquake-Induced Landslides

Ground shaking can also lead to ground failure on slopes, or earthquake-induced landslides. See discussion under Landslide Hazard, below.

 Tsunami Inundation Area

 Urbanized Area

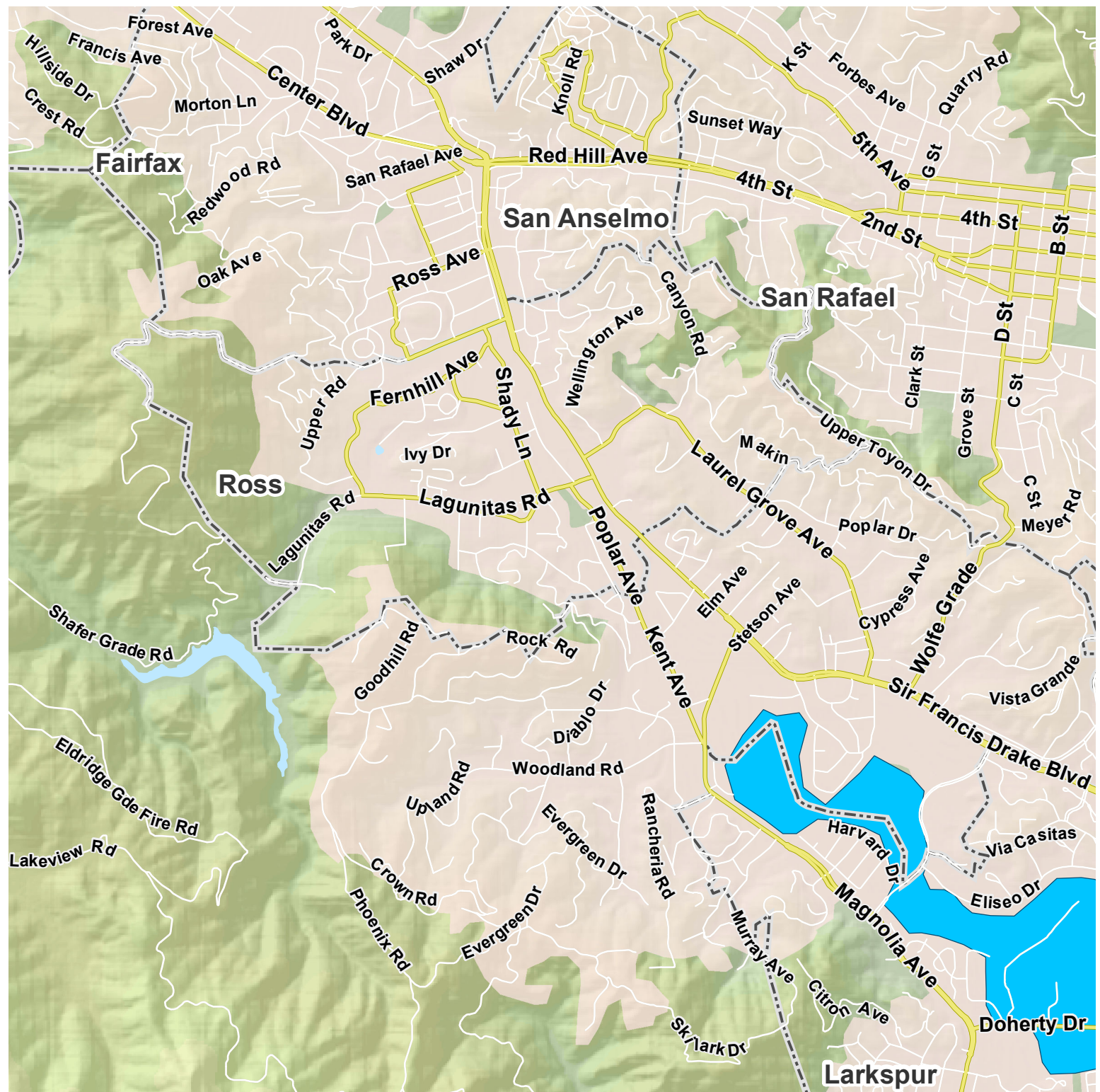
This tsunami inundation planning map for the San Francisco Bay Region is based on modeling a number of potential earthquake sources and hypothetical extreme undersea, near-shore landslide sources.

This data was produced by CalEMA and is intended for local jurisdictional, coastal planning uses only. Data for north coastal Sonoma County is not yet available. For more information visit <http://quake.abag.ca.gov/tsunami>.

Source: California Emergency Management Agency, Coastal Region (2009)

This map is available at
<http://quake.abag.ca.gov>

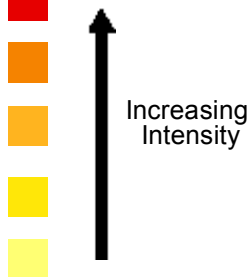
Disclaimer: The California Emergency Management Agency (CalEMA), the University of Southern California (USC), and the California Geological Survey (CGS) make no representation or warranties regarding the accuracy of this inundation map nor the data from which the map was derived. Neither the State of California nor USC shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.



Earthquake Shaking Potential for the San Francisco Bay Region

Level of Earthquake Hazard

- These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently.
- This intense shaking can damage even strong, modern buildings.



- These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

Major Roads

Local Roads

Water



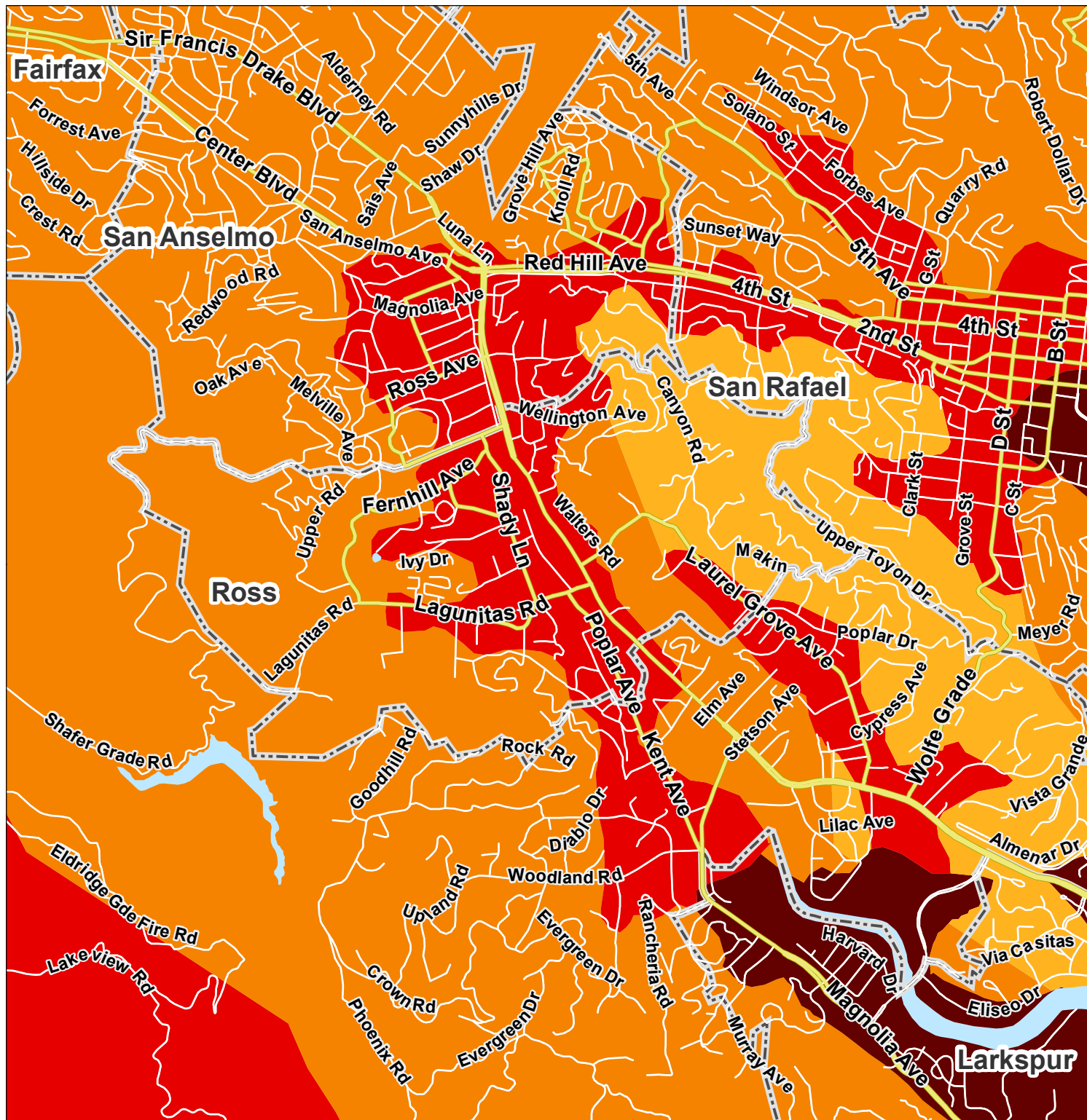
Scale: 1 inch = 0.43 miles

Source:
This interactive map is a derivative of the Probabilistic Seismic Hazard Map that was produced by the California Seismic Safety Commission, California Geological Survey, California Office of Emergency Services and US Geological Survey, 2003

The colors on this map have been changed from the original map. For more information visit:
<http://www.consrv.ca.gov/CGS/rghm/psha/>

This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

This map is available at <http://quake.abag.ca.gov/>



Earthquake Shaking Scenario

Modified Mercalli Intensity
Shaking Severity Level

- | | |
|--|------------------|
|  | X-Very Violent |
|  | IX-Violent |
|  | VIII-Very Strong |
|  | VII-Strong |
|  | VI-Moderate |
|  | V-Light |



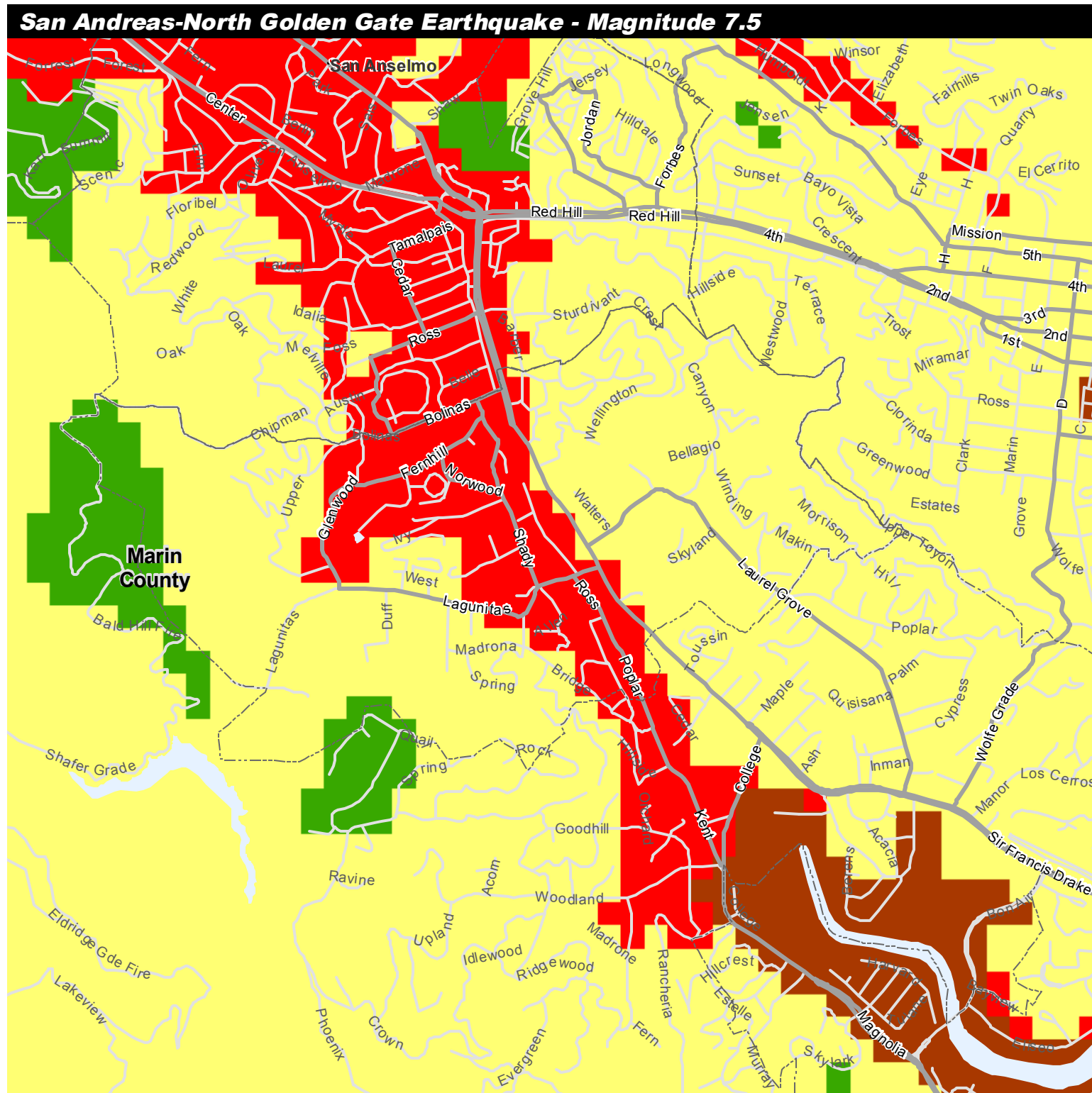
Scale: 1 inch = 0.37 miles

This map is intended for planning use only, and is not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community. Intensities may be incorrect by one unit higher or lower.

This map is available at
<http://quake.abag.ca.gov>

Source: ABAG Earthquake Program, June 2004

ABAG® Geographic Information Systems



**TABLE 2 – SUPPLEMENTARY INFORMATION FOR PLATES 2-20: Modified Mercalli Intensity Scale
Summary Descriptions and “Official” Full Description**

MMI Value	Description of Shaking Severity Used on Current Maps	Summary Damage Description Used on 1995 Maps	"Official" Full Description (from Richter, C.F., 1958. Elementary Seismology. W.H. Freeman and Company, San Francisco, pp. 135-149; 650-653.)
I.			Not felt. Marginal and long period effects of large earthquakes.
II.			Felt by persons at rest, on upper floors, or favorably placed.
III.			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV.			Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV wooden walls and frame creak.
V.	Light	Pictures Move	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI.	Moderate	Objects Fall	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).
VII.	Strong	Nonstructural Damage	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII.	Very Strong	Moderate Damage	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX.	Violent	Heavy Damage	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X.	Very Violent	Extreme Damage	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI.			Rails bent greatly. Underground pipelines completely out of service.
XII.			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

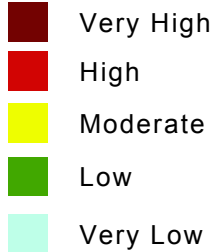
Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.

Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.

Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Liquefaction Susceptibility Map

Susceptibility Level



Major Roads

Local Roads



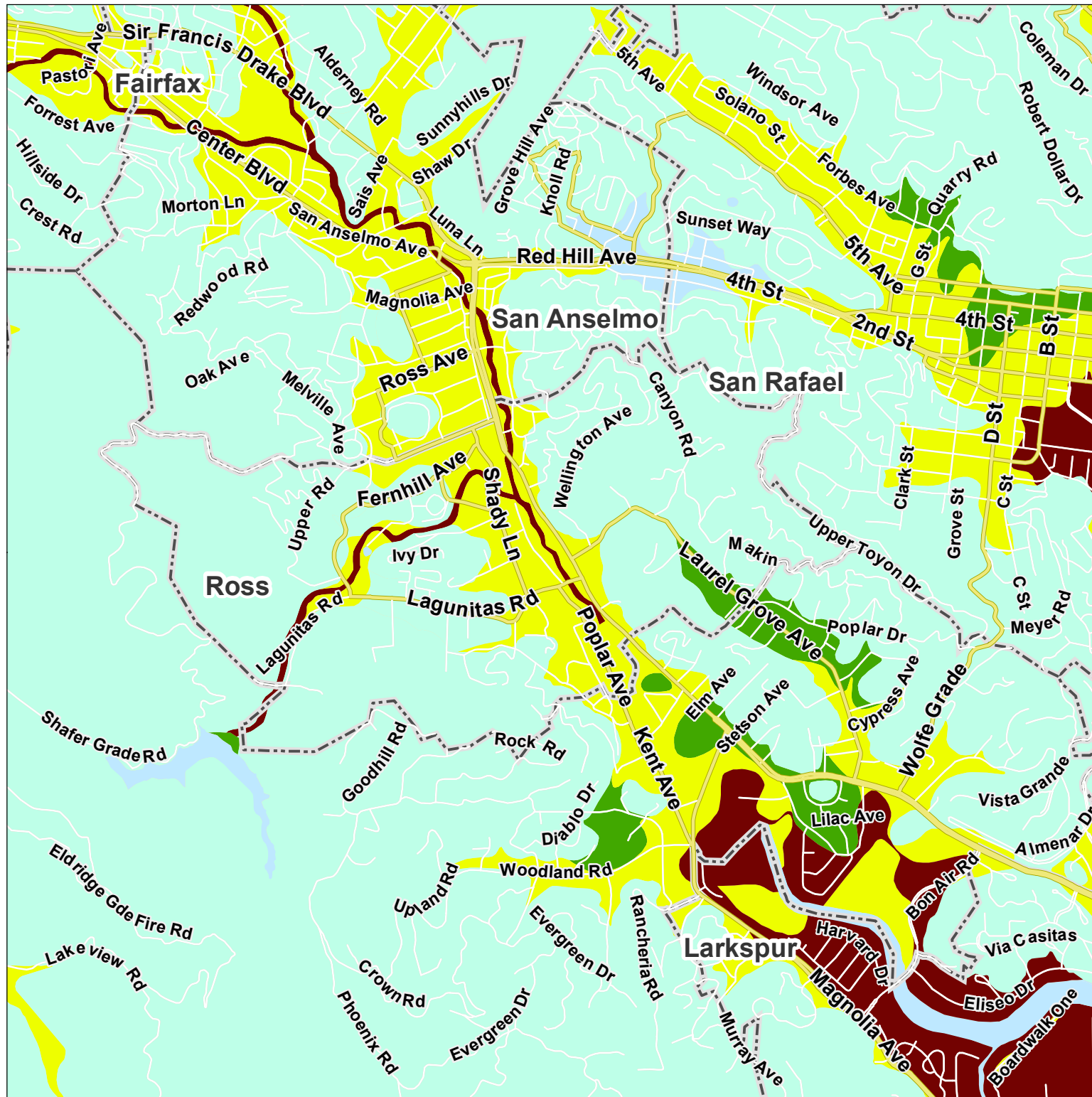
Scale: 1 inch = 0.42 miles

This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general hazard level of a neighborhood and the relative hazard levels from community to community. Hazard levels are less likely to be accurate if your neighborhood is on or near the border between two zones. This information is not a substitute for a site-specific investigation by a licensed professional.

This map is available at
<http://quake.abag.ca.gov>

Sources:
 This map is based on work by William Lettis & Associates, Inc. and USGS.
 USGS Open-File Report 00-444, Knudsen & others, 2000 and
 USGS Open-File Report 2006-1037, Witter & others, 2006

For more information visit:
<http://pubs.usgs.gov/of/2000/of00-444/>
<http://pubs.usgs.gov/of/2006/1037/>



Extent

Previous occurrences

Many moderate to great earthquakes (over magnitude 6.0) have affected the Bay Area. Twenty-two such events have occurred in the last 165 years, an average of one every seven and a half years. The devastating San Francisco earthquake occurred in 1906 and caused extensive damage in Oakland, San Jose and Santa Rosa. More recently, the 1989 Loma Prieta earthquake caused extensive damage in the Santa Cruz Mountains, as well as in Oakland and San Francisco.

There have been only three earthquake-related natural disasters in the Bay Area since 1950: the September 3, 2000 Napa earthquake (declared a disaster in only Napa County), the 1989 Loma Prieta earthquake (declared a disaster in Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, and Solano counties), and the April 1984 Morgan Hill earthquake (declared a disaster in Santa Clara County)

Probability of future events

The probability of a major earthquake in the Bay Area is great. The U.S. Geological Survey (USGS) indicates that there is a 63% probability of a magnitude 6.7 or larger earthquake in the Bay Area in the next 30 years (with a wide error range plus or minus 22%). Smaller earthquakes are more likely to occur and can still produce significant damage.

The probability of the rupture of individual faults in the next 30 years has also been prepared by USGS, as shown in the following table.

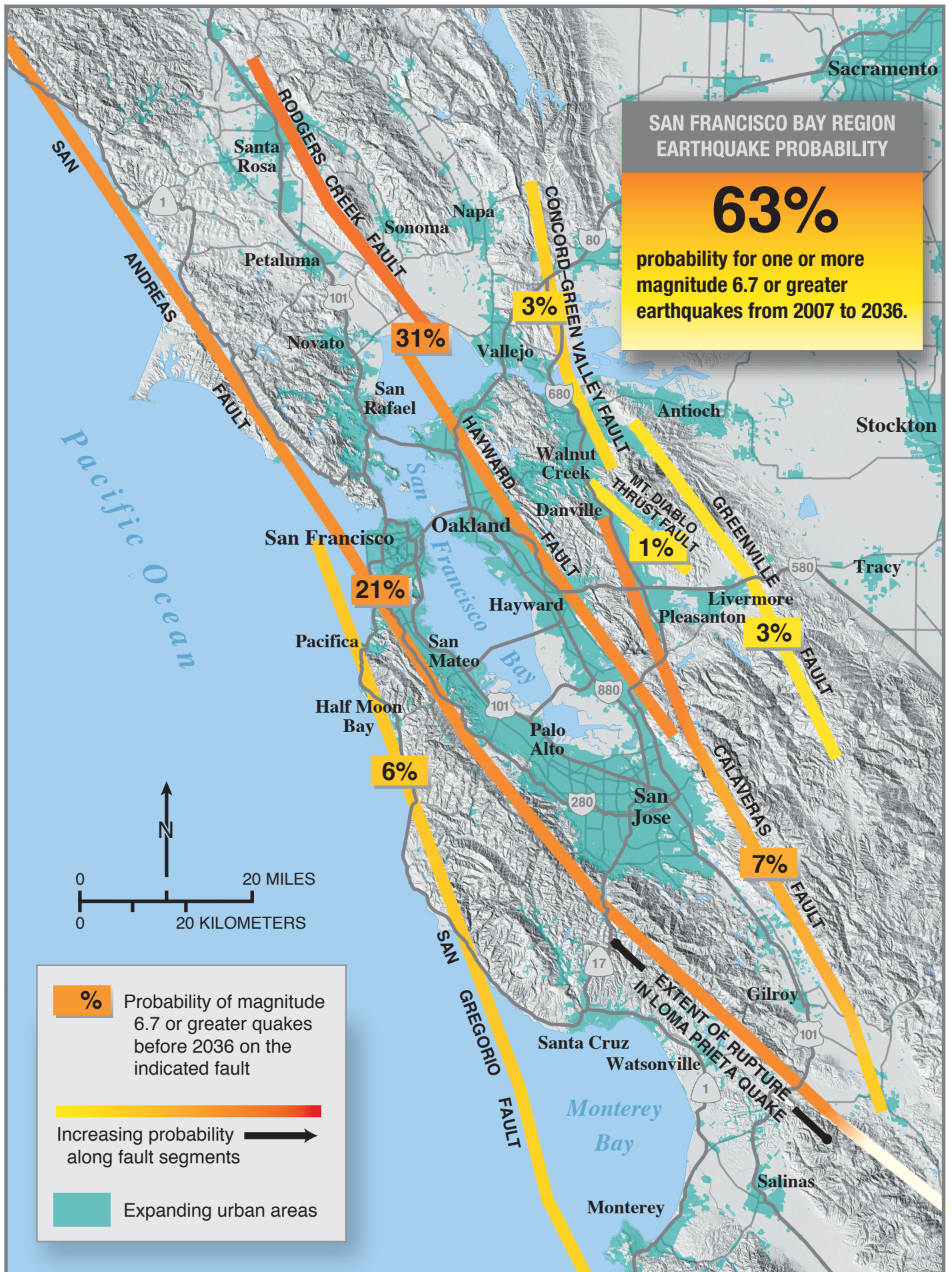


TABLE 1 – Probabilities of Selected Earthquake Scenarios Occurring in the Next 30 Years and Slip Rates on Associated Fault Segments [based on USGS Working Group on Earthquake Probabilities, 2003 and 2008*], [Scenario maps on ABAG web site are shaded.]

Fault	Segment (s)	Average Long-Term Slip Rate (mm / year)	% Probability of Characteristic Quake 2002-2031	% Probability of Quake ≥ 6.7 2007-2036
N. San Andreas	Santa Cruz Mountains (SAS)	17	2.6	4.0*
	Peninsula (SAP)	17	4.4	0.6*
	North Bay (SAN)	24	0.9	0.04*
	Ocean (north of Bay Area – SAO)	24	0.9	1.9*
	South Bay Segments (SAS + SAP)	17	3.5	4.4*
	Central Bay Segments (SAP + SAN)	17 – 24	0.0	0.0*
	Northern Segments (SAN + SAO)	24	3.4	4.1*
	Bay Area Segments (SAS+SAP+SAN)	17 – 24	0.1	0.05*
	Central + North (SAP + SAN + SAO)	17 – 24	0.2	0.2*
	Entire – Repeat of 1906 (SAS + SAP + SAN + SAO)	17 – 24	4.7	3.8*
	Floating M6.9	17 – 24	7.1	6.8
Hayward/Rogers Creek	Southern (HS)	9	11.3	4.8*
	Northern (HN)	9	12.3	1.2*
	Entire (HS + HN)	9	8.5	8.8*
	Rogers Creek (RC)	9	15.2	16.3*
	HN + RC	9	1.8	2.1*
	HS + HN + RC	9	1.0	1.2*
	Floating M6.9	9	0.7	0.7
Calaveras	Southern (Outside Bay Area - CS)	15	21.3	0.0*
	Central (CC)	15	13.8	0.0*
	CS + CC	15	5.0	0.1*
	Northern (CN)	6	12.4	2.4*
	CC + CN	6 – 15	0.3	0.3*
	CS + CC + CN	6 – 15	2.0	3.6*
	Floating M6.2	6 – 15	7.4	0.0
	Floating M6.2 on CS + CC	15	7.4	0.0
Concord/Green Valley	Concord (CON)	4	5.0	0.1
	Southern Green Valley (GVS)	5	2.3	0.0
	CON + GVS	4 – 5	1.6	0.3
	Northern Green Valley (GVN)	5	6.1	0.0
	Entire Green Valley (GVS + GVN)	5	3.2	0.4
	Entire (CON + GVS + GVN)	4 – 5	6.0	2.7
	Floating M6.2	4 – 5	6.2	0.0
San Gregorio	Southern (Outside Bay Area - SGS)	3	2.3	2.1
	Northern (SGN)	7	3.9	3.9
	SGS + SGN	3 – 7	2.6	2.6
	Floating M6.9	3 – 7	2.1	2.0
Greenville	Southern (GS)	2	3.1	0.7
	Northern (GN)	2	2.9	1.0
	Entire (GS + GN)	2	1.5	1.4
	Floating M6.2	2	0.4	0.0
Mt. Diablo Thrust	Mt. Diablo Thrust (MTD)	2	7.5	0.7*
Maacama - Garberville	Southern (only part in Bay Area)	9*	Not available	12.6*
Monte Vista - Shannon	Monte Vista Segment	0.4*	Not available	0.02*
West Napa	Entire Segment	1*	Not available	0.3*

Assessment of Town Vulnerability

Approximately half of the residences in Ross, all of the commercial buildings, two churches, the public grade school, and public facilities (including the town hall, post office, police and fire stations) are within the strong shaking and moderate liquefaction hazard areas. There are approximately 20 residential units in the least stable hillside areas, with approximately two dozed residences down slope of the least stable areas.

Although detailed studies have not been conducted, staff estimates that a significant number of the structures in the hazard area are wood frame structures built prior to 1940. Some of these structures have been retrofitted with modern foundations.

The Modified Mercalli Intensity Scale (below) indicates that strong shaking conditions will affect driving, damage masonry that is not reinforced or not designed to resist lateral forces, cause chimneys to fall, and move frame houses on their foundations if not bolted down. A major earthquake event could result in deaths, injuries, property and environmental damage, and disruption of normal government and community services. Hospitals outside of the Town may be impacted by an earthquake. Telephone systems will be affected by system failure, overloads and loss of electrical power. Natural gas leaks pose a fire threat and breaks in the system could affect service to the Town. Water sources could be compromised due to damage to treatment plants, pump stations and/or the pipelines that distribute potable water. Liquefaction-related damage to water supply pipelines could impair fire suppression, leaving the Town vulnerable to a large fire. Sewage collection systems throughout Marin County may sustain widespread damage if ground movement damages mains or pipelines. Electricity may be interrupted. Landslides may occur. Bridges and roads may be closed because of damage. An earthquake may also result in dam failure. (Source Marin County General Plan) Liquefaction of creeks during the winter storm season could exacerbate flood hazards.

There is no national, state or local warning system for earthquakes. Japan, Mexico, Turkey, Romania and Taiwan have early earthquake warning systems. Scientists in the United States have been testing a warning system that provides a few seconds to a few tens of seconds of warning before an earthquake event. This early warning would provide time for individuals to get to a safe location, to shutdown utilities, and take other steps to reduce hazards from ground shaking. California scientists are working to produce a reliable system for general use. (California Integrated Seismic Network <http://www.cisn.org/eew/>)

Uninhabitable housing due to ground shaking damage

ABAG predicts that up to 3,495 housing units in the Marin County area may be left uninhabitable by an Earthquake that involves the full San Andreas fault. Older single family homes (pre-1940s) are the most vulnerable to earthquake hazards. Based on the developments in the building codes and construction practices, World War II or, in terms of decades, 1940, has been identified as a turning point in the development of construction practices.

The Town estimates that half of the structures in Town were built prior to 1940 (more detailed estimates are necessary). Typical damage to pre-1940 single-family homes include the wood frame

coming off its foundation, racking of the cripple walls, the foundation itself cracking, or the chimney breaking at the roof line. A typical problem with houses built during this era is the connection between the wood frame and the foundation. These houses often lack steel bolts or any other type of "tie-down" between the foundation and the wood frame. Since these houses were built before the widespread use of plywood, they also typically lack appropriate shear reinforcing of the cripple walls (the walls between the top of the foundation and the floor diaphragm). Finally, steel reinforcing is often not found in the foundation of these houses or their chimneys. Some of these older houses may have brick foundations with weakly cemented joints.

The post-1940 house accounts for the remainder of the Ross housing stock. Typical building damage to post-1940 houses does not present widespread problems with foundation anchorage and foundation reinforcing. However, there often is a lack of proper reinforcement of the masonry chimneys. A significant number of post-1940 dwellings may suffer some type of chimney damage. The second major source of damage is damage (or even collapse) of garages with living area above in two-story or split-level homes due to long spans over the garages.

Transportation system disruption

ABAG's modeling of road closures in future earthquake scenarios predicts the earthquake will also result in 70 road closures in Marin County. The Town may experience road closures from liquefaction, earthquake-triggered landslides, shaking damage to bridges as well as indirect causes of closures such as building damage, hazmat releases, and utility pipeline breaks and fallen trees.

The Town of Ross will be affected by the regional impacts of regional transportation disruption, particularly closure of the main San Francisco bridges such as the Golden Gate.

Utility disruption

Pipelines break and leak as a result of earthquakes. An ABAG analysis of damaged pipelines following the 1989 Loma Prieta earthquake indicated that pipelines in areas subject to liquefaction and exposed to violent ground shaking were the most likely to have broken or leaked as a result of that earthquake. Some of the Town water and sewer facilities are very old and may leak and break. The Town gas and electricity system may be damaged and interrupted.

Critical facilities and infrastructure

The Town needs additional information on the vulnerability of Town critical facilities including the Ross Town Hall, the Police/Fire Station, Post Office, and bridges. The Town hall buildings are believed to have been bolted to their foundations. However, more information is needed. It is unknown how the structures, which have stucco walls and clay tile roofs, will perform in an earthquake.

Economy and tax base

Since the Town has little commercial tax base, a small commercial economy, and most residential property value is in land, a large earthquake is not anticipated to have significant long-term impact on the Town tax base.

Identification of Structures Subject to Hazard

The Town needs additional information on the vulnerability of Town facilities, housing stock and commercial and other privately-owned buildings. The Town has included mitigation strategies to obtain this information.

Estimating Potential Losses

The Town does not have a reliable method to estimate potential dollar losses to vulnerable structures from earthquake related causes. ABAG, in collaboration with USGS, CGS, and OES, has identified significant problems with using the ShakeMap scenarios (which tend to produce shaking levels lower than the ABAG Shaking Scenario maps), the existing vulnerability formulas (which are prone to underestimate housing losses and losses to wood-frame structures), and incomplete building inventory data. The HAZUS, software package developed by FEMA for loss modeling, loss estimates are currently inadequate for planning purposes. For example, the 1994 Northridge earthquake caused over \$40 billion in losses, HAZUS estimates the total losses for that earthquake as only \$23 billion.

In addition, the Town does not have reliable information on the value of existing structures. The Town cannot rely on assessed value, since the values are not updated to reflect actual value since Proposition 13.

Wildfire

Hazard Profile

Description

(Source: Marin County Hazard Mitigation Plan)

The Town of Ross is within the Wildland-Urban Interface (WUI). The Town borders directly on the open space lands of the Marin Municipal Water District. The hillsides and canyons carry the potential of high fire danger. The potential of wild land fire is an extreme risk to all areas within the Town, not just hillside areas. The fire season generally lasts from five to six months, when there is little rain.

Access to adjacent open space areas and the hillside and canyon areas is limited by few access routes and narrow roads. There is limited water availability, water pressure, and water flow in certain areas within the Town. The wildland fire hazard is caused by a combination of factors including hillside terrain, highly flammable vegetation and forest (particularly along the western border of MMWD land), long summers, and human activity. There are heavy fuel loads. Many homes have been built on steep slopes with vegetation in close proximity. The onset of Sudden Oak Death (SOD) has significantly increased the number of dead or weakened trees in the areas, which contributes to the fuel loads. The loss of oaks results in the increase in more fire hazardous trees, such as bays.

Wind is a predominant factor in the spread of fire. Marin County has a characteristic north-west wind that originates from the Pacific Ocean and will frequently become a factor in fire suppression efforts. During the dry season, the county also experiences occasional strong northeast winds.

Wildfires cause secondary hazards of flooding and landslides after slopes are stripped of vegetation and exposed to greater amounts of runoff. Wildfires also expose people to smoke, a health concern.

Location

CalFIRE has developed several maps depicting wildfire hazard areas. The two most useful maps are those depicting Wildland Urban Interface (WUI) wildfire threat and wildfire threat from wildland fuels in State Responsibility Areas. The WUI map depicts communities within 1.5 miles of a potential wildfire source, as determined by CDF-FRAP fuel and hazard data. These maps indicate that the entire Town of Ross is within the area of WUI wildfire threat. The hillside areas in the western side of Ross and southwestern side of the Town are threatened from wildland fuels.

Extent

Wildfires have the potential to damage and destroy thousands of acres of land, destroy many homes and result in deaths.

A wildfire simulation using existing conditions was recently prepared for a Ross property owner. The scenario models the severity of potential wildland fire. The simulation indicates that, within 3 hours from ignition, a fire originating in the vacant land on the west side of the Town could result in burning

502 acres of land and affecting 221 residences. The scenario fire destroys 104 residences and blocks access to 117 residences (4 of which burn down), preventing firefighting and safe evacuation.

The results of this wildland fire simulation are consistent with the results of a simulation prepared by the Marin Municipal Water District for a simulated fire originating near Deer Park –Worn Spring Road with 15-20 mile per hour northwest winds. Surface fuels were modified to characterize the presence of French broom and occasional SOD in the understory. Their scenario did not include fire suppression. Under the MMWD simulation, 301 acres and hundreds of homes are burned within 2 hours.

Wildland Urban Interface - Fire Threatened Communities



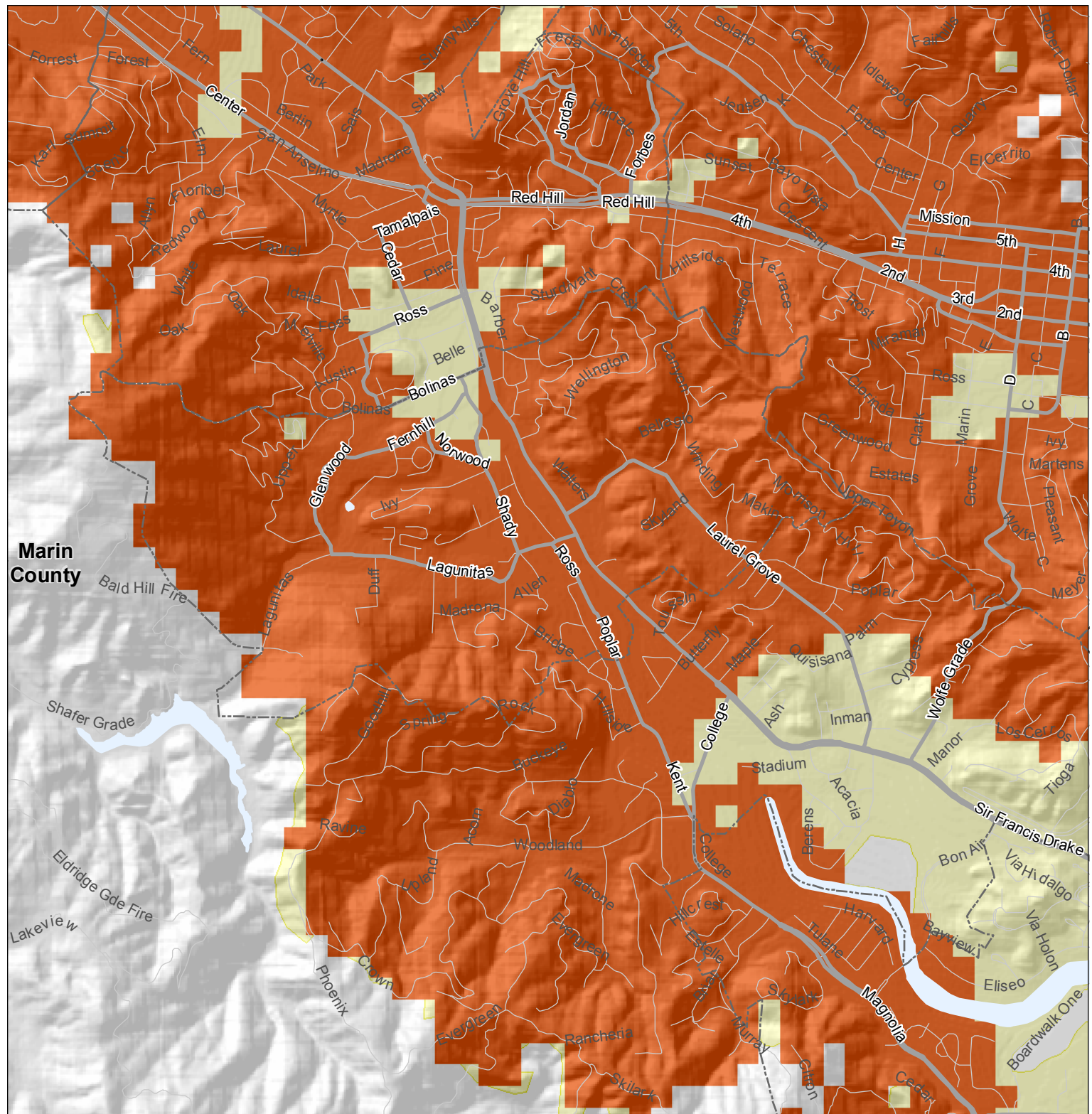
Community at Risk



Urbanized Area



1 inch = 0.39 miles



Local fire jurisdictions may have identified additional fire hazard areas, especially in communities adjacent to wildland.

This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

This map is available at
<http://quake.abag.ca.gov>

Source:
California Department of Forestry
and Fire Protection, 2003

Fire Threat in the San Francisco Bay Region



1 inch = 0.39 miles

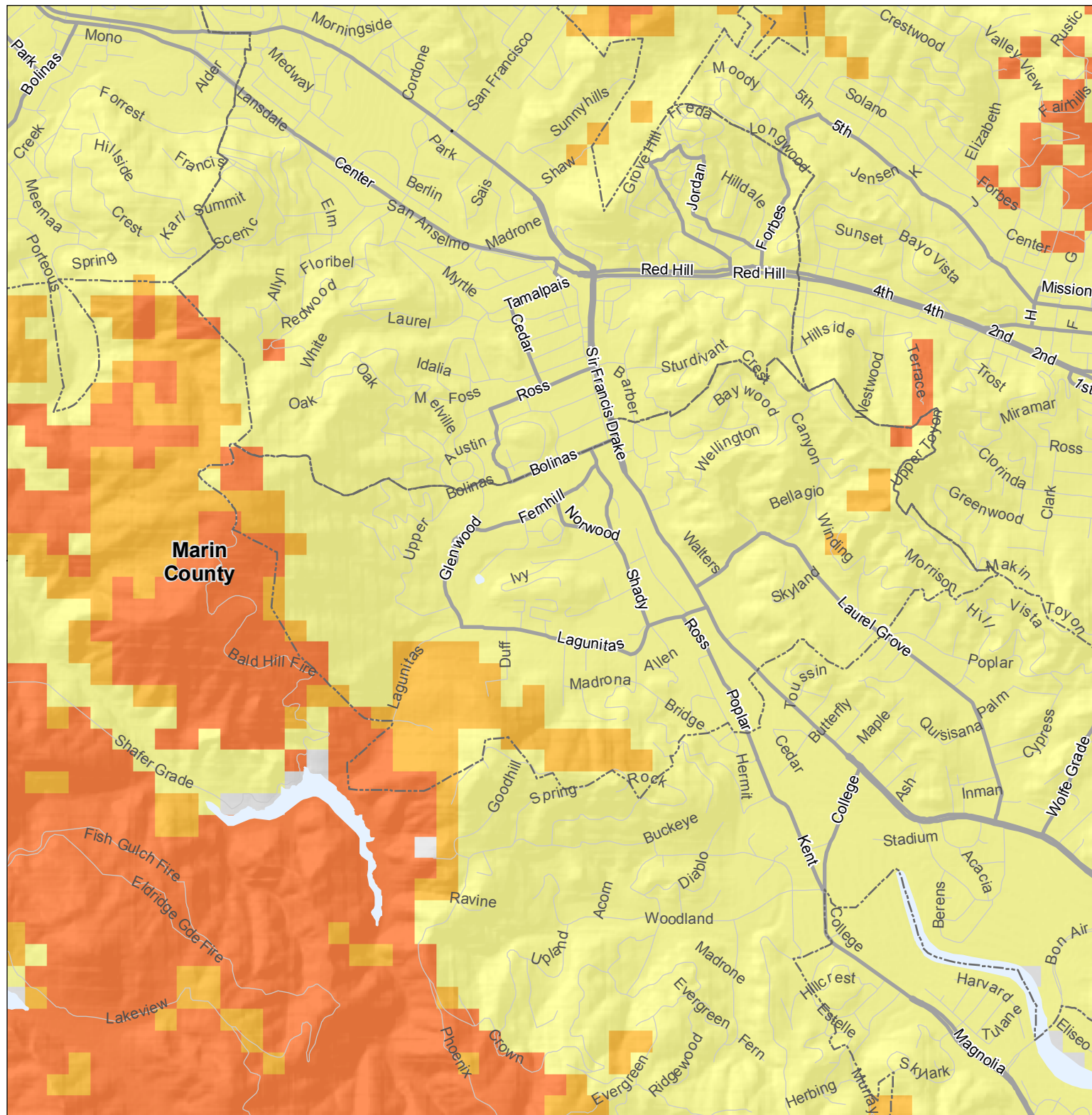
This map focuses on wildland fuels in State Responsibility Areas, that is, where the California Department of Forestry has primary jurisdiction for wildland fire response. Local fire jurisdictions may have identified additional fire hazard areas, especially in communities adjacent to wildland.

This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community.

This map is available at <http://quake.abag.ca.gov>

Combines expected fire frequency with potential fire behavior to create 4 threat classes

Source:
California Department of Forestry
and Fire Protection, 2005



1 hour
from
ignition

101KG TANK
(SKYE RANCH)

60KG TANK
(OAK AVE.)

- Any structure on Upper Rd is in/near fire perimeter

Elapsed Minutes	Homes Blocked	Homes Blocked Cumulative	Homes Burned Over	Homes Burned Over Cumulative	~Total Homes Affected
30	3	3	0	0	3
60	11	14	3	3	17

Because some blocked homes blocked later become burned over Total Homes Affected is less than the sum of Cumulative Homes Blocked and Cumulative Burned Over

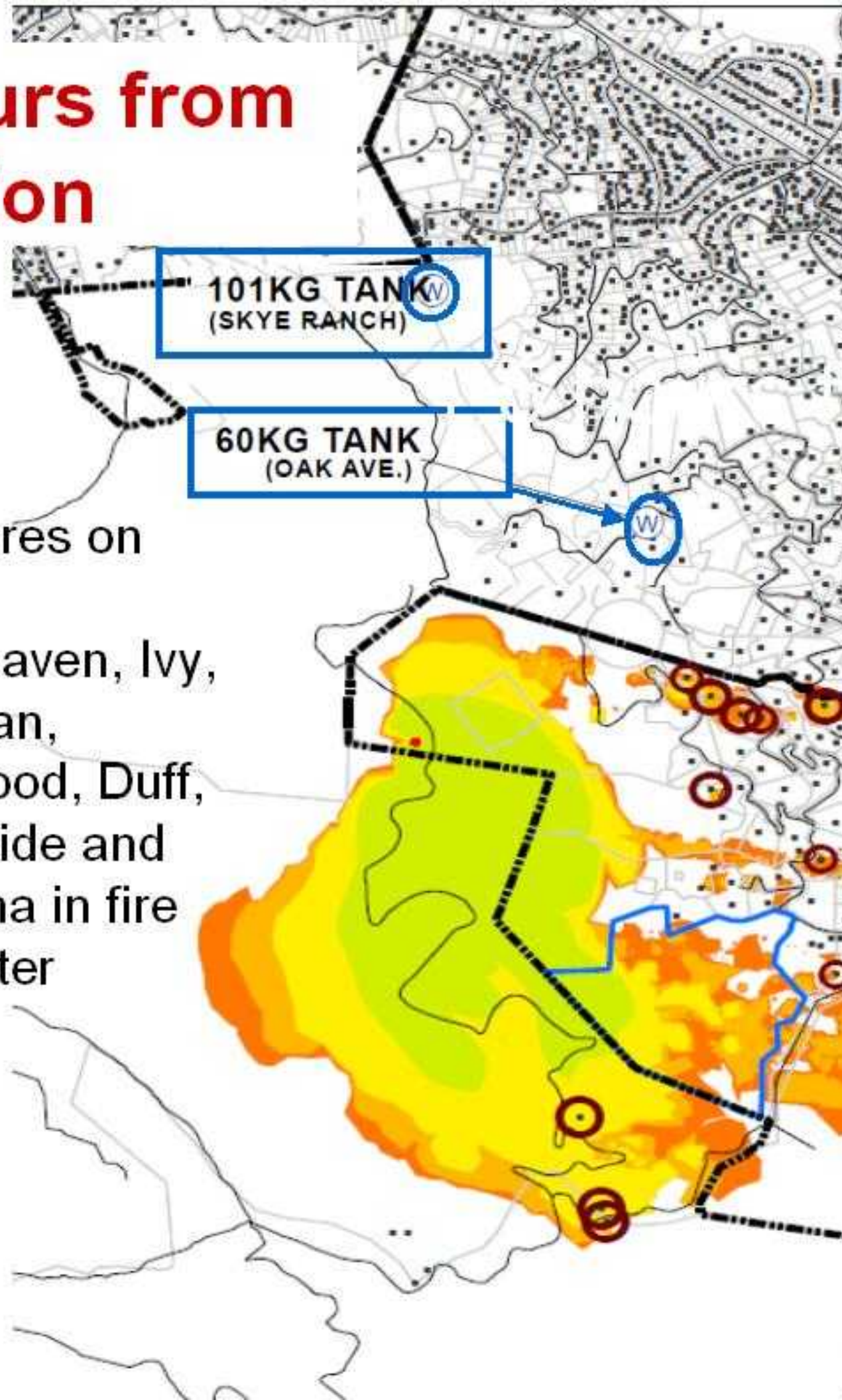
Spot fires
block roads

Suppression Response by Time Increment

Response time	15 mins	30 mins	45 mins	60 mins	75 mins	90 mins	105 mins
Agency							
Town of Ross	1 engine	1 engine					
Ross Valley Fire		1 engine	1 engine				
Kentfield Fire		1 engine					
Larkspur Fire		1 engine					
San Rafael				2 engine			
Marin County		5 engines	1 dozer				
		2 helicopters	2 air tankers	1 water tender			
				1 hand crew			
Corte Madera			1 engine				
Mill Valley			1 engine				
Southern Marin Fire			1 engine				
Tiburon Fire			1 engine				
Novato Fire							
Solano County							5 engines
Contra Costa County							5 engines
San Francisco							5 engines
Total Engines Added	1 engine	9 engines	5 engines	2 engines			15 engines
		2 h/c	2 h/c + 2 air tankers			2 h/c + 2 air tankers	
Total Aircraft		helicopters	tankers	2 h/c	2 h/c	tankers	2 h/c
Total Engines available	1 engine	10 engines	14 engines	16 engines	16 engines	16 engines	31 engines
Total Bulldozers			1 dozer	1 dozer	1 dozer	1 dozer	1 dozer

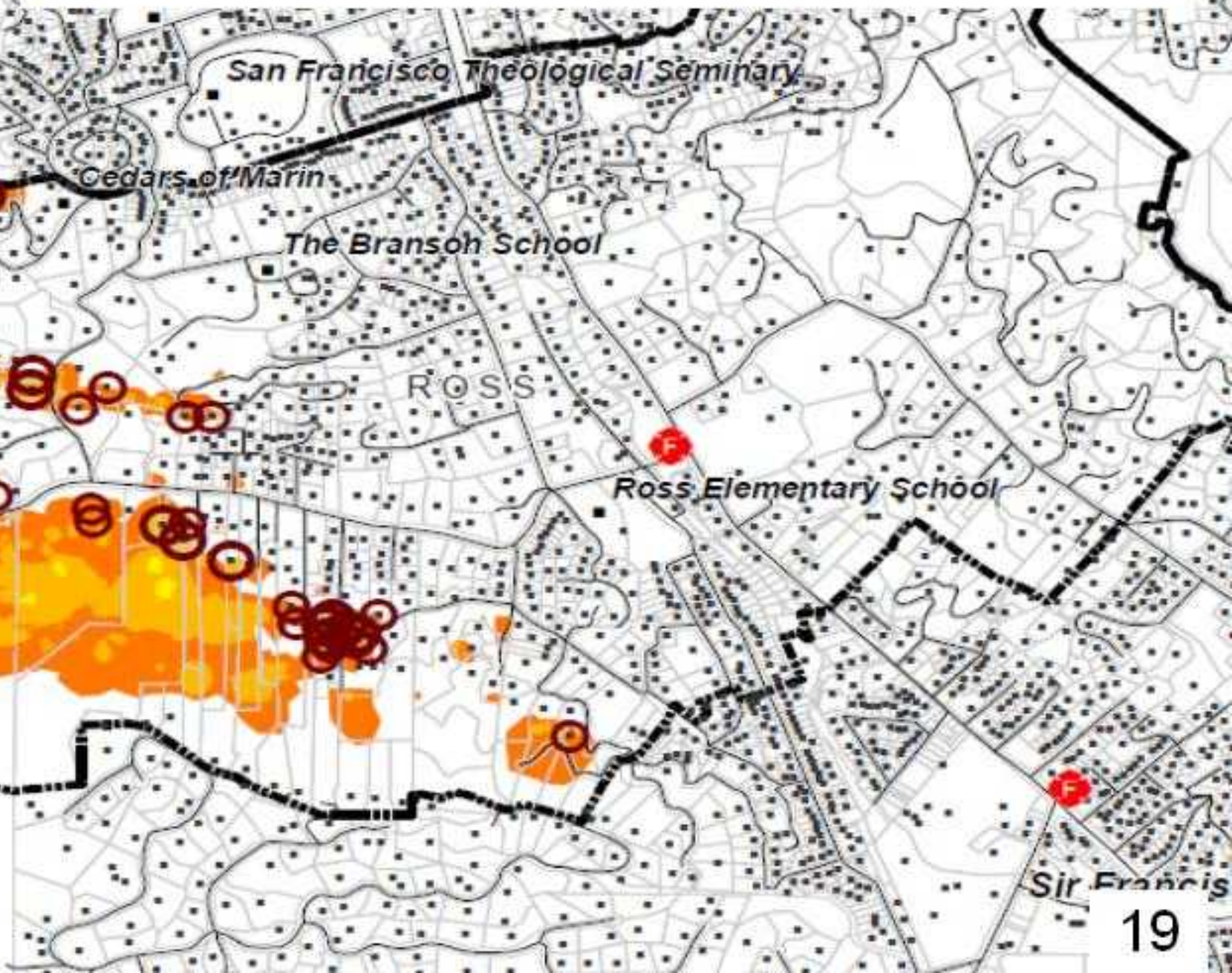
2 hours from ignition

- Structures on Upper, Woodhaven, Ivy, Chipman, Glenwood, Duff, Woodside and Madrona in fire perimeter



Elapsed Minutes	Homes Blocked	Homes Blocked Cumulative	Homes Burned Over	Homes Burned Over Cumulative	~Total Homes Affected
30	3	3	0	0	3
60	11	14	3	2	16
90	38	52	13	16	68
120	40	92	20	36	128

Because some blocked homes blocked later become burned over Total Homes Affected is less than the sum of Cumulative Homes Blocked and Cumulative Burned Over



**3.0 hours
from ignition**

10TKG TANK
(SKYE RANCH)

60KG TANK
(OAK AVE.)

Elapsed Minutes	Homes Blocked	Homes Blocked Cumulative	Homes Burned Over	Homes Burned Over Cumulative	~Total Homes Affected
30	3	3	0	0	3
60	11	14	3	3	17
90	38	52	13	16	68
120	40	92	20	36	128
150	9	101	36	72	173
180	16	117	32	104	221

Because some blocked homes
blocked later become burned over
Total Homes Affected is less than the
sum of Cumulative Homes Blocked
and Cumulative Burned Over

Additional
dwellings are
blocked

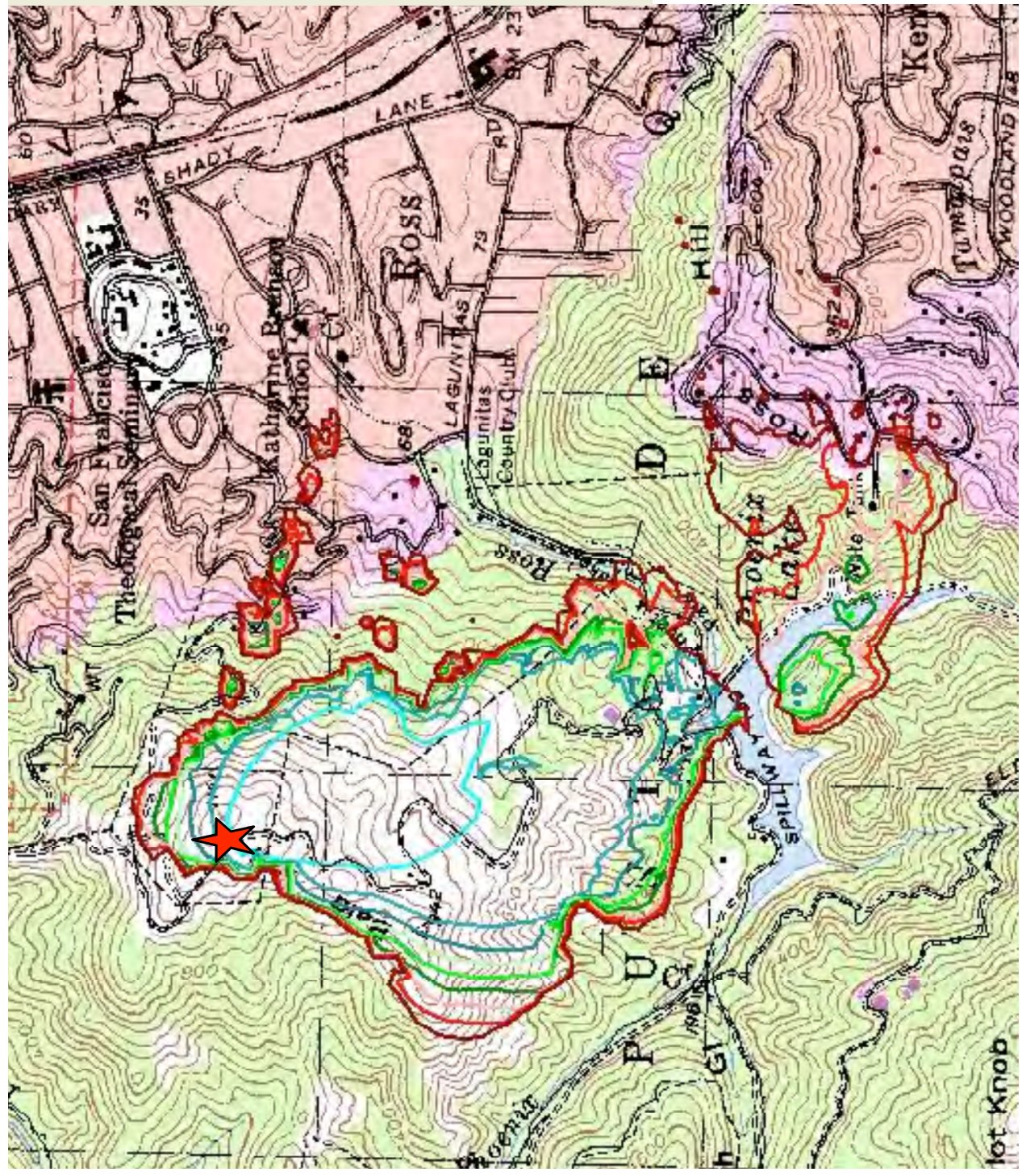
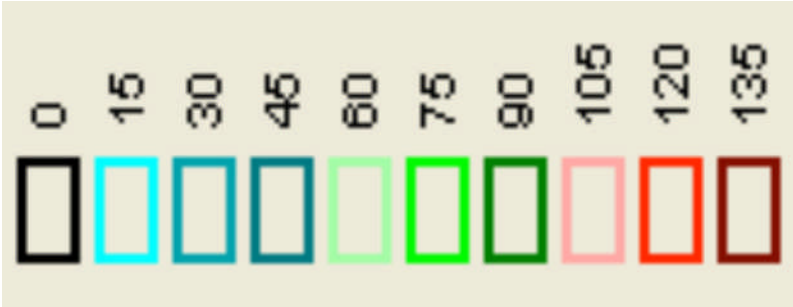
221 houses
impacted

502 acres burned

A few homes
were blocked
then burned over

Worn Springs Road with Broom & SOD

<i>Date</i>	<i>Elapsed Time</i>		<i>Fire Area (acres)</i>	<i># of Fires</i>		<i>Spots</i>		<i>Perimeter (miles)</i>
	<i>Time</i>	<i>Time</i>		<i>Fires</i>	<i>Fires</i>	<i>Spots</i>	<i>Spots</i>	
29-Aug	12:00	0:00	0.0	1	0			0.0
29-Aug	12:15	0:15	52.7	44	43			0.7
29-Aug	12:30	0:30	143.9	66	116			2.4
29-Aug	12:45	0:45	176.1	65	25			3.6
29-Aug	13:00	1:00	194.2	55	8			4.8
29-Aug	13:15	1:15	211.2	60	40			6.4
29-Aug	13:30	1:30	231.0	172	103			8.1
29-Aug	13:45	1:45	265.7	204	32			8.8
29-Aug	14:00	2:00	301.0	192	208			9.4



Previous occurrences of the hazard

Since record keeping began in 1859, major fires have periodically raged through Marin County. An 1881 fire burned an estimated 65,000 acres. An 1890 fire burned over 8,000 acres. A 1891 fire burned over 12,000 acres. In 1923 the largest fire in Marin County history burned over 40,000 acres, including areas of Ross. The 1929 Mill Valley fire burned 1,000 acres and destroyed 110 homes in Mill Valley. A 1945 fire burned 20,000 acres of watershed land. In 1995 the Mount Vision Fire burned more than 12,000 acres of Point Reyes National Seashore in West Marin and destroyed 48 homes.

The largest urban-wildland fire in the Bay Area, the 1991 fire in the East Bay Hills, resulted in \$1.7 billion in losses. In that fire, 3,354 family dwellings and 456 apartments were destroyed, while 25 people were killed and 150 people were injured.

Probability of future events

Wildfire is a probable hazard and the Town could sustain severe damage from a large wildland fire. Times of drought and seasonal high winds increase the probability. An earthquake that damages gas pipelines and water pipelines could simultaneously increase the risk of wildland fire and also decrease the Town's ability to suppress it.

Assessment of Town Vulnerability

The entire Town (approximately 820 residences) is in the Wildland Urban Interface (WUI) wildfire threat areas. Approximately 100 residences are in high wildfire threat areas in the State Responsibility Areas (SRAs). Fewer than 12 additional residences may be built in the future on vacant lots in the wildfire danger areas.

Many residences in the high wildfire threat areas were built prior to code changes and have wood shingle siding and some have wood shake roofs. Residences may be surrounded by flammable vegetation. Certain areas of the Town have water pressure and water flow that do not meet current standards.

The Town seeks to minimize risk by regulating the safety of new structures and by vegetation management. The Town applies fire-safe construction standards, greater emphasis on fire equipment access and improved water supply with new development. Sprinklers are required on all new or significantly remodeled residences.

The Town would use an air horn at the fire house to alert residents to the emergency. The Town would send recorded emergency announcements by phone to subscribers in the Marin Emergency Alert Notification System (MEANS) or by public address from a passing patrol car.

The Town fire department, like any other jurisdiction in Marin County, would not have sufficient resources to fight a wildland fire. In the event of a major wildland fire, every jurisdiction in Marin County and numerous state and federal agencies would be tapped for equipment under mutual aid agreements.

The Town critical facilities are located within the center of the Town and further from the high wildfire threat areas. A wildland fire would destroy transmission lines in the area of the fire. Underground pipelines would not be particularly vulnerable to damage from wildfires.

Identification of Structures Subject to Hazard

Estimating Potential Losses

Wildfires are very costly. The cost of fire suppression can be over \$1 million dollars per day. The Mount Vision Fire of 1995 in West Marin is an example of a very damaging and costly fire. Fire suppression cost \$6 million dollars. Structural damage for the loss of 48 homes and 18 with substantial damage reached \$23 million dollars. The utility repair costs reached \$1.3 million dollars. Stabilizing roads and slopes for erosion control cost \$1.3 million. (Marin Operational Area Hazard Mitigation Plan)

The average construction cost in Ross is approximately \$350 per square foot. The replacement cost of structures alone in the Ross fire scenarios, above, would exceed \$100 million dollars (not including contents).

Additional costs associated with the loss of homes to wild land fire include disruption of utilities, transportation, and other public services. In addition, there are lost wages, costs of temporary shelter, and other costs that cannot be captured easily.

Landslide

Hazard Profile

Description

Landslides are a hazard in the Town of Ross. Landslides include all movements of soil, rock or debris as a result of falling, sliding or flowing. The triggering cause may be heavy rainfall or seismic activity. An untimely occurrence of a large earthquake during or soon after a sustained period of moderate to heavy rainfall could produce a landslide problem in Ross.

Landslides may destroy residences, block roads, sever utilities and water supply, and injure or kill people. Emergency operations may be hampered by road closures and loss of communications. Extensive efforts may be required to rescue trapped persons, recover bodies, remove debris, assist in reestablishing vital public services and utilities, and offer care and shelter to affected persons. A typical soil debris avalanche in Marin involves a few hundred cubic yards of soil and colluvium and is the result of total saturation of a part of a hillside.

Location

The U.S. Geological Survey has developed maps depicting both debris flow source areas and existing landslides. "The best available predictor of where movement of slides and earth flows might occur is the distribution of past movements. These landslides can be recognized from their distinctive topographic shapes, which can persist in the landscape for thousands of years. Most of the landslides recognizable in this fashion range in size from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. Some small proportion of them may become active in any one year, with movements concentrated within all or part of the landslide masses or around their edges."²¹

Slope stability maps of the Town of Ross area and other portions of Marin County were prepared by the California Division of Mines and Geology in 1976. The maps identify many slide areas in the Town. The classifications are interpretive, and generally apply to large areas. Within each area conditions may range on a local level. For example, a site in an area designated as a slope stability zone 1 (stable) may have unmapped landslides, and a site designated as a slope stability 4 (least stable) may be a relatively stable site.

The zones are defined as follows:

Zone 1: The most stable category. This zone includes resistant rock that is either exposed or is covered only by shallow colluvium or soil. Also included in this zone are broad, relatively level areas along the tops of ridges or in valley bottoms that may be underlain by material that is quite weak (such as Franciscan melange matrix and alluvium) but occupies a relatively stable position.

²¹ United States Geological Survey, "Summary Distribution of Slides and Earth Flows in the San Francisco Bay Region, California", 1997

Zone 2: Includes narrow ridge and spur crests that are underlain by relatively competent bedrock, but are flanked by steep, potentially unstable slopes.

Zone 3: Areas where the steepness of the slopes approaches the stability limits of the underlying geological materials. Some landslide deposits that appear to have relatively more stable positions than those classified within Zone 4 are shown here.

Zone 4: The least stable category. This includes most landslide deposits in upslope areas, whether presently active or not, and slopes where there is substantial evidence of downslope creep of the surface materials. These areas should be considered naturally unstable, subject to potential failure even in the absence of man's activities and influences. Banks along deeply incised streams are also included in Zone 4.

The effects of debris avalanche landslides are not reflected on the 1976 Slope Stability Map and may cross over all four zone areas

Extent

Previous occurrences

Flooding and landsliding associated with severe storms have been among the most common disasters in the Bay Area during the period from 1950 to 2009. During periods of heavy rainfall, excessive water consistently triggers slides in the County and caused significant infrastructure damage during the floods of 1970, 1973, 1982, 1983, 1986, 1998, and January 2005.

Debris avalanche landslides occurred in Ross during the winters of 1982 and 1983 and travelled thousands of feet. According to a prior Ross resident, the Baywood Avenue area has experienced 6 small landslides from 1980-2002.

Probability of future events

It is very probable that the Town will experience future landslides. In general, landslides are most likely during periods of higher than average rainfall or El Nino winter storms. In addition, the ground must be saturated prior to the onset of a major storm for significant landsliding to occur.

Assessment of Town Vulnerability

There is no way for the Town to estimate the scale of individual landslides in terms of size or extent based on the available maps. Most landslides have resulted in localized damage and road closures.

Summary of the Town's vulnerability

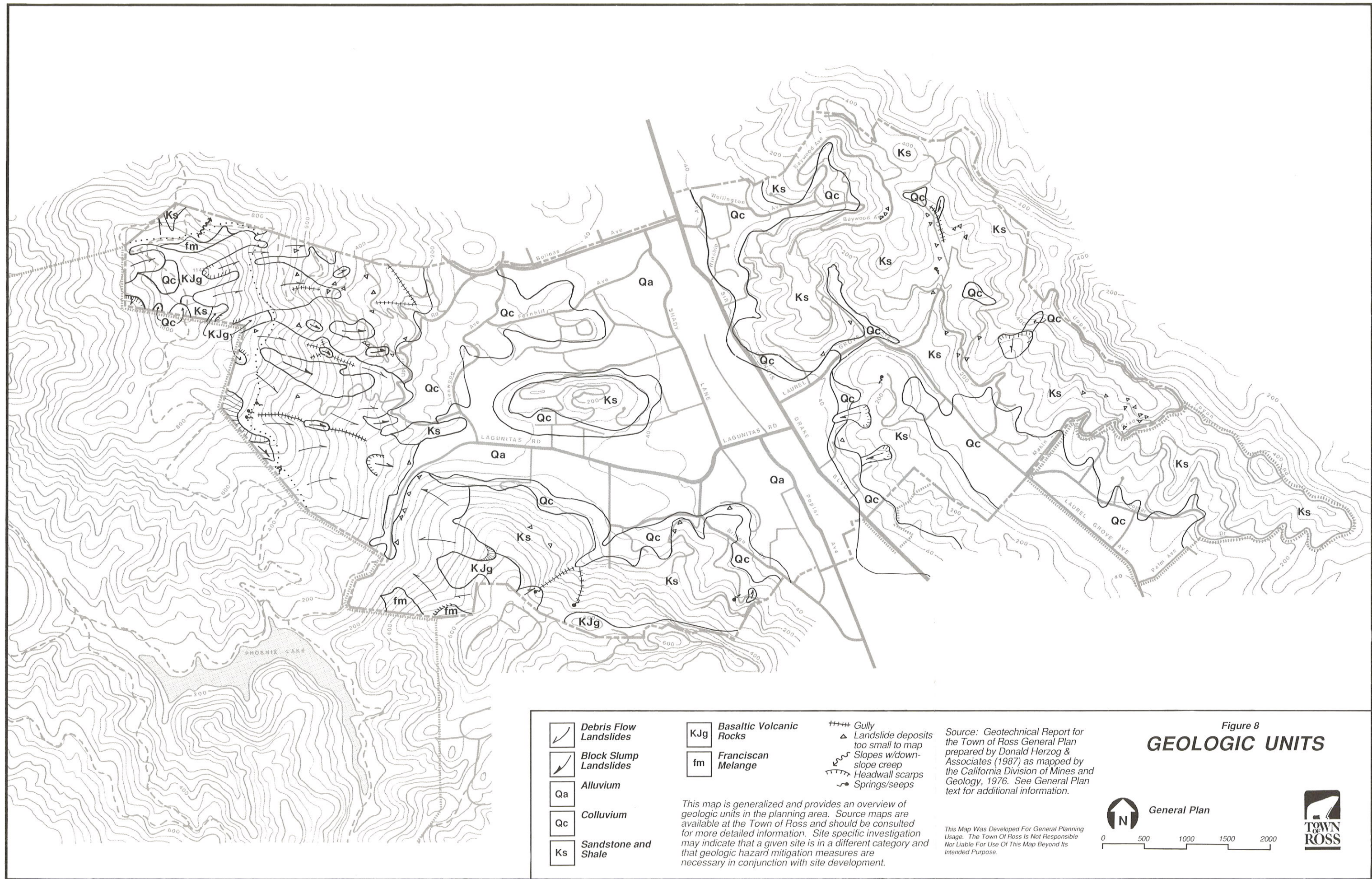
The Town's critical facilities and schools are not located in slide hazard areas. Roads and residential infrastructure would be impacted by a slide. Residences in the immediate area of a slide could be damaged or destroyed.

There is residential development, roads and utilities in the areas mapped as "mostly landslides" on the Summary Distribution of Slides map. But, in general, most development is located outside of these areas.

Many of the roads and utilities in the slide hazard area are privately owned. This could slow recovery from the hazard as residents seek financing or resolve property ownership disputes.

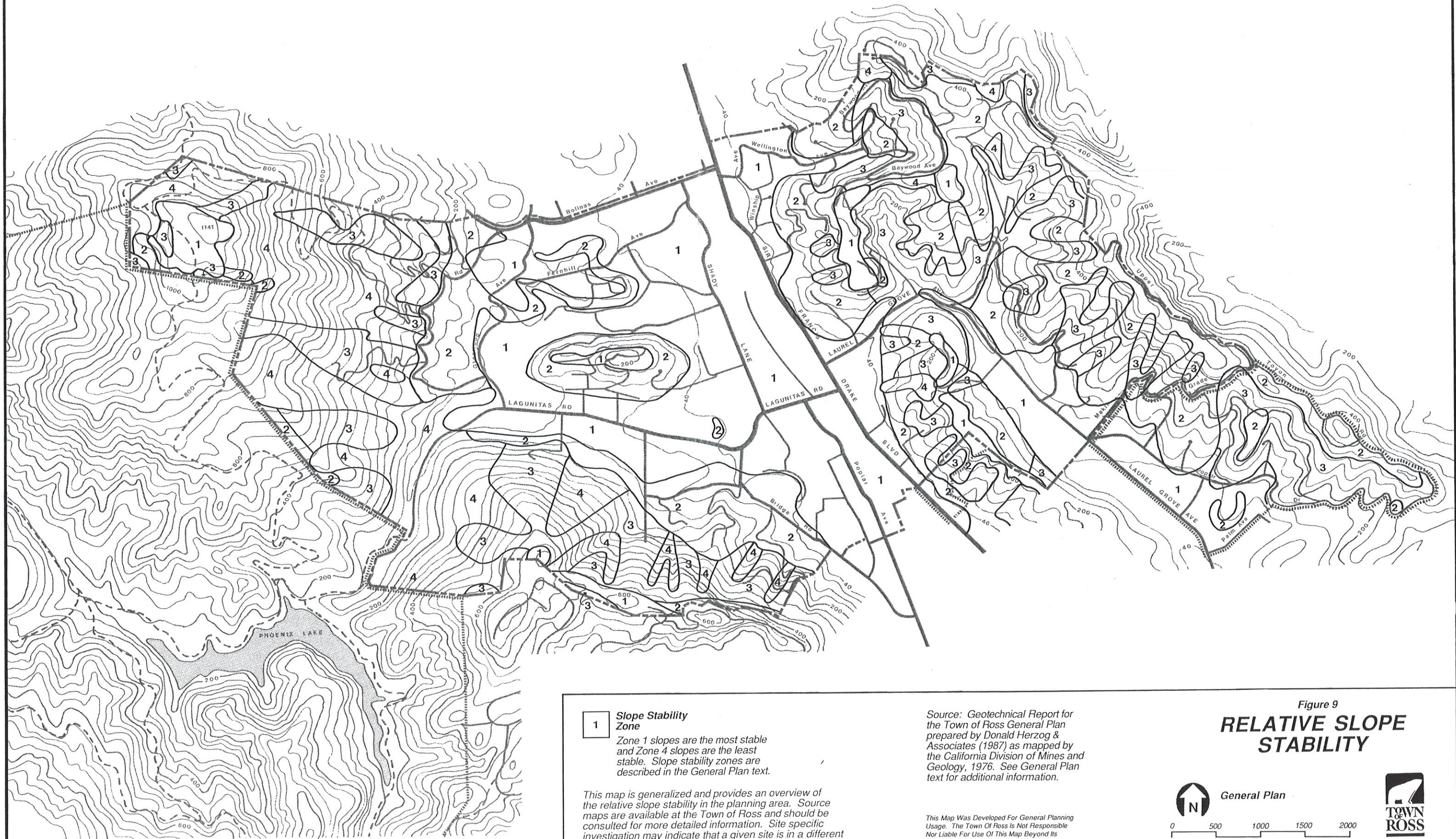
Estimating Potential Losses

It is difficult to estimate potential losses from landslides since the size of the landslides and the damage they cause are varied. At best, the costs involve the cost of the slide clean up and stabilization of the area. From there the costs vary widely. The Town of San Anselmo estimated it would cost \$98,000 and \$140,000 for repairs associated with two roads damaged by slides in March 2011. The City of Mill Valley insurers paid over 4 million dollars in damages and litigation costs for a slide originating from a Town road that resulted in the death of a resident.



This map illustrates the San Anselmo area, highlighting the city of San Anselmo, San Rafael, Ross, and Larkspur. The map shows a network of streets, including major roads like Sir Francis Drake Blvd, Center Blvd, San Anselmo Ave, Ross Ave, Fernhill Ave, Lagunitas Rd, Poplar Ave, Kent Ave, and Magnolia Ave. It also depicts the San Anselmo River and surrounding hills. The map is color-coded to show different land use types, with green representing open space or parks, yellow representing developed areas, and red representing residential or commercial zones. The map is oriented with North at the top.

ABAG® Geographic Information Systems



Dam Failure

Hazard Profile

Description

Dam failures can result from a number of natural or manmade causes such as earthquakes. Dam failure can result in inundation of areas downstream.

Phoenix Lake Dam, owned by the Marin Municipal Water District (MMWD), is on the west side of the Town of Ross. The State of California Department of Dam Safety indicates the dam was built in 1907 and has a capacity of 612 Acre Feet. A Marin Municipal Water District employee indicates that the dam is a small earth fill dam constructed in 1906 using the hydraulic fill method and that the current storage capacity is 411 acre-feet.

Location

In the 1970's, State law required dam owners to develop maps depicting areas that might be inundated by dam failure. The law required that each map be produced only once, without any requirements for updating. The maps were developed using engineering hydrology principals and represent the best estimate of where the water would flow if the dam completely failed with a full reservoir. The inundation pathway is based on completely emptying the reservoir and does not include runoff from storms. Dam inundation maps do not indicate the depth of inundation and may represent only an inch of water over some inundation areas.

Phoenix Lake flows to Ross Creek for approximately 1½ miles to Corte Madera Creek. From that point, Corte Madera Creek passes through residential and commercial areas through the Town. The mapped dam inundation area follows this path and is wider than the Town's flood hazard area.

No recent maps have been made of the inundation area. Development downstream of the dam and upgrades to the dam may have altered the inundation area since the 1970s. The inundation map provides an estimate of the general location and extent of the dam failure inundation area.

Extent

Many residential housing units existing within the dam inundation area. MMWD indicates that, "while the instantaneous failure of the embankment, or any failure for that matter, is very unlikely, water from such a failure would reach downtown Ross in less than ½ hour. Since the volume of water in the lake is small, any such flooding would pass quickly, and likely be relatively shallow, however, in extreme circumstances some damage would undoubtedly occur."

Previous occurrences

A dam has never failed in the San Francisco Bay Area.

Probability of future events

The 1988 Town of Ross General Plan Safety Element provides:

In 1974, a seismic stability analysis of Phoenix Lake Dam was conducted for the Marin Municipal Water District. The purpose of this study was to assess the risk of seismically induced flooding associated with failure of Phoenix Lake Dam. The earth dam was constructed just prior to the 1906 earthquake, which created a landslide on the inside portion of the dam embankment. The slope stability analysis conducted in 1974 concluded that the dam spillway could settle from 4 – 6 feet during an earthquake with a Richter magnitude of 8.5 generated along the San Andreas fault. The 1906 San Francisco earthquake had a Richter magnitude of 8.3.

In response to this assessment, the Marin Municipal Water District has widened the spillway by 5 to 6 feet and has lowered the spillway by 6 feet. Accordingly, these improvements to the dam have reduced the flood risk to one flood in 30,000 years.

According to MMWD, “the dam has been modified several times in the last 100 years including increased height of fill, outlet works changes, an embankment buttress fill in the 1960s and a new spillway, designed for a spillway design flood with a recurrence interval of once in 10,000 years or so, and an increase in freeboard in the mid-1980s.” The dam is inspected yearly by the California Division of Safety of Dams and has been rated by that agency as acceptable for continued operation. Their rating for the facility is 3C, there is a potential for damage should the dam fail but that the dam is in good condition for its age.

The Phoenix Lake Dam is over 100 years old. According to ABAG, when a dam is known to have a failure potential, the water level is reduced to allow for partial collapse without loss of water as required by the State Division of Safety of Dams and by safety protocols established by dam owners. Thus, the probability of failure resulting in damage from the inundation is low.

Assessment of Town Vulnerability

Many residences, a church, the Town public school, and critical facilities are in areas mapped as the Phoenix Lake dam failure inundation area. However, based on available information, the Town does not believe the dam poses a significant hazard to the community.

In 2011, the California Department of Water Resources awarded a \$7.66 million grant to the Marin County Flood Control District’s Ross Valley Watershed Flood Protection program to fund a \$15.6 million project to retrofit for the Phoenix Lake reservoir into a facility that will function as a flood control detention basin in addition to its current use as a water supply storage facility and public recreation area. This project will be developed in partnership with the Marin Municipal Water District, who currently owns and operates Phoenix Lake. The project would seismically retrofit the dam and construct other improvements to the hydraulic and recreational infrastructures of the lake. The project would bring the dam up to modern safety standards. In addition, new inundation maps are likely to be prepared as the project is reviewed.

Dam Failure Inundation Areas

Areas that can be inundated
by any one of:

-  5 different dams
-  4 different dams
-  3 different dams
-  2 different dams
-  1 dam only
-  Urbanized Area

Shaded to show topographical relief



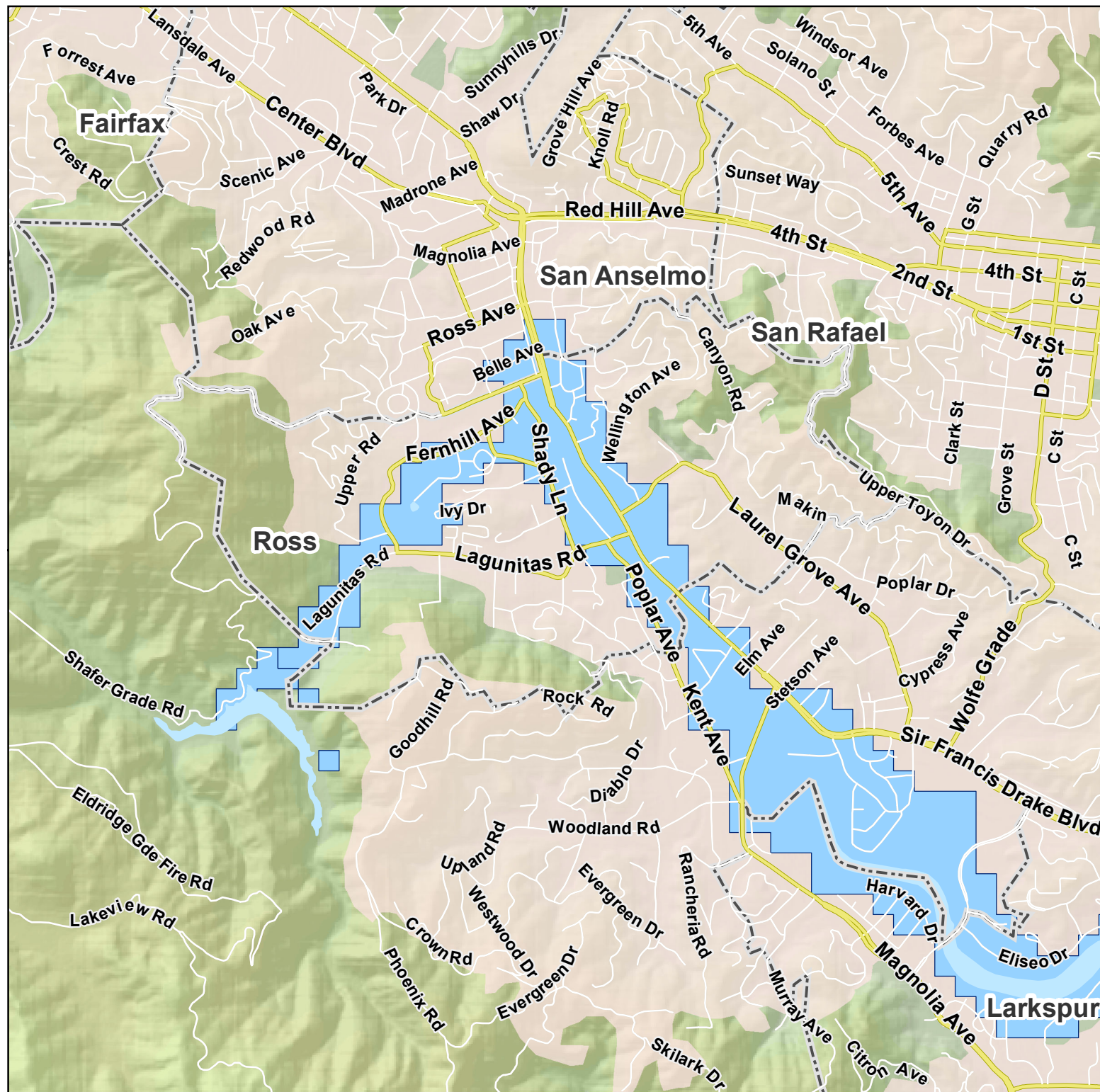
Scale: 1 inch = 0.41 miles

This map is intended for planning use only
and is not intended to be site specific.
Rather it depicts the general risk within
neighborhoods and the relative risk from
community to community.

This hazard map is generalized from maps
dam owners are required to prepare and file
with the State Office of Emergency Services.

Source: ABAG, 1995

This map is available at
<http://quake.abag.ca.gov>



Drought

Hazard Profile

Town of Ross receives water from the Marin Municipal Water District (MMWD). The Town and many residents have groundwater wells for irrigation. MMWD has a long-term water supply and management plan that includes a drought analyses and impacts of climate change. The information in this section is obtained from the 2010 Water Management Plan.

Description

A drought is a long period (typically two or three years) with below average rainfall that results in deficiencies in surface and subsurface water supplies.

MMWD has precautions to avoid or minimize droughts. During a declared shortage, MMWD would issue notifications to its customers to conserve water. If the length of service interruption were to be for an extended period of time, MMWD would determine if the situation is localized or widespread and develop a specific plan to provide water for health and safety during the situation. During extended periods of water shortage the District has worked with other water suppliers to provide modest amounts of water.

Location

The entire Town of Ross is subject to drought.

Extent

The longer the duration of the drought, the more severe the potential impacts will be.

Previous occurrences of the hazard

The Marin Municipal Water District 2010 Urban Water Management Plan provides information on previous Marin County droughts. Marin County experienced a drought in 1975 to 1977. This was MMWD's drought of record. A more prolonged drought punctuated with brief periods of rainfall occurred from 1987 through 1992.

Probability of future events

According to MMWD, the 1976-78 drought was an unusual event, with a recurrence pattern estimated in excess of once in 400 years. The worst 3 and 5 year dry periods in the record are not particularly severe, with a return frequency of less than once in 100 years.

Assessment of Town Vulnerability

Droughts are usually associated with the hazard of impacts on agriculture, which can impact people indirectly. Since there is no agriculture in Ross, prolonged periods of drought do not cause crop losses. Lack of water affects the Town creeks, groundwater supply, threatened species (Steelhead), and the Town's ability to suppress wildfires. A drought may result in dry vegetation that is susceptible to ignition and wildfires. A drought in Ross can affect residents and businesses that rely on water. A drought can result in financial losses associated with loss of landscaping.

The Marin Municipal Water District indicates that existing water supply sources, in combination with the conservation program, are projected to be sufficient to meet the needs of the MMWD service area for the planning horizon of the 2010 Urban Water Management Plan.

MMWD indicates their facilities are designed to collect and deliver a sufficient amount of water to survive a repeat of the 1976-78 drought with an acceptable level of emergency water rationing. Due to the current level of conservation by its customers (who have reduced their per capita water consumption by 29% compared to the non-conserving water use levels of the 1970s), MMWD is planning its future water supply so that the depth of mandatory rationing will be no more than 25% with a frequency of once in 80+ years.

Based on the 2010 Urban Water Management Plan, MMWD is not currently seeking alternative water supplies such as desalination.

Climate change is likely to increase the number and severity of future droughts. The magnitude of this change is currently unknown.

Estimating Potential Losses

With current supplies and conservation levels, drought is not anticipated to cause significant losses. Climate change may result in a warmer climate and droughts could become more frequent, more severe, and longer-lasting.

Plan Maintenance Process

Monitoring, Evaluating, and Updating the Plan

The Town is required to review and revise this hazard mitigation plan and resubmit it for approval within 5 years in order to remain eligible for mitigation project grant funding.

To ensure the plan stays current and incremental progress is made on implementing the mitigation strategies, the Town will make every effort to update this Plan within five years by using a similar method to update the plan as was used to develop this plan. The Town will consider working with the Association of Bay Area Governments to update this plan as an Annex to the ABAG Regional Hazard Mitigation Plan. Representatives of each Town department will form a planning team to review and update the plan. All plan updates will be subject to the public input and review process that is a part of all plan development in the Town of Ross. A draft plan will be presented at a public hearing to the Town Council by June 2015. The plan would be resubmitted for approval before November 2015. The Town may update the plan at its own discretion any time prior to that if new hazard information becomes available, priorities for implementation change, or other circumstances prompt an update.

The town planner (or other staff as assigned by the Town Manager) will review the implementation of the plan annually, concurrently with the annual review of the Ross General Plan. The town planner will solicit progress reports from the departments assigned responsibility for implementation of each of the mitigation actions. Suggestions for changes in priorities of existing actions may be made at that time, as well as suggestions for new mitigation actions to be incorporated into the next update of the plan.

Incorporation into Existing Planning Mechanisms

The Town will incorporate the mitigation programs into existing programs. The mitigation objectives and actions are designed to be carried out through the normal government activity. For example, any code revisions or updates will be accomplished using standard procedures for code development. Structural improvements to buildings and infrastructure will be incorporated into the Town capital improvement projects and be subject to that process.

Continued Public Involvement

The Town will continue to involve the public in the plan maintenance by noticing meetings when the plan will be reviewed and discussed through the Town email list and by postings at Town Hall and the Town Post Office.

The adopted plan will be placed on the Town website. When the Town proceeds with an update of the plan, a public hearing will be held to solicit public comment and input. All draft updates will be posted on the Town website for public review prior to consideration by the Town Council.

Mitigation Strategy

Local Hazard Mitigation Goals

The Town's hazard mitigation goals are taken from Part IV of the *Town of Ross General Plan 2007-2025*. The Town *General Plan* was adopted after extensive public participation by a committee made up of Ross residents assisted by Town Staff. The mitigation goals also include the Town's goals to protect historic structures and the natural environment.

Historic Heritage. Maintain the historic feel of Ross by preserving and maintaining historic buildings, resources and areas with recognized historic or aesthetic value that serve as significant reminders of the past. (General Plan Policy 4.1)

Town Bridges. Maintain and protect bridges as an important part of Ross' heritage. If a bridge must be rebuilt or retrofitted, it should be done in a way that is compatible with its historic look. (General Plan Policy 4.3)

Protecting Community Health and Safety, and Preparing for Emergencies

Location of Future Development. Development will only be permitted in areas where risks to residents can be adequately mitigated. (General Plan Policy 5.1)

Geologic Review Procedures. At the time a development is proposed, Ross geologic and slope stability maps should be reviewed to assess potential geologic hazards. In addition, suitability for development must be based on site-specific geotechnical investigations. (General Plan Policy 5.2)

Fire Resistant Design. Buildings should be designed to be fire defensive. Designs should minimize risk of fire by a combination of factors including, but not limited to, the use of fire-resistant building materials, fire sprinklers, noncombustible roofing and defensible landscaping space. (General Plan Policy 5.3)

Maintenance and Landscaping for Fire Safety. Ensure that appropriate fire safety and landscaping practices are used to minimize fire danger, especially in steeper areas. Due to the high fire hazard in the steeper areas of Town, special planting and maintenance programs will be required to reduce fire hazards in the hills and wildland areas, including removal of invasive non-native vegetation such as broom, acacia and eucalyptus. (General Plan Policy 5.4)

Fire Safety in New Development. New construction will adhere to all safety standards contained in the Building and Fire Code. Hazards to life and property shall be minimized by such measures as fire preventive site design, fire resistant landscaping and building materials, and the use of fire suppression techniques and resources. (General Plan Policy 5.5)

Hazardous Materials Storage and Disposal. Require the proper use, storage, and disposal of hazardous materials to prevent leakage, contamination, potential explosions, fires or the escape of harmful gases, and to prevent individually innocuous materials from combining to form hazardous substances, especially at the time of disposal. (General Plan Policy 5.11)

Access for Emergency Vehicles. New construction shall be denied unless designed to provide adequate access for emergency vehicles, particularly fire fighting equipment. (General Plan Policy 5.12)

Town Responsibilities for Emergency Preparation and Response. Undertake emergency preparedness planning in cooperation with other public agencies and local organizations. Publicize emergency plans, provide information on disaster preparedness to residents and businesses, and continue essential Town emergency public services during natural disasters. (General Plan Policy 5.13)

Flood Protection in New Development. All new construction and substantial remodels within the 100-year floodplain must comply with the Town's floodplain regulations. (General Plan Policy 6.1)

Flood Control Improvements. The Town supports the construction of flood control improvements consistent with the natural environment, the design character of the Town of Ross and the safety and protection of persons and property. (General Plan Policy 6.2)

Ross Valley Flood and Watershed Protection. The Town will work with other jurisdictions within the Ross Valley watershed to develop a comprehensive approach to flood protection and resource preservation strategies. (General Plan Policy 6.3)

Runoff and Drainage. Stormwater runoff should be maintained in its natural path. Water should not be concentrated and flow onto adjacent property. Instead, runoff should be directed toward storm drains or, preferably to other areas where it can be retained, detained, and/or absorbed into the ground. (General Plan Policy 6.4)

Permeable Surfaces. To the greatest extent possible, development should use permeable surfaces and other techniques to minimize runoff into underground drain systems and to allow water to percolate into the ground. Landscaped areas should be designed to provide potential runoff absorption and infiltration. (General Plan Policy 6.5)

Creek and Drainage Setbacks, Maintenance and Restoration. Keep development away from creeks and drainageways. Setbacks from creeks shall be maximized to protect riparian areas and to protect residents from flooding and other hazards. Encourage restoration of runoff areas, to include but not be limited to such actions as sloping banks, providing native Creek access vegetation, protecting habitat, etc., and work with property owners to identify means of keeping debris from blocking drainageways. (General Plan Policy 6.6)

Riparian Vegetation. Protect existing creek and riparian vegetation and encourage the use of native species during creek restoration. Assure that modification of natural channels is done in a manner that retains and protects creekside vegetation, integrates fish passage and includes habitat restoration in its natural state. (General Plan Policy 6.7)

List of Mitigation Strategies with Priorities and Hazards Mitigated

The planning team identified, considered and analyzed a comprehensive range of specific mitigation actions and projects to reduce the effects of each hazard. Factors considered to select mitigation measures included: 1.) public support for the mitigation action, 2.) feasibility and any secondary impacts, 3.) anticipated staffing, funding, and maintenance requirements to determine if the Town has the personnel and administrative capabilities necessary to implement the action or whether outside help would be needed, 4.) legal authority to implement the action, 5.) budget constraints and cost (“Big ticket” mitigation actions have been considered for implementation where additional Federal and State funding may be available), and 6.) impact on the environment and historic structures.

Prioritization of mitigation strategy

The following table defines the priorities for mitigation used by the planning team to designate the priority for each mitigation strategy:

Existing Program	This is an official program or strategy that is currently occurring and generally receives adequate funding.
Existing program underfunded	This is an existing program that has recently received less funding than needed to maintain the program or strategy to its full potential. Additional funding is needed to effectively carry out this strategy. In some cases the Town has deferred this strategy due to lack of funding.
Very high	This is a mitigation strategy which is generally occurring, but either does not require money to implement or is being carried out on an unofficial basis.
High	This is a program which is considered to be a high priority and for which funded is being actively sought and can be implemented as soon as funding becomes available.
Moderate	This is a strategy which is deemed beneficial, but for which funding is not actively being sought. The Town would consider implementing this strategy if funding became available, but it is not deemed a high priority.

Implementation of Mitigation Actions

The spreadsheet details the department(s) responsible for implementing the actions. All actions will be funded by the Town general fund or grant funding. The timeframe to complete each action is provided.

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
AH-1	All-Hazards	Education and Awareness	Train homeowners to locate and shut off gas valves if they smell or hear gas leaking.	Existing program	Low	Continuous	Fire
AH-2	All-Hazards	Education and Awareness	Conduct periodic tests of the alerting and warning system.	Existing program	Low	Continuous	Fire
AH-3	All-Hazards	Education and Awareness	Implement Ross Valley Emergency Preparedness. Initiate discussions with other Ross Valley jurisdictions to consider opportunities to jointly respond to emergencies such as flood, fire, earthquake or other emergency situations. Cost savings and coordination opportunities could include the creation of a Town staff disaster planning coordinator, formation of a disaster preparedness committee reporting to Town staff (resident volunteers, Town official), sharing of resources and development of outreach programs to residents and businesses to provide training and information about disaster preparedness. (General Plan Program 5.B)	Existing program, underfunded	Medium	2-3 years	Fire
AH-4	All-Hazards	Education and Awareness	Encourage the formation of a community- and neighborhood-based approach to wildfire education and action through local Fire Safe Councils and the Fire Wise Program to take advantage of grant funds currently available to offset costs of specific council-supported projects.	Existing program, underfunded	TBD	1-2 years	Fire
AH-5	All-Hazards	Education and Awareness	Promote attendance at local or regional hazard conferences and workshops for elected officials and staff to educate them on the critical need for programs in mitigating earthquake, wildfire, flood, and landslide hazards.	Existing program	Low	Continuous	Administration, Building and/or Planning
AH-6	All-Hazards	Education and Awareness	Facilitate the distribution of emergency preparedness or mitigation materials that are prepared by others, such as by posting links at the Town web site, emails and placing materials at the Ross Post Office. Conduct workshops, and/or provide outreach encouraging residents, school employees, and private businesses' employees to have family disaster plans that include drop-cover-hold earthquake drills, fire and storm evacuation procedures, and shelter-in place emergency guidelines.	Existing program	Low	Continuous	Fire
AH-7	All-Hazards	Education and Awareness	Review and, if necessary, update evacuation plans. Consider organizing evacuation drills.	High	TBD	1-3 years	Fire
AH-8	All-Hazards	Education and Awareness	Consider expanding residential building reports to include hazard disclosure for known natural hazards in Ross: 1) Special Flood Hazards Areas (designated by FEMA), 2) Areas of Potential Flooding from dam failure inundation, 3) Very High Fire Hazards Severity Zones, 4) Wildland Fire Zones, and 5) Liquefaction and Landslide Hazards Zones (designated under the Seismic Hazards Mapping Act).	Low	Low	1-3 years	Building and/or Planning
AH-9	All-Hazards	Historic Preservation	Establish preservation-sensitive measures for the repair and re-occupancy of historically significant privately-owned structures, including requirements for temporary shoring or stabilization where needed, arrangements for consulting with preservationists and expedited permit procedures for suitable repair or rebuilding of historically or architecturally valuable structures.	Moderate	Medium	1-2 years	Building and/or Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
AH-10	All-Hazards	Historic Preservation	Create incentives for private owners of historic or architecturally significant buildings to undertake mitigation to levels that will minimize the likelihood that these buildings will need to be demolished after a disaster, particularly if those alterations conform to the federal Secretary of the Interior's Guidelines for Rehabilitation.	Medium	Low	1-2 years	Building and/or Planning
AH-11	All-Hazards	Prevention	Continue development and maintenance of the Local Hazard Mitigation Plan. Consider coordination with the ABAG Regional Hazard Mitigation Plan in the future.	Very High	Low	1 Year	Planning
AH-12	All-Hazards	Prevention	Create and update hazard mitigation page on the Town website that provides a copy of the hazard plan, progress reports, information on hazards and mitigation with an emphasis on what residents may undertake to mitigate for their own sites, emergency response and warning information.	Existing program	Low	6 months	Planning
AH-13	All-Hazards	Prevention	Continue to regulate and enforce the location and design of street-address numbers on buildings.	Existing program	Low	Continuous	Building and Fire
AH-14	All-Hazards	Prevention	Encourage replacing above ground electric and phone wires and other structures with underground facilities, and use the planning-approval process to ensure that all new phone and electrical utility lines are installed underground.	Existing program	Low	Continuous	Building
AH-15	All-Hazards	Prevention	Support and encourage efforts of lifeline infrastructure/utility system providers (PG&E, MMWD and Marin Sanitary Service) as they plan for and arrange financing for seismic retrofits and other disaster mitigation strategies. (For example, by passing resolutions in support of retrofit programs.)	High Priority	Low	Continuous	Administration
AH-16	All-Hazards	Prevention	Assist residents and businesses in the development of defensible space through roadside collection and/or chipping services (for brush, weeds, and tree branches).	Moderate	Medium	1 Year	Fire
AH-17	All-Hazards	Prevention	Consider establishing a hazard mitigation fee for building permits to create a hazard mitigation funding source for initiatives or grant cost-share requirements	Low	Low	1-3 years	Administration, Planning and/or Building
AH-18	All-Hazards	Prevention	Consider hazard abatement districts as a funding mechanism to ensure that mitigation strategies are implemented and enforced over time.	Low	Medium	1-3 years	Administration, Planning and/or Building
AH-19	All-Hazards	Prevention	Consider improvement of currently unused pedestrian rights-of-way/paths as walkways to serve as additional evacuation routes.	Low	High	2-5 years	Public Works and/or Planning
AH-20	All-Hazards	Prevention	Map areas of vulnerable roads and develop action plan to assist residents to repair private roads, driveways and slide hazard areas.	Medium	TBD	1-3 years	Public Works
AH-21	All-Hazards	Prevention	Identify and work with non-profits and through other mechanisms to protect as open space those areas susceptible to extreme hazards (such as through land acquisition, zoning, and designation as priority conservation areas).	Medium	TBD	1-3 years	Administration or Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
AH-22	All-Hazards	Prevention	Develop a continuity of operations plan for the Town that includes back-up storage of plans and essential electronic files as well as procedures to continue normal Town operations after a disaster. Identify and mitigate problems with architectural components and equipment that will prevent critical buildings from being functional after major natural disasters, such as computers and servers, phones, files, and other tools used by staff to conduct daily business.	High	Medium	1-2 years	Administration
AH-23	All-Hazards	Prevention	Prepare a basic Recovery Plan that outlines the major issues and tasks that are likely to be the key elements of community recovery, as well as integrate this planning into response planning (such as with continuity of operations plans).	Moderate	Low	1-3 years	Administration, Fire and Police
AH-24	All-Hazards	Property Protection	Elevate Public Safety building and Town Hall above the base flood elevation and upgrade to meet current fire and seismic safety standards.	Existing program, underfunded	\$3,000,000 to \$6,000,000	1-5 years	Town Administration
AH-25	All-Hazards	Property Protection	Consider retrofit or replacement of critical facilities that are shown to be vulnerable to damage in natural disasters, considering any issues of historical significance.	Existing program, underfunded	High	1-5 years	Public Works
AH-26	All-Hazards	Property Protection	Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling Town-owned facilities.	Moderate	TBD	1-5 years	Public Works
AH-27	All-Hazards	Recovery	Establish plans for ensuring fuel will be available for police, fire and vehicles for other recovery staff in the event of a large scale Bay Area disaster.	Moderate	Low	2-3 years	Fire and Police
AH-28	All-Hazards	Recovery	Train on call public works staff in emergency response.	Moderate	\$25,000	1-2 years	Public Works
AH-29	All-Hazards	Recovery	If necessary, when remodeling Town-owned buildings and facilities, remove asbestos to speed up clean up of buildings so that they can be reoccupied more quickly.	Low	TBD	1-5 years	Public Works
AH-30	All-Hazards	Recovery	Develop and enforce a repair and reconstruction ordinance to ensure that damaged buildings are repaired in an appropriate and timely manner and retrofitted concurrently.	Existing Program	Low	6-12 months	Planning
AH-31	All-Hazards	Recovery	Develop post-disaster development and recovery ordinance to facilitate recovery.	Existing Program	Low	6-12 months	Planning
AH-32	All-Hazards	Recovery	Consider a program to encourage owners of private buildings and educational facilities to participate in a program similar to San Francisco's Building Occupancy Resumption Program (BORP). This program permits owners of private buildings to hire qualified structural engineers to create building-specific post-disaster inspection plans and allows these engineers to become automatically deputized as City/County inspectors for these buildings in the event of an earthquake or other disaster.	Moderate	Low	1-3 years	Building and/or Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
AH-33	All-Hazards	Response	Continue to maintain a list of property owners that may need assistance during or after a hazard event and their contact information, such as seniors and the disabled.	Existing program	Low	Continuous	Fire
AH-34	All-Hazards	Response	Continue the neighborhood watch block captain and team programs.	Existing program	Low	Continuous	Fire
AH-35	All-Hazards	Response	Continue to sponsor the formation and training of Get Ready Ross / Community Emergency Response Teams (CERT) for residents in the community.	Existing program	Low	Continuous	Fire
AH-36	All-Hazards	Response	Continue to work with other local agencies to offer the 20-hour basic CERT training course.	Existing program	Low	Continuous	Fire
AH-37	All-Hazards	Response	Consider relocating or setting up backup Town Emergency Operations Center out of the floodplain and train employees on how to access the area and on the EOC plan.	Very High	Low	6 months	Fire
AH-38	All-Hazards	Response	Provide information to encourage residents to maintain at least 72 hours and up to one week of emergency supplies in the event of isolation during an emergency for work and home.	Very High	Low	1 Year	Fire
AH-39	All-Hazards	Response	In the event that lights are needed for rapid evacuation after a disaster, consider installing battery back-ups, emergency generators, or lights powered by alternative energy sources to ensure that intersection traffic lights function following loss of power.	Low	Medium	1-3 years	Public Works
AH-40	All-Hazards	Response	Consider relaxing development standards for installation of emergency generators (such as exceptions to setbacks).	Low	Low	1-3 years	Planning
AH-41	All-Hazards	Response	Obtain at least three laptop computers for use outside of Police Department should the public safety building be uninhabitable due to hazards.	Moderate	\$3,000	1 Year	Police
AH-42	All-Hazards	Response	Obtain propane heaters, stoves and lanterns for emergency use for employees.	Moderate	Low	1 Year	Police
AH-43	All-Hazards	Response	Encourage employees to have a family disaster plan so that they are prepared to assist the Town in the event of a disaster.	Very High	Low	6-12 months	Fire
AH-44	All-Hazards	Response	Ensure that fire, police, and other emergency personnel have adequate radios, breathing apparatuses, protective gear, and other equipment to respond to a major disaster.	High	Medium	1-2 years	Fire, Police and Public Works
AH-45	All-Hazards	Response	Maintain the Town's emergency operations center in a fully functional state of readiness.	Existing program	Low	Continuous	Fire
AH-46	All-Hazards	Response	Update and maintain the Town's Standardized Emergency Management System (SEMS) Plan and the National Incident Management System (NIMS) Plan, and submit an appropriate NIMSCAST report.	Existing program	Low	1 Year	Fire and Police
AH-47	All-Hazards	Response	Work cooperatively with the American Red Cross, Town schools, churches, MA&GC and non-profits to set up memoranda of understanding for use of education facilities as emergency shelters following disasters.	Moderate	Low	1 Year	Administration or Fire

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
AH-48	All-Hazards	Response	Minimize the likelihood that power interruptions will adversely impact critical facilities by ensuring that they have adequate back-up power. Obtain small gasoline powered generator for emergency power for public safety to charge flashlight, portable batteries, etc.	Moderate	\$1,000	1 Year	Fire and Police
AH-49	All-Hazards	Response	Develop a program to provide at-cost NOAA weather radios to residents of flood hazard areas that request them, with priority to neighborhood watch captains and others trained in their use.	Moderate	Low	1-3 years	Fire
AH-50	All-Hazards	Response	Offer CERT training to employees.	Moderate	Low	1-3 years	Fire
AH-51	All-Hazards/Climate Change	Prevention	Continue to implement activities in the Town of Ross Climate Action Plan (November 2010).	Existing program, underfunded	TBD	Continuous	Administration
DAM-1	Dam Failure	Response	Improve coordination among the Marin Municipal Water District and the Town so that the Town can better plan for evacuation of areas that could be inundated if the Phoenix Lake Dam fails.	Moderate	Low	1-3 years	Fire
DR-1	Drought	Prevention	Continue to require projects to comply with MMWD water conservation ordinances.	Existing program	Low	Continuous	Planning and Building
EQ-1	Earthquakes	Education and Awareness	Obtain a current initial earthquake performance evaluation of Town owned buildings (public safety, Town Hall, post office). Inform staff, Town Council and the public, regarding the extent to which the Town buildings may be affected by an earthquake and if they will only perform at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake.	Moderate	TBD	12-18 months	Public Works
EQ-2	Earthquakes	Historic Preservation	If necessary, research to determine seismic stability of Town-owned bridges. If work is necessary, expedite the funding and retrofit of seismically-deficient Town-owned bridges by working with Caltrans and other appropriate governmental agencies, considering they are historic structures.	High	TBD	1-3 years	Public Works
EQ-3	Earthquakes	Prevention	Continue to require preparation of site-specific geologic or geotechnical reports for development and redevelopment proposals in areas subject to earthquake-induced landslides or liquefaction and condition project approval on the incorporation of necessary mitigation measures related to site remediation, structure and foundation design, and/or avoidance.	Existing program	Low	Continuous	Building
EQ-4	Earthquakes	Prevention	Require that local government reviews of geologic and engineering studies are conducted by appropriately trained and credentialed staff or contractors.	Existing program	Low	Continuous	Administration and/or Building
EQ-5	Earthquakes	Prevention	Investigate and adopt appropriate financial, procedural, and land use incentives for property owners to retrofit vulnerable structures (see http://quake.abag.ca.gov/fixit). Inform residents that retrofits are exempt from increases in property taxes.	High	Low	1-3 years	Building and/or Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementation	Responsible Department
EQ-6	Earthquakes	Prevention	Create a mechanism to require the bracing of water heaters and flexible couplings on gas appliances, and/or the bolting of homes to their foundations and strengthening of cripple walls to reduce fire ignitions due to earthquakes.	Moderate	Low	1-3 years	Building and/or Fire
EQ-7	Earthquakes	Property Protection	Continue to require engineered plan sets for seismic retrofitting of heavy two-story homes with living areas over garages, split level homes, soft-story seismic retrofits, and hillside homes, until standard plan sets and construction details become available.	Existing program	Low	Continuous	Building
EQ-8	Earthquakes	Property Protection	Continue to require that all new privately-owned buildings be constructed in compliance with requirements of the most recently adopted version of the California Building Code.	Existing program	Low	Continuous	Building
EQ-9	Earthquakes	Property Protection	Ensure that building department staff and contract building inspectors are appropriately trained and certified and support continued education to ensure enforcement of building codes and construction standards, as well as to identify typical design inadequacies of housing and recommended improvements.	Existing program	Low	Continuous	Administration and/or Building
EQ-10	Earthquakes	Property Protection	Promote regional retrofit classes or workshops for homeowners.	Very High	Low	Continuous	Building and/or Planning
EQ-11	Earthquakes	Property Protection	Require geologic reports in areas mapped by others as having significant liquefaction or landslide hazards.	Existing program	Low	Continuous	Building and/or Planning
EQ-12	Earthquakes	Property Protection	Encourage contract building inspector and building staff to take classes on a periodic basis (such as the FEMA- developed training classes offered by ABAG) on retrofitting of single-family homes, including application of Plan Set A.	Very High	Low	Continuous	Building
EQ-13	Earthquakes	Property Protection	Expedite the funding and retrofit of road structures by working with Caltrans and other appropriate governmental agencies.	Existing program, underfunded	TBD	Continuous	Public Works
EQ-14	Earthquakes	Property Protection	Consider modification to Town building code to initiate a lower threshold for seismic improvement.	Moderate	Low	1-5 years	Building
EQ-15	Earthquakes	Property Protection	Utilize or consider adoption of a retrofit standard that includes standard plan sets and construction details for voluntary bolting of homes to their foundations and bracing of outside walls of crawl spaces ("cripple" walls), such as Plan Set A developed by a committee representing the East Bay-Peninsula-Monterey Chapters of the International Code Council (ICC), California Building Officials (CALBO), the Structural Engineers Association of Northern California (SEAONC), the Northern California Chapter of the Earthquake Engineering Research Institute (EERI-NC), and ABAG's Earthquake Program.	Moderate	Low	1-3 years	Building
EQ-16	Earthquakes	Property Protection	Install earthquake-resistant connections when pipes enter and exit bridges and work to retrofit of these structures.	Moderate	TBD	1-5 years	Public Works

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
EQ-17	Earthquakes	Property Protection	Prepare an inventory of private facilities that are potentially hazardous, including, but not limited to, multiunit, soft story, concrete tilt-up, and concrete frame buildings.	Moderate	TBD	1-5 years	Building and/or Planning
FL-1	Flooding	Education and Awareness	As new flood-control projects are completed, request that FEMA revise its flood-insurance rate maps and digital Geographic Information System (GIS) data to reflect flood risks as accurately as possible.	Existing program	Low	Continuous	Public Works
FL-2	Flooding	Education and Awareness	Document and install plaques to inform property owners of historic flood levels.	Low	TBD	1-5 years	Public Works/Building
FL-3	Flooding	Prevention	Work with San Anselmo to improve their drainage system and add new culverts at seven sites along upper Oak Avenue in San Anselmo, as identified as Measure 1 in the "Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Stormwater; Bolinas Avenue in Ross and San Anselmo, California," January 25, 2011.	Existing program underfunded	\$330,000	1-2 years	Public Works
FL-4	Flooding	Prevention	Consider amending the Town floodplain management ordinance to create cumulative substantial improvement rules.	Moderate	Low	1-3 years	Building and/or Planning
FL-5	Flooding	Prevention	Prepare articles to educate /remind homeowners of actions they can take before/after a storm.	Existing program	\$5,000	Annual	Public Works
FL-6	Flooding	Prevention	Annually inspect and clean Town creeks of debris. Use public outreach to inform the Town's residents of the annual creek clean-up work. Maintain a log of debris removed annually.	Existing program	\$15,000	Annual	Public Works
FL-7	Flooding	Prevention	Continue to provide information on locations for obtaining sandbags deliver those materials to vulnerable populations upon request.	Existing program	Low	Annual	Public Works
FL-8	Flooding	Prevention	Continue to provide link to web enabled and publicly-accessible County automated system of flood gauges.	Existing program	0	Completed	Administration
FL-9	Flooding	Prevention	Assist, support, and/or encourage the U.S. Army Corp of Engineers, various Flood Control and Water Conservation Districts, and other responsible agencies to locate and maintain funding for the development of flood control projects that have high cost-benefit ratios (such as through the writing of letters of support and/or passing resolutions in support of these efforts).	Existing program	Low	Continuous	Administration
FL-10	Flooding	Prevention	Continue to encourage new development near floodways to incorporate a setback from watercourses to allow for changes in stormwater flows in the watershed over time.	Existing program	Low	Continuous	Planning
FL-11	Flooding	Prevention	Continue to have Town staff inspect creek areas after each storm.	Existing program	Low	Continuous	Public Works
FL-12	Flooding	Prevention	Continue to inspect creek areas in response to citizen complaints.	Existing program	Low	Continuous	Public Works
FL-13	Flooding	Prevention	Encourage residents and business owners to elevate structures within flood hazard areas.	Existing program	Low	Continuous	Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementation	Responsible Department
FL-14	Flooding	Prevention	Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform to the Regional Water Quality Control Board's Best Management Practices.	Existing program	Low	Continuous	Public Works
FL-15	Flooding	Prevention	Continue to enforce regulations concerning new construction (and major improvements to existing structures) within flood zones in order to be in compliance with federal requirements and become a participant in the Community Rating System of the National Flood Insurance Program.	Existing program	Low	Continuous	Building
FL-16	Flooding	Prevention	Install grates to catch debris.	Existing program	Medium	Continuous	Public Works
FL-17	Flooding	Prevention	Participate in Ross Valley Flood Protection and Watershed Program. Work with other Ross Valley jurisdictions to address a watershed-wide approach to drainage, warning systems, emergency response, and flood insurance programs. (General Plan Program 6.A)	Existing program	TBD	Continuous	Public Works and Administration
FL-18	Flooding	Prevention	Perform annual creek dredging to remove accumulated sediments from Lagunitas Road to the fish ladder.	Existing program	\$35,000	Continuous	Public Works
FL-19	Flooding	Prevention	Continue to repair and make structural improvements to storm drains, pipelines, and/or channels to enable them to perform to their design capacity in handling water flows as part of regular maintenance activities. Continue to request private property owners to do the same, as necessary.	Existing program	\$250,000	One to five years	Public Works
FL-20	Flooding	Prevention	Work with other Ross Valley jurisdictions to explore and adopt land use regulations to minimize additional runoff, or reduce runoff, within the Ross Valley watershed. (General Plan Program 6.C)	Existing program	Low	Ongoing	Public Works, Planning and/or Administration
FL-21	Flooding	Prevention	Prepare GIS storm water map of the watershed to determine the water flow and design a culvert system appropriate to the volume and flow of peak runoff. Complete the identification of existing culverts and the need for new ones.	Existing program underfunded	\$80,000	Two to Five months	Public Works
FL-22	Flooding	Prevention	Reconstruct and enlarge bridge openings and culverts.	Moderate	TBD	Continuous	Public Works
FL-23	Flooding	Prevention	Construct a new 1,400 ft. long, 42-48" diameter reinforced concrete pipe culvert network running under the south gutter line on lower Bolinas Avenue. The culvert would originate with inlets at the Richmond Avenue intersection and outfall to Corte Madera Creek at the Sir Francis Drake Boulevard Bridge, as identified as Measure 4 in the "Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Stormwater; Bolinas Avenue in Ross and San Anselmo, California," January 25, 2011.	Existing program, underfunded	\$780,000	1-2 years	Public Works
FL-24	Flooding	Prevention	Construct an approximately 300,000 gallon subsurface stormwater detention vault beneath Richmond Avenue as identified as Measure 8b in the "Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Stormwater; Bolinas Avenue in Ross and San Anselmo, California," January 25, 2011.	Existing program, underfunded	\$650,000	1-2 years	Public Works

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementation	Responsible Department
FL-25	Flooding	Prevention	Create bioretention areas at the St. Anselm Church overflow parking lot and the Town's adjacent right of way as identified as Measure 4b in the "Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Stormwater; Bolinas Avenue in Ross and San Anselmo, California," January 25, 2011.	Existing program, underfunded	\$220,000	1-2 years	Public Works
FL-26	Flooding	Prevention	Ensure staff are knowledgeable regarding floodplain management regulations to improve enforcement of current standards for all development within flood hazard areas. Ensure that contract building inspectors have appropriate training and expertise in floodplain management regulations to monitor construction projects.	Very High	0 to \$25,000	1-2 years	Building and Planning
FL-27	Flooding	Prevention	Secure a one-way flap gate at the existing Corte Madera Creek outfall at the Winship Avenue Bridge section as identified as Measure 2j in the "Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Stormwater; Bolinas Avenue in Ross and San Anselmo, California," January 25, 2011.	Existing program, underfunded	\$20,000	1-2 years	Public Works; County of Marin agencies responsible for implementing the Ross Valley Flood Reduction and Creek Management Strategy.
FL-28	Flooding	Prevention	Create and update a photo record of the Town creeks to document condition and structures linked with GPS.	Existing program, underfunded	\$10,000	Annual	Public Works
FL-29	Flooding	Prevention	Continue maintenance efforts to keep storm drains and creeks free of obstructions, while retaining vegetation in the channel (as appropriate) to allow for the free flow of water. Develop a "Maintain-a-Drain" campaign, similar to that of the City of Oakland, encouraging private businesses and residents to keep storm drains in their neighborhood free of debris.	Existing program, underfunded	Low	Continuous	Public Works
FL-30	Flooding	Prevention	Support creation of detention basins at Phoenix Lake and locations in the Ross Valley and other flood control projects as recommended in the Ross Valley Flood Damage Reduction Feasibility Study.	Existing program, underfunded	TBD	Ongoing	Town Council
FL-31	Flooding	Prevention	Continue to develop guidelines that limit the coverage of impervious surfaces, that require the use of permeable surfaces, that implement other regulations to effectively channel and minimize site runoff, and that allow water to percolate into the ground. (General Plan Program 6.B)	High	Low	1 Year	Building and Planning
FL-32	Flooding	Prevention	Assist neighborhoods to develop regular program of inspecting and clearing private road culverts.	Moderate	Low	1-3 years	Public Works

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
FL-33	Flooding	Prevention	To reduce flood risk, thereby reducing the cost of flood insurance to private property owners, apply for participation in the Community Rating System of the National Flood Insurance Program and work to qualify for the highest-feasible rating.	Moderate	Low	2-3 years	Building
FL-34	Flooding	Prevention	When properties that may provide opportunities for drainage improvements are for sale, acquire easements to install drainage improvements, such as between Bolinas Avenue and Fernhill.	Moderate	High	Ongoing	Public Works
FL-35	Flooding	Property Protection	Amend Town floodplain management regulations to review thresholds for “substantial improvement” to take into account the depreciated cost value of structures, rather than the market value.	Moderate	Low	1-2 years	Building and/or Planning
FL-36	Flooding	Property Protection	Create a building and elevation inventory of structures in the floodplain	Moderate	Medium	1-3 years	Building and/or Planning
FL-37	Flooding	Property Protection	Adopt regulations or design guidelines to limit basement and understory storage and mechanical areas below the base flood elevation, particularly for repetitive damaged properties.	Moderate	Low	1-5 years	Building and/or Planning
FL-38	Flooding	Property Protection	Amend Town floodplain management regulations to adopt freeboard regulation to require finished floor to be 18” above the base flood elevation, rather than at the base flood elevation, to protect joists and vents from flood damage. Develop base flood elevation map using historical flood data.	Moderate	Low	1-5 years	Building and/or Planning
FL-39	Flooding	Response	Purchase three pair hip-wader pants, for use by on-duty personnel to reach flooded areas.	High	\$1,500	1 Year	Police
FL-40	Flooding	Response	Purchase one SUV for use in flooding situations where patrol cars may not be able to operate due to high water.	Moderate	\$45,000	1 Year	Police
FL-41	Flooding	Property Protection	Continue the Town of Ross participation in the National Flood Insurance Program (NFIP) and require projects that result in substantial improvements to comply with the Town floodplain development regulations and provide elevation certificates to the Town.	Existing program	Low	Ongoing	Building
LS-1	Landslides	Prevention	Establish and enforce provisions under the creek protection, grading, storm water management, and discharge control ordinances designed to control erosion and sedimentation.	Existing program	Low	Ongoing	Building
LS-2	Landslides	Property Protection	Continue to enforce requirements in zoning ordinance to address hillside development constraints, especially in areas of existing landslides.	Existing program	Low	Ongoing	Planning

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementation	Responsible Department
LS-3	Landslides	Property Protection	Increase efforts to reduce landslides and erosion in existing and future development by improving appropriate code enforcement and use of applicable standards for private property, such as those appearing in the California Building Code, California Geological Survey Special Report 117 – Guidelines for Evaluating and Mitigating Seismic Hazards in California, American Society of Civil Engineers (ASCE) report Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California, and the California Board for Geologists and Geophysicists Guidelines for Engineering Geologic Reports. Such standards should cover excavation, fill placement, cut-fill transitions, slope stability, drainage and erosion control, slope setbacks, expansive soils, collapsible soils, environmental issues, geological and geotechnical investigations, grading plans and specifications, protection of adjacent properties, and review and permit issuance.	Existing program	Low	Ongoing	Building
LS-4	Landslides	Property Protection	Require geotechnical and soil-hazard investigations be conducted and filed to prevent grading from creating unstable slopes, and that any necessary corrective actions be taken prior to development approval.	Existing program	Low	Ongoing	Building and/or Planning
LS-5	Landslides	Property Protection	Require that staff and consultants reviewing these investigations are appropriately trained and credentialed.	Existing program	Low	Ongoing	Building
WF-1	Wildfires	Natural Resource Protection	Ensure that Town-initiated fire-preventive vegetation-management techniques and practices for creek sides and high-slope areas do not contribute to the landslide and erosion hazard. For example, vegetation in these sensitive areas could be thinned, rather than removed, or replanted with less flammable materials. When thinning, the non-native species should be removed first. Other options would be to use structural mitigation, rather than vegetation management in the most sensitive areas.	Existing program, underfunded	Medium	Continuous	Fire
WF-2	Wildfires	Prevention	Work with Marin Municipal Water District to identify needed improvements to the water supply for fire suppression.	Existing program	TBD	12-18 months	Fire
WF-3	Wildfires	Prevention	Continue to adopt and amend as needed updated versions of the California Building and Fire Codes so that optimal fire-protection standards are used in construction and renovation projects.	Existing program	Low	Continuous	Fire and Building
WF-4	Wildfires	Prevention	Increase local patrolling during periods of high fire weather.	Existing program	Low	Continuous	Fire
WF-5	Wildfires	Prevention	Monitor weather during times of high fire risk using, for example, weather stations tied into police and fire dispatch centers.	Existing program	Low	Continuous	Fire
WF-6	Wildfires	Prevention	Participate in multi-agency efforts to mitigate fire threat, such as the Hills Emergency Forum (in the East Bay), various FireSafe Council programs, and town/city-utility task forces. Such participation increases a jurisdiction's competitiveness in obtaining grants.	Existing program	Low	Continuous	Fire

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementat ion	Responsible Department
WF-7	Wildfires	Prevention	Increase efforts to reduce hazards in areas exposed to high to-extreme fire threat through improving engineering design and vegetation management for mitigation, appropriate code enforcement, and public education on defensible space mitigation strategies.	Existing program	Low	Continuous	Fire
WF-8	Wildfires	Prevention	Expand vegetation management program to more effectively manage the fuel load through roadside collection and chipping, mechanical fuel reduction equipment, use of goats or other organic methods of fuel reduction.	Existing program, underfunded	TBD	12-18 months	Fire
WF-9	Wildfires	Prevention	Continue the defensible space vegetation program.	Existing program, underfunded	Low	Continuous	Fire
WF-10	Wildfires	Prevention	Maintain fire roads and/or public right-of-way roads and keep them passable at all times or ensure that those responsible for maintenance and upkeep maintain the roads.	Existing program, underfunded	Medium	Continuous	Fire
WF-11	Wildfires	Prevention	Prepare an accurate database of water tanks owned by Marin Municipal Water District and privately owned tanks and swimming pools that are available for fire fighting. Plan for any additional tanks the Town may need to ensure enough capacity for fire fighting.	High	TBD	1 to 5 years	Fire and/or Planning
WF-12	Wildfires	Property Protection	Conduct periodic fire-safety inspections of all multi-family buildings, as required by State law. Conduct periodic fire-safety inspections of all privately-owned commercial and buildings.	Existing program	Low	Continuous	Fire
WF-13	Wildfires	Property Protection	For new development, ensure all dead-end segments of roads and/or long driveways include turn-around sufficient for fire equipment.	Existing program	Low	Continuous	Building, Planning and Fire
WF-14	Wildfires	Property Protection	Consider fire safety, evacuation, and emergency vehicle access when reviewing proposals to add secondary units or additional residential units in wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.	Existing program	Low	Continuous	Planning and Fire
WF-15	Wildfires	Property Protection	Create a mechanism to enforce provisions of the California Building and Fire Codes and other local codes that require the installation of smoke detectors and fire-extinguishing systems on existing residential buildings by making installation a condition of finalizing a permit for any work valued at over a fixed amount and/or as a condition for the transfer of property.	Existing program	Low	Continuous	Building and Fire
WF-16	Wildfires	Property Protection	Require fire sprinklers in all new or substantially remodeled structures.	Existing program	Low	Continuous	Fire

LIST OF MITIGATION STRATEGIES

No.	Hazard Addressed		Specific Mitigation Strategy	Priority	Estimated Cost (or High Medium Low if cost not available)	Timeline for Implementation	Responsible Department
WF-17	Wildfires	Property Protection	Require that new homes in wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat be constructed of fire-resistant building materials (including roofing and exterior walls) and incorporate fire-resistant design features (such as minimal use of eaves, internal corners, and open first floors) to increase structural survivability and reduce ignitability. Note - See Structural Fire Prevention Field Guide for Mitigation of Wildfires at http://osfm.fire.ca.gov/structural.html .	Existing program	Low	Continuous	Building and Planning
WF-18	Wildfires	Property Protection	Work with Marin Municipal Water District and homeowners to upgrade fire hydrants and water lines as necessary.	Existing program	\$1.8 million	One to five years.	Fire
WF-19	Wildfires	Property Protection	Require that development in hillside areas provide adequate access roads (with width and vertical clearance that meet the minimum standards of the Fire Code or relevant local ordinance), onsite fire protection systems, and fire breaks.	Existing program	Low	Ongoing	Building, Planning and Fire
WF-20	Wildfires	Property Protection	Prepare Water System (Pressure) Master Plan. Coordinate with the Marin Municipal Water District (MMWD) to evaluate water pressure and water lines to ensure adequate fire protection. Identify locations where improvements are needed and adopt requirements and funding mechanisms in coordination with MMWD to implement these improvements. (General Plan Program 5.A)	Existing program, underfunded	TBD	Ongoing	Fire
WF-21	Wildfires	Property Protection	Continue to ensure existing and new development have a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow).	Existing program, underfunded	Low	Continuous	Building, Planning and Fire
WF-22	Wildfires	Public Education and Awareness	Develop plans for evacuation or sheltering in place of Ross and Branson school children in the event of a wildfire emergency so that streets are not overloaded near schools by students evacuating and parents attempting to pick up their children, which may restrict access by emergency vehicles.	Moderate	Low	12-18 months	Fire

Appendices

TOWN OF ROSS

RESOLUTION NO. 1758

A RESOLUTION OF THE ROSS TOWN COUNCIL ADOPTING A LOCAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Ross is subject to various earthquake-related hazards such as ground shaking, liquefaction and landsliding; and

WHEREAS, the Town of Ross is subject to various weather-related hazards including wildfires, floods, and landslides; and

WHEREAS, the Town of Ross seeks to reduce the potential loss of life, property damage, and environmental degradation from natural disasters, while accelerating economic recovery from those disasters; and

WHEREAS, the Town of Ross is committed to increasing the disaster resistance of the infrastructure, health, housing, economy, government services, education, environment, and land use systems in the Town; and

WHEREAS, the federal Disaster Mitigation Act of 2000 requires all cities, counties, and special districts to have adopted a Local Hazard Mitigation Plan to receive disaster mitigation funding from FEMA;

NOW, THEREFORE, BE IT RESOLVED, that:

1. The Town Council of the Town of Ross has considered the potential environmental effects of the project and has determined the project to be exempt from environmental review under the California Environmental Quality Act pursuant to the following sections: 1.) Section 15061(b)(3), CEQA applies only to projects which have the potential for causing a significant effect on the environment; 2.) Section 15262, feasibility and planning studies; and Section 15306, basic data collection and research for information gathering purposes.

2. The Town Council of the Town of Ross adopts the Town of Ross Local Hazard Mitigation Plan dated January 12, 2012, as its local hazard mitigation plan.

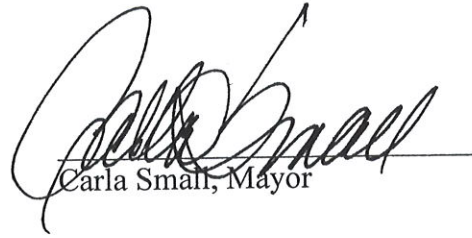
The foregoing resolution was duly and regularly adopted by the Ross Town Council at its regular meeting held on the 12th day of January 2012 by the following vote:

AYES: Council Members Small, Hunter, Martin, Russell, Strauss

NOES:

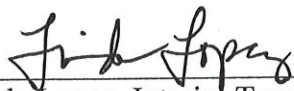
ABSENT:

ABSTAIN:



Carla Small, Mayor

ATTEST:



Linda Lopez, Interim Town Clerk

Stakeholders

The following stakeholders were contacted during the planning process:

Diane Rudden, President
Ross Property Owners Association
PO Box 747
Ross, CA 94957

The Rev. Chris Rankin-Williams
St. John's Episcopal Church
PO Box 217
Ross, CA 94957

Lise Stampfli Torme, President
Ross Valley Flood Mitigation League
PO Box 2845
San Anselmo, CA 94979

Pam Riley, Director
Ross Recreation
PO Box 117
Ross, CA 94945

Sandra Guldman, President
Friends of Corte Madera Creek
PO Box 415
Larkspur, CA 94977

Jay Tasho, Manager
Lagunitas Country Club
PO Box 1367
Ross, CA 94945

David Peery
MMWD Engineering
220 Nellen Ave.
Corte Madera, CA 94925

Carrie Harrington, Communications Manager
Marin Humane Society
171 Bel Marin Keys Blvd.
Novato, CA 94949

Tom Cronin, S&W Division Manager
MMWD Engineering
220 Nellen Ave.
Corte Madera, CA 94925

Patty Garbarino, President
Marin Sanitary Service
565 Jacoby Street
San Rafael, CA 94901

Patti Dullea, Superintendent
Ross School
PO Box 1058
Ross, CA 94957

Brett Richards, General Manager
Ross Valley Sanitary District
1301 Andersen Drive
San Rafael, CA 94901

Dr. Thomas W. Price, Head of School
The Branson School
PO Box 1662
Ross, CA 94945

Chris Kelley, CEO
Marin Art & Garden Center
P.O. Box 437
Ross, CA 94957

Nancy Neu, Principal
Redwood High School
395 Doherty Drive
Larkspur, CA 94939

Fire Chief Paul Smith, Jr.,
Kentfield Fire Protection District
1004 Sir Francis Drake Blvd
Kentfield, CA 94904

Debra Berry, Professional Standards
Marin County Sheriff's Office
3501 Civic Center Drive #145
San Rafael, CA 94903

Roger Meagor, Fire Chief
Ross Valley Fire Department
777 San Anselmo Ave
San Anselmo, CA 94960

Father Neal Healy, Pastor
St. Anselm Church
PO Box 1061
Ross, CA 94957

Debbie Stutsman, Town Manager
Town of San Anselmo
525 San Anselmo Avenue
San Anselmo, CA 94960

Joe Horak
Account Executive, Energy Solutions & Services
PG&E
111 Stony Circle
Santa Rosa, CA 95401

County of Marin
Department of Public Works
3501 Civic Center Drive Room#304
San Rafael, CA 94903

Dave Arkens, CFM
ISO/CRS Specialist
3233 Cutty Sark Street
Las Vegas, NV 89117

Ross Valley Sanitary District
2960 Kerner Boulevard
San Rafael, CA 94901

Town of Ross DMA Survey

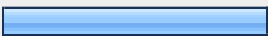
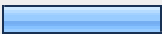
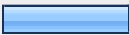
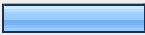
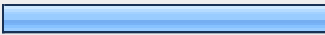
1. Zipcode of your residence:		
	Response Percent	Response Count
ZIP:	100.0%	82
answered question		82
skipped question		0

2. Internet Access?		
	Response Percent	Response Count
Yes	97.4%	75
No	2.6%	2
answered question		77
skipped question		5

3. Do you		
	Response Percent	Response Count
Own	96.3%	77
Rent	3.8%	3
Other	0.0%	0
answered question		80
skipped question		2

4. How concerned are you about the following disasters affecting your community?						
	Not Concerned	Somewhat Concerned	Moderately Concerned	Very Concerned	Rating Average	Response Count
Floods	10.0% (8)	16.3% (13)	25.0% (20)	48.8% (39)	3.13	80
Fire	7.4% (6)	13.6% (11)	35.8% (29)	43.2% (35)	3.15	81
Landslide	32.9% (26)	31.6% (25)	24.1% (19)	11.4% (9)	2.14	79
Earthquake	5.0% (4)	21.3% (17)	36.3% (29)	37.5% (30)	3.06	80
Telecommunications Failure	26.3% (21)	30.0% (24)	28.8% (23)	15.0% (12)	2.33	80
Agricultural	72.2% (57)	21.5% (17)	2.5% (2)	3.8% (3)	1.38	79
Severe Weather	32.5% (26)	33.8% (27)	23.8% (19)	10.0% (8)	2.11	80
Biological/Plant/Animal	62.8% (49)	20.5% (16)	12.8% (10)	3.8% (3)	1.58	78
Explosions	78.2% (61)	15.4% (12)	3.8% (3)	2.6% (2)	1.31	78
Utility Interruption	23.8% (19)	32.5% (26)	27.5% (22)	16.3% (13)	2.36	80
Terrorism	52.6% (41)	30.8% (24)	7.7% (6)	9.0% (7)	1.73	78
Radiation	64.6% (51)	24.1% (19)	10.1% (8)	1.3% (1)	1.48	79
Dam Failure	51.9% (41)	26.6% (21)	11.4% (9)	10.1% (8)	1.80	79
Economic Disruption	34.2% (27)	25.3% (20)	27.8% (22)	12.7% (10)	2.19	79
Special Events	71.6% (53)	21.6% (16)	4.1% (3)	2.7% (2)	1.38	74
Health Alert/Epidemic	39.2% (31)	38.0% (30)	17.7% (14)	5.1% (4)	1.89	79
Transportation Services	57.7% (45)	34.6% (27)	3.8% (3)	3.8% (3)	1.54	78
Water/Waste Water Loss	22.8% (18)	36.7% (29)	24.1% (19)	16.5% (13)	2.34	79
	answered question					81
	skipped question					1

5. What is the most effective way for you to receive information about how to make your household and home safer from natural disasters? (Please check all that apply.)

		Response Percent	Response Count
Newspaper		40.0%	32
Television news		23.8%	19
Television ads		3.8%	3
Radio news		18.8%	15
Radio ads		3.8%	3
Schools		8.8%	7
Town Council Meetings		21.3%	17
Mail		48.8%	39
Fire Department		26.3%	21
Internet		62.5%	50
Fact sheet/brochure		25.0%	20
Church/religious organization		1.3%	1
Employer		0.0%	0
Public meetings		21.3%	17
Utility Bills		8.8%	7
Email		88.8%	71
Post Office		32.5%	26
answered question			80
skipped question			2

6. In the following list, please check those activities that you:					
	Have done	Plan to do	Not done	Unable to do	Response Count
Attended meetings or received written information on natural disasters or emergency preparedness?	65.8% (52)	10.1% (8)	24.1% (19)	0.0% (0)	79
Talked with family members about what to do in case of a disaster or emergency?	66.3% (53)	15.0% (12)	18.8% (15)	0.0% (0)	80
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	37.5% (30)	40.0% (32)	22.5% (18)	0.0% (0)	80
Prepared a "Disaster Supply Kit" (extra food, water, medications, batteries, first aid items and other emergency supplies)?	48.1% (38)	31.6% (25)	20.3% (16)	0.0% (0)	79
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	19.0% (15)	13.9% (11)	65.8% (52)	1.3% (1)	79
	answered question				80
	skipped question				2

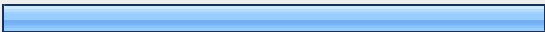
7. Building a disaster supply kit, receiving First Aid training and developing a household/family emergency plan are all inexpensive activities that require a personal time commitment. How much time (per year) are you willing to spend on disaster/emergency preparedness? (Please check only one.)

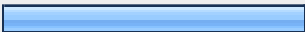
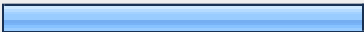
	Response Percent	Response Count
0-1 hour 	6.3%	5
2-3 hours 	40.5%	32
4-7 hours 	32.9%	26
8-15 hours 	8.9%	7
16+ hours 	3.8%	3
Other (please specify) 	7.6%	6
answered question		79
skipped question		3

8. Do you know how to shut off your (circle all that apply):

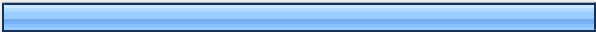
	Yes	No	Response Count
Electricity	80.0% (64)	20.0% (16)	80
Water	80.0% (64)	20.0% (16)	80
Gas	78.5% (62)	21.5% (17)	79
answered question			81
skipped question			1

9. Is your home at risk of flooding or earthquake damage? If so please answer Question 10 below.

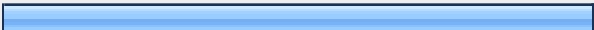
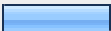
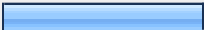
	Response Percent	Response Count
Yes 	82.3%	65
No 	17.7%	14
answered question		79
skipped question		3

10. Do you carry Flood Insurance?		
	Response Percent	Response Count
Yes 	45.5%	35
No 	54.5%	42
<i>answered question</i>		77
<i>skipped question</i>		5

11. Do you carry Earthquake Insurance?		
	Response Percent	Response Count
Yes 	26.3%	20
No 	73.7%	56
<i>answered question</i>		76
<i>skipped question</i>		6

12. Would you be willing to make your home more resistant to natural disasters?		
	Response Percent	Response Count
Yes 	89.7%	70
No 	10.3%	8
<i>answered question</i>		78
<i>skipped question</i>		4

**13. What nonstructural or structural modifications for earthquakes and floods have you made to your home?
(Please check all that apply.)**

		Response Percent	Response Count
Anchor bookcases, cabinets to wall		42.1%	32
Secure home to foundation		78.9%	60
Secure water heater to wall		89.5%	68
Brace inside of cripple wall with sheathing		48.7%	37
Install latches on drawers and cabinets		15.8%	12
Brace unreinforced chimney		17.1%	13
Fit gas appliances with flexible connections		59.2%	45
Brace unreinforced masonry, concrete walls and foundations		30.3%	23
None		3.9%	3
Other (please specify)		9.2%	7
answered question			76
skipped question			6

14. Natural and human-caused disasters can have a significant impact on a community but planning for these events can help lessen the impact. The following statement will help us determine community priorities for planning for those hazards. Please tell us how important each one is to you.

	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important	Response Count
Protecting private property	70.0% (56)	21.3% (17)	5.0% (4)	2.5% (2)	1.3% (1)	80
Protecting critical facilities (hospitals, transportation networks, fire stations)	91.1% (72)	7.6% (6)	1.3% (1)	0.0% (0)	0.0% (0)	79
Preventing development in hazard areas	55.1% (43)	24.4% (19)	20.5% (16)	0.0% (0)	0.0% (0)	78
Protecting natural environment	63.3% (50)	26.6% (21)	8.9% (7)	1.3% (1)	0.0% (0)	79
Protecting historical and cultural landmarks	38.0% (30)	39.2% (31)	15.2% (12)	6.3% (5)	1.3% (1)	79
Promoting cooperation among public agencies, citizens, non-profit organizations and businesses	62.0% (49)	30.4% (24)	5.1% (4)	1.3% (1)	1.3% (1)	79
Protecting and reducing damage to utilities	63.8% (51)	33.8% (27)	2.5% (2)	0.0% (0)	0.0% (0)	80
Strengthening emergency services (police, fire, ambulance)	59.5% (47)	27.8% (22)	12.7% (10)	0.0% (0)	0.0% (0)	79
	<i>answered question</i>					80
	<i>skipped question</i>					2

15. Please check the box that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.

	Agree	Neutral	Disagree	Not Sure	Response Count
I support a regulatory approach to reducing risk.	48.1% (38)	24.1% (19)	16.5% (13)	11.4% (9)	79
I support the Ross Valley Watershed Planning Project.	46.8% (36)	20.8% (16)	1.3% (1)	31.2% (24)	77
I support policies to prohibit development in areas subject to natural hazards.	74.7% (59)	13.9% (11)	6.3% (5)	5.1% (4)	79
I support the use of local tax dollars to reduce risks and losses from natural disasters.	63.3% (50)	21.5% (17)	6.3% (5)	8.9% (7)	79
I support protecting historical and cultural structures.	49.4% (39)	35.4% (28)	3.8% (3)	11.4% (9)	79
I would be willing to make my home more disaster-resistant.	71.8% (56)	21.8% (17)	5.1% (4)	1.3% (1)	78
I support steps to safeguard the local economy following a disaster event	59.0% (46)	29.5% (23)	7.7% (6)	3.8% (3)	78
I support improving the disaster preparedness of schools.	86.1% (68)	12.7% (10)	1.3% (1)	0.0% (0)	79
	answered question				80
	skipped question				2

Source Document List

Author	Title	Source	Date
Association of Bay Area Governments	Taming Natural Disasters/Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area	ABAG Publication Number: P09001EQK - Available online at quake.abag.ca.gov/mitigation	2010 update of 2005 plan
County of Marin	Marin County Operational Area Hazard Mitigation Plan	County of Marin Sheriff, Office of Emergency Services San Rafael, CA	Jul-08
FEMA	FEMA Repetitive Loss List	Town of Ross Building Department	
FEMA	Flood Insurance Study	Town of Ross Building Department	4-May-09
FEMA	FEMA Flood Insurance Rate, Panels 458, 456, 454, and 452, Map Nos. 06041C0454D, 06041C0452D, 06041C0458D and 06041C0456D	Town of Ross Building Department	4-May-09
Marin County Community Development Agency	Marin Countywide Plan	Marin County Community Development Agency	6-Nov-07
Marin County Department of Public Works	Ross Valley Flood Protection web site library www.marinwatersheds.org	Marin County Department of Public Works	
Marin County Department of Public Works	Hazardous Materials Area Plan	Marin County Department of Public Works, Waste Management Division	July 2008
MMWD	Phoenix Lake Dam Information	Email: Dana Roxon, MMWD	29-Mar-10
MMWD	2010 Urban Water Management Plan	http://www.marinwater.org/controller?action=menuclick&id=642	Jul-11
Ross School, Ross	Ross School district annex to ABAG Local Hazard Mitigation Plan	http://www.abag.ca.gov/bayarea/eqmaps/mitigation/RossSD-Annex.pdf	2-Apr-07
Ross Valley Sanitary District	Sewer System Replacement Master Plan	http://www.rvsd.org/about-us/planning-and-capital-improvements	Jan-07
Smeltzer, Matt, P.E., Geomorph Design	Final Draft Report: Planning-Level Hydrology and Hydraulics Study for Reducing Street Inundation and Overflow by Storm water; Bolinas Avenue in Ross and San Anselmo,	Town of Ross Planning Department	25-Jan-11

	California		
Author	Title	Source	Date
Stetson Engineers, Inc.	Capital Improvement Plan Study for Flood Damage Reduction and Creek Management in Flood Zone 9/Ross Valley	http://marinwatersheds.org/doc uments/CIPStudyReportMay201 1.pdf	May-11
Stetson Engineers, Inc.	Technical Memorandum No 1: Existing Conditions Analysis and Attachment A	Town of Ross	20-Oct-09
Town of Ross	Climate Action Plan	Town of Ross	Nov-10
Town of Ross	Town of Ross General Plan 2007 - 2025	Town of Ross Planning Department	2007
Town of Ross	Emergency Operations Plan	Town of Ross Fire Department	Dec-05
Town of Ross	Town of Ross General Plan	Town of Ross Planning Department	1988
Town of Ross	Town of Ross Municipal Code	Town of Ross	
Various	GIS Maps	Marinmap.org	